STANDARD PLANS

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SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS (Cont'd)		
SIGNAL, LIGHTING AND ELECTRICAL SYSTEMS - EXTINGUISHABLE MESSAGE SIGN, 10" LETTERS	ES-27B	278
SIGNAL, LIGHTING AND ELECTRICAL SYSTEMS - EXTINGUISHABLE MESSAGE SIGN AND FLASHING BEACONS	ES-28	279
SIGN ILLUMINATION - MERCURY SIGN ILLUMINATION EQUIPMENT	ES-29	280
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SIGN ILLUMINATION - SIGN ILLUMINATION EQUIPMENT	ES-32A	282
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Click on Desired Plan Sheet

(See "Cross Reference Listing" following the Index for cross referencing of old plan numbers to the new plan numbers used in this edition.)

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

REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
K. Hintzman
No. 14703
Exp. 3-31-93
CIVIL
STATE OF CALIFORNIA

A

AB	aggregate base
ABBC	asbestos bonded bituminous coated
ABM	air-blown mortar
Abn	abandon
Abut	abutment
AC	asphalt concrete
ACB	asphalt concrete base
ACP	asbestos cement pipe
AFES	alternative flared end section
Ahd	ahead
Adj	adjust
Alt	alternate
AP	alternative pipe
APC	alternative pipe culvert
APU	alternative pipe underdrain
AS	aggregate subbase
ASRP	aluminum spiral rib pipe
Assy	assembly
ATPB	asphalt treated permeable base
ATPM	asphalt treated permeable material
Ave	avenue

B

BB	beginning of bridge
BC	begin horizontal curve
BCR	begin curb return
Beg	begin
Bit Ctd	bituminous coated
Bk	back
Bkf	backfill
Bldg	building
Blvd	boulevard
BM	bench mark
Br	bridge
BVC	begin vertical curve
BW	barbed wire

C

CAA	cable anchor assembly
CAP	corrugated aluminum pipe
CAPA	corrugated aluminum pipe arch
CAS	construction area sign
C-C	center to center
CF	cubic foot
Chnl	channel
CIDH	cast-in-drilled-hole
CIP	cast iron pipe
CIPCP	cast-in-place concrete pipe
℄	centerline
CL	chain link
Cl	class
Clr	clear, clearance
Co	county
Col	column
Conc	concrete
Cond	conduit
Conn	connector
Const	construction)
Coord	coordinate
Cr	creek
CRSP	concreted rock slope protection
CSP	corrugated steel pipe
CSPA	corrugated steel pipe arch
CTB	cement treated base
CTPB	cement treated permeable base
CTPM	cement treated permeable material
Culv	culvert
CY	cubic yard

D

D	depth
Dbl	double
DD	downdrain
Del	delineator
Det	detour or detail
DF	Douglas Fir
DI	drainage inlet
Dia	diameter
Dist	distance
DMBB	double metal beam barrier
Dr	drive
DTBB	double thrie beam barrier
Dwy	driveway

E

EA	each
Ease	easement
EB	end of bridge or eastbound
EC	end horizontal curve
ECR	end curb return
ED	edge drain
EDC	edge drain cleanout
EDO	edge drain outlet
EDV	edge drain vent
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	expressway
Exp Jt	expansion joint

F

F & C	frame and cover
Fdn	foundation
FEBT	facing eastbound traffic
FNBT	facing northbound traffic
FSBT	facing southbound traffic
FWBT	facing westbound traffic
FES	flared end section
FF	filter fabric
F & G	frame and grate
FG	finished grade
FH	fire hydrant
FL	flow line
Fr Rd	frontage road
Ft	foot or feet
Ftg	footing
Fwy	freeway

G

Ga	gage
GAL	gallon
Galv	galvanized
GP	grading plane
GR	guard railing
GSP	galvanized steel pipe

H

H	height
HD	horizontal drain
Horiz	horizontal
HP	hinge point or horsepower
HS	high strength
HW	headwall
Hwy	highway

I

IB	imported borrow
ID	inside diameter
Inv	invert
Irr	irrigation

J

JP	joint pole
JS	junction structure
Jt	joint

L

L	length
LB	pound
LCB	lean concrete base
LF	linear foot
Loc	location
LOL	layout line
Ln	lane
LS	lump sum
Lt	left

M

Max	maximum
MB	metal beam
MBB	metal beam barrier
MBGR	metal beam guard railing
Med	median
MH	manhole
Mi	mile(s)
Mkr	marker
MFBM	thousand foot board measure
Min	minimum
Misc I&S	miscellaneous iron and steel
Misc	miscellaneous
Mod	modified or modify
Mon	monument
MP	metal plate
MPGR	metal plate guard railing
MR	movement rating
Mtl	material

N

NB	northbound
No	number

O

Oblr	obliterate
OC	overcrossing
OD	outside diameter
OG	original ground
OGAC	open graded asphalt concrete
OH	overhead

P

PAP	perforated aluminum pipe
PB	pull box
PC	point of curvature
PCC	point of compound curve or portland cement concrete
PCP	perforated concrete pipe
PCVC	point of compound vertical curve
Ped	pedestrian
Ped OC	pedestrian overcrossing
Ped UC	pedestrian undercrossing
Perm Mtl	permeable material
PG	profile grade
PI	point of intersection
PL, P/L	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
PPP	perforated plastic pipe
PPL	preformed permeable liner
PRC	point of reverse curve
PRF	pavement reinforcing fabric
PRVC	point of reverse vertical curve
PSP	perforated steel pipe
PVC	polyvinyl chloride
Pvmt	pavement

R

R	radius
RCA	reinforced concrete arch
RCB	reinforced concrete box
RCP	reinforced concrete pipe
RCPA	reinforced concrete pipe arch
R & D	remove and dispose
Rd	road
Reinf	reinforced or reinforcing
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

S

SAE	structure approach embankment
Salv	salvage
SAPP	structural aluminum plate pipe
SB	southbound
SC	sand cushion
℄	station line
SCSP	slotted corrugated steel pipe or sacked concrete slope protection
SD	storm drain; structural section drain; subgrade drain
Sec	section
Sep	separation
SG	subgrade
Shld	shoulder
Sht	sheet
SM	selected material
Spec	special
SPP	slotted plastic pipe
SQFT	square foot
SQYD	square yard
SS	slope stake
SSBM	strap and saddle bracket method
SSPA	structural steel plate arch
SSPP	structural steel plate pipe
SSPPA	structural steel plate pipe arch
SSRP	steel spiral rib pipe
St	street
STA, Sta	station
STBB	single thrie beam barrier
Std	standard
Str	structure
Surf	surfacing
SW	sidewalk or sound wall
Swr	sewer

T

T	semi-tangent
TAB	tablet
TBB	thrie beam barrier
Tbr	timber
TC	top of curb
TCB	traffic control box
Temp	temporary
TG	top of grate
TP	telephone pole
TPB	treated permeable base
TPM	treated permeable material
Trans	transition
TS	traffic signal or tubular steel
Typ	typical
Typ Sec	typical section

U

UC	undercrossing
UD	underdrain
UP	underpass

V

V	design speed, valve
Var	variable
VC	vertical curve
VCP	vitrified clay pipe
Vert	vertical
Via	viaduct

W

W	width
WB	westbound
WH	weep hole
WM	wire mesh
WSP	welded steel pipe
WV	water valve
WW	wing wall

X

Xing	crossing
X Sec	cross section

STATE OF CALIFORNIA
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ABBREVIATIONS

STD. PLAN A10A

A10A

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EXISTING TOPOGRAPHIC LINES AND SYMBOLS

- Building
- Foundation or Ruin
- Shoulder
- Surfaced Road with Lane Stripe
- Curb without Gutter
- Curb with Gutter
- Gravel or Dirt Road Drives or Walks
- Trail
- Railroad
- Bridge
- Culvert and Headwalls
- Fence and Gate
- Retaining Wall with Fence on Top
- Wall
- Median Barrier
- Guard Rail
- Small Stream or Ditch
- Large Body of Water
- Small Body of Water
- Vineyard (Show row direction)
- Orchard, Missing Tree, Interior Trees
- Tree
- Trees
- Ground Cover
- Freeway Signs (Overhead): 2 Posts, 1 Post
- Roadside Signs (New & Existing): 2 Posts, 1 Post
- Transmission Tower
- Fire Hydrant
- Power Pole (New & Existing)
- Utility Pole (New & Existing)
- Stand Pipe, Flagpole, Pullbox, Windmill, Well, Crash Cushion, Valve Cover
- Aerial Photo Center

CONTROL POINTS

- Horizontal and Vertical Control Point
- Horizontal Control Point
- Vertical Control Point
- Bench Mark

NEW CONSTRUCTION AND CADASTRAL SYMBOLS

- ℄ or LOL (9, 260, 1): Centerline, Station Line, Layout Line
- R/W: Right of Way Line
- Toe of Slope, C F, Top of Cut: Slope Line
- OG: Original Ground Line
- State, County, City, Forest, Subdivision, Section, Grant, Rancho: Boundary Line
- Structure (Bridge)

Underground Utilities

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

- Existing Wall
- New Wall (Face of Wall-LOL)
- Existing Guard Railing
- New Guard Railing
- Concrete Barrier
- Double Metal Beam Barrier, Double Thrie Beam Barrier
- Curb without Gutter
- Curb with Gutter
- Fence
- Ditch Flow Line
- Dike and Overside Drain (AC Dike, AC Overside Drain, Downdrain)
- Pipe Culvert (36" or less in diameter) (Pipe Inlet, Drainage Inlet, Flared End Section)
- Pipe Culvert (greater than 36" in diameter) (Headwall, Endwall)
- Railroad

STATE OF CALIFORNIA
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SYMBOLS

NO SCALE

A10B

STD. PLAN A10B

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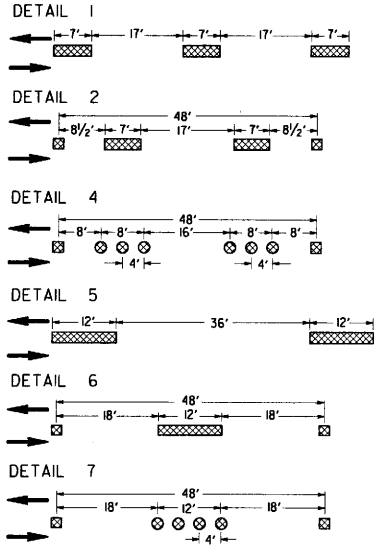
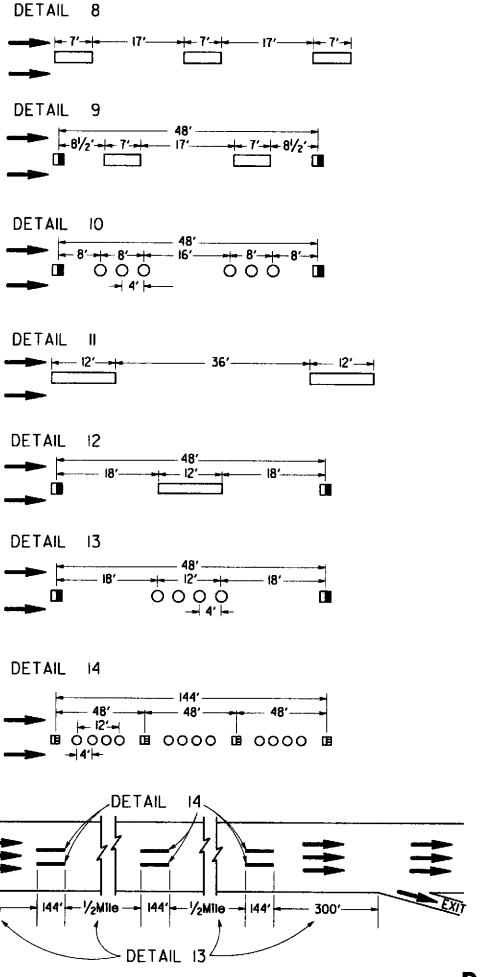
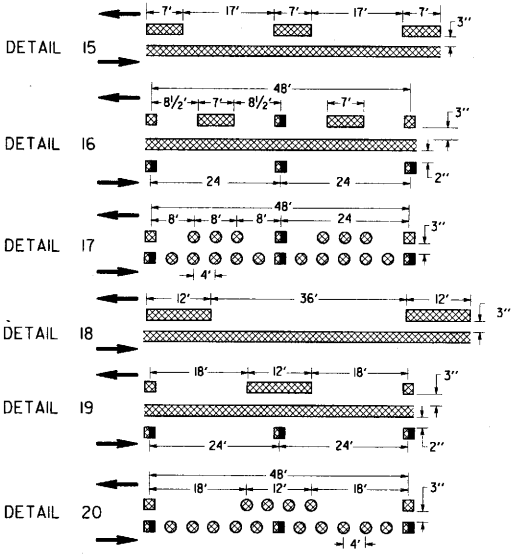
CENTERLINES
(2 LANE HIGHWAYS)



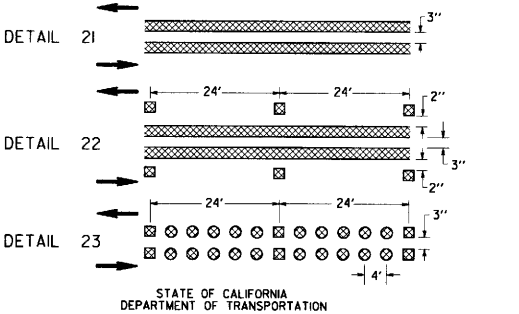
LANELINES
(MULTILANE HIGHWAYS)



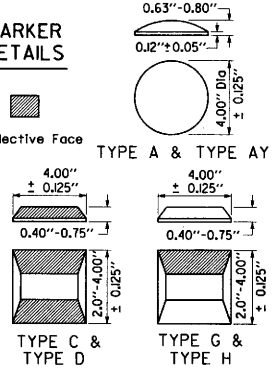
NO PASSING ZONES-ONE DIRECTION



NO PASSING ZONES-TWO DIRECTIONS



MARKER DETAILS



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

NOTES

1. Minimum projected area of reflective face = 1.00 square inch
2. Reflective markers need not be rectangular
3. Detail 3 deleted

STATE OF CALIFORNIA
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PAVEMENT MARKERS AND TRAFFIC LINES TYPICAL DETAILS

NO SCALE

A20A

STD. PLAN A20A

3

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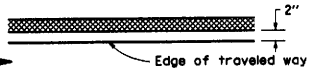
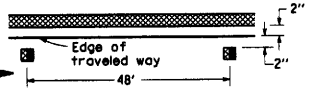
LEFT EDGELINES
(Divided Highways)

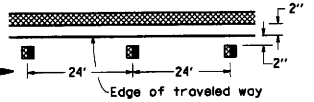
DETAIL 24



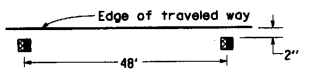
DETAIL 25



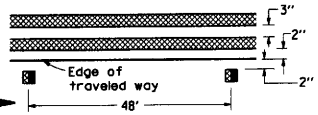
DETAIL 25A



DETAIL 26

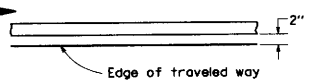


DETAIL 27



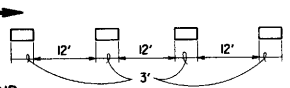
RIGHT EDGELINE

DETAIL 27B



RIGHT EDGELINE EXTENSION THROUGH INTERSECTIONS

DETAIL 27C



LEGEND

MARKERS

- TYPE D Two-way Yellow Reflective
- TYPE AY Yellow Non-reflective
- TYPE H One-way Yellow Reflective

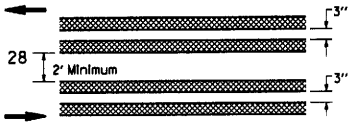
LINES

- 4" White
- 4" Yellow

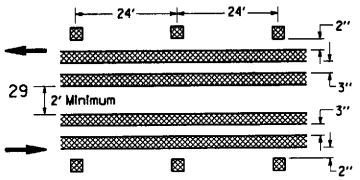
Direction of Travel

MEDIAN ISLANDS

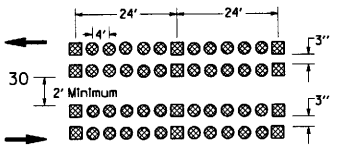
DETAIL 28



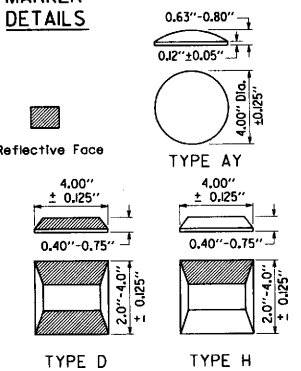
DETAIL 29



DETAIL 30



MARKER DETAILS

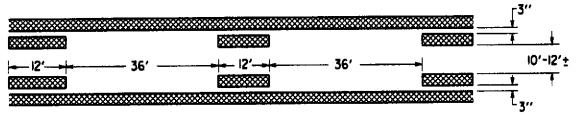


NOTES

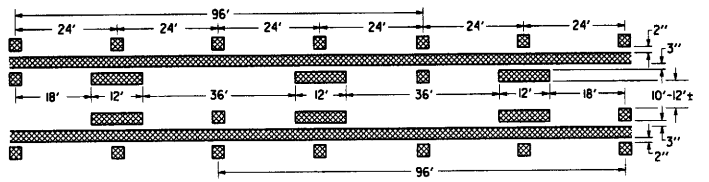
1. Minimum projected area of reflective face = 1.00 square inch
2. Reflective marker need not be rectangular
3. Detail 27A deleted

TWO-WAY LEFT TURN LANES

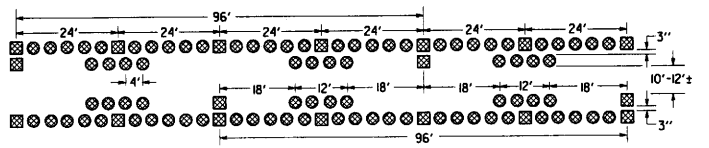
DETAIL 31



DETAIL 32

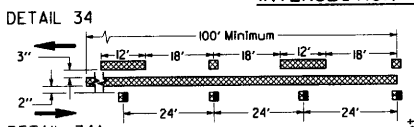


DETAIL 33

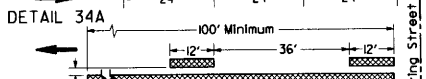


INTERSECTION TREATMENTS

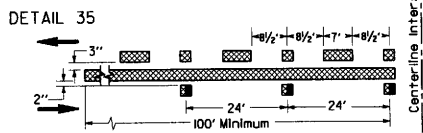
DETAIL 34



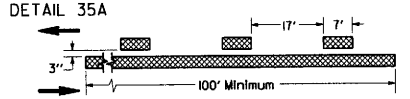
DETAIL 34A



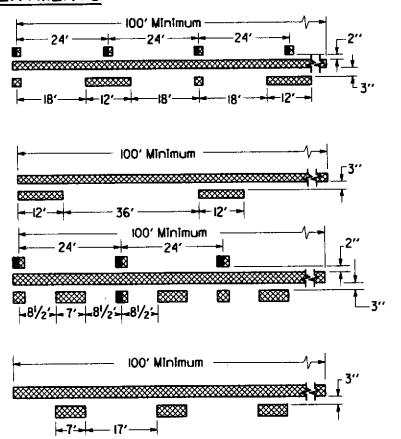
DETAIL 35



DETAIL 35A



Centerline Intersecting Street



STATE OF CALIFORNIA
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PAVEMENT MARKERS AND TRAFFIC LINES TYPICAL DETAILS

NO SCALE

A20B

STD. PLAN A20B

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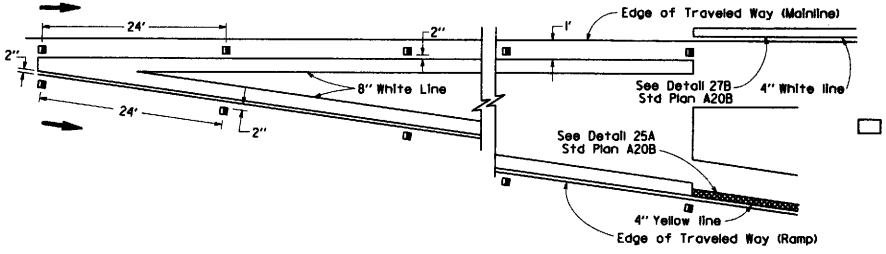
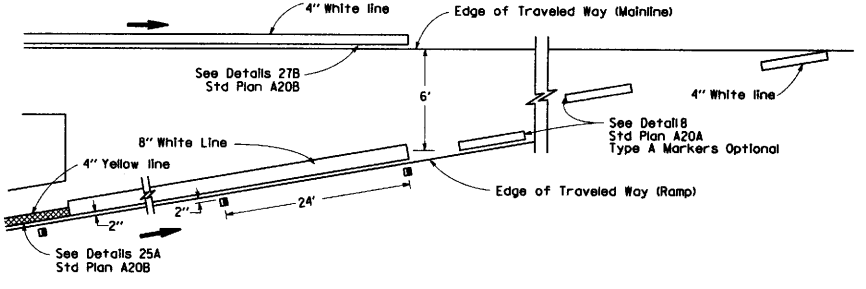
EXIT RAMP NEUTRAL AREA (GORE) TREATMENT

DETAIL 36



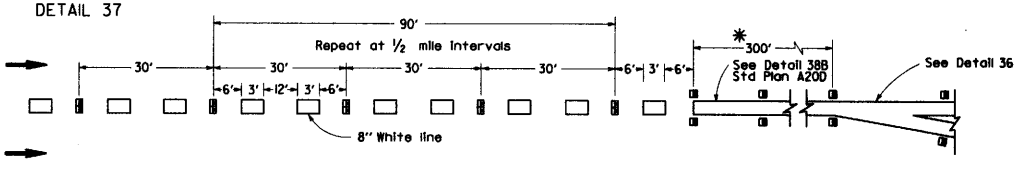
ENTRANCE RAMP NEUTRAL AREA (GORE) TREATMENT

DETAIL 36A

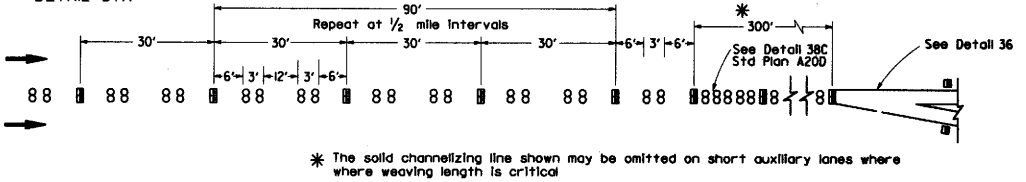


LANE DROP AT EXIT RAMPS

DETAIL 37



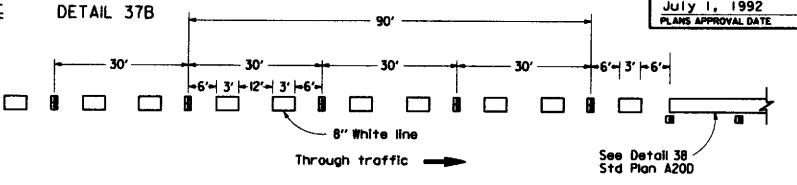
DETAIL 37A



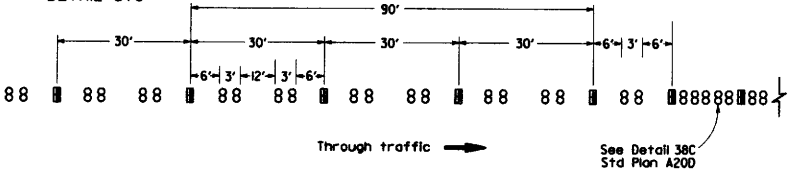
* The solid channelizing line shown may be omitted on short auxiliary lanes where where weaving length is critical

LANE DROP AT INTERSECTIONS

DETAIL 37B



DETAIL 37C

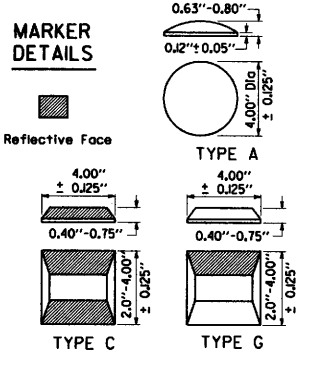


LEGEND

MARKERS

- TYPE A White Non-reflective
- TYPE C Red-clear Reflective
- TYPE G One-way Clear Reflective
- Direction of Travel

MARKER DETAILS



NOTES

1. Minimum projected area of reflective face = 1.00 square inch
2. Reflective markers need not be rectangular

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PAVEMENT MARKERS AND TRAFFIC LINES TYPICAL DETAILS

NO SCALE

A20C

STD. PLAN A20C

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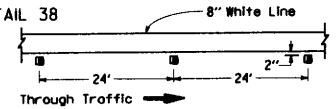
REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

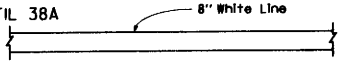
REGISTERED PROFESSIONAL ENGINEER
P. Lowden Jr.
No. 12284
Exp. 3-31-93
CIVIL
STATE OF CALIFORNIA

CHANNELIZING LINE

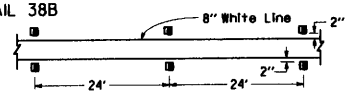
DETAIL 38



DETIL 38A



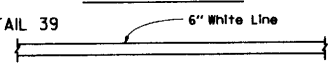
DETAIL 38B



DETAIL 38C

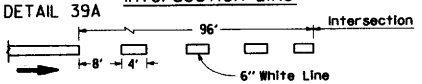
BIKE LANE LINE

DETAIL 39



BIKE LANE
Intersection Line

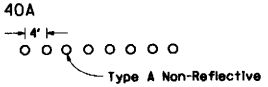
DETAIL 39A



LANE LINE EXTENSIONS THROUGH INTERSECTIONS

DETAIL 40

DETAIL 40A

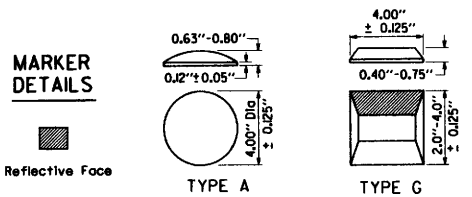


LEGEND

MARKERS

- TYPE A White Non-reflective
- TYPE G One-way Clear Reflective
- Direction of Travel

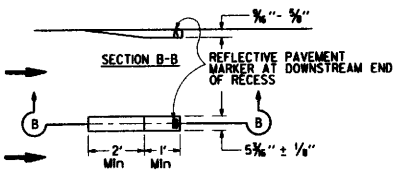
MARKER DETAILS



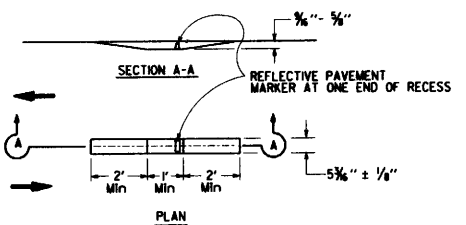
NOTES

1. Minimum projected area of reflective face = 1.00 square inch
2. Reflective markers need not be rectangular
3. See typical traffic line details for marker patterns to be used with recessed pavement markers. Detail 14 requires a Type 2 recess.

RECESS DETAIL FOR REFLECTIVE PAVEMENT MARKER

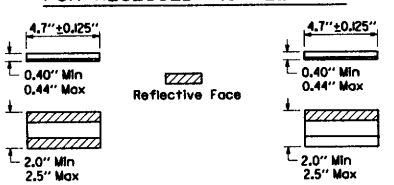


ONE-WAY TRAFFIC
(TYPE 1)



TWO-WAY TRAFFIC
(TYPE 2)

REFLECTIVE PAVEMENT MARKER FOR RECESSED INSTALLATION



TYPE C & TYPE D TYPE G & TYPE H

See Note 3

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PAVEMENT MARKERS AND TRAFFIC LINES TYPICAL DETAILS

NO SCALE

A20D

STD. PLAN A20D

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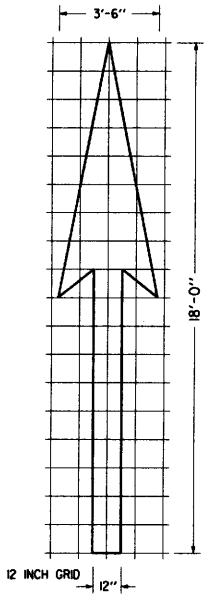
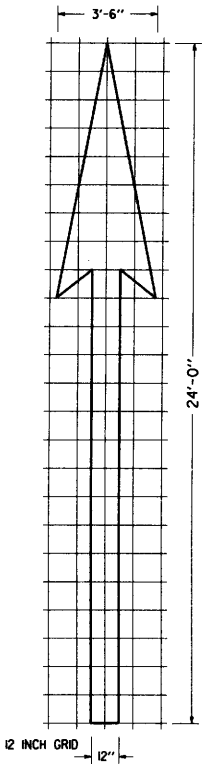
REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

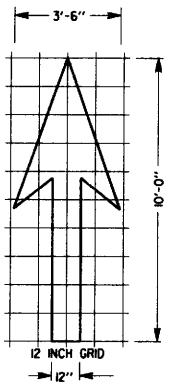
REGISTERED PROFESSIONAL ENGINEER
P. Lowden Jr.
No. 12284
Exp. 3-31-93
CIVIL
STATE OF CALIFORNIA



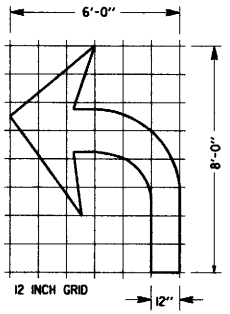
A=25 SQFT
TYPE I(18) ARROW



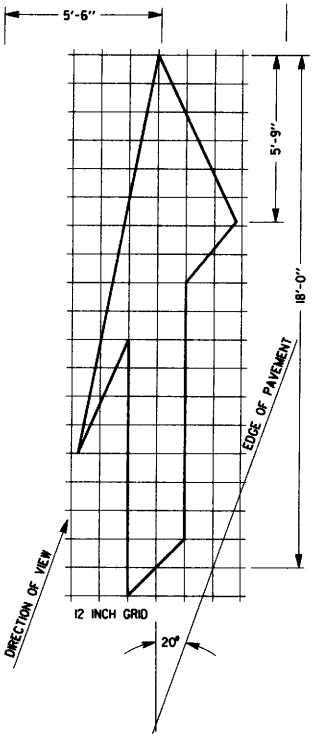
A=31 SQFT
TYPE I(24) ARROW



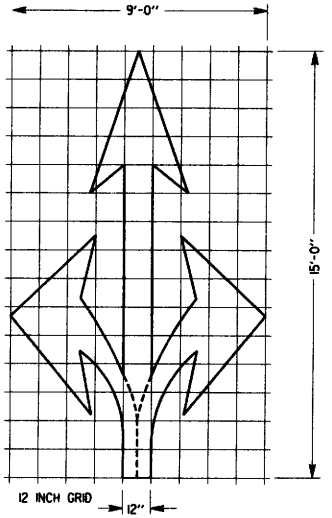
A=14 SQFT
TYPE I(10) ARROW



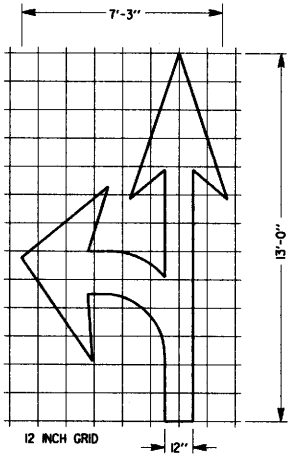
A=15 SQFT
TYPE IV (L) ARROW
(FOR TYPE IV(R) ARROW, USE MIRROR IMAGE)



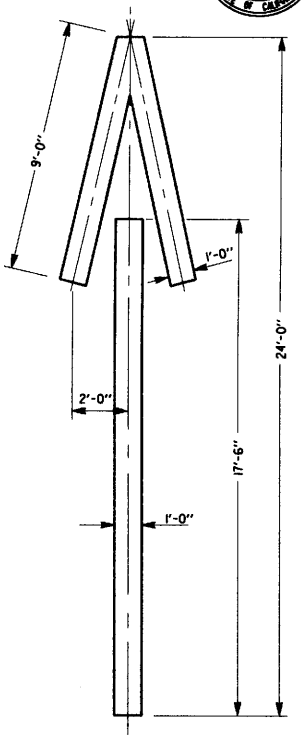
A=42 SQFT
TYPE VI ARROW
RIGHT LANE DROP ARROW
(FOR LEFT LANE, USE MIRROR IMAGE



A=36 SQFT
TYPE VIII ARROW



A=27 SQFT
TYPE VII(L) ARROW
(FOR TYPE VII(R) ARROW, USE MIRROR IMAGE)



A=33 SQFT
TYPE V ARROW

NOTE:

MINOR VARIATIONS IN DIMENISONS MAY BE ACCEPTED BY THE ENGINEER.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PAVEMENT MARKINGS ARROWS

NO SCALE

A24A

STD. PLAN A24A

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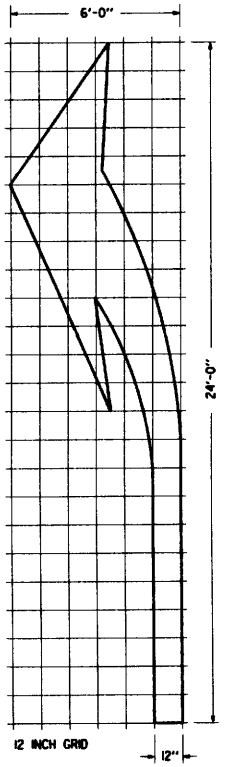
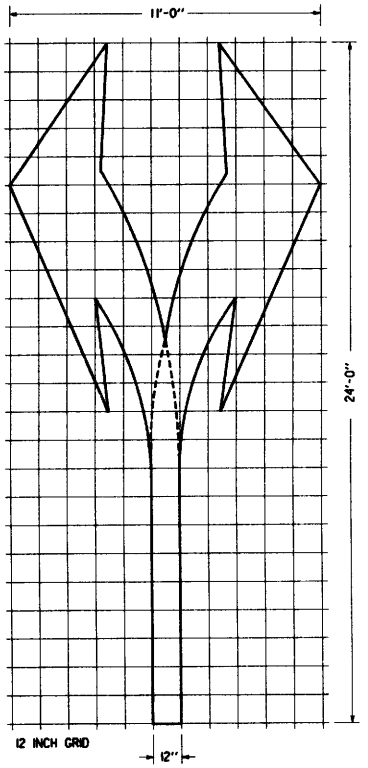
REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

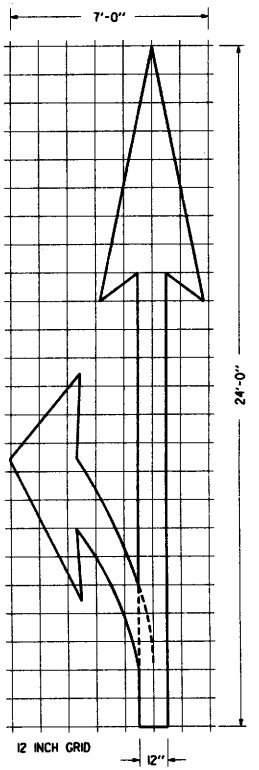
REGISTERED PROFESSIONAL ENGINEER
P. Lowden Jr.
No. 12284
Exp. 3-31-93
CIVIL
STATE OF CALIFORNIA



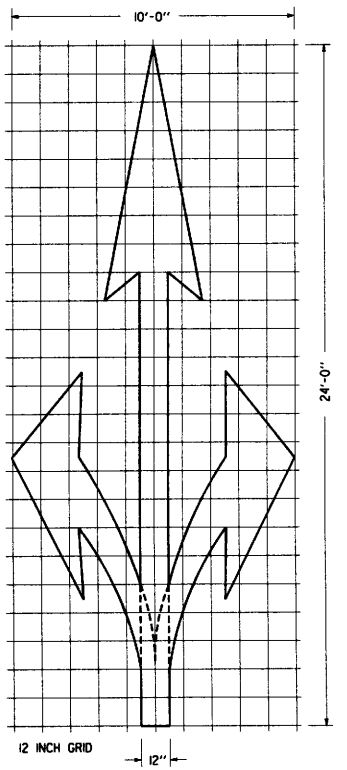
A=42 SQFT
TYPE III (L) ARROW
(FOR TYPE III (R) USE MIRROR IMAGE)



A=73 SQFT
TYPE III (B) ARROW



A=45 SQFT
TYPE II (L) ARROW
(FOR TYPE II (R) USE MIRROR IMAGE)



A=59 SQFT
TYPE II (B) ARROW

NOTE

MINOR VARIATIONS IN DIMENISONS
MAY BE ACCEPTED BY THE ENGINEER.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PAVEMENT MARKINGS
ARROWS

NO SCALE

A24B

STD. PLAN A24B

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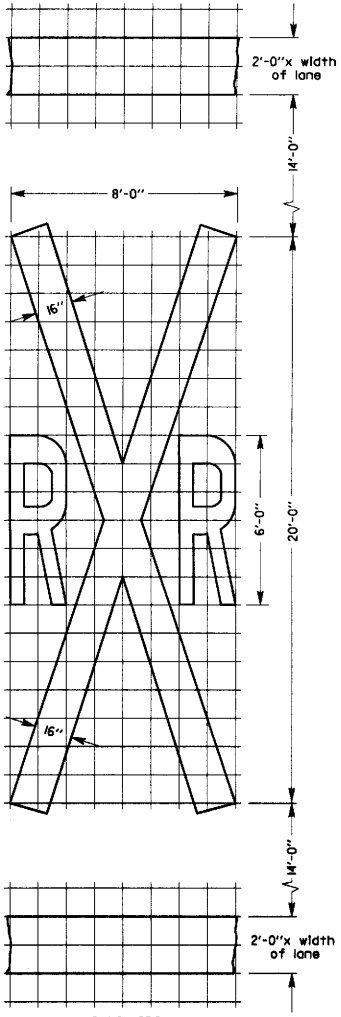
REGISTERED CIVIL ENGINEER

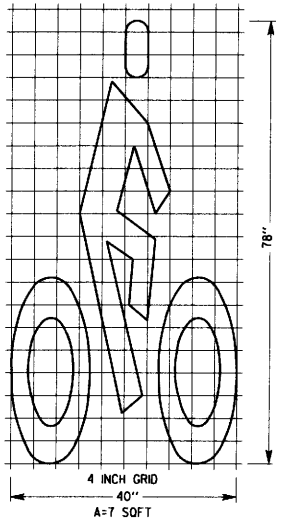
July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
P. Lowden Jr.
No. 12284
Exp. 3-31-93
CIVIL
STATE OF CALIFORNIA

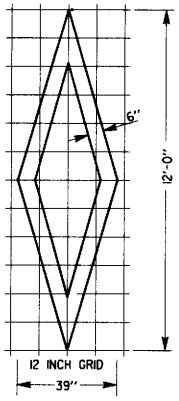


12 INCH GRID
A=70 SQFT*
RAILROAD CROSSING SYMBOL

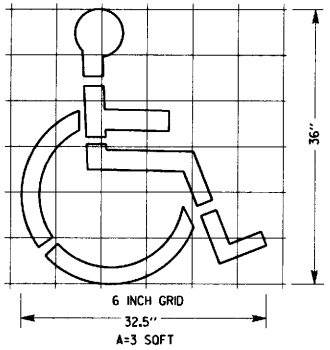
*70 SQFT DOES NOT INCLUDE THE 2'x0"xVARIABLE WIDTH TRANSVERSE LINES.



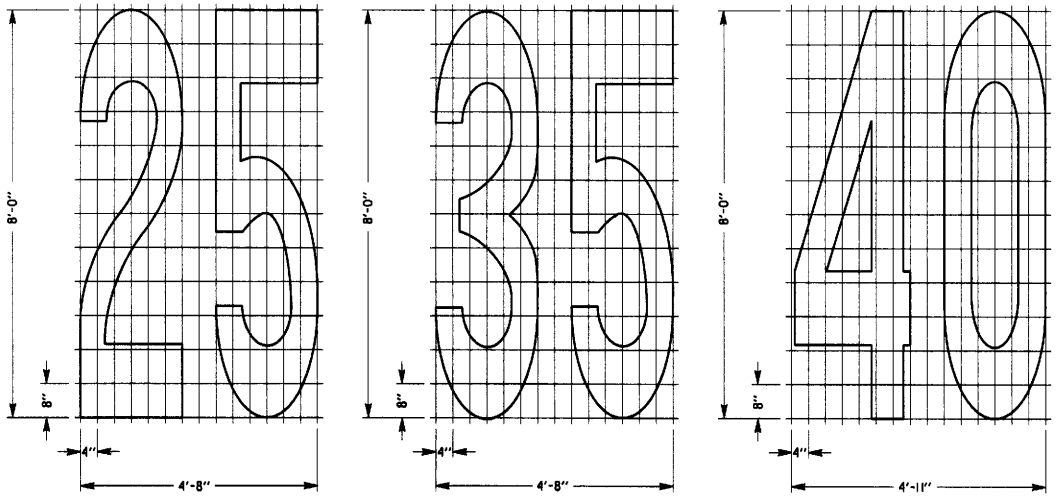
A=7 SQFT
BIKE LANE SYMBOL



A=11 SQFT
DIAMOND SYMBOL



A=3 SQFT
HANDICAPPED PARKING SYMBOL



A=17.5 SQFT
A=16.5 SQFT
A=19.5 SQFT
NUMERALS

NOTE

MINOR VARIATIONS IN DIMENISONS MAY BE ACCEPTED BY THE ENGINEER.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PAVEMENT MARKINGS SYMBOLS AND NUMERALS

NO SCALE

A24C

STD. PLAN A24C

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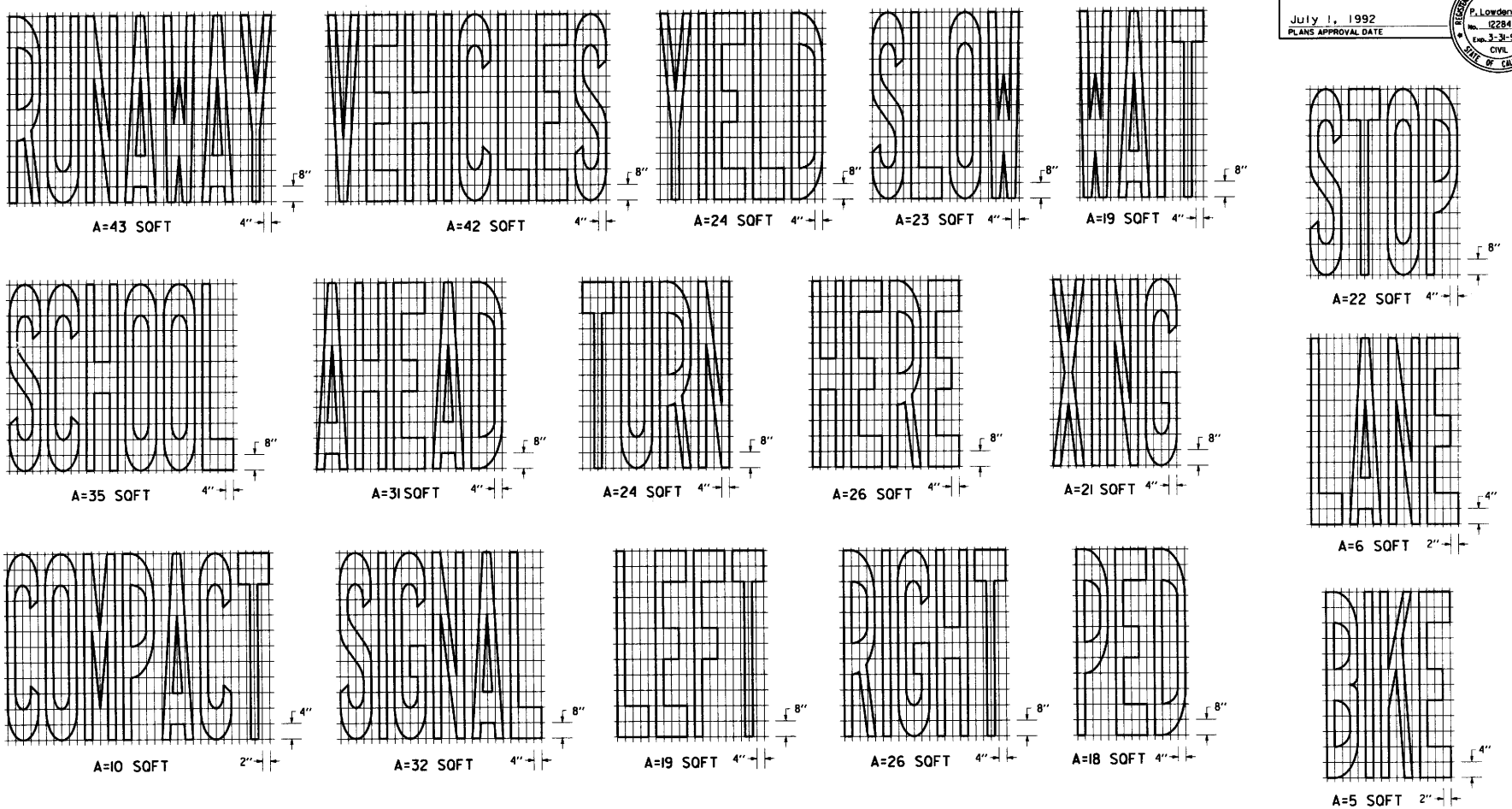
M Lowden Jr.
REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
P. Lowden Jr.
No. 12284
Exp. 3-31-93
CIVIL
STATE OF CALIFORNIA



NOTES

(1) If a message consists of more than one word, it should read "UP", i.e., the first word should be nearest the driver.

(2) The space between words should be at least four times the height of the characters for low speed roads, but not more than ten times the height of the characters. The space may be reduced appropriately where there is limited space because of local conditions.

(3) Minor variations in dimensions may be accepted by the Engineer.

(4) Portions of a letter, number or symbol may be separated by connecting segments not to exceed 2" in width.

WORD MARKINGS

ITEM	SQFT	ITEM	SQFT	ITEM	SQFT	ITEM	SQFT
XING	21	YIELD	24	BIKE	5	PED	18
AHEAD	31	SCHOOL	35	SLOW	23	COMPACT	10
WAIT	19	SIGNAL	32	STOP	22	RUNAWAY	43
LANE	6	TURN	24	LEFT	19	VEHICLES	42
RIGHT	26	HERE	26				

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PAVEMENT MARKINGS WORDS

NO SCALE

A24D

STD. PLAN A24D

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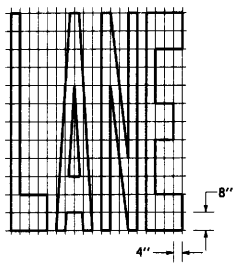
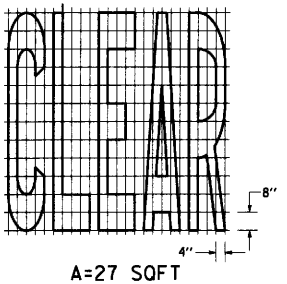
PLANS APPROVAL DATE

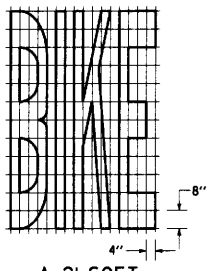
REGISTERED PROFESSIONAL ENGINEER
P. Lowden Jr.
No. 12284
Exp. 3-31-93
CIVIL
STATE OF CALIFORNIA



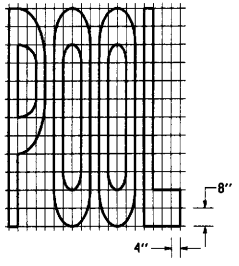
A=24 SQFT



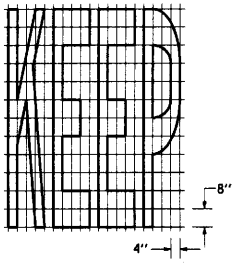
A=27 SQFT



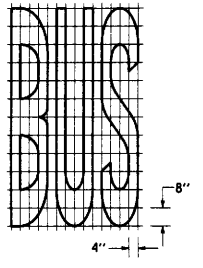
A=21 SQFT



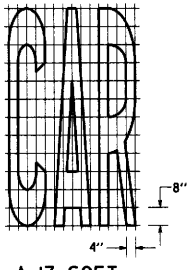
A=23 SQFT



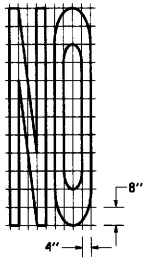
A=24 SQFT



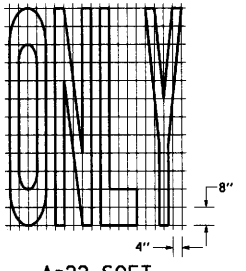
A=20 SQFT



A=17 SQFT



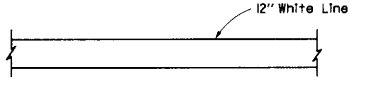
A=5 SQFT



A=22 SQFT

CROSSWALK AND LIMIT LINE

See Note 5



WORD MARKINGS			
ITEM	SQFT	ITEM	SQFT
LANE	24	NO	5
POOL	23	BIKE	21
CAR	17	BUS	20
CLEAR	27	ONLY	22
KEEP	24		

NOTES

(1) If a message consists of more than one word, it should read "UP", i.e., the first word should be nearest the driver.

(2) The space between words should be at least four times the height of the characters for low speed roads, but not more than ten times the height of the characters. The space may be reduced appropriately where there is limited space because of local conditions.

(3) Minor variations in dimensions may be accepted by the Engineer.

(4) Portions of a letter, number or symbol may be separated by connecting segments not to exceed 2" in width.

(5) Crosswalks contiguous to school grounds are to be 12" yellow lines in place of 12" white shown.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PAVEMENT MARKINGS WORDS AND CROSSWALKS

NO SCALE

A24E

STD. PLAN A24E

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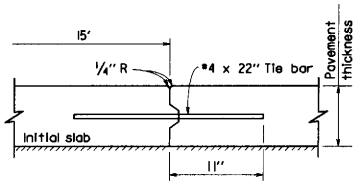
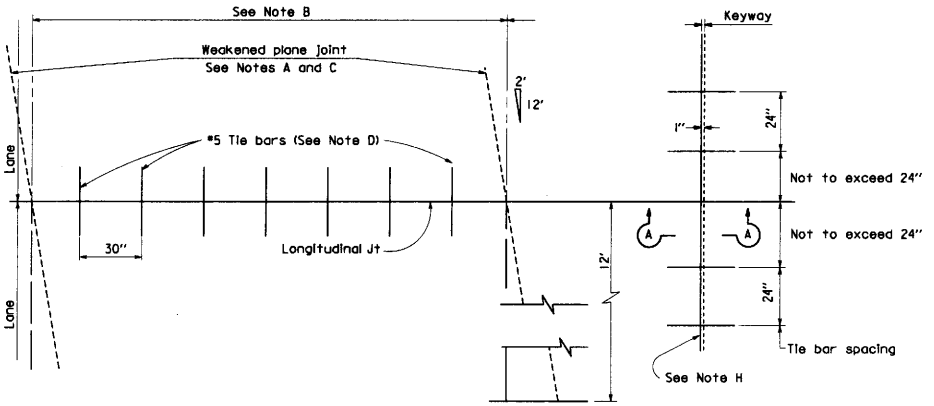
REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

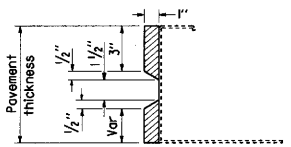
REGISTERED PROFESSIONAL ENGINEER K. Mori No. 14733 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA



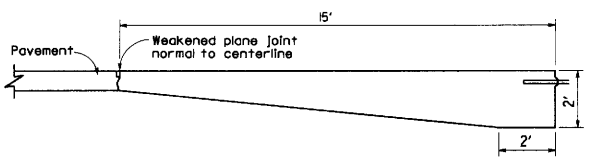
SECTION A-A
TRANSVERSE CONTACT JOINT WITH KEYWAY AND TIE BARS
See Note E



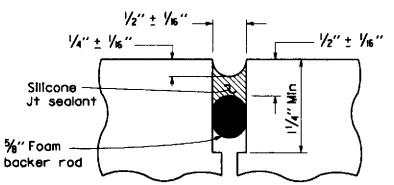
PLAN - PAVEMENT



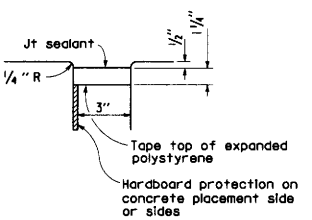
DETAIL OF METAL OR WOODEN INSERTS TO BE PLACED ON FORM



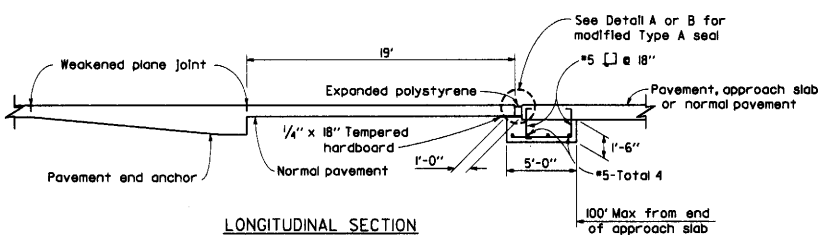
PAVEMENT END ANCHOR DETAIL
See Note F



JOINT DETAIL
All transverse and longitudinal joints

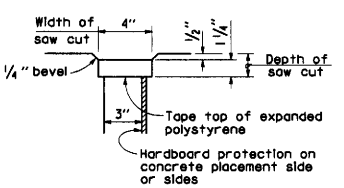


FORMED JOINT
DETAIL A



LONGITUDINAL SECTION

PAVEMENT PRESSURE RELIEF JOINT
See Note G



OPTIONAL SAW CUT
DETAIL B

NOTES

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.

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.

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

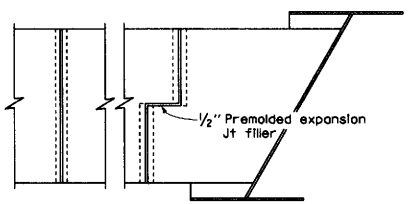
D. Install 30-inch long deformed #5 Tie Bars on 30-inch centers along all longitudinal adjoining PCC joints placed in the middle 1/3 depth of the slab.

E. 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.

F. Pavement end anchors shall be constructed as the terminal panels of all pavement not abutting existing pavement or structures, at pavement pressure relief joint, or elsewhere if ordered by the Engineer.

G. Pavement pressure relief joint to be used only when specified in the Special Provisions.

H. Transverse contact joint with keyway and tie bars shall be placed at least 5' from the location of any weakened plane joint.



NORMAL JOINT STAGGERED JOINT

PLAN

Pavement pressure relief joints when placed at ends of approach slabs.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PORTLAND CEMENT CONCRETE PAVING DETAILS

NO SCALE

A35A

STD. PLAN A35A

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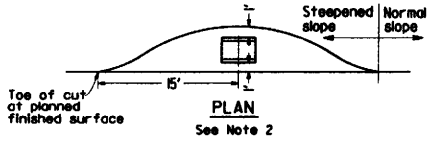
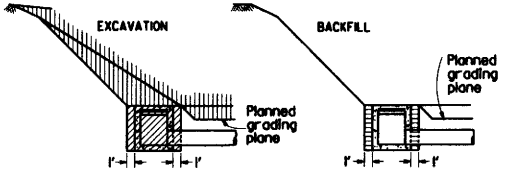
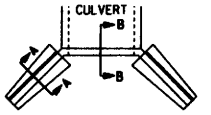


PLAN
See Note 2



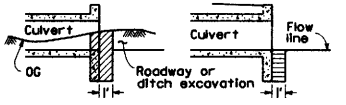
SECTION

RECESSES AT CULVERT INLETS



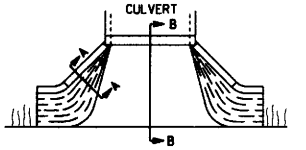
PLAN OF WING WALL

SECTION A - A

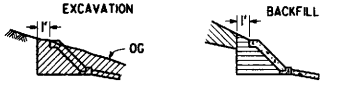


SECTION B - B

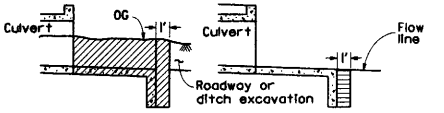
WING WALLS



PLAN OF WARPED WING WALL

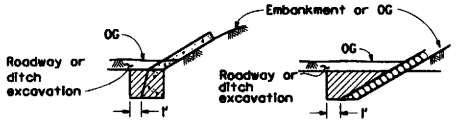


SECTION A - A

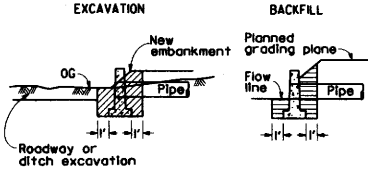


SECTION B - B

WARPED WING WALLS

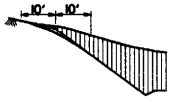


SLOPE PROTECTION
See Note 3



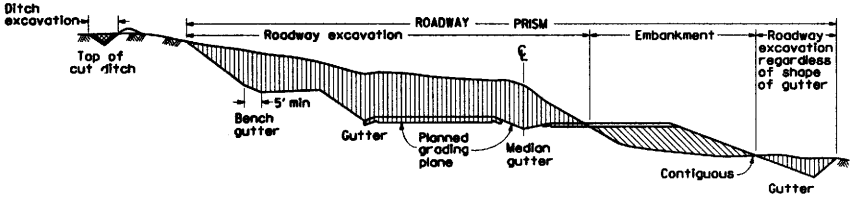
PIPE HEADWALLS

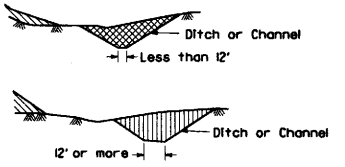
PAVED OR LINED DITCH



SLOPE ROUNDING

DIKE AND GUTTER





ROADWAY EXCAVATION - DITCH EXCAVATION

NOTES

1. This drawing indicates the work to be done and limits of payment for:
   - Roadway Excavation
   - Ditch Excavation
   - Structure Excavation for Slope Protection
2. Slopes and dimensions may vary to fit field conditions.
3. Top limit of structure excavation is original ground if ditch is not excavated.

LEGEND

- Structure Excavation
- Structure Backfill
- Ditch Excavation
- Slope Protection
- Roadway Excavation
- Roadway Embankment
- Original Ground

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

EXCAVATION AND BACKFILL MISCELLANEOUS DETAILS

NO SCALE

A62A

STD. PLAN A62A

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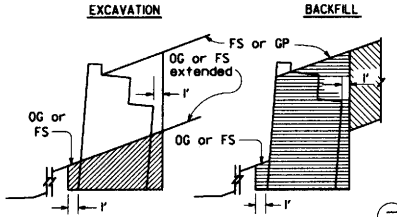
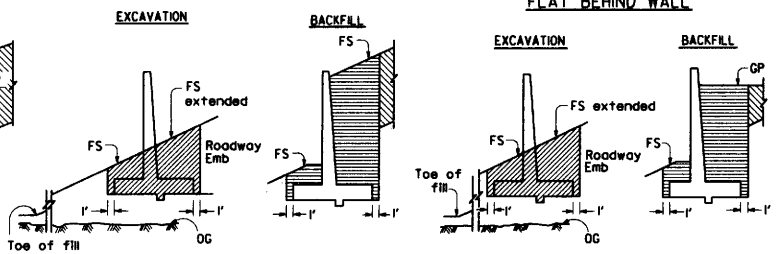
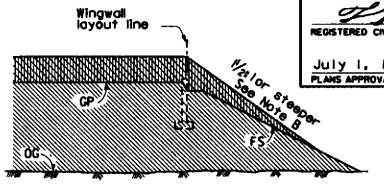


CRIB WALL, ON SLOPE



RETAINING WALL IN FILL, ON SLOPE

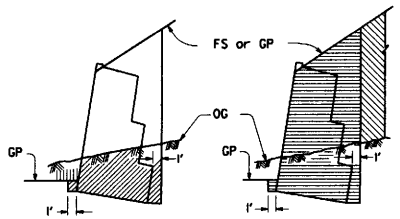


SECTION F-F

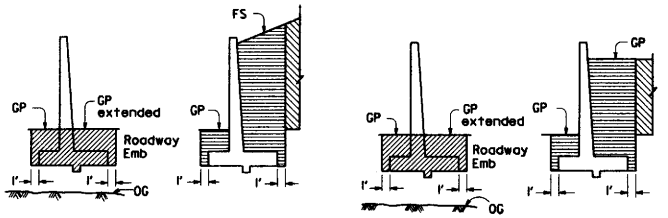
SURCHARGE NOTES

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

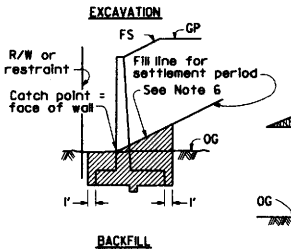
B. Surcharge slopes to be as steep as stability of material permits.

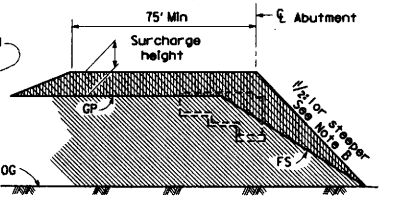


REINFORCED CONCRETE OR TIMBER CRIB WALL

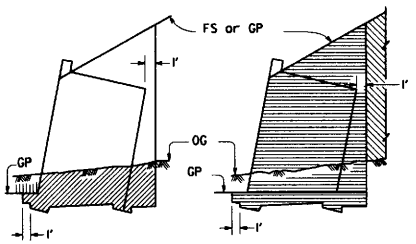


RETAINING WALL IN FILL

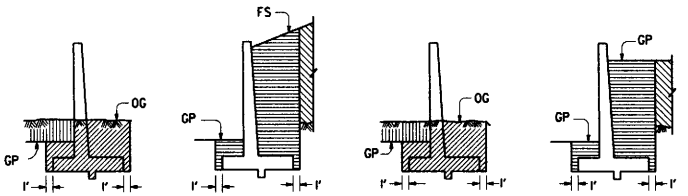




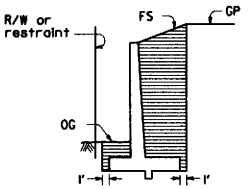
ELEVATION



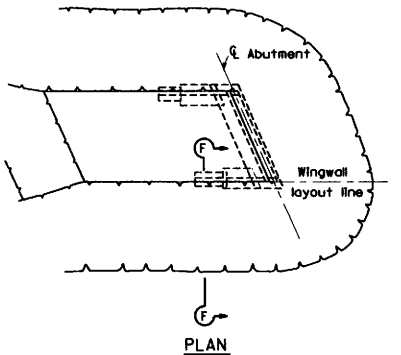
METAL CRIB WALL



RETAINING WALL IN FILL & CUT



RETAINING WALL IN OG WITH SETTLEMENT PERIOD AND NEXT TO R/W LINE OR OTHER RESTRAINTS

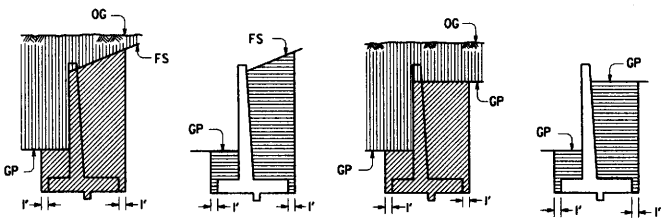


PLAN

BRIDGE EMBANKMENT SURCHARGE

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 crib wall 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.
6. Embankment slopes to be as steep as material permits. Slope assumed to be 1:1 for purposes of quantity calculations.



RETAINING WALL IN CUT

ABBREVIATIONS

OG - Original Ground
FS - Planned Finished Surface
GP - Planned Grading Plane

LEGEND

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

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

LIMITS OF PAYMENT FOR EXCAVATION AND BACKFILL BRIDGE SURCHARGE AND WALL

NO SCALE

A62B

STD. PLAN A62B

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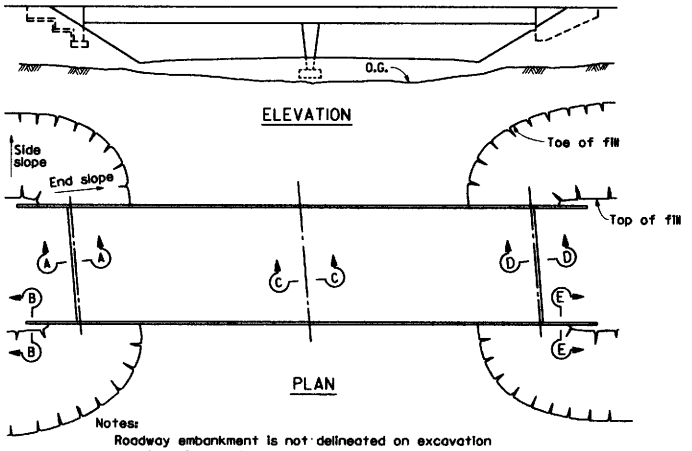
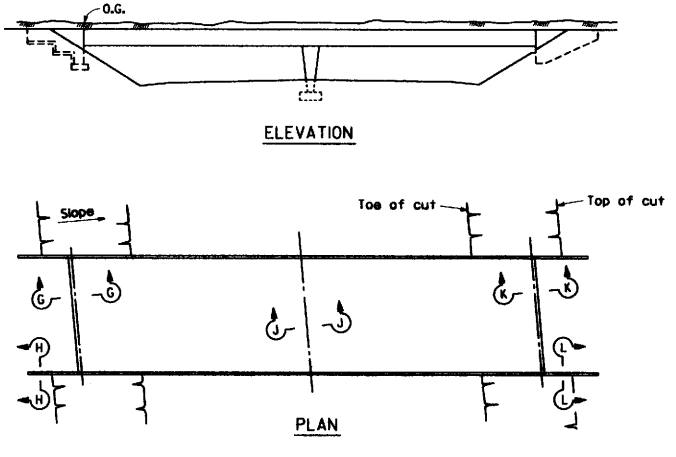
IN FILL

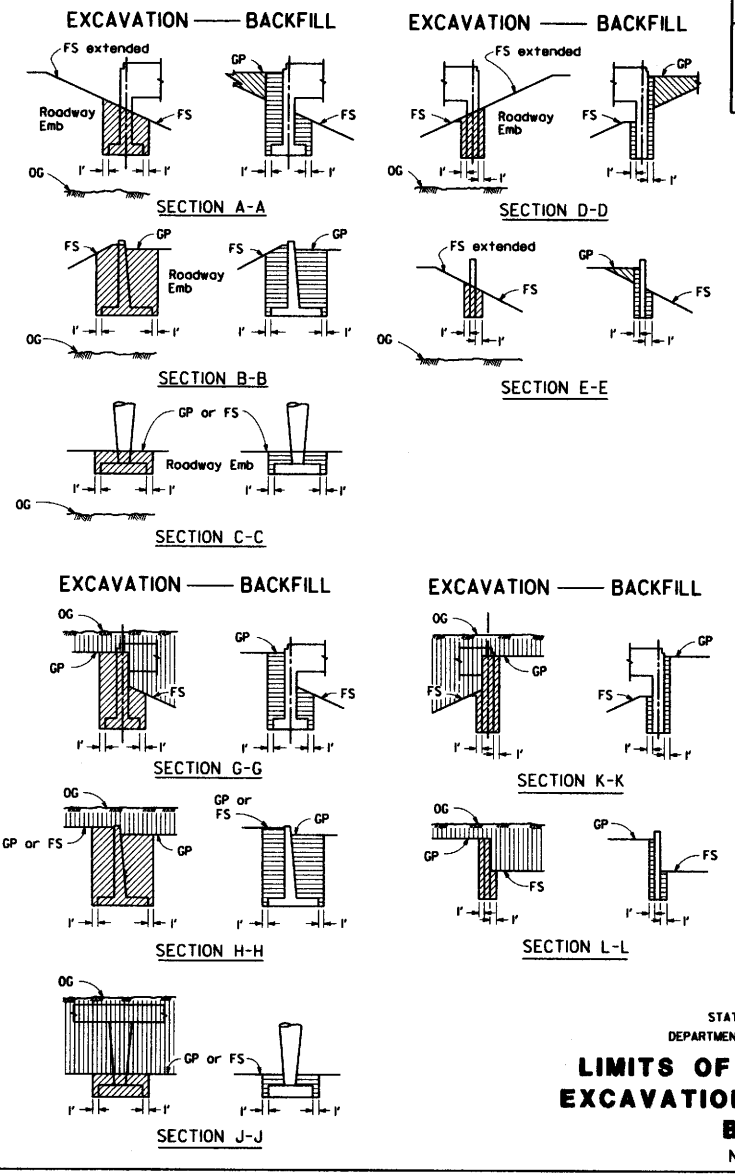


Notes:
Roadway embankment is not delineated on excavation drawings for clarity. Emankment must be in place before structure excavation is made.

IN CUT



NOTE:
If no roadway excavation is involed at bridge, structure excavation is measured from original ground.



ABBREVIATIONS

OG	Original Ground
FS	Planned Finished Surface
GP	Planned Grading Plan

LEGEND

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

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

LIMITS OF PAYMENT FOR EXCAVATION AND BACKFILL BRIDGE

NO SCALE

A62C

STD. PLAN A62C

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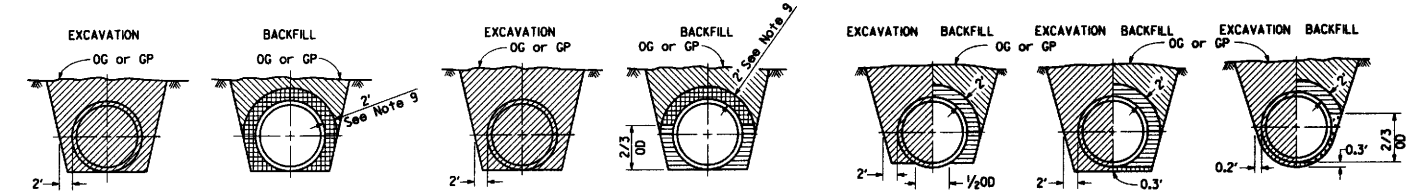
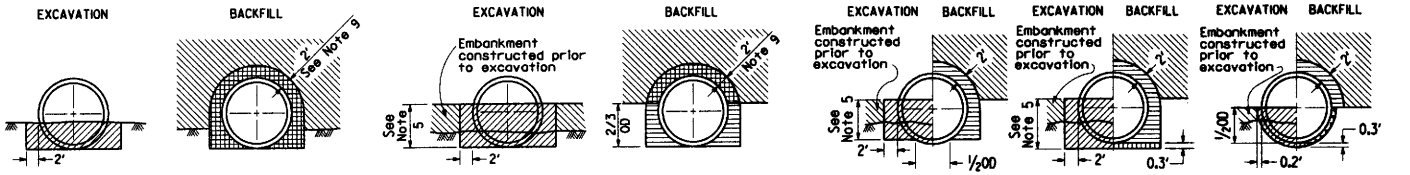


IN TRENCH

SHAPED BEDDING | SAND BEDDING | SOIL CEMENT BEDDING

IN TRENCH



IN EMBANKMENT

SHAPED BEDDING A | SAND BEDDING B | SOIL CEMENT BEDDING C

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

See Notes 6 and 9

METHOD 1

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

See Notes 8 and 9

METHOD 2

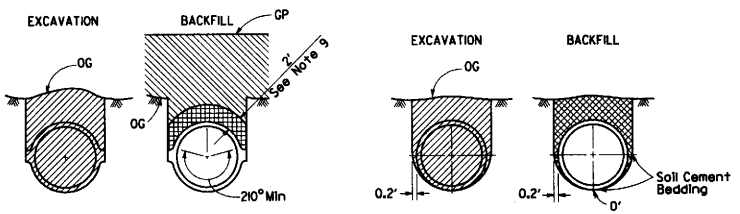
MINIMUM ALLOWABLE CLASSES OF RCP FOR METHOD 3

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

METHOD 3

REINFORCED CONCRETE PIPE

See Notes 1, 2, 7 and 10



IN TRENCH ONLY

CAST-IN-PLACE

IN TRENCH ONLY

PRECAST
See Note 7

NON-REINFORCED CONCRETE PIPE

LEGEND

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

OD = Outside diameter for circular pipes and maximum vertical dimension for other shapes

ID = Inside diameter for circular pipes and minimum vertical dimension for other shapes

RCP = Reinforced concrete pipe

NOTES

1. Unless otherwise shown on the plans or specified in the special provision, the Contractor shall have the option of selecting the class of RCP and the method of backfill to be used, provided the height of cover does not exceed the value shown for the RCP selected.
   Example:
   24" RCP culvert with maximum cover of 19' the options are:
   a) Class V Special or stronger with Method 1.
   b) Class III or stronger with Method 2.
   c) Class II or stronger with Method 3.
   Cover is defined as the maximum vertical distance from top of pipe to finished grade within the length of any given culvert.
2. The class of RCP, method of backfill and bedding selected shall be the same throughout the length of any given culvert.
3. The "length of any culvert" is defined as the culvert between:
   a. Successive drainage structures (inlets, junction boxes, headwalls, etc.)
   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.
4. Slope or shore excavation sides as necessary.
5. Embankment height prior to excavation for installation of all classes of RCP under Methods 2, 3A and 3B shall be as follows:
   Pipe sizes 12" to 42" ID = 30"
   Pipe sizes 48" to 84" ID = 2/3 OD
   Pipe sizes larger than 84" ID = 60"
6. The maximum size for all classes of RCP placed under Method 1 is 78" ID.
7. Non-reinforced precast pipe sizes 36" or smaller may also be placed under Methods 1, 2 or 3.
8. Oval or arch shaped RCP shall be placed under Method 2 only.
9. Embankment compaction requirements govern over the 90% relative compaction backfill requirement within 2½ feet of finished grade.
10. Backfill shall be placed full width of excavation except where dimensions are shown for backfill width or thickness. Dimensions shown are minimums.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

EXCAVATION AND BACKFILL CONCRETE PIPE CULVERTS

NO SCALE

A62D

STD. PLAN A62D

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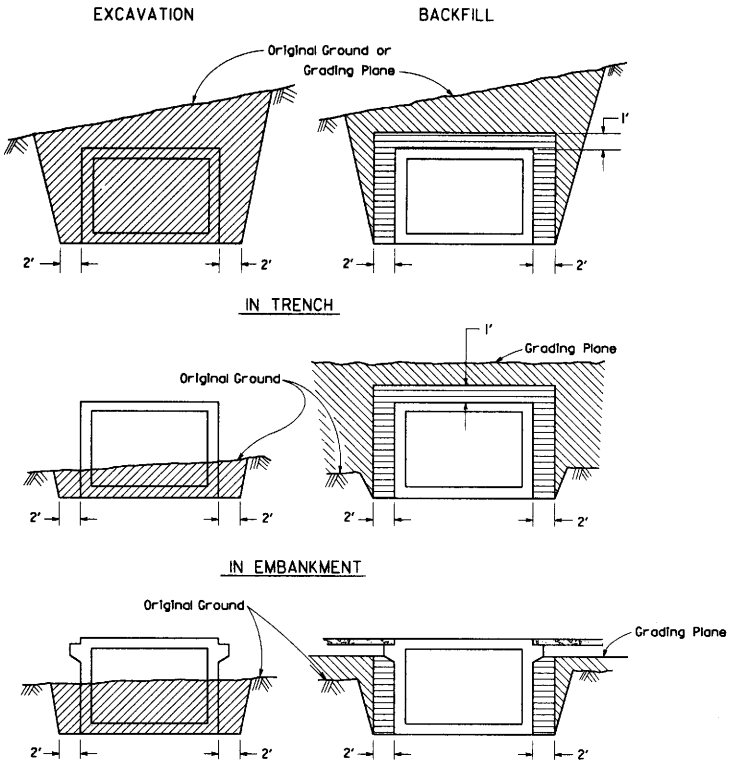
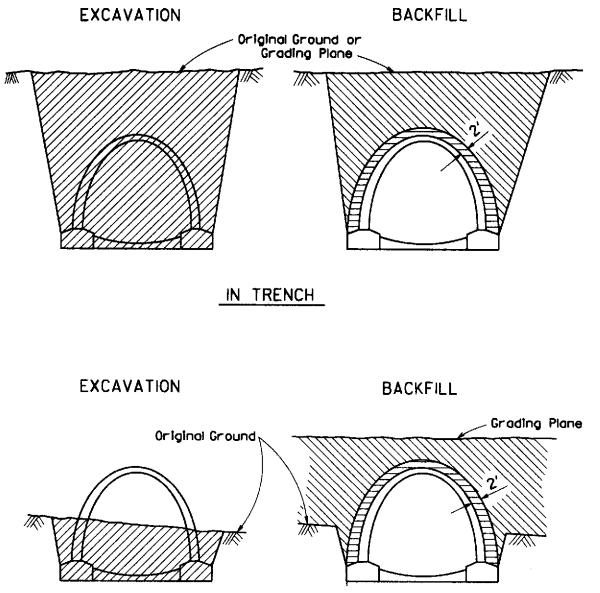
PLANS APPROVAL DATE

RECORDED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA



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 CAST-IN-PLACE REINFORCED CONCRETE BOX AND ARCH CULVERTS

NO SCALE

A62E

STD. PLAN A62E

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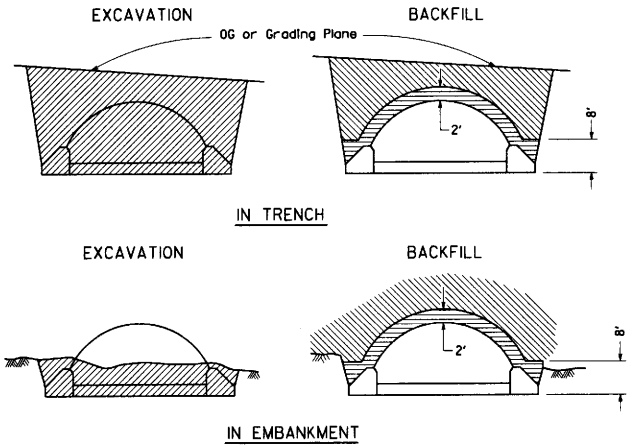
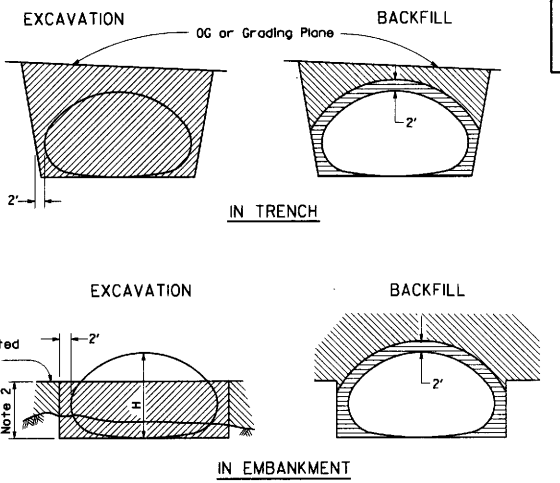
REGISTERED CIVIL ENGINEER

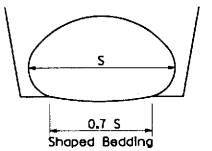
July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA



STRUCTURAL STEEL PLATE ARCHES

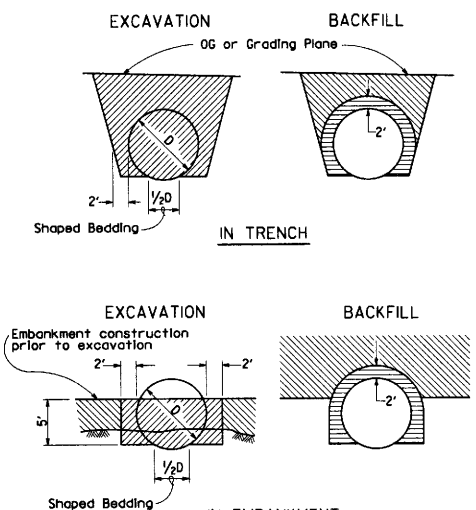




SHAPED BEDDING

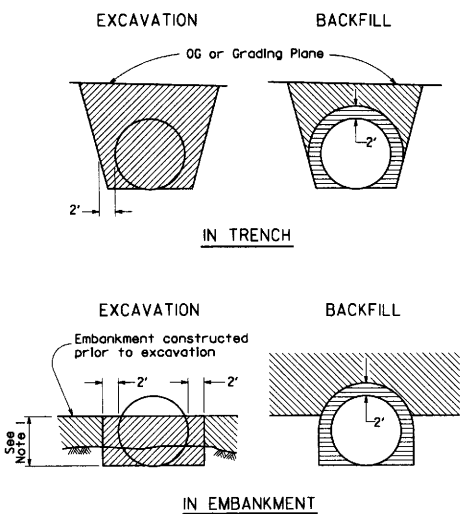
S = Larger than 84"

STRUCTURAL STEEL PLATE PIPE ARCHES AND VEHICULAR UNDERCROSSING



PIPES

Larger than 84"



METAL AND PLASTIC PIPES AND CORRUGATED METAL PIPE ARCHES

84" or Smaller

NOTES

1. PIPES: 30" minimum for diameters up to and including 42" then 2/3 diameter but no more than 60" required. CORRUGATED METAL PIPE ARCHES: 30" maximum.
2. 2/3 H up to 60" maximum.
3. Slope or shore excavation sides as necessary.
4. Backfill shall be placed full width of excavation except as noted.
5. Diagrams do not apply to overside drains.
6. Dimensions shown are minimum.
7. For strutting requirement of structural steel plate pipe, arches and vehicular undercrossing during construction, see Standard Plan D88A.

LEGEND

- Structure Excavation (Culvert)
- Roadway Embankment
- Structure Backfill (Culvert) 95% Relative Compaction
- Original Ground

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

EXCAVATION AND BACKFILL METAL AND PLASTIC CULVERTS

NO SCALE

A62F

STD. PLAN A62F

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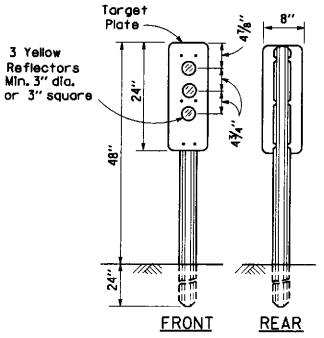
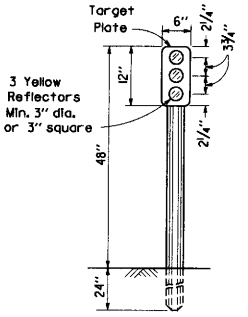
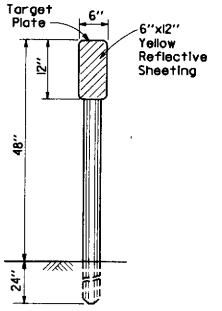
REGISTERED PROFESSIONAL ENGINEER
P. Lowden Jr.
No. 12284
Exp. 3-31-93
CIVIL
STATE OF CALIFORNIA



TYPE L-1
OBJECT MARKER



TYPE L-2
OBJECT MARKER

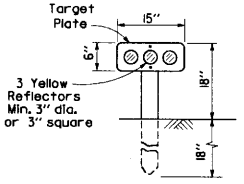


TYPE L-3
OBJECT MARKER

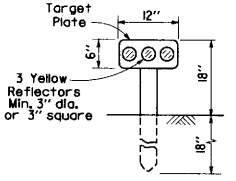
NOTES

1. All object marker posts, except Type K-4 markers, may be either metal or flexible and may have cored anchors, driven anchors, or surface mounted bases.

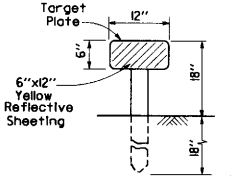
2. See Standard Plan A73B for metal post details and additional markers.



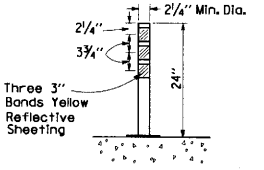
TYPE K-1
OBJECT MARKER



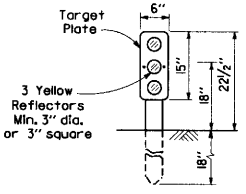
TYPE K-2
OBJECT MARKER



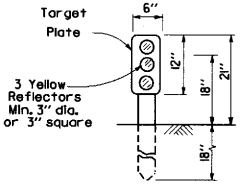
TYPE K-3
OBJECT MARKER



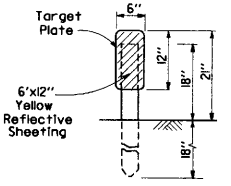
TYPE K-4
OBJECT MARKER
(Round Flexible Post)
Surface Mount



TYPE K-1A
OBJECT MARKER



TYPE K-2A
OBJECT MARKER



TYPE K-3A
OBJECT MARKER

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

MARKERS

NO SCALE

A73A

STD. PLAN A73A

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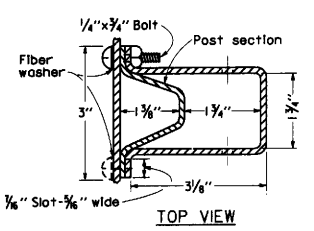
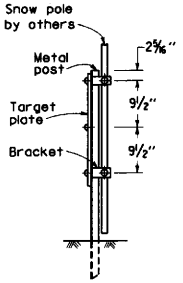
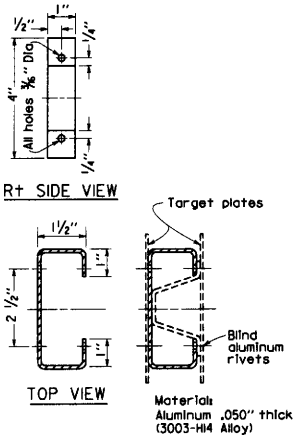
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
P. Lowden Jr.
No. 12284
Exp. 3-31-93
CIVIL
STATE OF CALIFORNIA

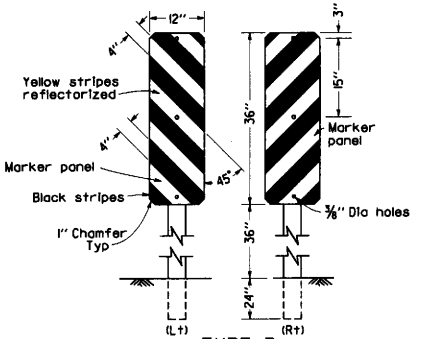


SNOW POLE BRACKET

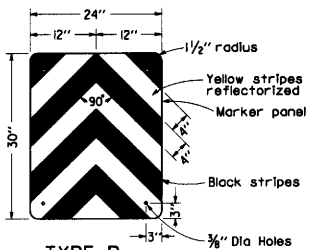




TWO PLATE POST MOUNT



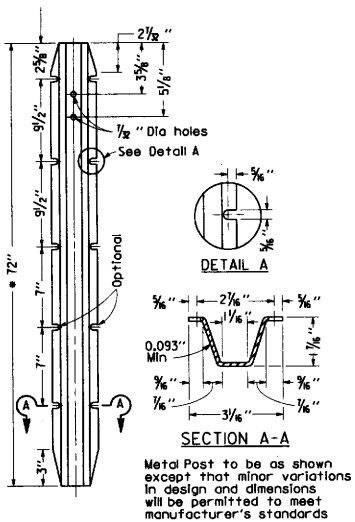
TYPE P
OBJECT MARKER
(METAL POST OR 4"X4" WOOD POST)



TYPE R
OBJECT MARKER
PANEL

NOTES

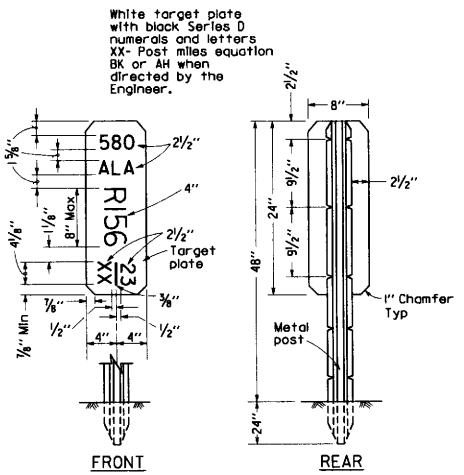
1. See Standard Plan A73A for additional object markers.



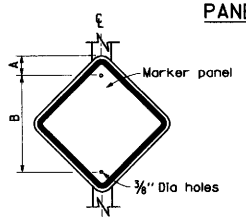
Metal Post to be as shown except that minor variations in design and dimensions will be permitted to meet manufacturer's standards

* 96" for Type P object marker and 36" for Type K object marker

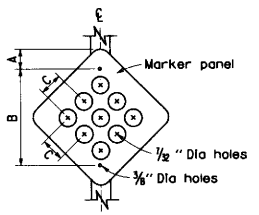
METAL POST DETAIL



MILEPOST MARKER



TYPE N-1,N-2,N-3
OBJECT MARKERS



TYPE N-4,N-5
OBJECT MARKERS

TYPE N	SIZE	BORDER WIDTH	MARGIN WIDTH	A	B	C	CORNER RADIUS
-1,-2,-3	18"x18"	3/8"	3/8"	3"	18"	—	1 1/2"
-4,-5	18"x18"	—	—	3"	18"	4"	1 1/2"

N-1. Yellow reflective background with black border.
N-2. Red reflective background with black border.
N-3. Orange reflective background with black border.
N-4. Yellow background with 9-3" yellow reflectors.
N-5. Red background with 9-3" red reflectors.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

MARKERS

NO SCALE

A73B

STD. PLAN A73B

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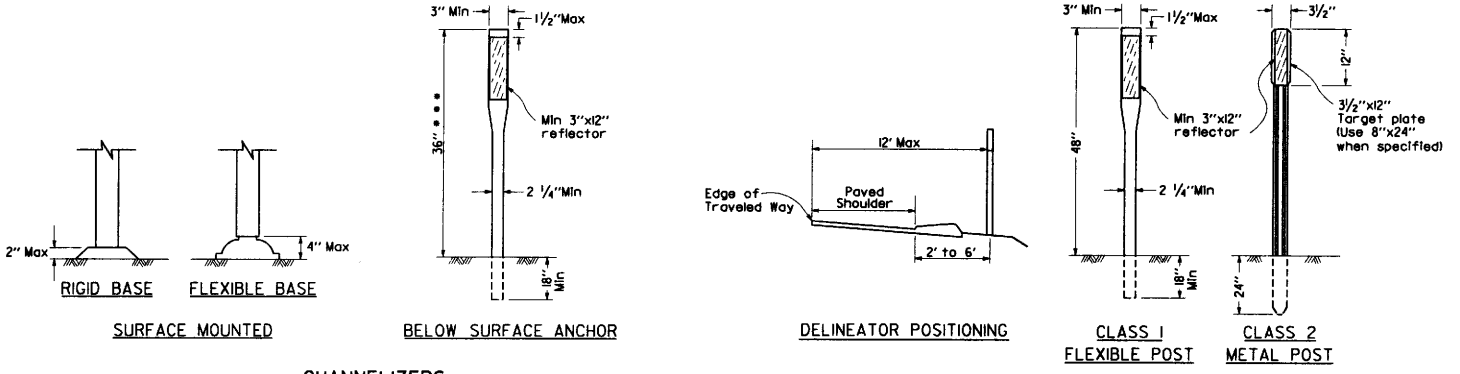
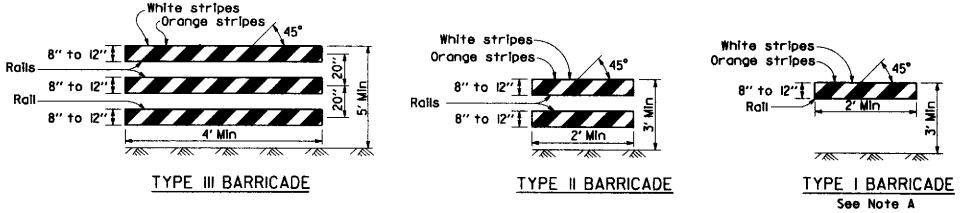
REGISTERED PROFESSIONAL ENGINEER P. Lowden Jr. No. 12284 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA



CHANNELIZERS

* * * A minimum post height of 28" may be used at locations where speeds are 40 MPH or less

DELINEATORS



BARRICADES

Only face of rails shown. Barricade construction materials and supports as specified in the specifications.

BARRICADE	TYPE I	TYPE II	TYPE III
Width of Rail	8"Min - 12"Max *	8"Min - 12"Max *	8"Min - 12"Max *
Length of Rail	2' Min	2' Min	4' Min
Width of Stripes * *	6"	6"	6"
Height	3' Min	3' Min	5' Min
Number of Reflectorized Rail Faces	2 (one each direction)	4 (two each direction)	3 if facing traffic in one direction 6 if facing traffic in two direction

* For the wooden option dimensions are nominal lumber dimensions.
* * For rails less than 3 feet long, 4 inch wide stripes shall be used.
Note A: Barricades to have a minimum of 270 square inches of retroreflective area facing traffic when used on freeways, expressways, and other high speed highways.

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

NOTES

1. The reflector used on back of delineator shall be one 3" square reflective sheeting or one standard reflex reflector.
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.
3. See Standard Plan A73B for metal post details.

DELINEATOR REFLECTORIZATION

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DELINEATORS, CHANNELIZERS AND BARRICADES

NO SCALE

A73C

STD. PLAN A73C

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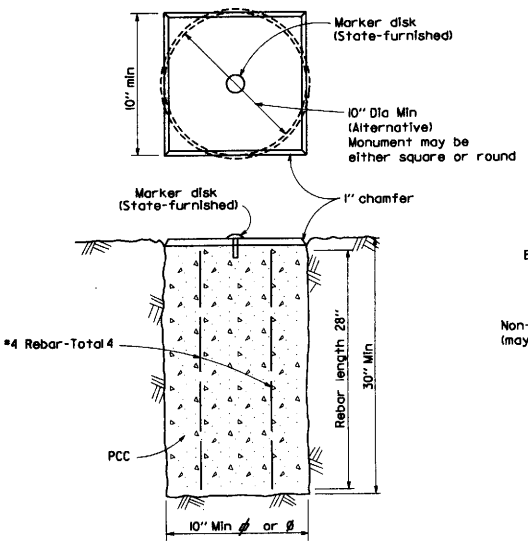
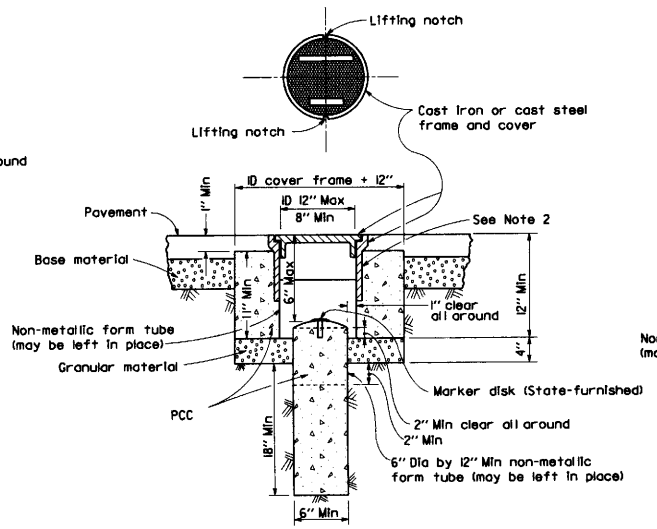
REGISTERED PROFESSIONAL ENGINEER E. A. Jenkins No. 11157 Exp. 12-31-92 CIVIL STATE OF CALIFORNIA

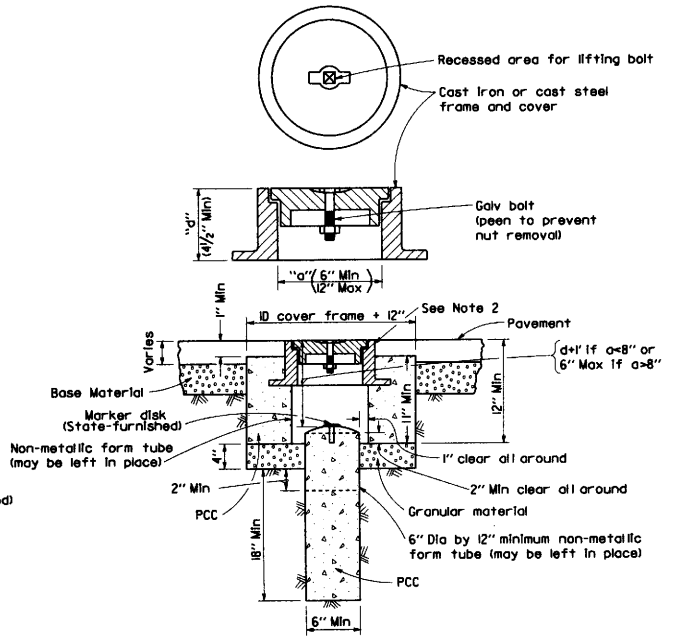


TYPE A



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 the concrete a minimum of 3".
3. Type D monument shall be either Alternative No. 1 or Alternative No. 2 at the contractor's option.
4. All portland cement concrete shall be Class B or minor concrete with 1" maximum aggregate.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SURVEY MONUMENTS

NO SCALE

A74

STD. PLAN A74

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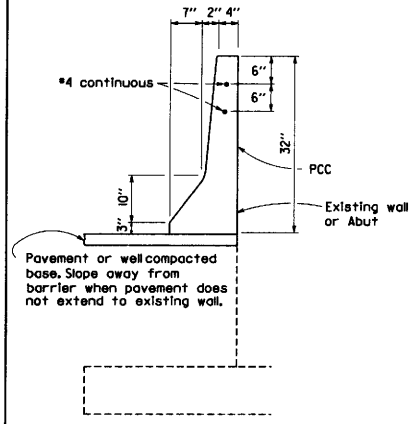
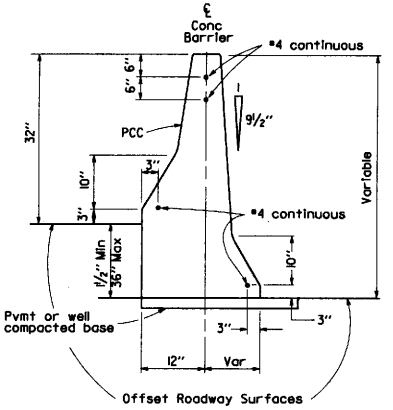
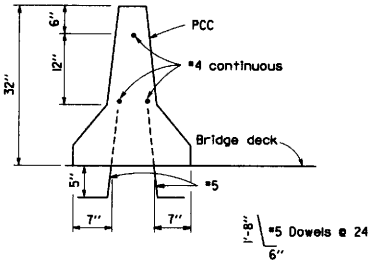
REGISTERED PROFESSIONAL ENGINEER J. E. Summers No. 29741 Exp. 3-31-95 CIVIL STATE OF CALIFORNIA



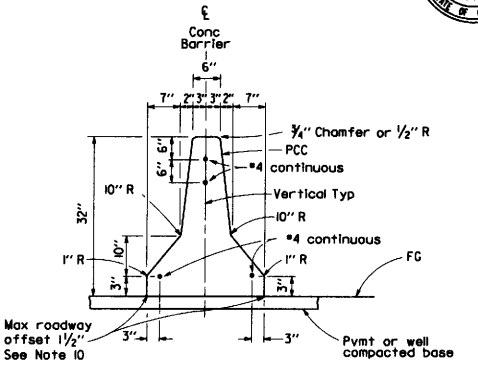
CONCRETE BARRIER
TYPE 50D
Details similar to Type 50 except as noted



CONCRETE BARRIER
TYPE 50C

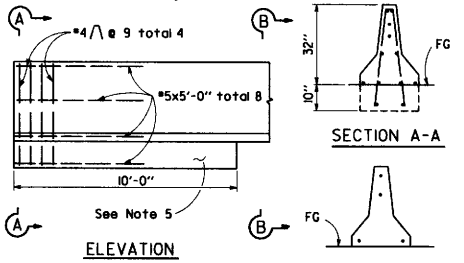


CONCRETE BARRIER
TYPE 50A
Details similar to Type 50 except as noted
See Note 7



CONCRETE BARRIER
TYPE 50

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

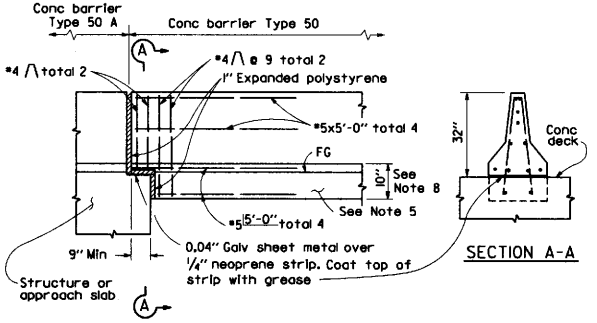


ELEVATION

SECTION A-A

SECTION B-B

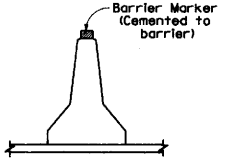
BARRIER END ANCHOR
See Note 9



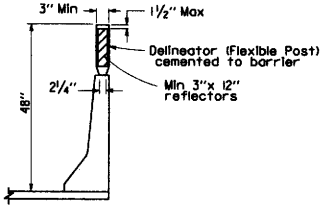
ELEVATION

SECTION A-A

CONNECTION TO STRUCTURE



MEDIAN BARRIER DELINEATION
See Notes 11 and 12



CONCRETE BARRIER DELINEATION
(For barriers not located in median)
See Note 11

NOTES

1. See Standard Plan A75B for concrete barrier transitions at bridge column and sign pedestals.
2. Opening 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 interruptions in barrier.
6. See Standard Plan A75C for glare screen details.
7. 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.
8. 10" Barrier footing extends 10' back from structure.
9. For transition to TBB see Standard Plan A78D.
10. Where roadway offset is greater than 1½", see Concrete Barrier Type 50C.
11. Barrier delineation to be used when required by the special provisions.
12. Spacing of barrier markers to match spacing of raised pavement markers on the adjacent median edgeline pavement delineation.

STATE OF CALIFORNIA
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CONCRETE BARRIER TYPE 50
NO SCALE

A75A

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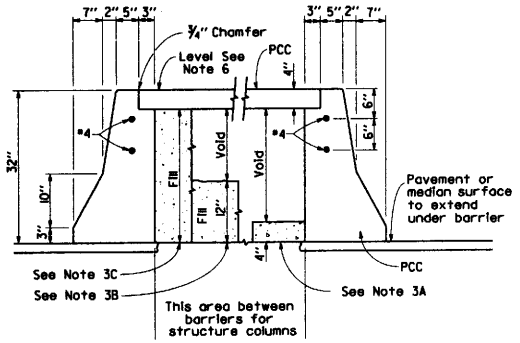
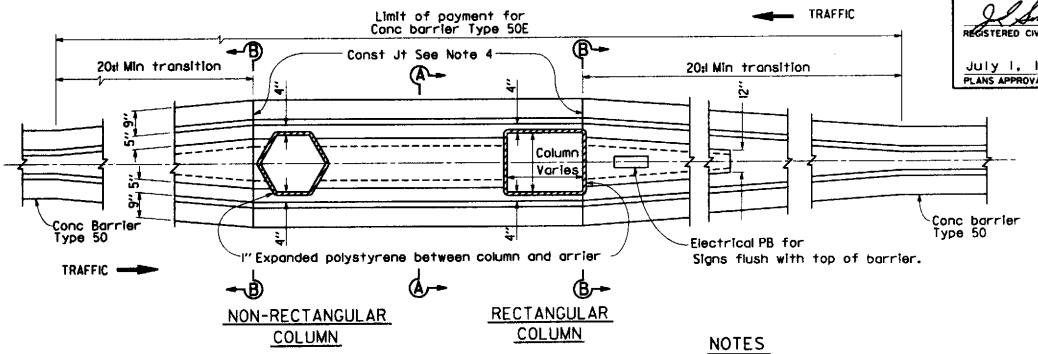


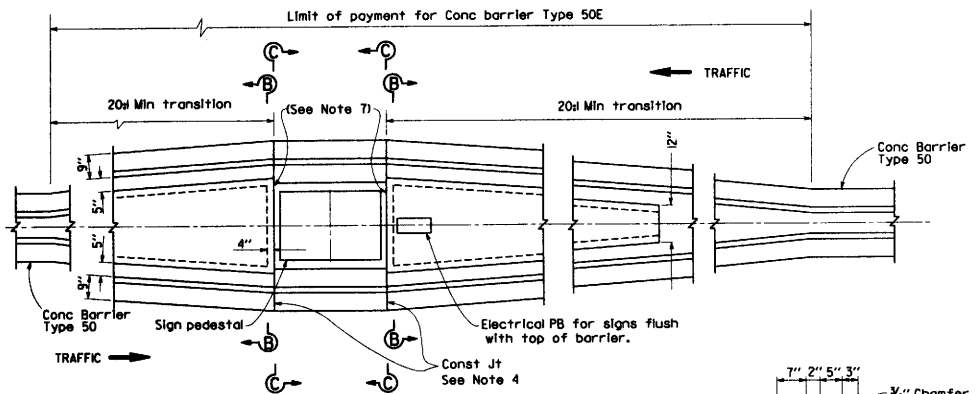
SECTION A-A



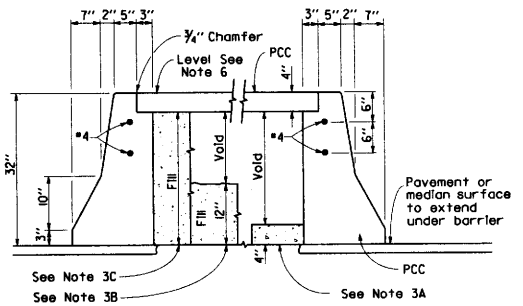
TRANSITION AT BRIDGE COLUMN
CONCRETE BARRIER TYPE 50E

NOTES

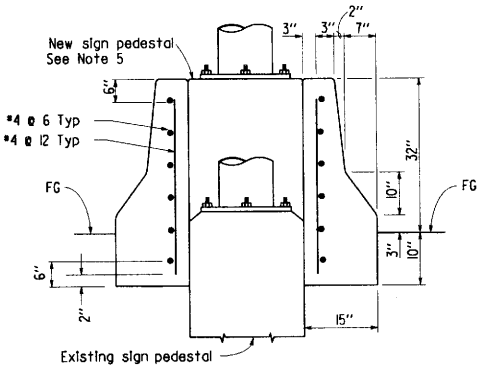
1. See Standard Plan A75A for Concrete barrier Type 50.
2. See Standard Plan A75C for Headlight glare Screen Details.
3. Contractor options for fill between barrier walls:
   A. Place 4" PCC at base between barrier walls.
   B. Place 12" of granular material at base between walls.
   C. Place granular material from base to bottom of 4" cap.
   Forming material for 4" cap may remain in place.
4. Reinforcing steel shall extend continuous through construction joints.
5. See "Overhead Sign" plans for sign pedestal elevations on new construction.
6. Adjust height of barrier on low side of offset or superelevated roadways to provide level grade across top of Type 50E Barrier.
7. 4" PCC vertical walls at existing sign pedestals.



TRANSITION AT SIGN PEDESTAL
CONCRETE BARRIER TYPE 50E



SECTION B-B



SECTION C-C

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

CONCRETE BARRIER TYPE 50E

NO SCALE

A75B

STD. PLAN A75B

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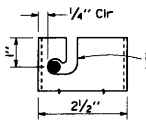
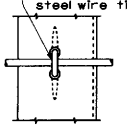
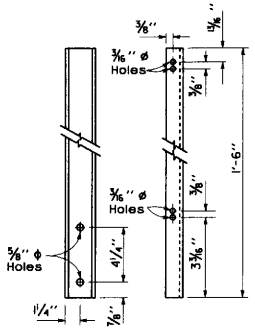


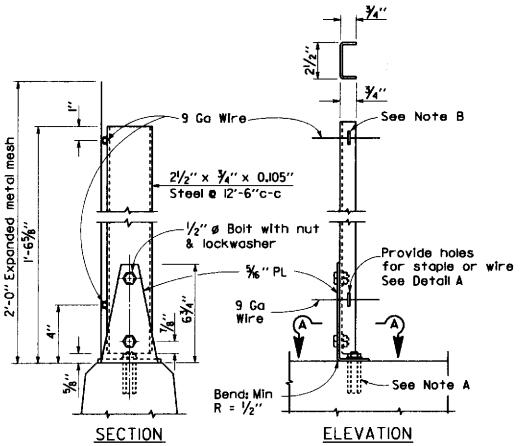
DETAIL B



DETAIL A



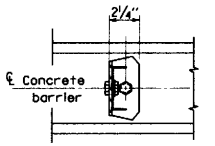
GLARE SCREEN POST DETAILS



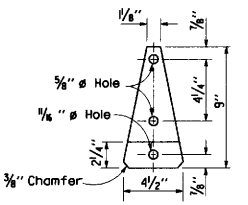
SECTION ELEVATION

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.

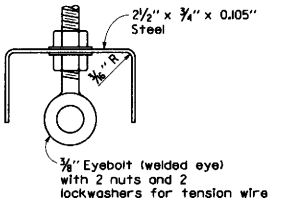


SECTION A-A



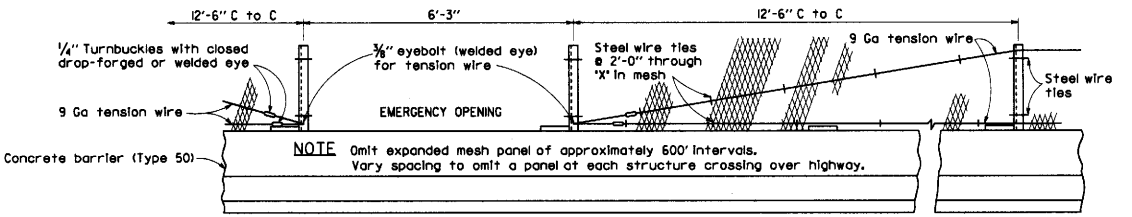
5/16" PLATE

(5/16" plate to conform to ASTM A36 specifications)



DETAIL C

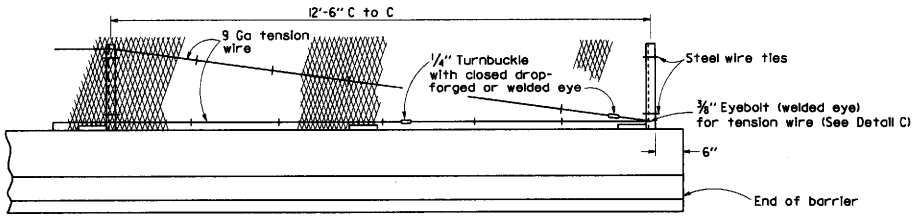
GLARE SCREEN ATTACHMENT DETAILS - CONCRETE BARRIER TYPE 50



NOTE Omit expanded mesh panel of approximately 600' intervals. Vary spacing to omit a panel at each structure crossing over highway.

ELEVATION HEADLIGHT GLARE SCREEN

Mesh joints shall occur at 12'-6" supports and shall overlap at least 2 diamonds.



END PULL POST ASSEMBLY FOR HEADLIGHT GLARE SCREEN

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

HEADLIGHT GLARE SCREEN

NO SCALE

A75C

STD. PLAN A75C

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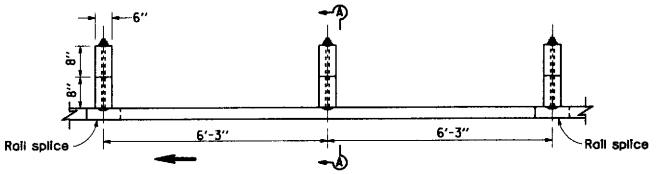
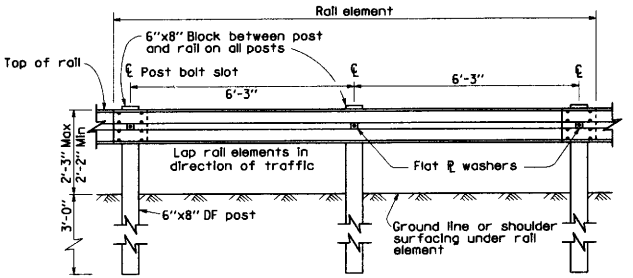
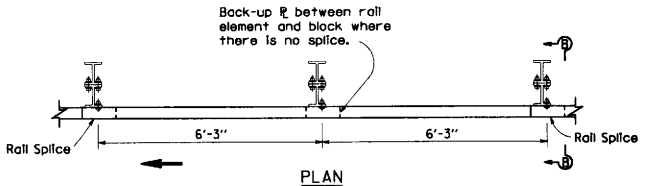


PLAN

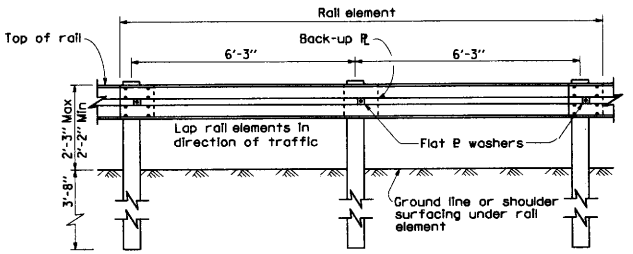


ELEVATION

METAL BEAM GUARD RAIL WITH WOOD POST AND BLOCKS

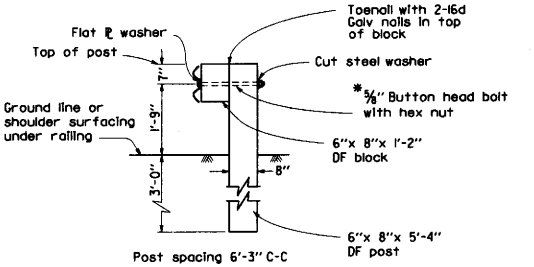


PLAN



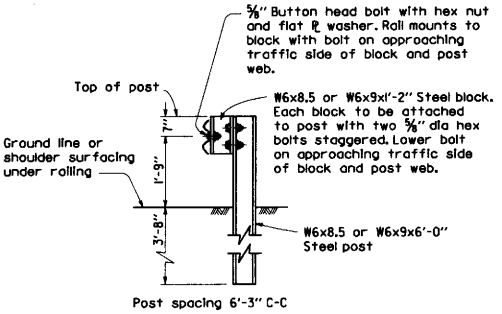
ELEVATION

METAL BEAM GUARD RAIL WITH W6x8.5 OR W6x9 STEEL POSTS AND BLOCKS

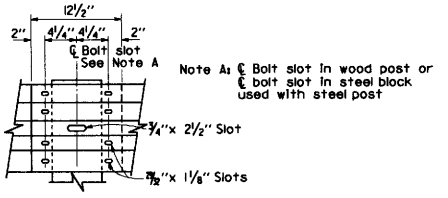


SECTION A-A

* Where bolt is reversed or 5/8" threaded rod is used to mount rail, no more than 1/2" of thread may be exposed on traffic side of rail.

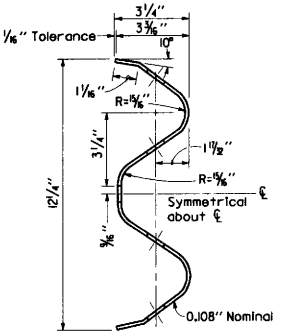


SECTION B-B



RAIL SPLICE DETAIL
ELEVATION VIEW

Splice the overlapped ends of the rail elements with 5/8"x 1 1/4" button head oval shoulder bolts and 5/8"x 1 1/4" recessed hex nut in the 29/32"x 1 1/8" slots. Total 8 per rail splice; 4 per terminal section and end section. Lap rail elements in direction of traffic.



SECTION THRU
RAIL ELEMENT

NOTES

1. For details of standard hardware used to construct guard railing, see Standard Plan A77B.
2. For details of posts and blocks used to construct guard railing, see Standard Plan A77C.
3. Guard railing post spacing to be 6'-3" center to center, except as otherwise noted.
4. Top of rail to be 27" above the ground line or shoulder surfacing under the rail element.
5. For guard railing approach flares, see Standard Plans A77D and A77E.
6. For embankment widening details to accommodate guard railing approach flares, see Standard Plan A77F.
7. For guard railing end anchor details, see Standard Plans A77G and A77I.
8. For guard railing connection details to bridge railing, retaining walls and abutments, see Standard Plan A77J.
9. For guard railing connection details to bridge sidewalks and curbs, see Standard Plan A77K.
10. For dike positioning with guard railing installations, see Standard Plan A77F.
11. Direction of traffic indicated by →

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METAL BEAM GUARD RAILING

NO SCALE

A77A

STD. PLAN A77A

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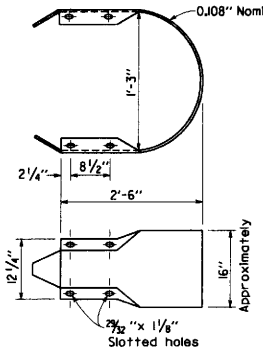
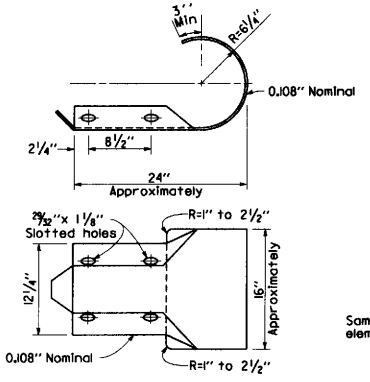
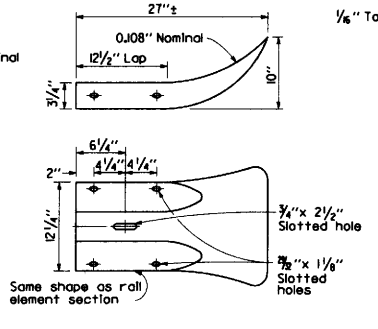


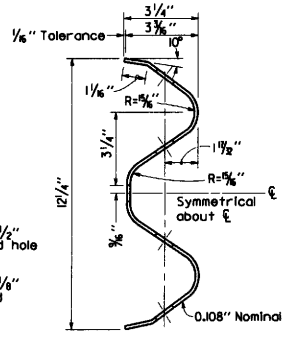
RETURN SECTION



TERMINAL SECTION
TYPE A



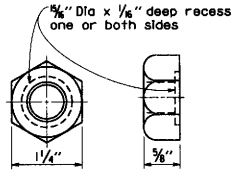
TERMINAL SECTION
TYPE B



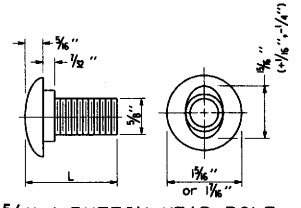
SECTION THRU
RAIL ELEMENT

NOTES

1. Terminal sections will not be installed on the trailing end of guard railing placed adjacent to one-way roadways.
2. Back-up plate to be used between guard rail element and steel block on steel post where there is no rail element splice. See Standard Plan A77A
3. For end section details, see Standard Plan A77J.
4. For terminal section Type C, see Standard Plan A77H

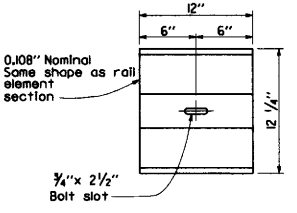


5/8" Ø RECESS NUT

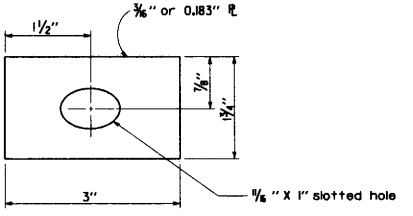


5/8" Ø BUTTON HEAD BOLT

L	THREAD LENGTH
1¼"	full thread length
2"	1½" Min thread length
9½"	1¾" Min thread length
18"	2½" Min thread length



BACK-UP PLATE
See Note 2



FLAT PLATE WASHER

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

METAL BEAM GUARD RAILING STANDARD HARDWARE

NO SCALE

A77B

STD. PLAN A77B

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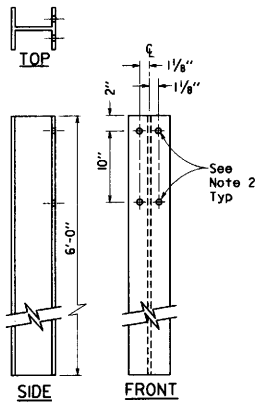
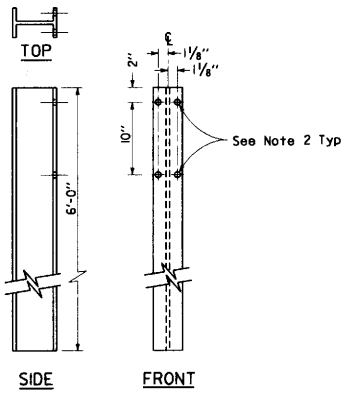
NOTES

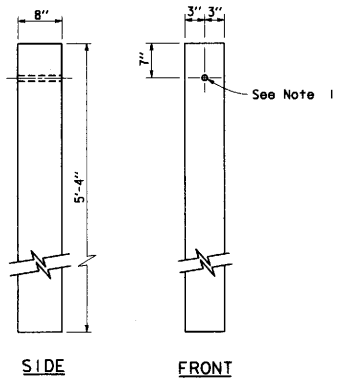
1. All holes in wood posts and blocks shall be 3/4" Ø ±1/16".
2. All holes in steel posts and blocks shall be 15/16" Ø maximum.
3. Contractor may submit alternative steel post details for Engineer's approval.
4. Dimensions shown for wood post are nominal.



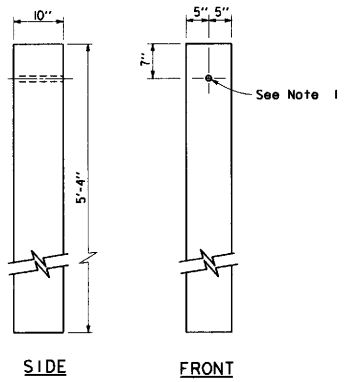
W6x15 STEEL POST



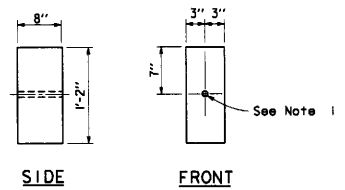
W6x8.5 OR W6x9 STEEL POST



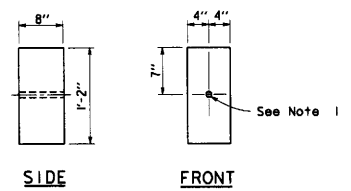
6" x 8" DOUGLAS FIR POST



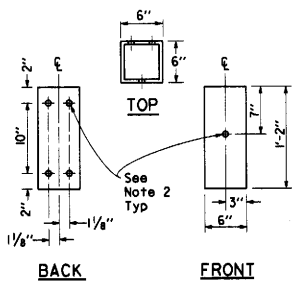
10" x 10" DOUGLAS FIR POST



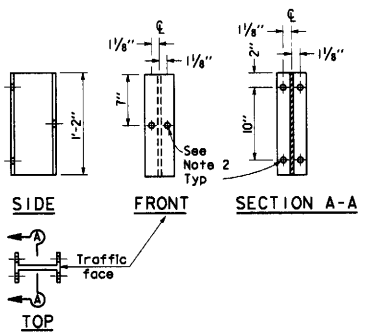
6" x 8" DOUGLAS FIR BLOCK



8" x 8" DOUGLAS FIR BLOCK



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



W6x8.5 OR W6x9 STEEL BLOCK

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

METAL BEAM GUARD RAILING POSTS AND BLOCKS

NO SCALE

A77C

STD. PLAN A77C

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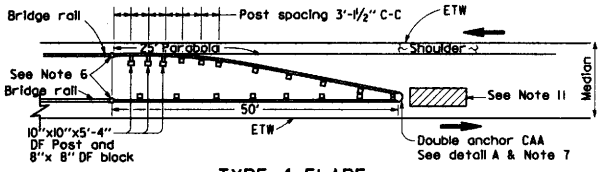
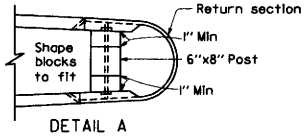
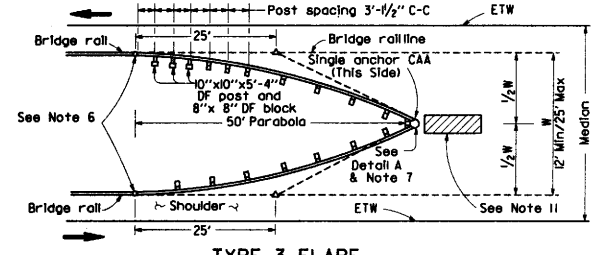
CAA = Cable Anchor Assembly



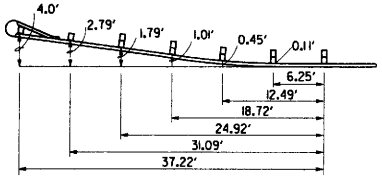
TYPE 4 FLARE
See Note 3



DETAIL A



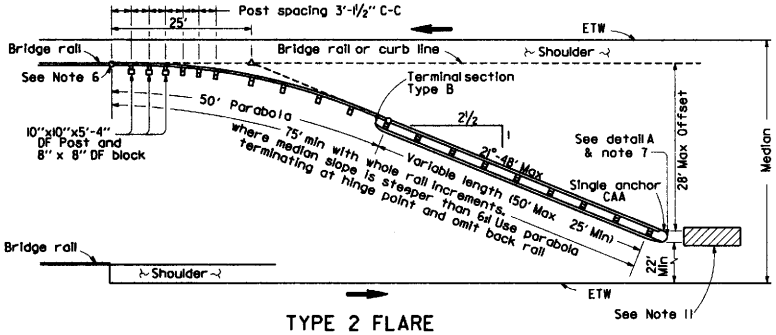
TYPE 3 FLARE
See Note 3



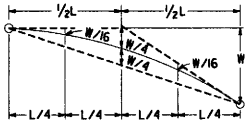
37'-6" PARABOLIC OFFSETS

NOTES

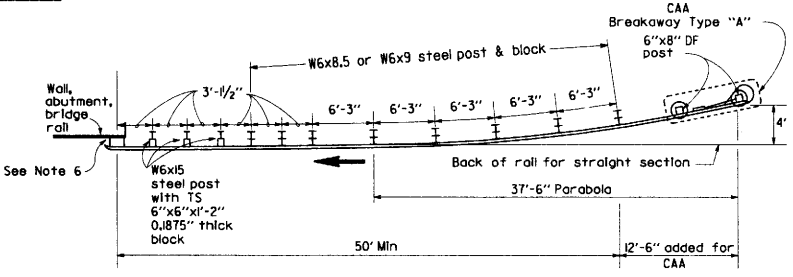
1. Post, blocks and hardware to be used are shown on Standard Plans A77B and A77C.
2. Guard rail post spacing to be 6'-3" center to center, except as otherwise noted.
3. Except as noted, posts shown are 6"x8" DF. W6x8.5 or W6x9 steel posts and blocks may be specified for 6"x8" DF posts and blocks where applicable. Where 10"x10" DF posts and 8"x8" DF blocks are shown, W6x15 steel posts and Tubular Steel 6"x6"x1'-2" (0.1875" thick) blocks may be specified where applicable.
4. Top of rail to be 27" above ground line or shoulder surfacing under the rail element.
5. Direction of traffic indicated by ⟶
6. For connection details see Standard Plan A77J or A77K.
7. For end anchor details see Standard Plan A77G and A77I.
8. Terminal Sections will not be installed on trailing end of guard rail placed adjacent to one-way roadways.
9. Parabola portion of Type I Flare used at approach end of guard railing for embankment installations.
10. For embankment widening details to accomodate approach flares, see Standard Plan A77F.
11. Sand filled crash cushion, as shown on Standard Plan A81, or other crash cushion approved by the Engineer is required for Type 2, 3 and 4 flares, when the end of the guard rail is within 30 feet of the edge of traveled way (ETW) of approaching traffic.



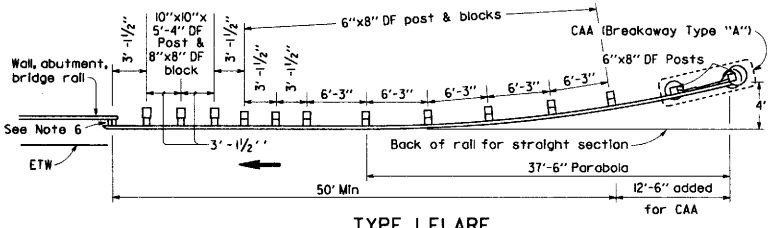
TYPE 2 FLARE
(See Note 3)



TYPICAL PARABOLIC LAYOUT



TYPE I FLARE
(STEEL POST INSTALLATION)
See Note 9



TYPE I FLARE
(WOOD POST INSTALLATION)
See Note 9

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

GUARD RAIL FLARES

NO SCALE

A77D

STD. PLAN A77D

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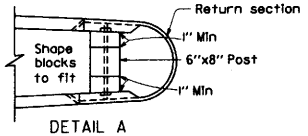
PLANS APPROVAL DATE

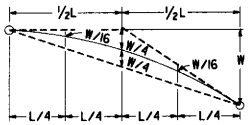
PROFESSIONAL ENGINEER — J. E. Summers — No. 29741 — Exp. 3-31-95 — CIVIL — STATE OF CALIFORNIA

NOTES

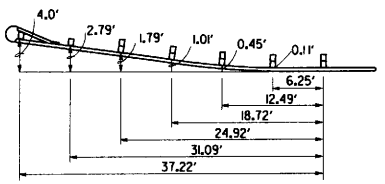
1. Post, blocks and hardware to be used are shown on Standard Plan A77A and A77B.
2. Guard rail post spacing to be 6'-3" center to center, except as noted.
3. Except as noted, posts and blocks shown are 6"x8" DF. W6x8.5 or W6x9 steel posts and blocks may be specified where applicable. Where 10"x10" DF posts and 8"x8" DF blocks are shown, W6x15 steel post and Tubular Steel 6"x6"x 1'-2" (0.1875" thick) blocks may be specified where applicable.
4. Top of rail to be 27" above ground line or shoulder surfacing under the rail element.
5. A 4' minimum clearance is required between face of rail and a fixed object located directly behind a guard rail post. A fixed object located behind the rail but not behind a guard rail post requires a 3' minimum clearance. Where minimum clearance cannot be obtained use approach railing transition details for fixed objects.
6. Direction of traffic indicated by ⟶.
7. For connection details see Standard Plan A77J.
8. For end anchor details see Standard Plans A77G and A77I .
9. Terminal Sections will not be installed on trailing end of guard rail placed adjacent to one-way roadways.
10. Type 7 flare has been deleted.
11. Sand filled crash cushion, as shown on Standard Plan A81, or other crash cushion approved by the Engineer, is required for Type 5 and 6 flares, when the end of the guard rail is within 30 feet of the edge of traveled way (ETW) of approaching traffic.



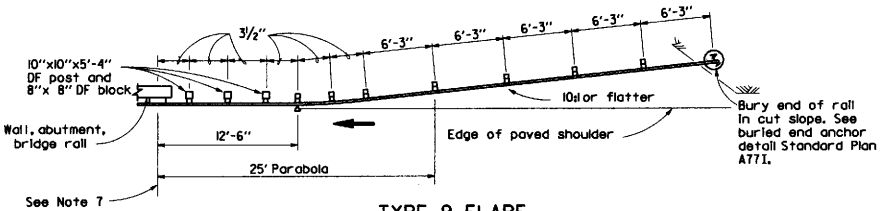
DETAIL A



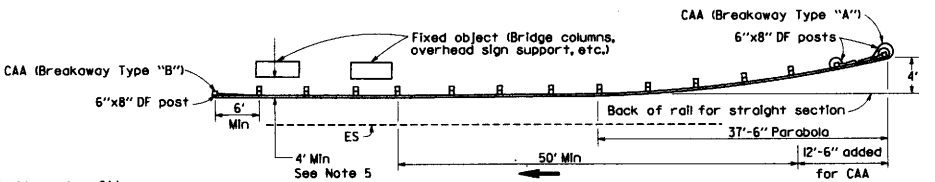
TYPICAL PARABOLIC LAYOUT



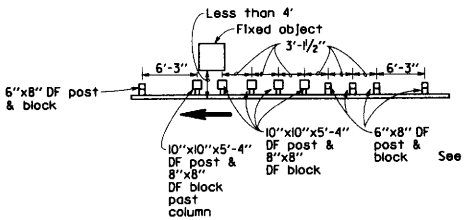
37'-6" PARABOLIC OFFSETS



TYPE 9 FLARE

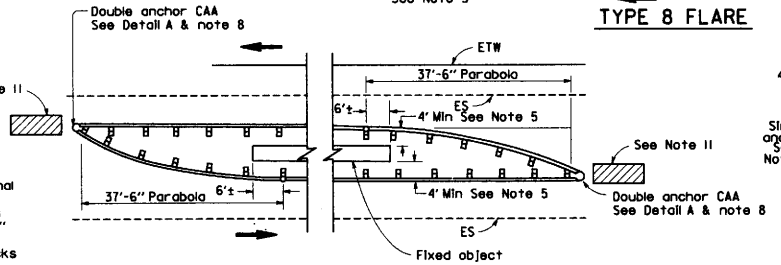


TYPE 8 FLARE

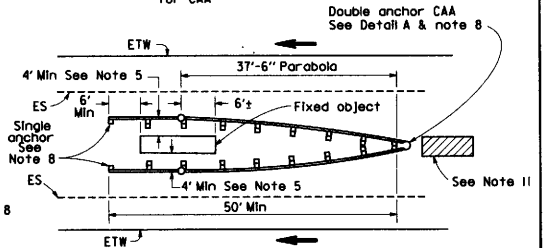


Use with Type 5, 6, and 8 flares when guard rail is less than 4' from fixed object. See Note 5. For a series of columns, additional 10"x10"x5'-4" DF post at 3'-1½" center to center spacing to be used between columns. Where 10"x10" DF posts and 8"x8" DF blocks are shown, W6x15 steel posts and Tubular Steel 6"x6"x1'-2" (0.1875" thick) blocks may be specified where applicable. Where 6"x8" DF posts and blocks are shown, W6x8.5 or W6x9 steel posts and blocks may be specified where applicable.

APPROACH RAILING TRANSITION DETAIL FOR FIXED OBJECT



TYPE 5 FLARE



TYPE 6 FLARE

CAA = Cable Anchor Assembly

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

GUARD RAIL FLARES

NO SCALE

A77E

STD. PLAN A77E

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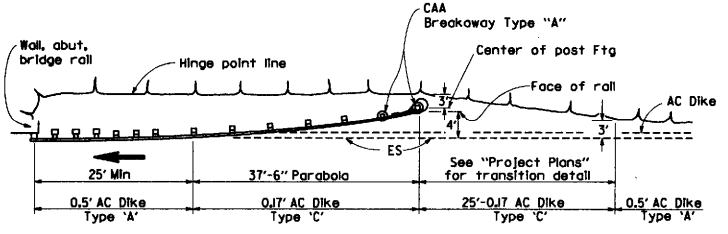
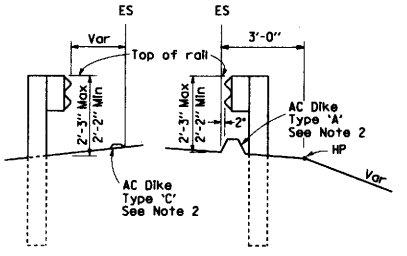


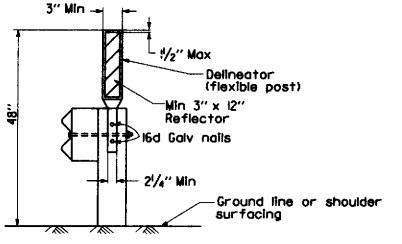
EMBANKMENT WIDENING AND DIKE PLACEMENT DIAGRAM

See Note 1 and 2



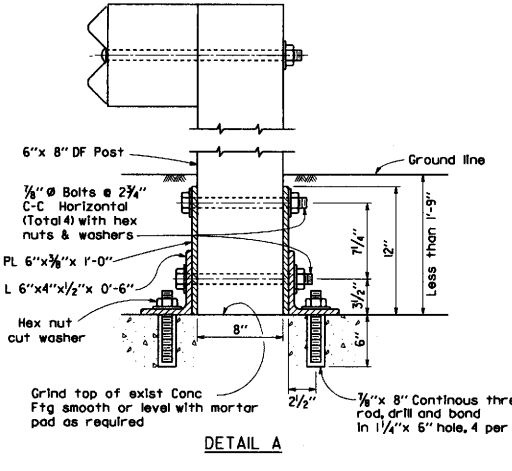
DIKE POSITIONING

(See Note 2)

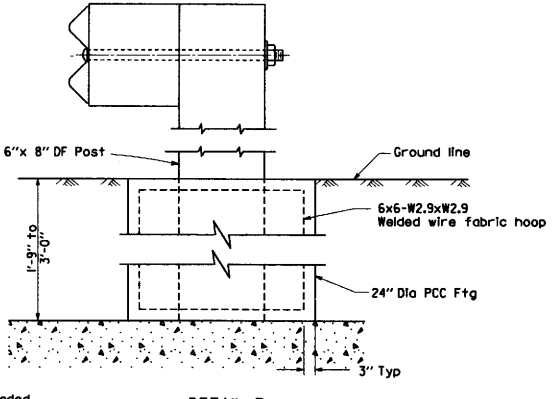


GUARD RAILING DELINEATION

See Note 4



DETAIL A



DETAIL B

Form socket in concrete to receive 6"x8" post or place concrete around 6"x8" post wrapped with one layer of 1/2" thick expanded polystyrene foam sheeting. Do not nail polystyrene to post. Post to be centered in concrete footing.

POST FOOTINGS

(See note 3)

Use where standard embedment of railing post is restricted by underground concrete facilities such as footing of walls, columns, etc. Use Detail A where embedment of post is less than 1'-9". Use Detail B where embedment of post is between 1'-9" and 3'-0".

NOTES

1. For guard rail flare details, see Standard Plans A77D and A77E.
2. When necessary to place dike in front of guard rail, only Type 'C' dike may be used. For dike details see Standard Plan A87.
3. For standard railing post embedment see Standard Plan A77A.
4. Guard railing delineation to be used when required by special provisions.
5. Direction of traffic indicated by →

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METAL BEAM GUARD RAILING MISCELLANEOUS DETAILS

NO SCALE

A77F

STD. PLAN A77F

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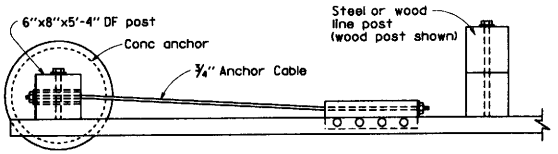
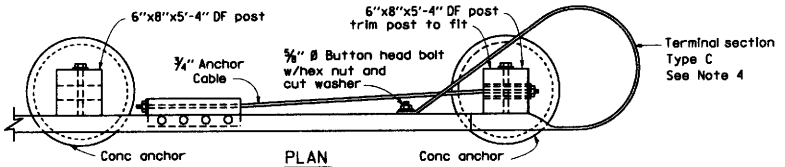
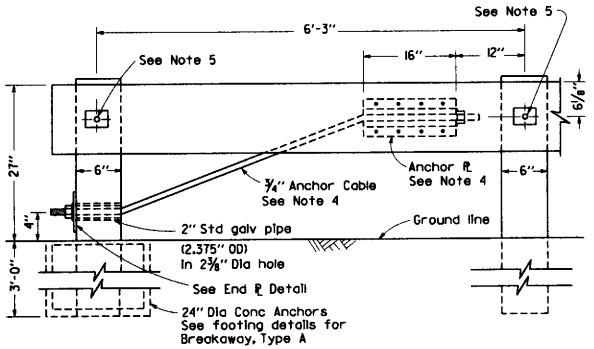


PLAN

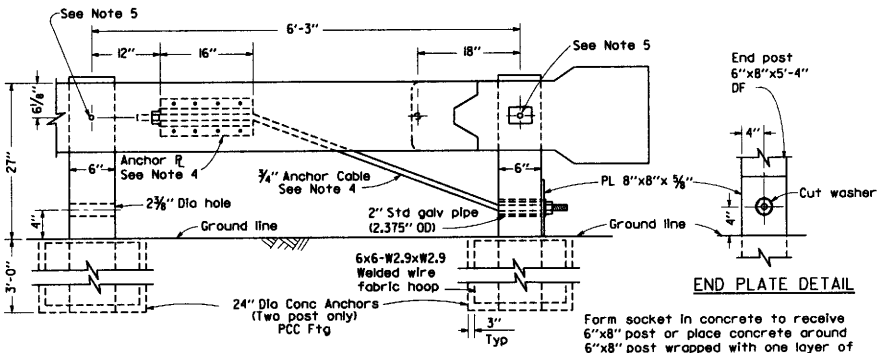


PLAN



ELEVATION

CABLE ANCHOR ASSEMBLY
(BREAKAWAY, TYPE B)

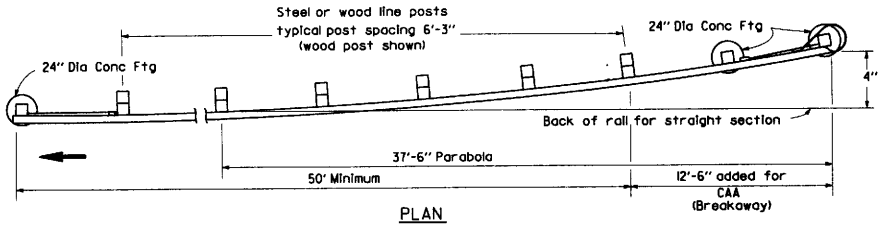


ELEVATION

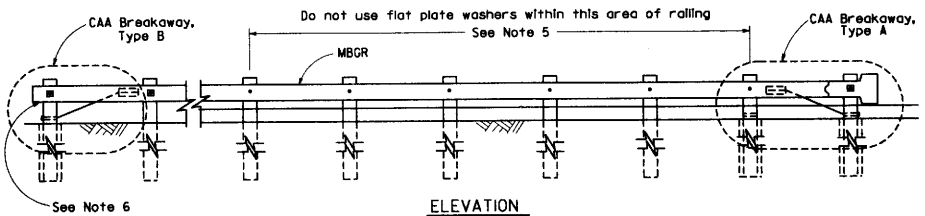
CABLE ANCHOR ASSEMBLY
(BREAKAWAY, TYPE A)

END PLATE DETAIL

Form socket in concrete to receive 6"x8" post or place concrete around 6"x8" post wrapped with one layer of 1/2" thick expanded polystyrene foam sheeting. Do not nail polystyrene to post. Post to be centered in concrete footing.



PLAN



ELEVATION

BREAKAWAY END ANCHORS

NOTES

1. For typical use of cable anchor assembly (Breakaway, Type A), see Standard Plans A77D and A77E.
2. Cable anchor assembly (Breakaway, Type B) is typically used on the trailing end of guard railing for embankment installations except two-way road beds less than 60 feet in width.
3. Direction of traffic indicated by →
4. For details of Terminal Section Type C, anchor plate and 3/4" cable, see Standard Plan A77H.
5. Do not use flat plate washers under head of rail mounting bolt at the second anchor post of Type A anchors and next five line posts. Use flat plate washers on other line posts and at the first anchor post of Type A anchor and at the Type B anchor post.
6. For Trailing end of guard rail adjacent to one-way roadway omit terminal section.

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GUARD RAIL END ANCHORS (BREAKAWAY)

NO SCALE

A77G

STD. PLAN A77G

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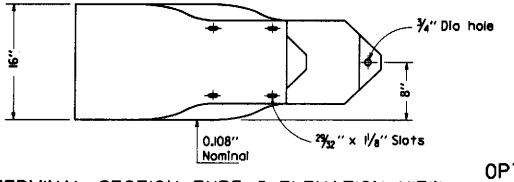
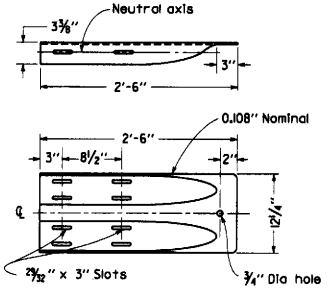


TERMINAL SECTION TYPE C-ELEVATION VIEW

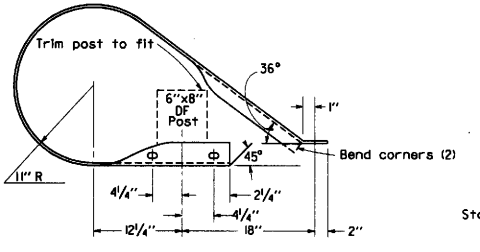


TERMINAL CONNECTOR FOR OPTIONAL DESIGN TERMINAL SECTION TYPE C

DETAIL C

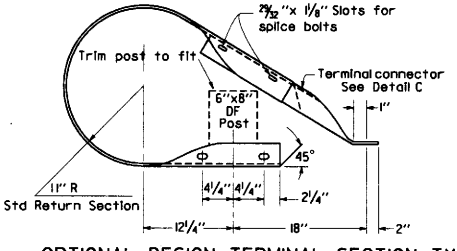
NOTE

1. See Standard Plan A77G for Breakaway End Anchor details.



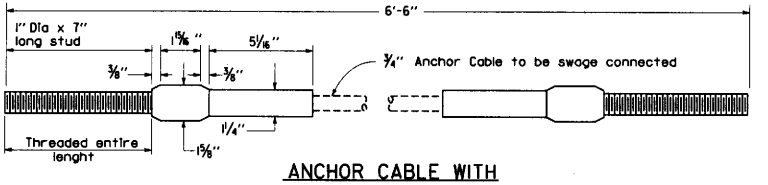
TERMINAL SECTION TYPE C

DETAIL A



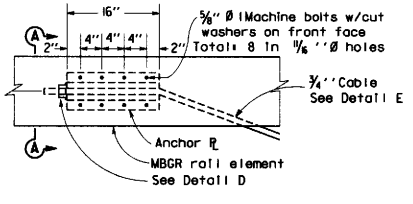
OPTIONAL DESIGN TERMINAL SECTION TYPE C

DETAIL B

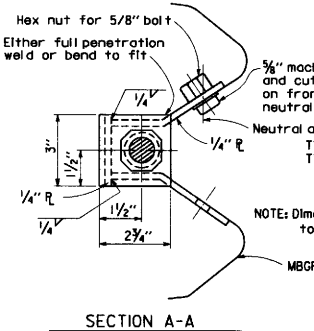


ANCHOR CABLE WITH SWAGED FITTING AND STUD

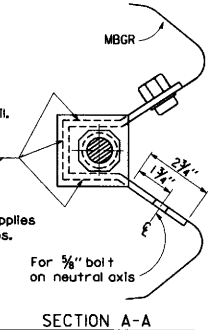
DETAIL E



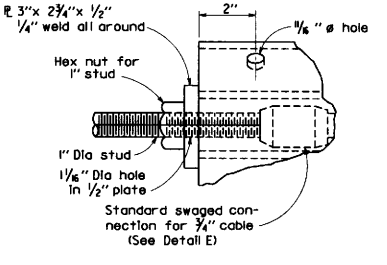
ANCHOR PLATE DETAIL



SECTION A-A
(ALTERNATIVE TYPE 1)



SECTION A-A
(ALTERNATIVE TYPE 2)



DETAIL D

STATE OF CALIFORNIA
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GUARD RAIL END ANCHORS (BREAKAWAY HARDWARE)

NO SCALE

A77H

STD. PLAN A77H

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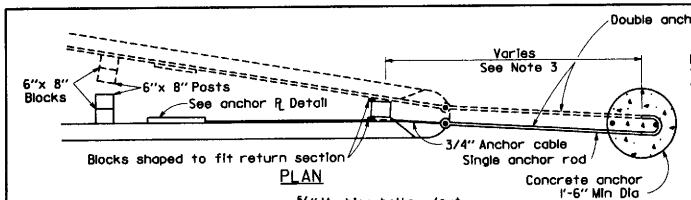
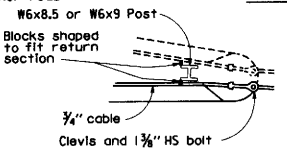
NOTES

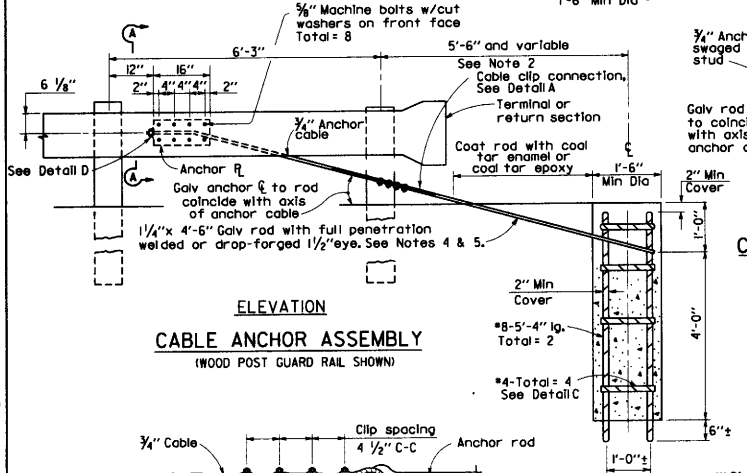
1. For typical use of end anchors shown on this plan, See Standard Plans A77D and A77E.
2. Anchor cable to be parallel to guard rail for straight runs of rail. Anchor cable may have angle point at anchor plate if guard rail is curved.
3. 5'-6" with terminal section. May be less than with return sections if separate rods connect to concrete anchor.
4. Anchor rod hooks to be in contact with anchor reinforcement when concrete is placed. Wire ties may be used to position anchor rods.
5. Cable clip connection (Detail A) or clevis and bolt connection (Detail B) to be used with wood post guard railing installation. For steel post guard railing installations, clevis and bolt connection (Detail B) is to be used. Other alternative for attaching cable to anchor rod must be approved by the engineer.



PLAN



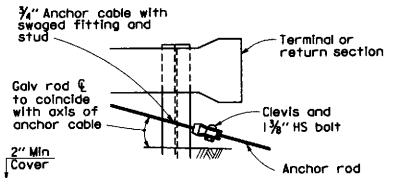
PLAN



ELEVATION

CABLE ANCHOR ASSEMBLY

(WOOD POST GUARD RAIL SHOWN)

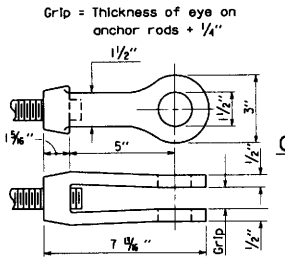


ELEVATION

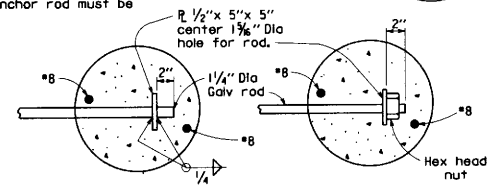
CLEVIS AND BOLT CONNECTION

DETAIL B

(STEEL POST GUARD RAIL SHOWN)
See Note 5

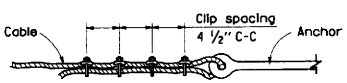


CLEVIS



OPTIONAL SINGLE ANCHOR ROD END DETAILS

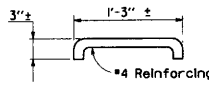
Not to be used for double anchors



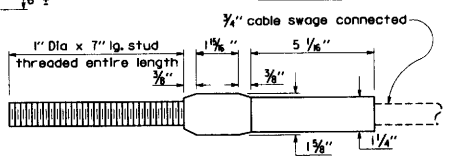
"U" bolts of clip on short end of cable only
"U" bolts tightened to 50 Ft lbs. torque

CABLE CLIP CONNECTION

DETAIL A
See Note 5

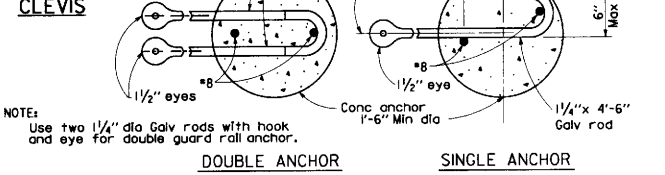


DETAIL C



ANCHOR CABLE WITH SWAGED FITTING AND STUD

DETAIL E

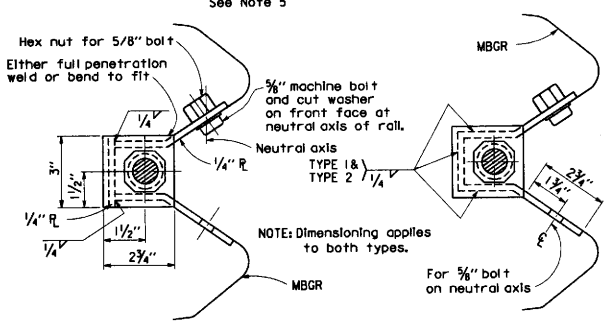


NOTE:
Use two 1 1/4" dia Galv rods with hook and eye for double guard rail anchor.

DOUBLE ANCHOR

SINGLE ANCHOR

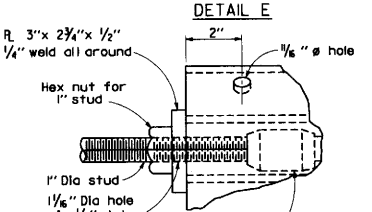
ANCHOR RODS



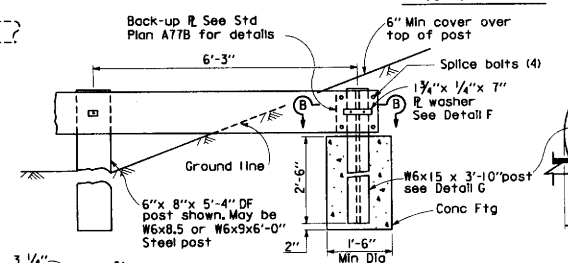
SECTION A-A
(ALTERNATIVE TYPE 1)

SECTION A-A
(ALTERNATIVE TYPE 2)

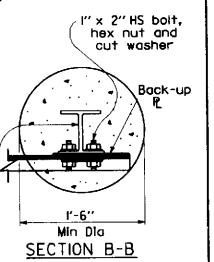
ANCHOR PLATE DETAILS



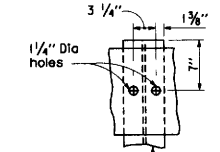
DETAIL D



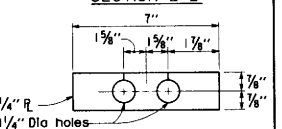
BURIED POST ANCHOR



SECTION B-B



DETAIL G



DETAIL F

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

BARRIER AND GUARD RAIL END ANCHORS

NO SCALE

A77I

STD. PLAN A77I

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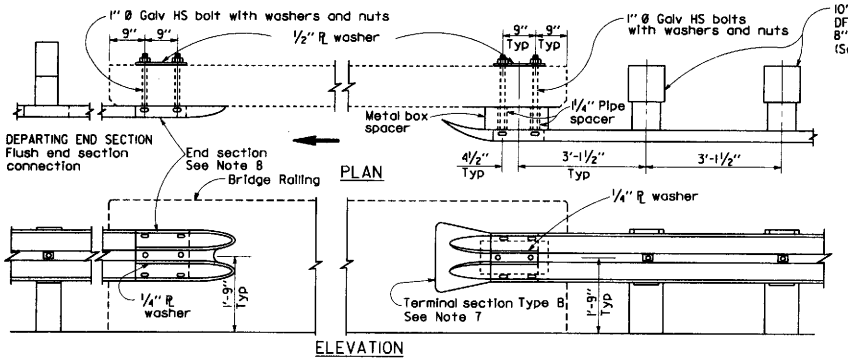
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

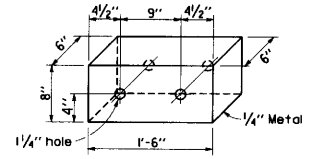
REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER J. E. Summers No. 29741 Exp. 3-31-95 CIVIL STATE OF CALIFORNIA

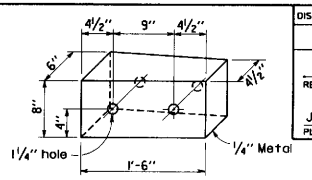


GUARD RAIL CONNECTION TO BRIDGE RAILING



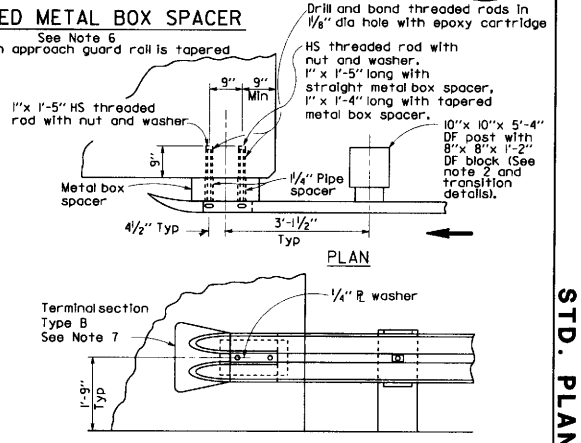
STRAIGHT METAL BOX SPACER

See Note 6
Use when approach guard rail is not tapered

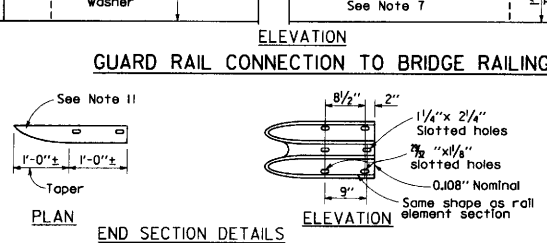


TAPERED METAL BOX SPACER

See Note 6
Use when approach guard rail is tapered



GUARD RAIL CONNECTION TO WALL OR ABUTMENT FACE



END SECTION DETAILS

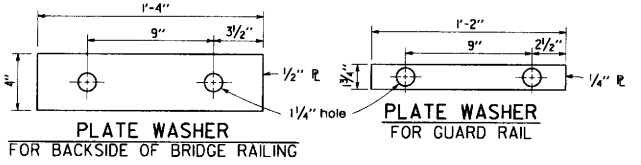
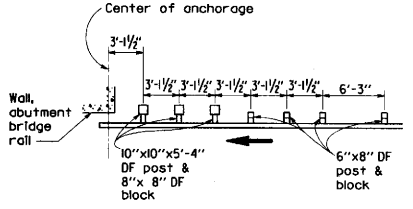
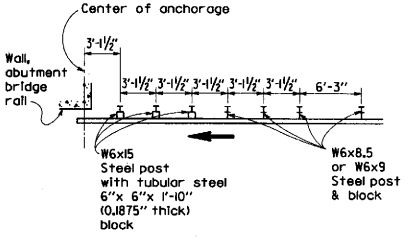


PLATE WASHER
FOR BACKSIDE OF BRIDGE RAILING

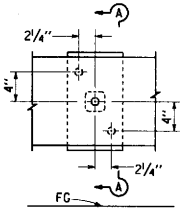
PLATE WASHER
FOR GUARD RAIL



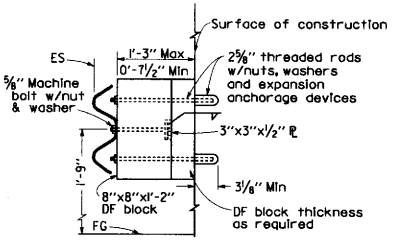
APPROACH RAILING TRANSITION
WOOD POSTS



APPROACH RAILING TRANSITION
STEEL POSTS



BLOCKOUT DETAIL-ELEVATION



SECTION A-A

See Notes 9 and 10

GUARD RAIL ANCHORAGE TO WALL OR ABUTMENT

NOTES

1. These connection details apply to bridge rails, abutments and retaining walls. For additional connection details for bridge railing, see Standard Plan B11-53 and B11-54 and the project plans.
2. Where 10"x10" DF post and 8"x8" DF blocks are shown, W6x15 steel posts and tubular steel 6"x 6"x 1'-2" (0.1875" thick) blocks may be specified where applicable.
3. Additional details of post, blocks and hardware are shown on Standard Plans A77B and A77C.
4. Direction of traffic indicated by ➡
5. For approach railing details, see Type 1 flare on Standard Plan A77D and transition details on this plan.
6. When metal box spacer is installed, place 1 1/4"x 5" and 1 1/4"x 4" pipe spacers on 1" bolts passing through interior of tapered box spacer and 1 1/4"x 5 1/4" pipe spacers on 1" bolts passing through interior of straight box spacer.
7. Terminal sections will not be installed on trailing end of approach guard rail placed adjacent to one-way roadways. When terminal section is not installed, use backup plate between rail element and metal box spacer. See Standard Plan A77B for backup plate details.
8. This type of connection may be used for both the approach and departing ends of structures on roadways 28 feet or less in width.
9. Use timber shims without posts where rail to wall or abutment clearance is less than 15 inches.
10. Do Not attach rail to bridge columns. Use separate posts as shown on Standard Plan 77E.
11. End sections may be cut from Type B terminal section or fabricated.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

GUARD RAIL CONNECTIONS TO BRIDGE RAILS, RETAINING WALLS AND ABUTMENTS

NO SCALE

A77J

STD. PLAN A77J

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REGISTERED CIVIL ENGINEER

July 1, 1992

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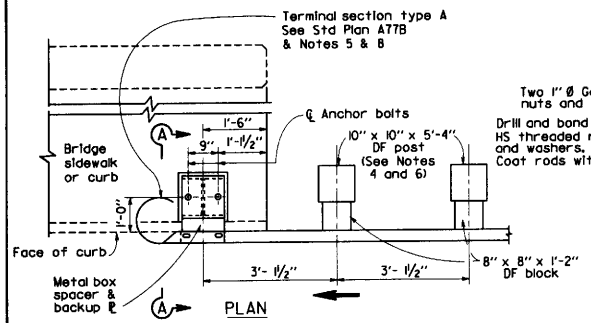
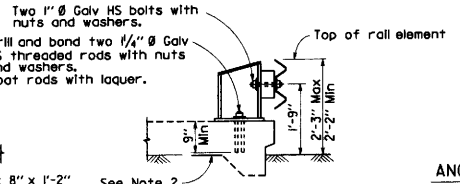
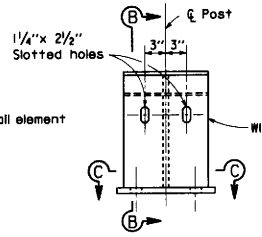


PLAN

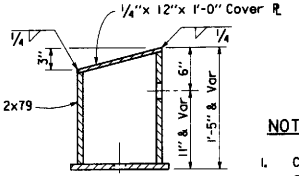


SECTION A-A

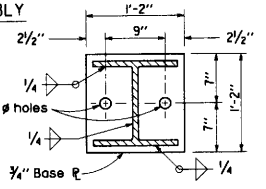


ANCHOR POST ASSEMBLY

See Note 7



SECTION B-B



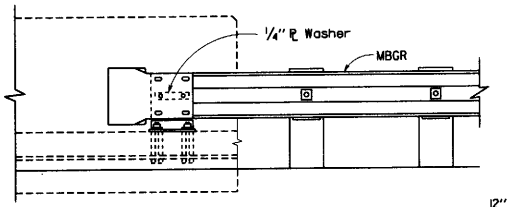
SECTION C-C

ANCHOR POST DETAILS

(FOR CONNECTION DETAIL A)

NOTES

1. Connection Details A and B applies to the traffic approach end of bridges. For departure end of bridges, see Connection Detail C.
2. When curb or sidewalk depth is less than 9", use Connection Detail B.
3. Direction of traffic indicated by ⟶
4. For approach railing details, see Type 1 Flare on Standard Plan A77D.
5. Terminal sections will not be installed on the trailing end of approach guard rail placed adjacent to one-way roadways.
6. Where 10" x 10" DF posts and 8" x 8" DF blocks are shown, W6 x 15 steel post and Tubular Steel 6" x 6" x 1'-2" (0.1875" thick) blocks may be specified where applicable.
7. Rail post assembly to be galvanized after fabrication.
8. Terminal section Type A to be used where pedestrian traffic is present.
9. For additional connection details for bridge barrier railing, see Standard Plans B11-53 and B11-54 and the project plans.



ELEVATION

CONNECTION DETAIL A

See Note 2

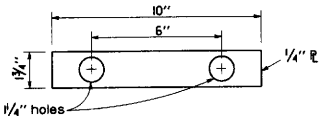
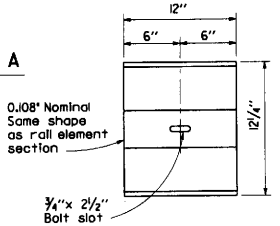
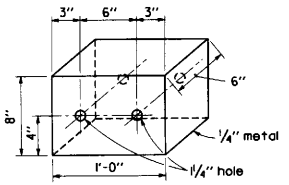


PLATE WASHER



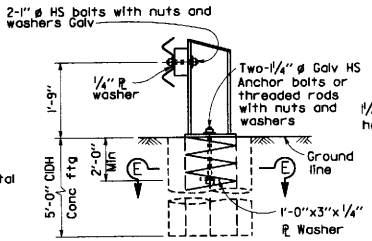
BACK-UP PLATE

For use between guard rail element and metal box spacer

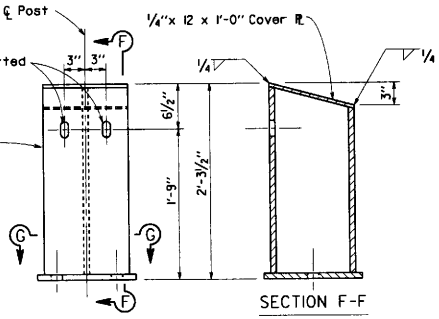


METAL BOX SPACER

Place 1¼"x 5¼" pipe spacers on 1" bolts passing through box interior



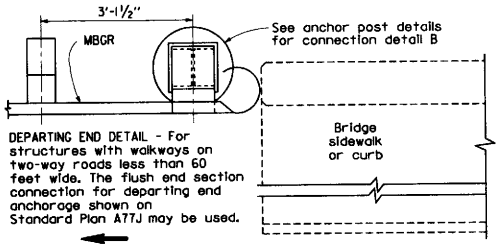
SECTION D-D



ANCHOR POST ASSEMBLY

See Note 7

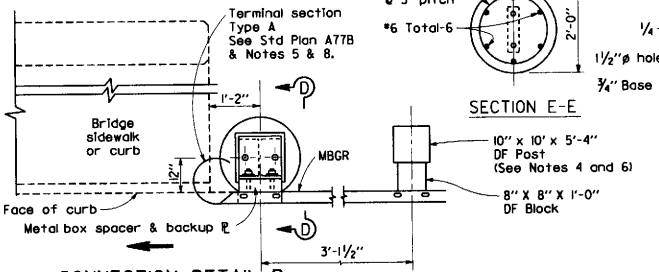
SECTION F-F



DEPARTING END DETAIL - For structures with walkways on two-way roads less than 60 feet wide. The flush end section connection for departing end anchorage shown on Standard Plan A77J may be used.

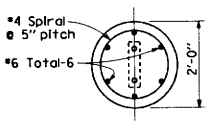
CONNECTION DETAIL C

PLAN

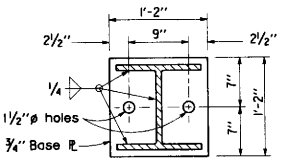


CONNECTION DETAIL B

PLAN



SECTION E-E



SECTION G-G

ANCHOR POST DETAILS

(FOR CONNECTION DETAIL B)

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

GUARD RAIL CONNECTION TO BRIDGE SIDEWALK AND CURBS

NO SCALE

A77K

STD. PLAN A77K

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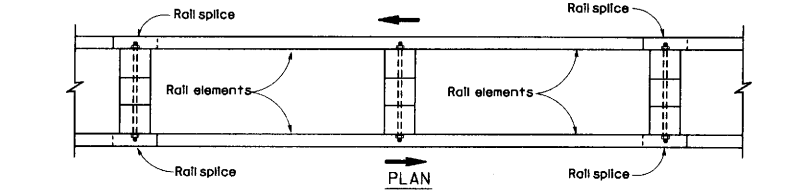
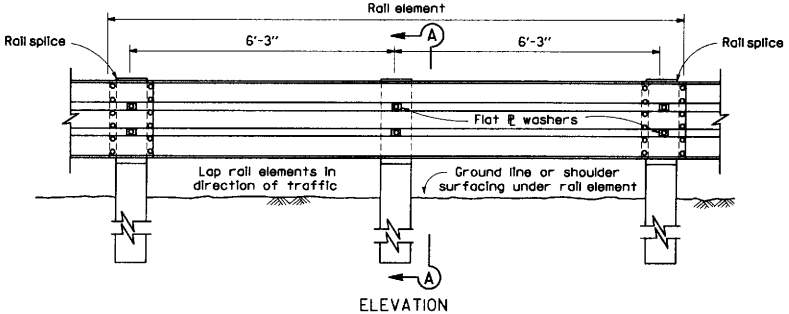
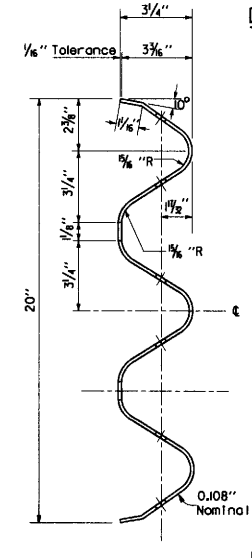


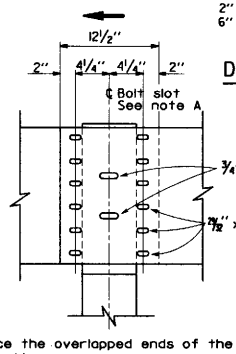


DOUBLE THRIE BEAM BARRIER

(Wood post barrier shown)



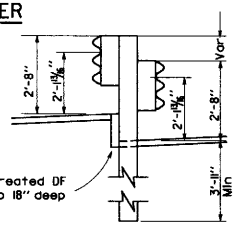
SECTION THRU RAIL ELEMENT



Note A: ℄ Bolt slot in wood post or ℄ bolt slot in steel block used with steel post.

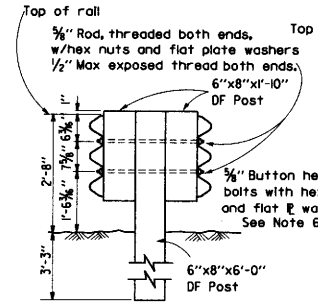
Splice the overlapped ends of the rail elements with ⅝"x 1¼" Button head oval shoulder bolts and ⅝"x 1¼" recessed hex nuts in 29/32"x 1⅛" slots. Total: 12 per rail splice and 4 per terminal section or return section. Lap rail elements in direction of traffic.

RAIL SPLICE DETAIL
ELEVATION VIEW

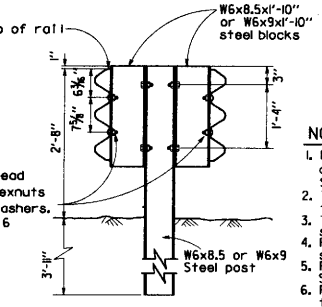


DOUBLE THRIE BEAM BARRIER
SAW TOOTH INSTALLTION

(Steel posts only)

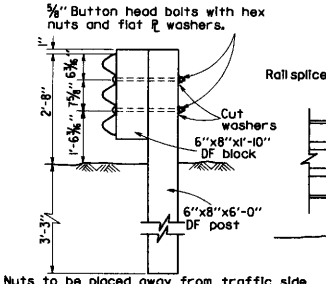


SECTION A-A



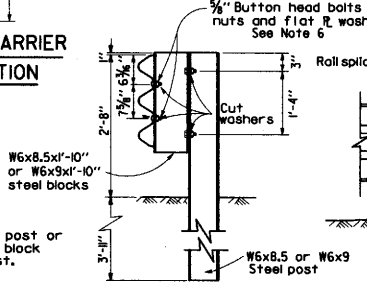
DOUBLE THRIE BEAM BARRIER

(Steel post and blocks)
Each block attached to post with two ⅝" Dia hex bolts and nuts. See Note 7



Nuts to be placed away from traffic side of rail. Hole placement in posts same for 10"x10"x6'-0" DF post.

SECTION B-B

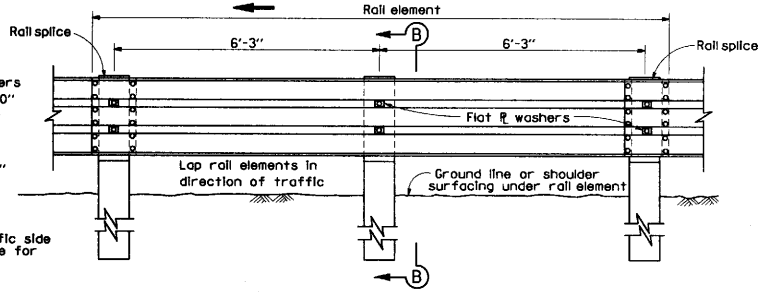


Block attached to post with two ⅝" Dia hex bolts and nuts. See Note 7

SECTION C-C

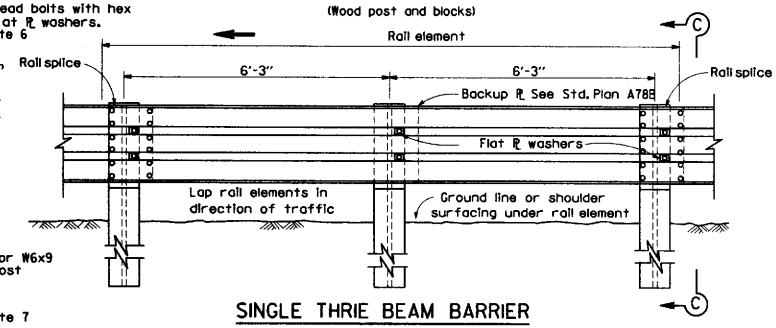
NOTES

1. For details of standard hardware, posts and blocks used to construct thrie beam barrier, see Standard Plan A78B.
2. Thrie beam barrier post spacing to be 6'-3" center to center, except as otherwise noted.
3. Top of barrier rail to be 32" above ground line or shoulder surfacing under the rail element.
4. For barrier end anchors and barrier connections, see Standard Plans A78C.
5. For connection to Type 50 concrete barrier, see Standard Plans A78D.
6. Rail mounts to block with 2 bolts on approaching traffic side of block and post web.
7. Block mounts to post with 2 bolts staggered. Lower bolt on approaching traffic side of block and post web.
8. Where standard embedment of barrier post is restricted by underground concrete facilities such as footing of walls, columns, etc., use post footing details on Standard Plan A77F.
9. Direction of traffic indicated by ⟶



SINGLE THRIE BEAM BARRIER

(Wood post and blocks)



SINGLE THRIE BEAM BARRIER

(Steel post and block)

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

THRIE BEAM BARRIER

NO SCALE

A78A

STD PLAN A78A

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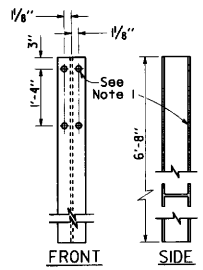
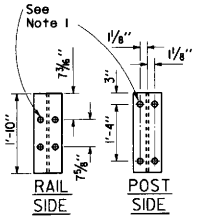
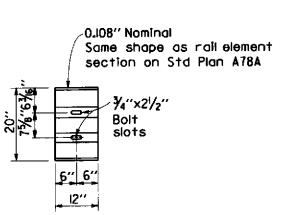


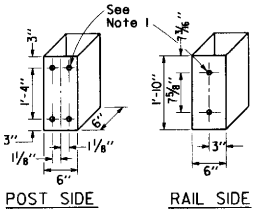
STEEL POST
W6x8.5, W6x9 or W6x15



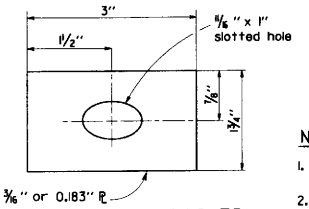
STEEL BLOCK
W6x8.5 or W6x9



BACK-UP PLATE
See Note 3



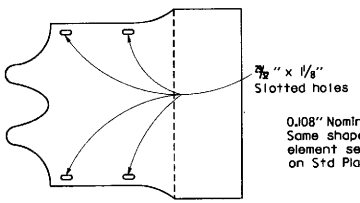
6"x6"x1'-10" (0.1875" Thick)
TUBULAR STEEL BLOCK
(Use with W6x15 post)

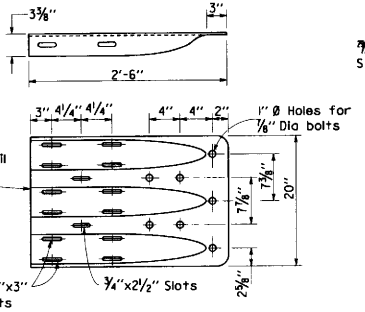


FLAT PLATE WASHER

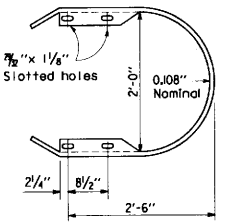
NOTES

1. All holes in steel post and blocks to be 11/16" Ø. Holes in wood and blocks to be 3/4" Ø ±1/16".
2. Contractor may submit alternative post details for Engineer's approval.
3. Back-up plate to be used between barrier rail element and steel block on steel post where there is no rail element splice. See Standard Plan A78A.
4. Terminal sections will not be installed on the trailing end of single thrie beam barrier placed adjacent to one-way roadways.
5. Median barrier delineation to be used when required by the special provisions. Spacing of barrier markers to match spacing of raised pavement markers on the adjacent median edgeline pavement delineation.
6. Direction of traffic indicated by ⟶
7. Block mounts to post with 2 bolts staggered. Lower bolt on approaching traffic side of block and post web.

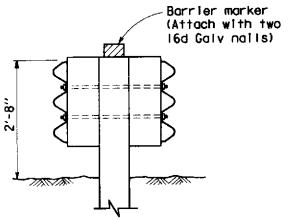




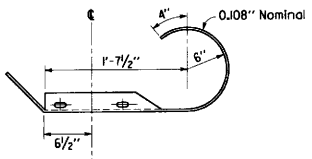
TERMINAL CONNECTOR



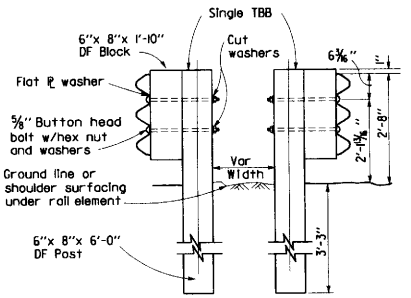
RETURN SECTION



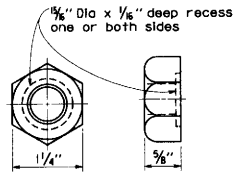
MEDIAN BARRIER DELINEATION
See Note 5



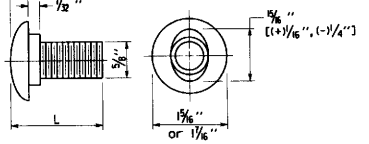
TERMINAL SECTION
See Note 4



SECTION A-A

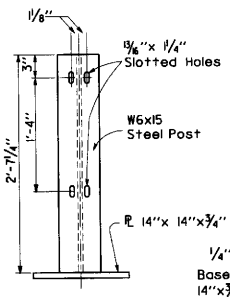


5/8" Ø RECESS NUT

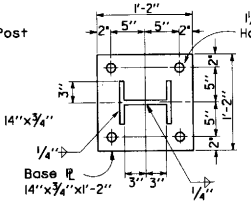


5/8" Ø BUTTON HEAD BOLT

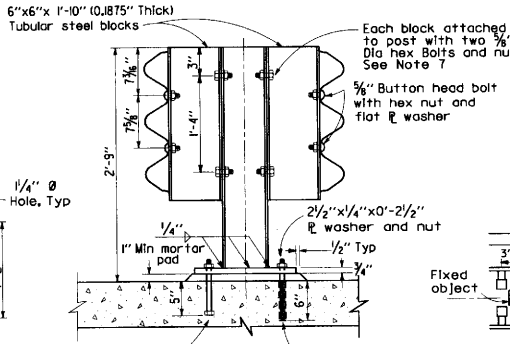
L	THREAD LENGTH
1 1/4"	full thread length
2"	1 1/2" Min thread length
9 1/2"	1 3/4" Min thread length
18"	2 1/2" Min thread length



BRIDGE POST DETAILS

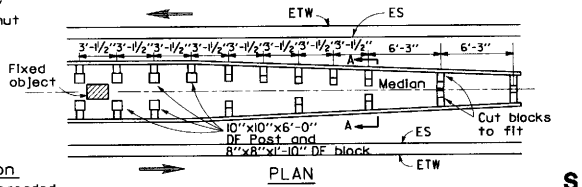


BRIDGE POST BASE PLATE PLAN



ELEVATION

DOUBLE THRIE BEAM BARRIER ON BRIDGE



PLAN

THRIE BEAM BARRIER AT FIXED OBJECTS
(WOOD POST SHOWN)
(Where rail clears fixed object by more than 3 feet, use normal post size and spacing.)

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

THRIE BEAM BARRIER STANDARD HARDWARE AND MISCELLANEOUS DETAILS

NO SCALE

A78B

STD PLAN A78B

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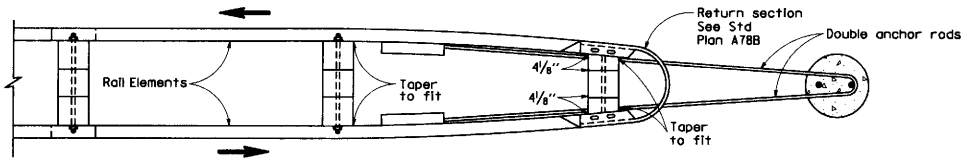
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

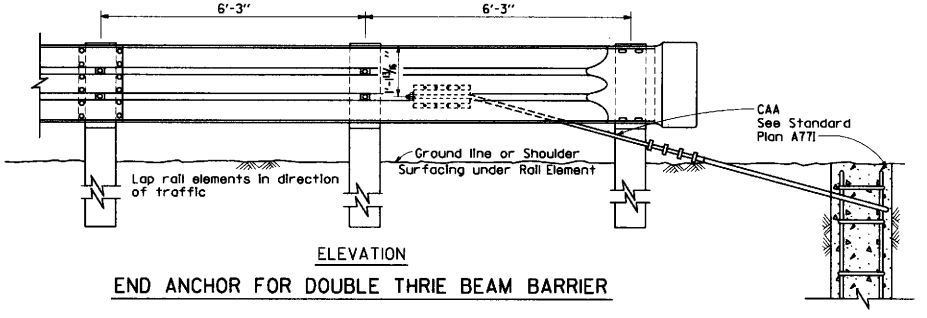
REGISTERED PROFESSIONAL ENGINEER
J. E. Summers
No. 29741
Exp. 3-31-95
CIVIL
STATE OF CALIFORNIA



PLAN

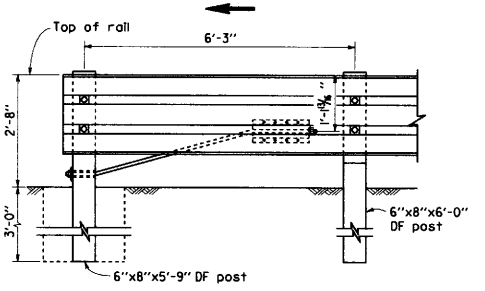
NOTES

1. For anchor details, see Cable Anchor Assembly (Breakaway, Type B) on Standard Plan A77G.
2. For anchor details, see Cable Anchor Assembly (Breakaway, Type A) on Standard Plan A77G.
3. For guard railing approach flares, see Standard Plan A77D.
4. For connection details to bridge, retaining walls and abutments, see Standard Plan A78E and A78F.
5. Direction of traffic indicated by →



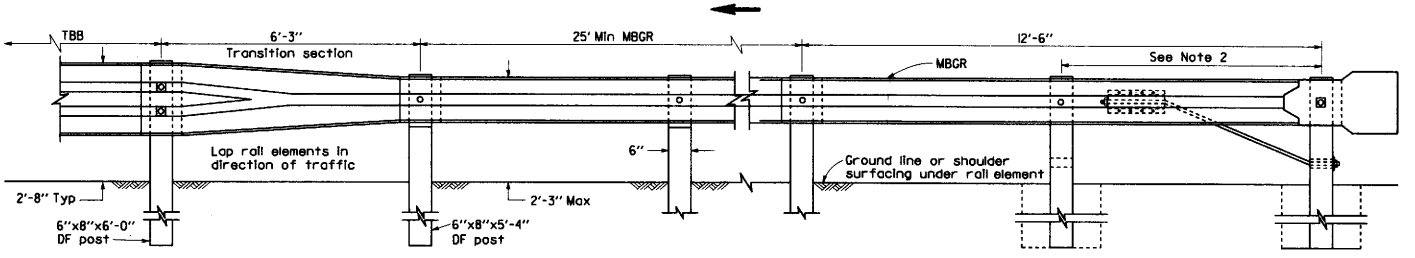
ELEVATION

END ANCHOR FOR DOUBLE THRIE BEAM BARRIER



TRAILING END ANCHOR FOR
SINGLE THRIE BEAM BARRIER

(For one-way roadways)
See Note 1



APPROACH END ANCHOR FOR
SINGLE THRIE BEAM BARRIER

See Note 3

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

THRIE BEAM BARRIER END ANCHORS

NO SCALE

A78C

STD PLAN A78C

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

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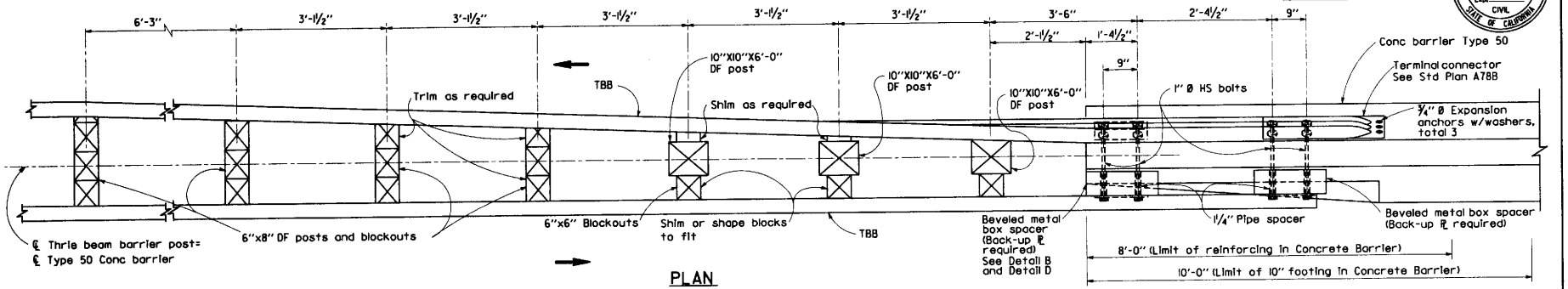
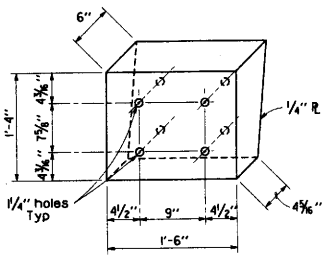
July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER J. E. Summers No. 29741 Exp. 3-31-95 CIVIL STATE OF CALIFORNIA

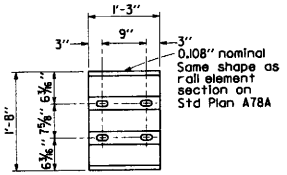


PLAN



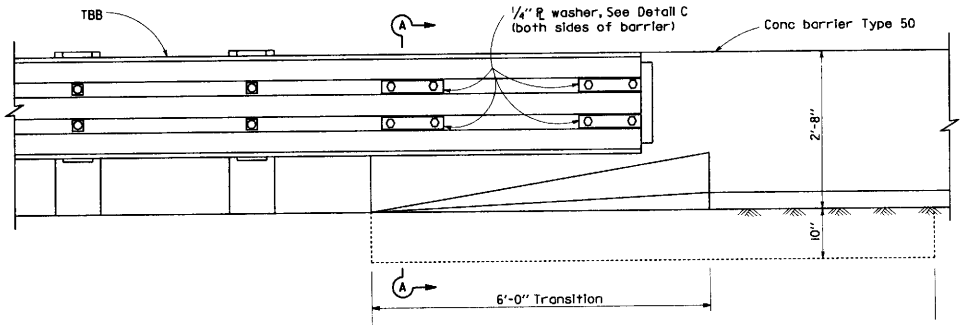
DETAIL B

Beveled metal box spacer
See Note 4

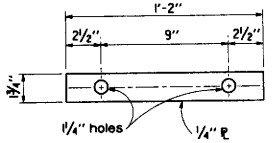


DETAIL D

Back-up ℙ
Use between box spacer and rail element

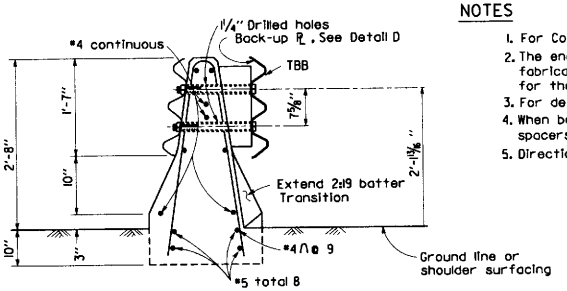


ELEVATION



DETAIL C

Plate Washer



SECTION A-A

NOTES

1. For Concrete Barrier Type 50, see Standard Plan A75A.
2. The ends of the barrier rail elements are to be fabricated to fit required spacing as shown for the connection.
3. For details not shown, see Standard Plans A78A and A78B.
4. When beveled metal box spacer is installed, place 1¼"x4¾" and 1¼"x4" pipe spacers on 1" HS bolts passing through interior of box.
5. Direction of traffic indicated by →

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

THRIE BEAM BARRIER CONNECTION TO CONCRETE BARRIER TYPE 50

NO SCALE

A78D

STD. PLAN A78D

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

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July 1, 1992
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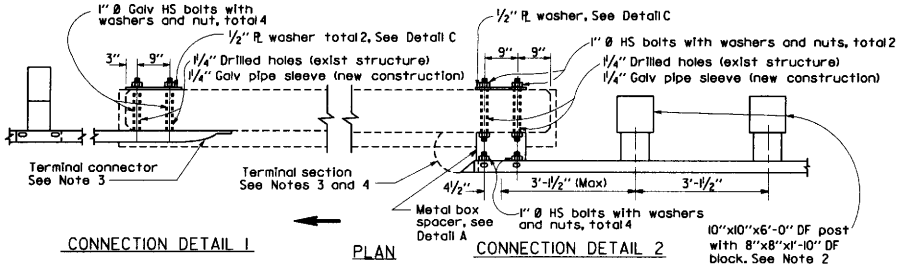
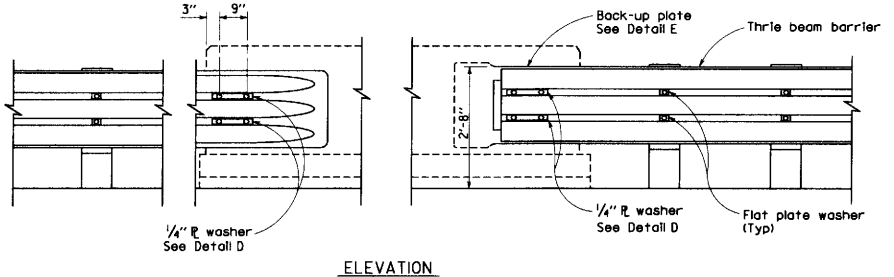
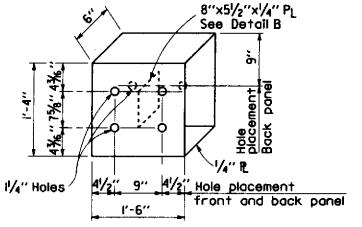


CONNECTION DETAIL 1 ← PLAN CONNECTION DETAIL 2

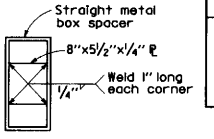


ELEVATION

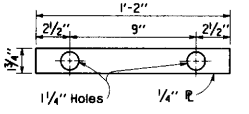
THRIE BEAM BARRIER CONNECTION TO BRIDGE RAILING WITH VERTICAL FACE



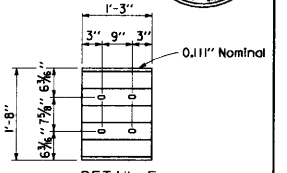
DETAIL A
STRAIGHT METAL BOX SPACER



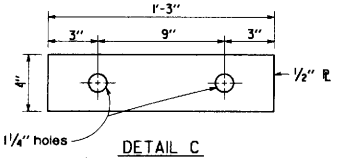
DETAIL B



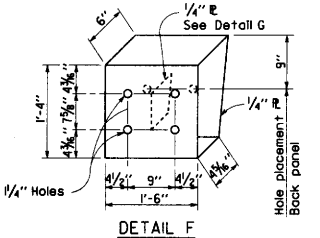
DETAIL D
1/4" PLATE WASHER



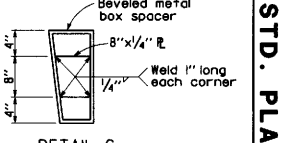
DETAIL E
BACK-UP PLATE
(Same shape as thrie beam rail element. Not required when terminal section is used.)



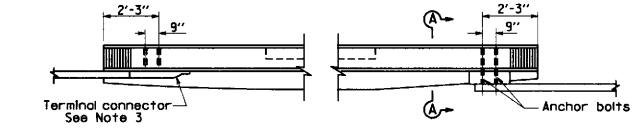
DETAIL C
1/2" PLATE WASHER



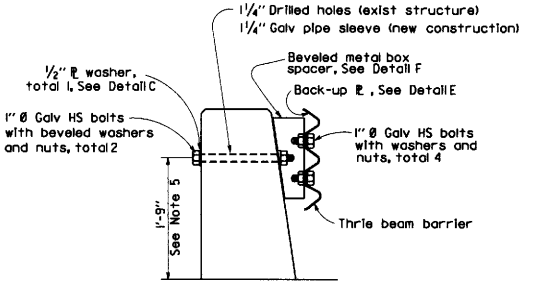
DETAIL F
BEVELED METAL BOX SPACER



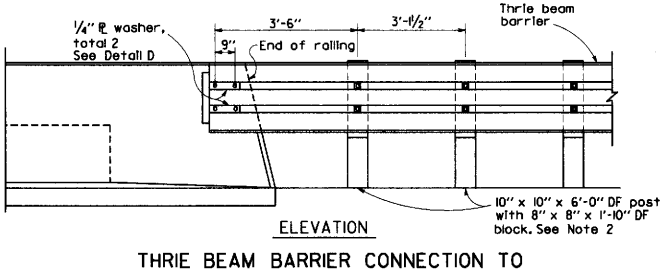
DETAIL G



CONNECTION DETAIL 3 (See Note 7) ← PLAN CONNECTION DETAIL 4



SECTION A-A



ELEVATION

THRIE BEAM BARRIER CONNECTION TO BRIDGE RAILING WITH SLOPED SAFETY FACE

NOTES

1. These connection details apply to concrete bridge railing. For additional connection details see project plans.
2. Where 10" x 10" DF post and 8" x 8" DF blocks are shown, W6x15 steel post and tubular steel 6" x 6" x 1'-10" (0.875" thick) blocks may be specified where applicable.
3. Terminal sections and terminal connectors are to be fabricated to fit required spacing as shown.
4. Terminal section will not be installed on trailing end of approach thrie beam barrier placed adjacent to one-way roadways. When terminal section is required, trim section to fit.
5. This dimension may vary slightly to fit existing bolt holes in existing bridge rail.
6. Connection Details 1 and 3 are to be used on departing end of structure.
7. Details for Connection Detail 3 similar to connection Detail 1 except for anchorage bolts offset dimensions from end of railing.
8. Direction of traffic indicated by →

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

THRIE BEAM BARRIER CONNECTIONS TO BRIDGE RAILS

NO SCALE

A78E

STD. PLAN A78E

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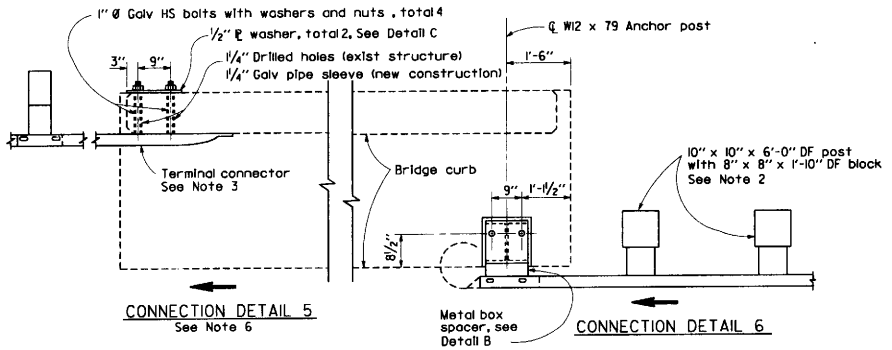
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

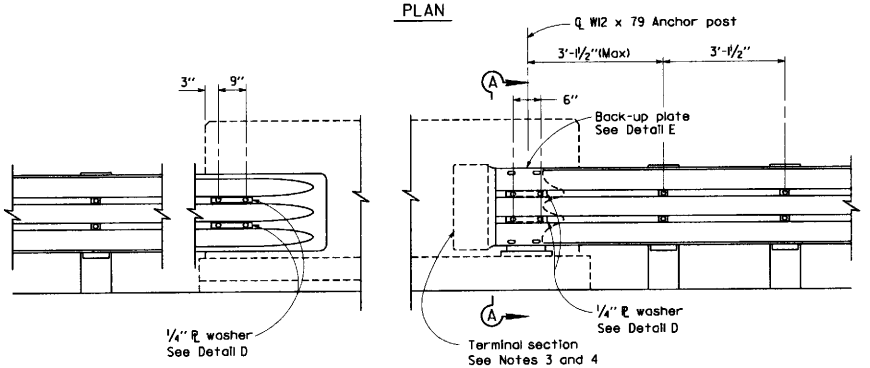
REGISTERED PROFESSIONAL ENGINEER J. E. Summers No. 29741 Exp. 3-31-95 CIVIL STATE OF CALIFORNIA



CONNECTION DETAIL 5
See Note 6

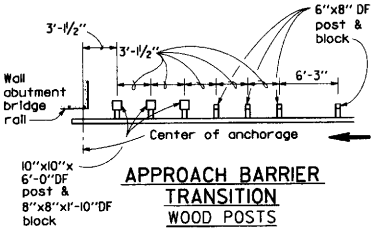
CONNECTION DETAIL 6

PLAN

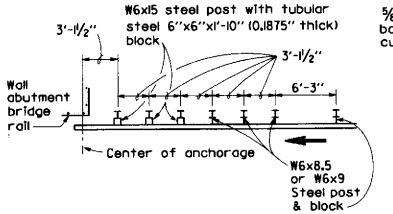


ELEVATION

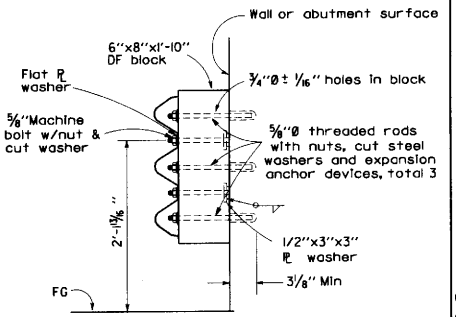
THRIE BEAM BARRIER CONNECTION TO BRIDGE SIDEWALK OR CURB



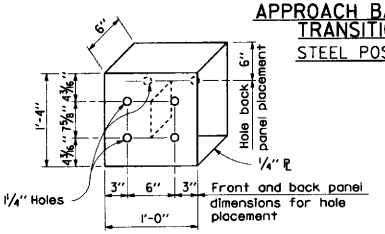
APPROACH BARRIER TRANSITION
WOOD POSTS



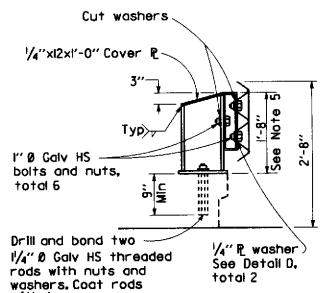
APPROACH BARRIER TRANSITION
STEEL POSTS



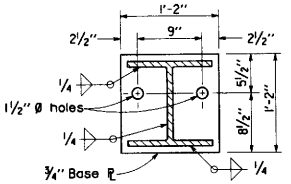
THRIE BEAM BARRIER ANCHORAGE TO WALL OR ABUTMENT
See Note 7



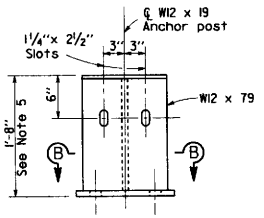
DETAIL B
STRAIGHT METAL BOX SPACER



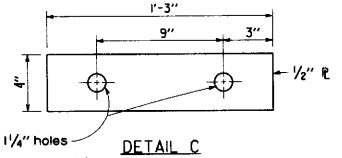
SECTION A-A



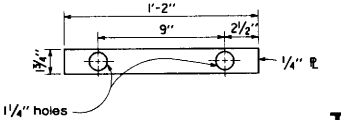
SECTION B-B



DETAIL A
ANCHOR POST ASSEMBLY



DETAIL C
1/2" PLATE WASHER



DETAIL D
1/4" PLATE WASHER

NOTES

1. These connection details apply to concrete bridge railing, abutments and retaining walls. For additional connection details see project plans.
2. Where 10" x 10" DF post and 8"x 8" DF blocks are shown, W6x15 steel post and tubular steel 6" x 6" x 1'-10" (0.1875" thick) blocks may be specified where applicable.
3. Terminal sections and terminal connectors are to be fabricated to fit required spacing as shown.
4. Terminal section will not be installed on trailing end of approach thrie beam barrier placed adjacent to one-way roadways. When terminal section is required, trim section to fit.
5. Dependent dimensions shall be verified in the field before fabricating any end connections to conform with existing pavement elevation conditions. The height of the thrie beam barrier shown is to be maintained.
6. Connection Detail 5 is to be used on departing end of structure.
7. Do not attach barrier rail to bridge columns. Use separate post as shown on the detail for thrie beam barrier at fixed object on Standard Plan A78B.
8. Direction of traffic indicated by →

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

THRIE BEAM BARRIER CONNECTIONS TO BRIDGE CURBS, RETAINING WALLS AND ABUTMENTS

NO SCALE

A78F

STD. PLAN A78F

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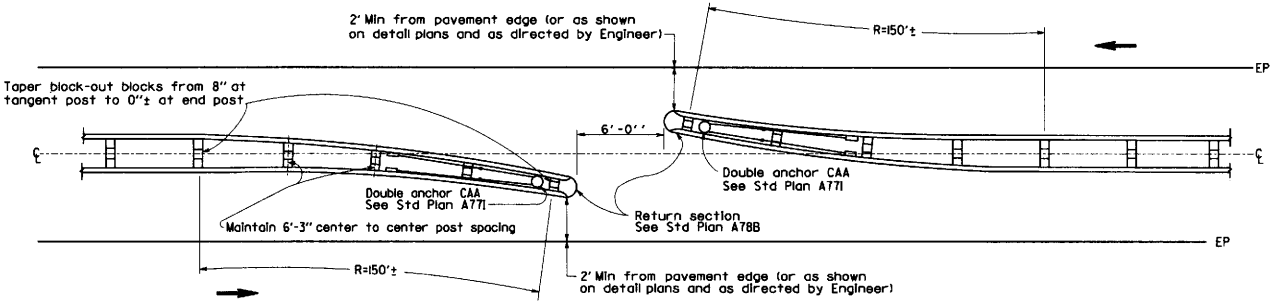
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
J. E. Summers
No. 29741
Exp. 3-31-95
CIVIL
STATE OF CALIFORNIA



PLAN VIEW

MOTORCYCLE PASSAGEWAY IN THRIE BEAM MEDIAN BARRIER

NOTES

1. For additional thrie beam barrier details, see Standard Plans A78A and A78B.
2. Direction of traffic indicated by →

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

THRIE BEAM BARRIER EMERGENCY PASSAGEWAY

NO SCALE

A80

STD. PLAN A80

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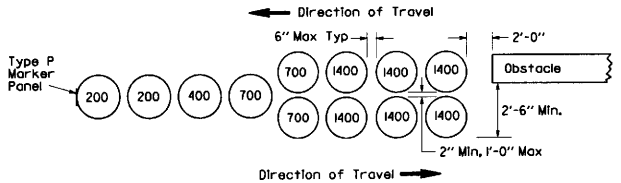
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

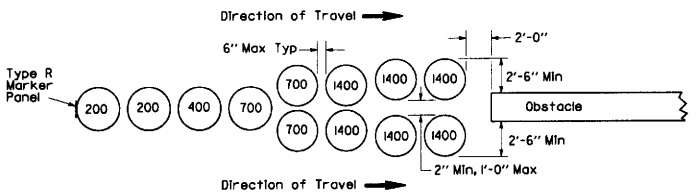
REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — J. E. Summers — No. 29741 — Exp. 3-31-95 — CIVIL — STATE OF CALIFORNIA



ARRAY 'A'
(APPROACH SPEED 45 MPH OR GREATER)



ARRAY 'B'
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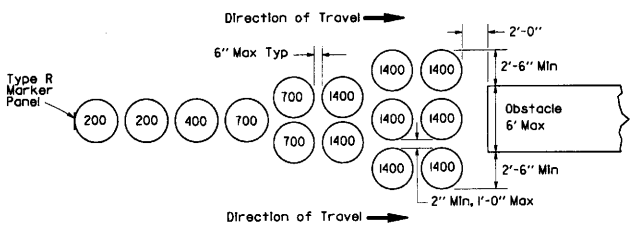

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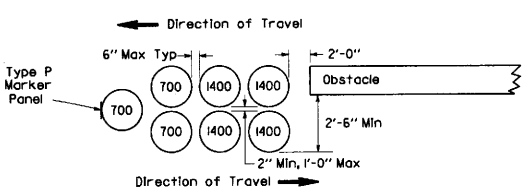

ARRAY 'D'
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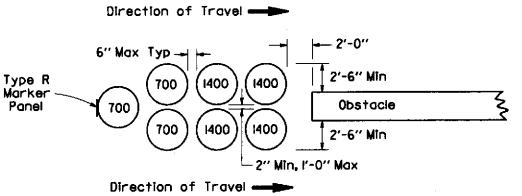

ARRAY 'E'
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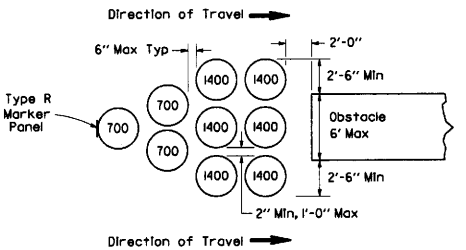

ARRAY 'F'
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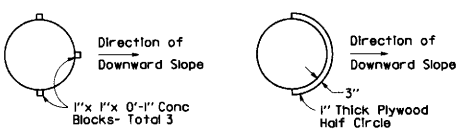
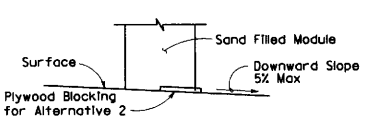


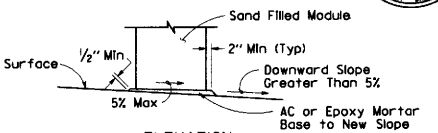
ALTERNATIVE 1 ALTERNATIVE 2

PLAN



ELEVATION

BRIDGE DECK MODULE BLOCKING DETAILS
(SEE NOTE 8)



ELEVATION

SLOPED SEAT DETAIL

PAINTING DETAIL
(SEE NOTE 7)

NOTES

1. (XXX) indicates module location and weight of sand in pounds for each module.
2. All sand weights are nominal.
3. Each module is to contain amount of sand indicated, supported according to the manufacturer's instructions.
4. Arrays 'A', 'B' and 'C' are designed for 65 MPH.
5. Crash cushion array may be angled toward approaching traffic when traffic approaches on one side only (array 'A' and 'D'). Amount of angle not to exceed 10 degrees.
6. Modules shall be placed on asphalt concrete, epoxy mortar or concrete surface.
7. Weight of sand and outline of each module shall be painted on the surface at each module location.
8. Module blocking, epoxied to the deck surface, is required for all modules placed on bridge decks. Two acceptable alternatives are shown. Other alternatives recommended by the manufacturer and approved by the Engineer will be accepted.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

CRASH CUSHION, SAND FILLED

NO SCALE

A81

STD. PLAN A81

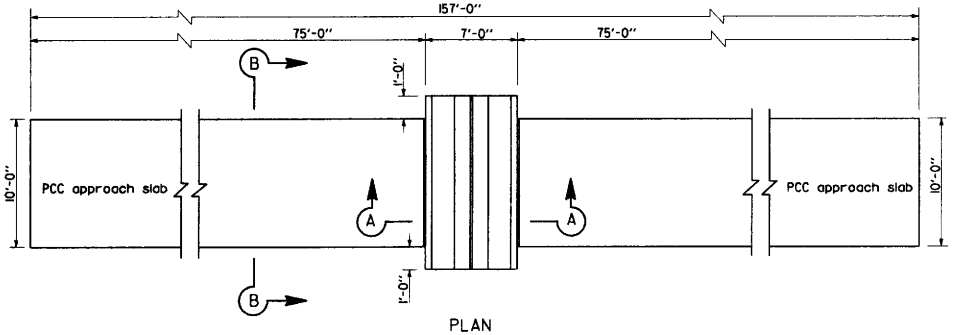
Return to Table of Contents

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

Kenneth Y. Mori
REGISTERED CIVIL ENGINEER

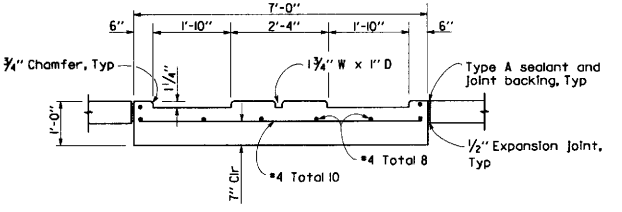
July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
K. Mori
No. 14733
Exp. 3-31-93
CIVIL
STATE OF CALIFORNIA



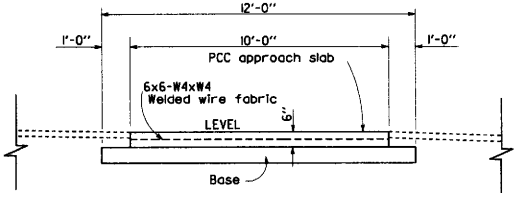
PLAN

PORTABLE SCALE PAD AND APPROACH SLAB



SECTION A-A

PORTABLE SCALE PAD DETAILS



SECTION B-B

APPROACH SLAB DETAILS

See Note 2

NOTES

1. PCC portable scale pad and PCC approach slabs shall be level in all directions.
2. See typical cross section on project plans for limits and thickness of structural section.

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DEPARTMENT OF TRANSPORTATION

PORTABLE SCALE PAD AND APPROACH SLAB DETAILS

NO SCALE

STD. PLAN A83

A83

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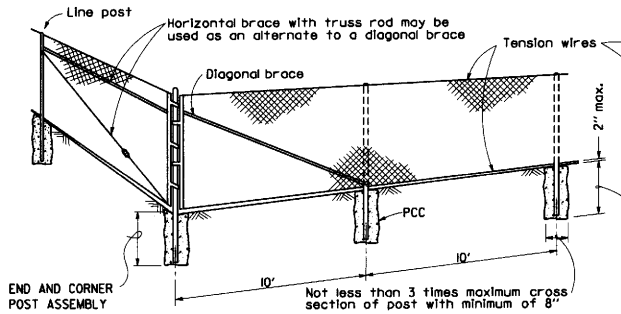
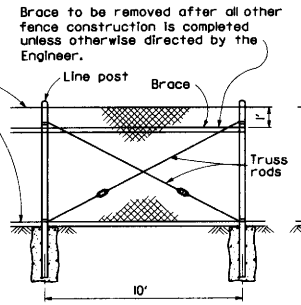
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

John L. Wright
REGISTERED CIVIL ENGINEER

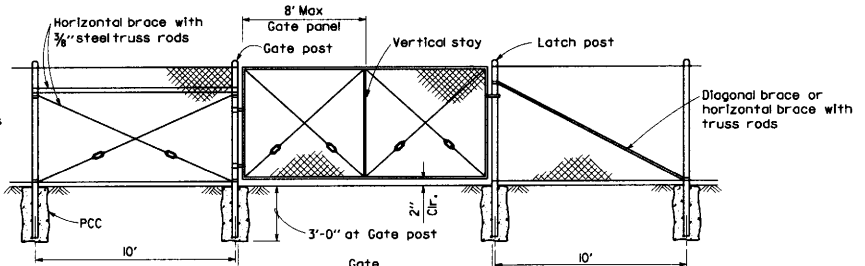
July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER J. L. Wright No. 33937 Exp. 6-30-94 CIVIL STATE OF CALIFORNIA

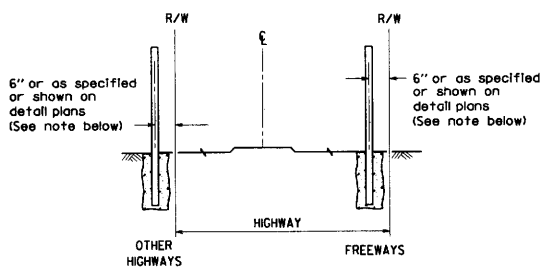




Line posts at 1000' maximum intervals braced and trussed in both directions except that this bracing and trussing may be omitted when the fabric is stretched by the equipment



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



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

FENCE LOCATION

TYPICAL MEMBER DIMENSIONS (See Notes)

FENCE HEIGHT	LINE POSTS			END, LATCH & CORNER POSTS			BRACES			
	ROUND ID	H	ROLL FORMED	ROUND ID	ROLL FORMED		ROUND ID	H	ROLL FORMED	
6' and less	1 1/2"	1 7/8" x 1 5/8"	1 7/8" x 1 5/8"	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 ID	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

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

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

CHAIN LINK FENCE

NO SCALE

A85

STD. PLAN A85

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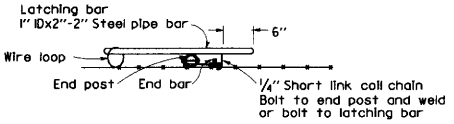
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

John L. Wright
REGISTERED CIVIL ENGINEER

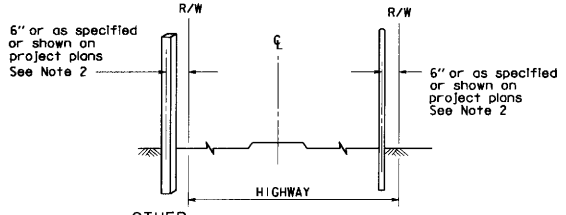
July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER J. L. Wright No. 33937 Exp. 6-30-94 CIVIL STATE OF CALIFORNIA



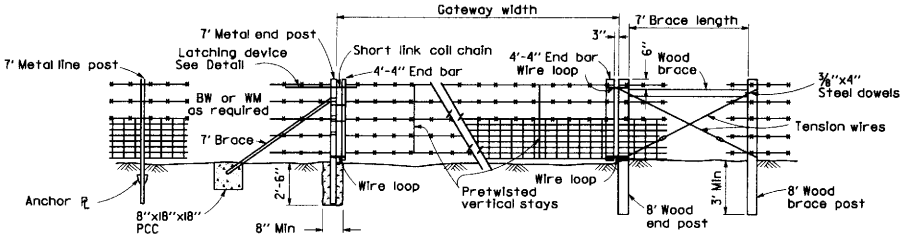
LATCHING DEVICE FOR GATEWAYS

See Note 1



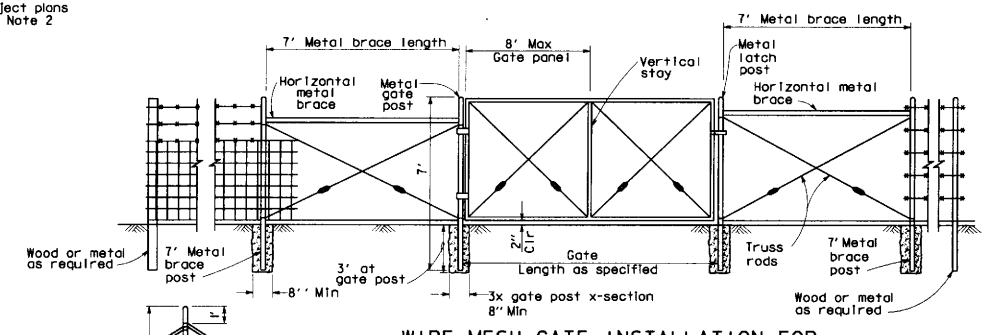
OTHER HIGHWAYS — FREEWAYS

FENCE LOCATION

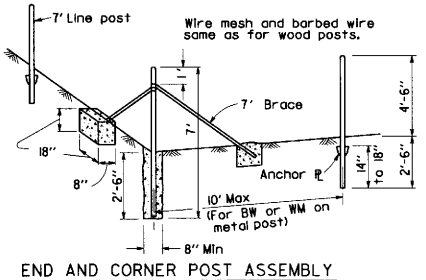


METAL POST INSTALLATION — GATEWAY (See Note 3) — WOOD POST INSTALLATION

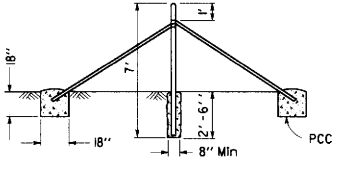
WIRE MESH GATE POST (See Note 4)		
GATE WIDTHS	NOMINAL ID	WEIGHT PER FT
Up thru 6'	2 1/2"	4.95
Over 6' thru 12'	3 1/2"	9.11
Over 12' thru 18'	5"	14.62
Over 18' to 24' Max	6"	18.97



WIRE MESH GATE INSTALLATION FOR EITHER WOOD OR METAL POST FENCES



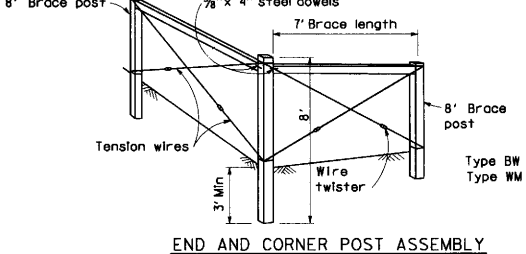
END AND CORNER POST ASSEMBLY



PULL POST ASSEMBLY

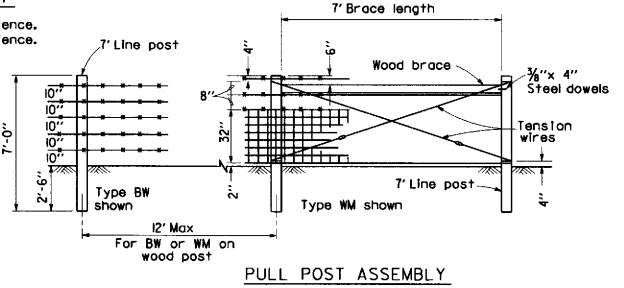
At 660' maximum intervals for WM fence.
At 1320' maximum intervals for BW fence.

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

NOTES

1. Metal end post and end bar shown. Use wood end post and end bar for wood post installation.
2. Offset to be 2' at monument locations, measured at right angles to R/W lines. Taper to achieve offset to be at least 20' long.
3. Gateway to be used when specified in the special provisions.
4. Post dimensions and weights are minimums. Larger sizes may be used on approval of Engineer.
5. Line post spacing for wood post equals 12' maximum. Line post spacing for metal post equals 10' maximum.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

BARBED WIRE AND WIRE MESH FENCES

NO SCALE

A86

STD. PLAN A86

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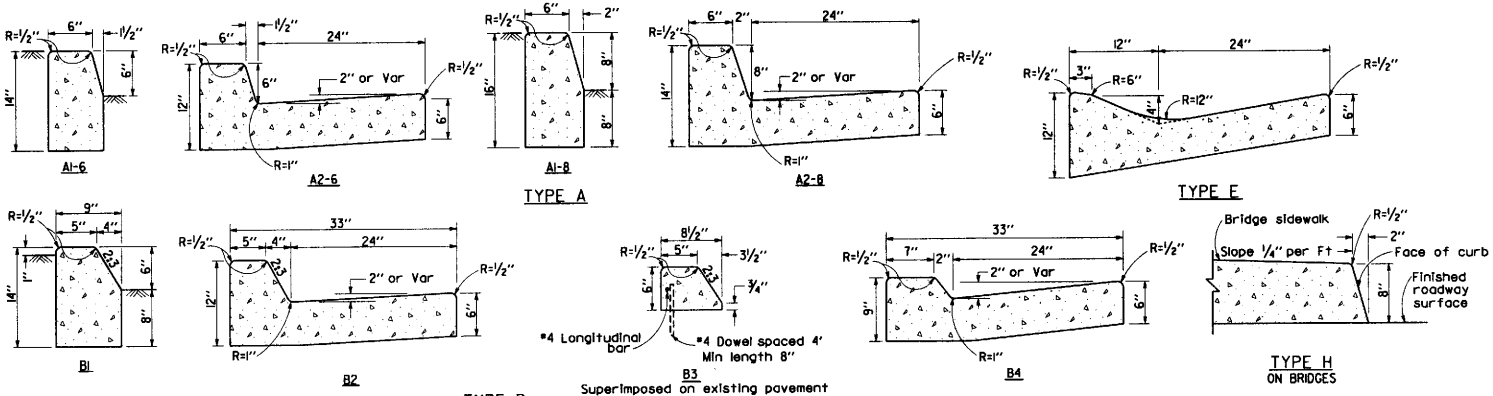
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

John L. Wright
REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER J. L. Wright No. 33937 Exp. 6-30-94 CIVIL STATE OF CALIFORNIA



CURB QUANTITIES

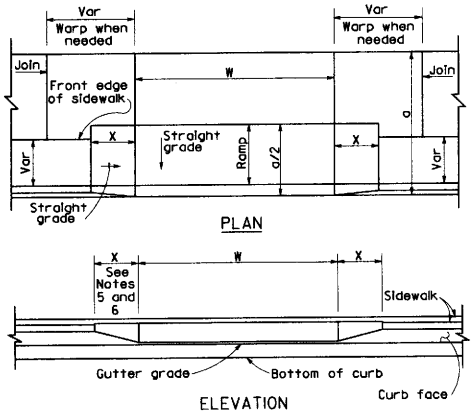
TYPE	CY PER LF
A1-6	0.02585
A2-6	0.05903
A1-8	0.03084
A2-8	0.06379
B1	0.02930
B2	0.06171
B3	0.01074
B4	0.05709
E	0.06661

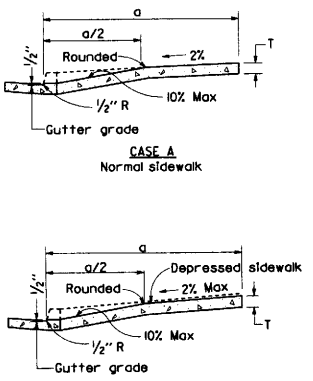
AC DIKE QUANTITIES

TYPE	CY PER LF
A	0.0135
B	0.0103
C	0.0038
D	0.0293
E	0.0130

AC quantities based on 5% cross slope

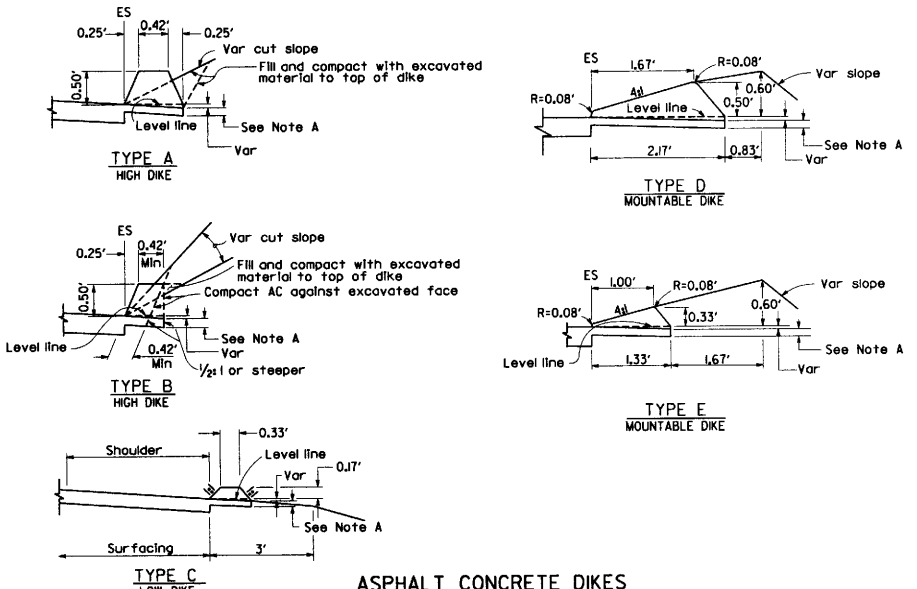
CURBS





SECTIONS

DRIVEWAYS



ASPHALT CONCRETE DIKES

NOTE A - Extend top layer of AC placed on the shoulder under dike with no joint at the ES

NOTES

1. Case A normally applies.
2. Use Case B when ramp slopes would exceed 10% in Case A.
3. Use Case B when sidewalk cross slope would exceed 2% in Case A. Longitudinal slope of warped area adjacent to driveway shall not vary more than 6% from the longitudinal grade line of the sidewalk.
4. The sidewalk cross slope in Case B may be increased to a maximum of 4% for distances not to exceed 20 feet.
5. X=3'-0" except for curb heights over 10" where 4:1 slopes shall be used on curb slope.
6. X is variable when sidewalk is located where wheelchairs may traverse the surface. Slopes shall be 12.5% maximum.
7. Sidewalk and ramp thickness "T" at driveway shall be 4" for residential and 6" for commercial.
8. 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
DEPARTMENT OF TRANSPORTATION

CURBS, DIKES AND DRIVEWAYS

NO SCALE

A87

STD. PLAN A87

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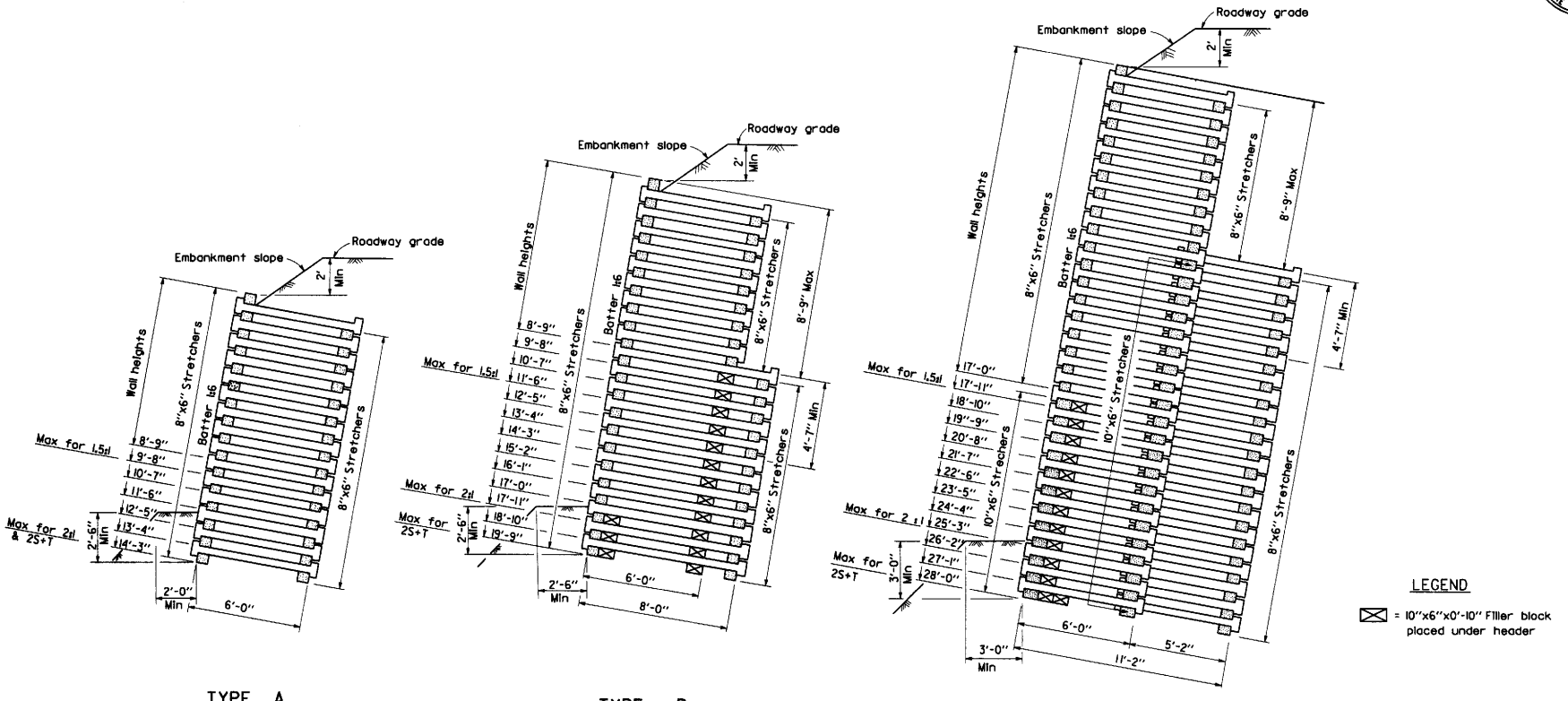
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
T. Pollock
No. 13332
Exp. 3-31-93
CIVIL
STATE OF CALIFORNIA

STD. PLAN C7A



TYPE A

TYPE B

TYPE C

LEGEND

= 10"x6"x0'-10" Filler block placed under header

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

REINFORCED CONCRETE CRIB WALL
BATTERED WALL - TYPES A, B AND C

NO SCALE

C7A

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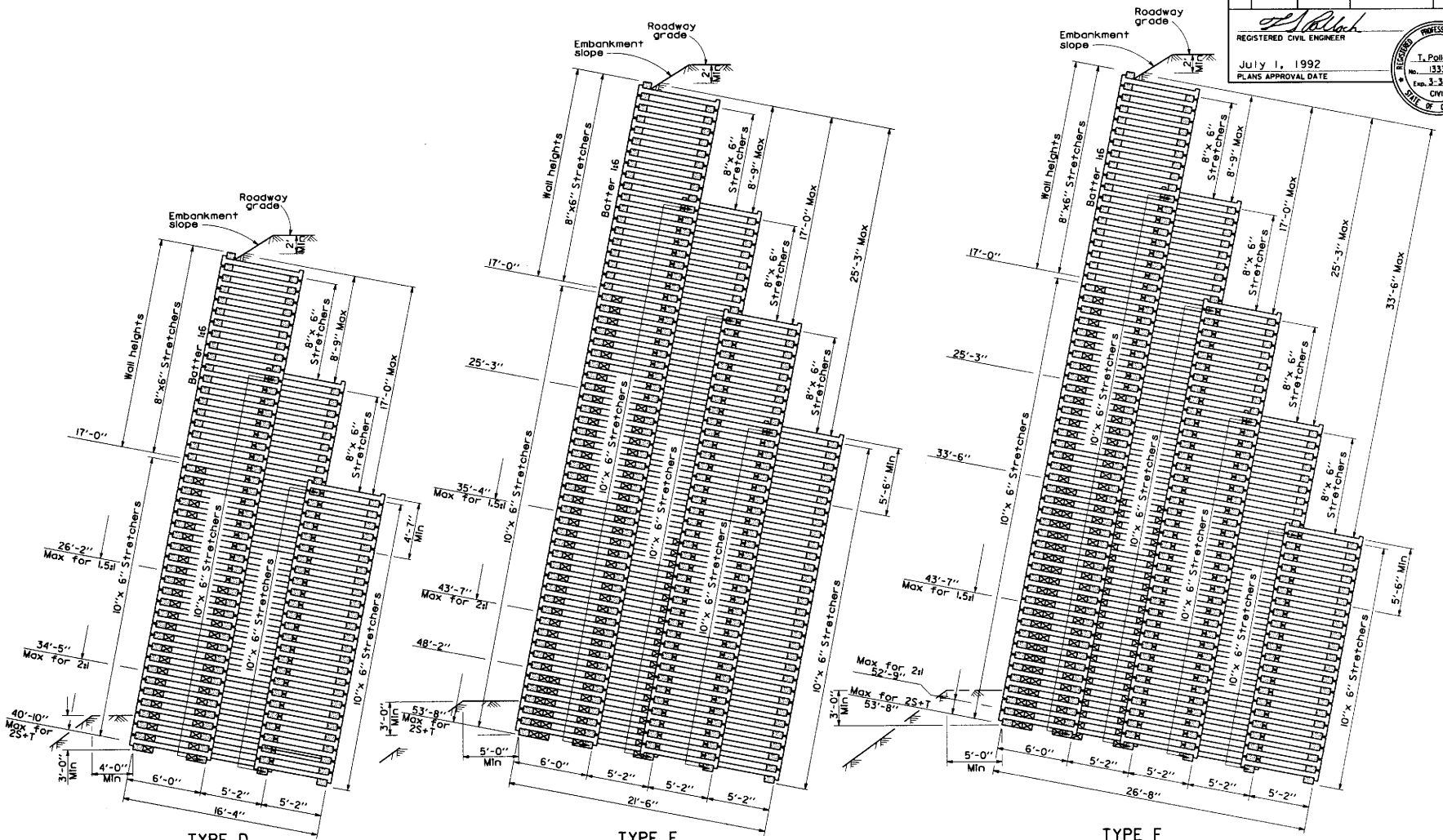
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER

July 1, 1992

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA



TYPE D

TYPE E

TYPE F

LEGEND

⊠ = 10"x 6"x 0'-10" Filler block placed under header

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

REINFORCED CONCRETE CRIB WALL
BATTERED WALL - TYPES D, E AND F

NO SCALE

C7B

STD. PLAN C7B

Return to Table of Contents

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

REGISTERED CIVIL ENGINEER

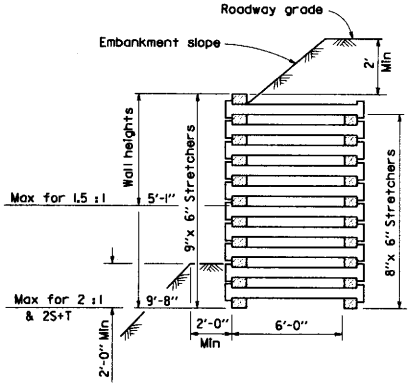
July 1, 1992

PLANS APPROVAL DATE

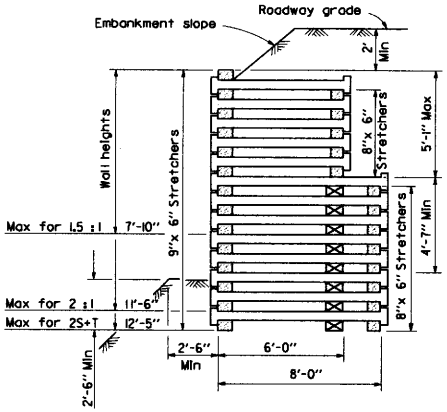
REGISTERED PROFESSIONAL ENGINEER
T. Pollock
No. 13332
Exp. 3-31-93
CIVIL
STATE OF CALIFORNIA

LEGEND

⊠ = 10"x 6"x 0'-10" Filler block placed under header



TYPE A



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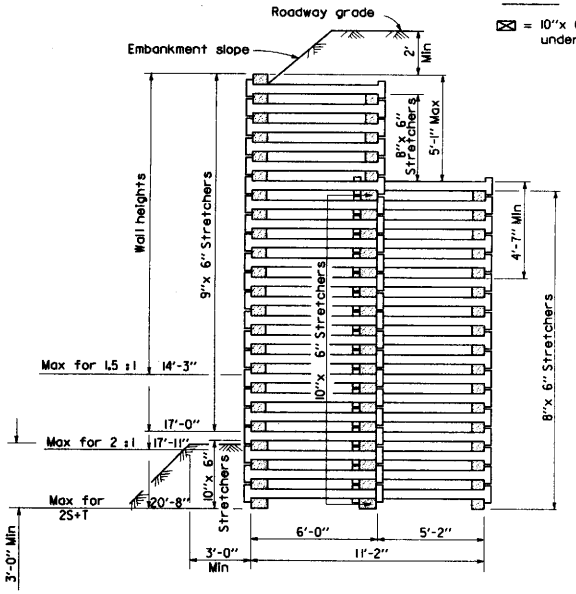

TYPE C

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

REINFORCED CONCRETE CRIB WALL VERTICAL WALL - TYPES A, B AND C

NO SCALE

C7C

STD. PLAN C7C

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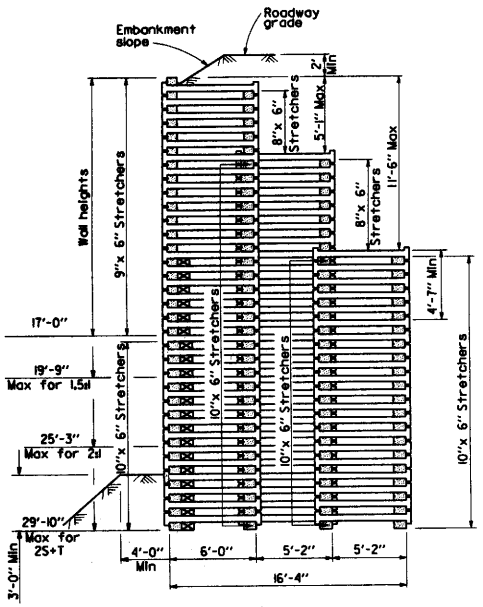
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

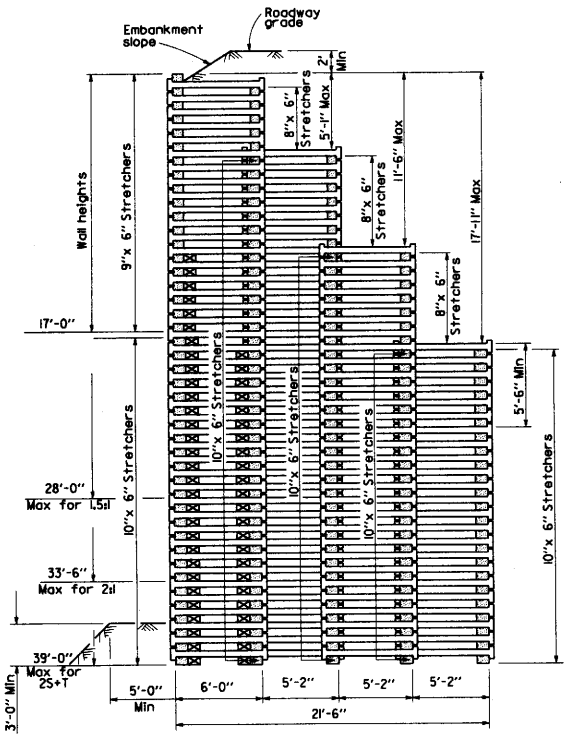
REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
T. Pollock
No. 13332
Exp. 3-31-93
CIVIL
STATE OF CALIFORNIA



TYPE D



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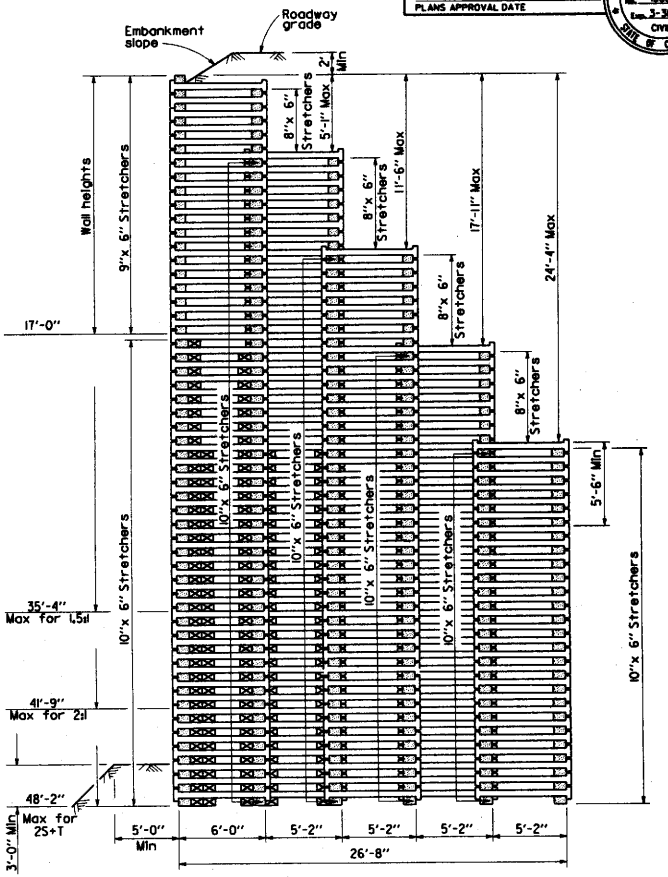

TYPE F

LEGEND

⊠ = 10"x 6"x 0'-10" Filler block placed under header

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

REINFORCED CONCRETE CRIB WALL VERTICAL WALL - TYPES D, E AND F

NO SCALE

C7D

STD. PLAN C7D

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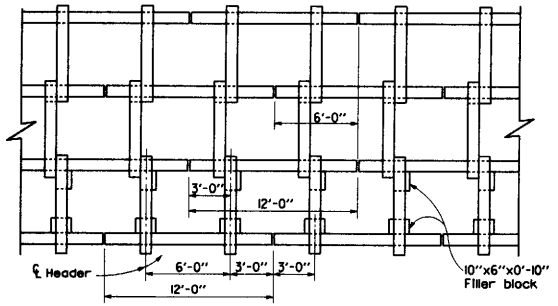
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

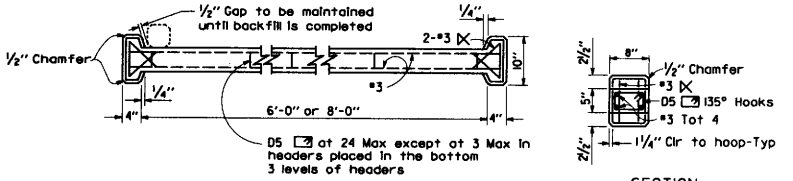
REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

T. Pollock
No. 13332
Exp. 3-31-93
CIVIL
STATE OF CALIFORNIA



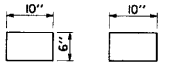
PARTIAL PLAN AT BASE
TYPE "D" SHOWN, OTHERS SIMILAR



ELEVATION

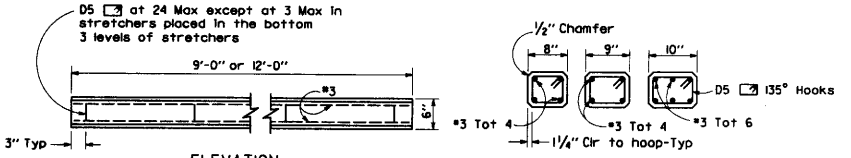
SECTION

HEADER DETAIL



END SIDE

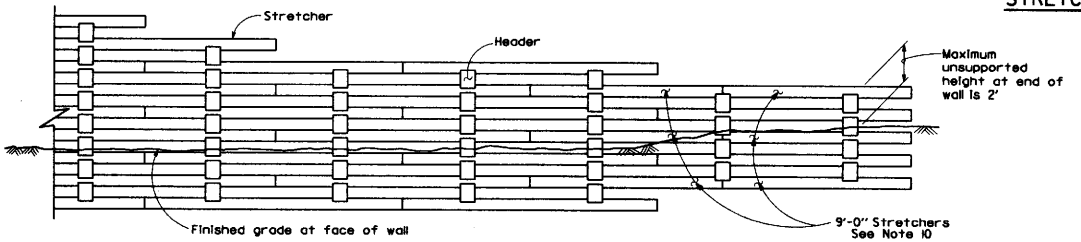
FILLER BLOCK DETAIL



ELEVATION

SECTION

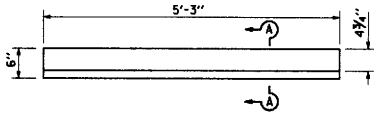
STRETCHER DETAIL



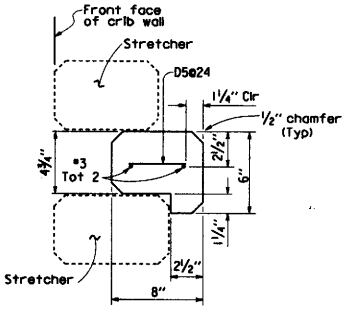
PARTIAL ELEVATION

GENERAL NOTES

1. Reinforced Concrete:
   Concrete - f'c = 3250 psi
   Bar Reinforcement - fy = 60000 psi
   Welded Wire Fabric - fy = 65000 psi
2. Soil Parameters:
   Backfill - ϕ = 34°
   δ = 22.7
   γ = 120 pcf
   Foundation - Φ = 34°
   Lateral earth pressure determined by Coulomb's theory.
3. Concrete to concrete bearing surfaces shall be finished to a smooth plane. The gap between bearing surfaces shall not exceed 1/8 inch. Where a gap of 1/16 inch to 1/8 inch exists, a 1/16 inch pad of asphalt felt or sheet neoprene shall be placed between the bearing surfaces. For wall Types D, E, and F, a 1/16 inch asphalt felt pad or sheet neoprene shall be placed between all concrete bearing surfaces below the 29'-10" level.
4. All members may be manufactured to dimensions 1/8 inch less in thickness and stretchers 1/2 inch less in length.
5. Where an opening is specified in the face of a wall, special length stretchers and additional headers may be required.
6. For non-tangent wall alignment, special length stretchers may be required.
7. For non-tangent wall alignment and at locations where filler blocks are required, special length front face closure members may be required.
8. The thickness of the lowest step for each wall type shall not be less than the dimension shown on these plans.
9. Use of "Front Face Closure Member" shall be required only when specified on project plans or in the Special Provisions.
10. All stretchers are 12'-0" except as noted.



ELEVATION



SECTION A-A

FRONT FACE CLOSURE MEMBER

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

REINFORCED CONCRETE CRIB WALL TYPES A,B,C,D,E AND F HEADER AND STRETCHER DETAILS

NO SCALE

C7E

STD. PLAN C7E

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

REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA

FOUNDATION PRESSURE-BATTERED WALL

(Kips Per Square Foot)

TYPE	LOADING CONDITION	WALL HEIGHT 1'-5"	2'-4"	3'-3"	4'-2"	5'-1"	6'-0"	6'-11"	7'-10"	8'-9"	9'-8"	10'-7"	11'-6"	12'-5"	13'-4"	14'-3"	15'-2"	16'-1"	17'-0"	17'-11"	18'-10"	19'-9"	20'-8"	21'-7"	22'-6"	23'-5"	24'-4"	25'-3"	26'-2"	27'-1"
A	1.5 :1	0.94*	1.02*	1.08*	1.11*	1.10*	1.33	1.70	2.13	2.64	3.22																			
	2 :1	0.81*	0.95*	1.09*	1.22*	1.34*	1.43*	1.51*	1.56*	1.59*	1.58*	1.78	2.13	2.52	2.96	3.46														
	2S+T	0.73*	0.88*	1.02*	1.16*	1.28*	1.37*	1.45*	1.49*	1.50*	1.57	1.88	2.25	2.67	3.13	3.67														
B	1.5 :1									2.16	2.61	3.10	3.64																	
	2 :1									1.40	1.64	1.90	2.18	2.49	2.83	3.18	3.57	3.99	4.46	4.96										
	2S+T									1.34*	1.50	1.69	1.88	2.14	2.45	2.73	3.05	3.40	3.79	4.23	4.69	5.21								
C	1.5 :1											2.26*	2.49	2.92	3.38	3.83	4.32	4.83	5.40	6.00										
	2 :1											1.83*	1.81	2.07	2.35	2.59	2.85	3.13	3.43	3.75	4.08	4.44	4.83	5.24	5.67	6.14	6.63	7.15		
	2S+T											1.59*	1.75	1.95	2.15	2.33	2.52	2.73	2.96	3.20	3.46	3.74	4.04	4.36	4.71	5.08	5.48	5.90	6.35	6.83
D	1.5 :1																3.76*	3.48*	3.54	3.96	4.40	4.86	5.34	5.84	6.35	6.87	7.42	8.01	8.62	
	2 :1																2.65*	2.55*	2.69	2.96	3.24	3.53	3.83	4.14	4.43	4.73	5.04	5.37	5.71	6.06
	2S+T																2.16	2.35	2.54	2.73	2.94	3.15	3.36	3.59	3.78	3.98	4.18	4.40	4.63	4.87
E	1.5 :1																						5.19*	4.89*	4.61*	4.98	5.41	5.85	6.31	6.78
	2 :1																						3.53*	3.42*	3.51	3.77	4.05	4.34	4.63	4.94
	2S+T																						2.87	3.05	3.24	3.43	3.63	3.84	4.04	4.26
F	1.5 :1																													6.09*
	2 :1																													4.14*
	2S+T																													3.79

TYPE	LOADING CONDITION	28'-0"	28'-11"	29'-10"	30'-9"	31'-8"	32'-7"	33'-6"	34'-5"	35'-4"	36'-3"	37'-2"	38'-1"	39'-0"	39'-11"	40'-10"	41'-9"	42'-8"	43'-7"	44'-6"	45'-5"	46'-4"	47'-3"	48'-2"	49'-1"	50'-0"	50'-11"	51'-10"	52'-9"	53'-8"
A	1.5 :1																													
	2 :1																													
	2S+T																													
B	1.5 :1																													
	2 :1																													
	2S+T																													
C	1.5 :1																													
	2 :1																													
	2S+T	7.34																												
D	1.5 :1																													
	2 :1	6.43	6.81	7.21	7.63	8.07	8.51	8.99	9.48																					
	2S+T	5.13	5.40	5.67	5.97	6.28	6.60	6.93	7.29	7.65	8.04	8.45	8.87	9.31	9.77	10.25														
E	1.5 :1	7.28	7.79	8.32	8.87	9.43	9.99	10.59	11.21	11.84																				
	2 :1	5.26	5.58	5.92	6.27	6.59	6.92	7.26	7.61	7.97	8.35	8.73	9.13	9.54	9.96	10.39	10.84	11.31	11.78											
	2S+T	4.48	4.71	4.95	5.19	5.39	5.60	5.82	6.04	6.28	6.52	6.77	7.03	7.30	7.58	7.87	8.17	8.48	8.80	9.13	9.48	9.84	10.21	10.59	10.98	11.39	11.82	12.25	12.70	13.17
F	1.5 :1	5.81*	6.06	6.48	6.91	7.35	7.80	8.27	8.76	9.25	9.77	10.30	10.84	11.41	11.98	12.55	13.16	13.78	14.41											
	2 :1	4.38	4.65	4.92	5.20	5.49	5.79	6.09	6.40	6.72	7.06	7.40	7.74	8.10	8.44	8.78	9.13	9.49	9.85	10.23	10.62	11.01	11.42	11.84	12.26	12.70	13.15	13.60	14.07	
	2S+T	3.98	4.17	4.36	4.56	4.76	4.97	5.19	5.41	5.63	5.86	6.10	6.33	6.58	6.79	7.00	7.21	7.44	7.66	7.90	8.14	8.39	8.65	8.92	9.19	9.47	9.76	10.05	10.36	10.67

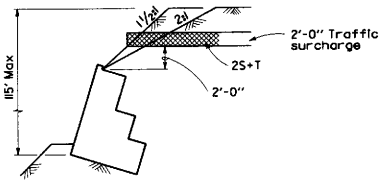
* Indicates pressure at heel

LEGEND FOR TABLE

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

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

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



LOADING CONDITIONS

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 loading condition and an allowable soil bearing capacity of 5.0 kips per square foot.

Select: Battered Type C or Type D wall. Actual H = 20'- 8".
Type D vertical wall can be used by increasing the allowable soil bearing capacity of the original ground.

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 A or Type B wall. Actual H = 9'- 8".

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 the allowable soil bearing capacity is 4.0 kips per square foot (considering the sloping ground in front of wall).

Select: Battered Type B or Type C wall or Vertical Type C wall.
Actual H = 10'- 7"

Example No. 4:

Given: Wall height 30'
2:1 embankment slope to be retained. Base in embankment (5' depth minimum).

Select: Battered Type D, Type E or Type F wall or Vertical Type F wall. Actual H = 30'- 9". For all types the foundation pressure is between 5.0 and 8.0 kips per square foot, embankment material below the wall must be "Structure Backfill" (See Design Example Footnote 1).

DESIGN EXAMPLES FOOTNOTES

1. To constitute a "wall base in embankment" condition, a minimum of 5 feet of embankment at 95 percent relative compaction is required below the base of the wall. When the foundation pressure is between 5.0 and 8.0 kips/square foot, the embankment below the wall shall be constructed with structure backfill material to the limits specified for embankments constructed with relative compaction of 95 percent. The maximum allowable soil bearing capacity is 8 kips/square foot.

2. For walls with "wall base in original ground" condition, the allowable soil bearing capacity, design lateral loads, and slope stability shall be determined by a foundation site investigation and by an analysis. Walls shall not be founded in original ground having an allowable soil bearing capacity of less than 3 kips/square foot.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DESIGN DATA FOR REINFORCED CONCRETE CRIB WALL FOUNDATION PRESSURE-BATTERED WALL

NO SCALE

C7F

STD. PLAN C7F

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REGISTERED CIVIL ENGINEER

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PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA

FOUNDATION PRESSURE - VERTICAL WALL

(Kips Per Square Foot)

TYPE	LOADING CONDITION	WALL HEIGHT 1'-5"	2'-4"	3'-3"	4'-2"	5'-1"	6'-0"	6'-11"	7'-10"	8'-9"	9'-8"	10'-7"	11'-6"	12'-5"	13'-4"	14'-3"	15'-2"	16'-1"	17'-0"	17'-11"	18'-10"	19'-9"	20'-8"	21'-7"	22'-6"	23'-5"	24'-4"	25'-3"	26'-2"	27'-1"
A	1.5 :1	0.63*	0.66*	0.88	1.25	1.68																								
	2 :1	0.54*	0.63*	0.69*	0.80	1.06	1.37	1.73	2.15	2.63	3.18																			
	2S+T	0.49*	0.58*	0.64*	0.82	1.07	1.35	1.68	2.06	2.48	2.97																			
B	1.5 :1						2.15 *	2.06	2.66																					
	2 :1						1.26*	1.45	1.83	2.23	2.65	3.09	3.59																	
	2S+T						1.16	1.48	1.79	2.11	2.45	2.82	3.22	3.65																
C	1.5 :1									2.96*	2.67	3.17	3.71	4.30	4.95	5.65														
	2 :1									1.72*	1.95	2.25	2.58	2.93	3.31	3.73	4.17	4.66	5.18	5.73										
	2S+T									1.67	1.95	2.19	2.44	2.71	3.01	3.32	3.66	4.02	4.41	4.82	5.26	5.73	6.22							
D	1.5 :1															3.97*	4.42	5.04	5.60	6.20	6.82	7.49								
	2 :1															2.83	3.22	3.65	3.99	4.35	4.73	5.14	5.56	6.01	6.48	6.97	7.49	8.03		
	2S+T															2.72	2.99	3.26	3.50	3.76	4.03	4.32	4.62	4.92	5.25	5.59	5.95	6.32	6.71	7.12
E	1.5 :1																			5.76*	5.81*	5.55	6.09	6.68	7.29	7.91	8.53	9.17	9.85	10.56
	2 :1																			3.42	3.70	4.01	4.38	4.79	5.20	5.63	6.01	6.40	6.81	7.24
	2S+T																			3.16	3.41	3.67	3.94	4.22	4.50	4.79	5.05	5.32	5.60	5.89
F	1.5 :1																											7.32	7.86	8.43
	2 :1																											5.27	5.64	6.03
	2S+T																											4.65	4.92	5.19

*Indicates pressure at heel

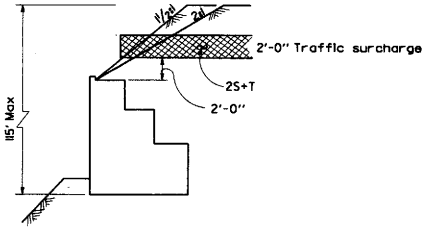
TYPE	LOADING CONDITION	28'-0"	28'-11"	29'-10"	30'-9"	31'-8"	32'-7"	33'-6"	34'-5"	35'-4"	36'-3"	37'-2"	38'-1"	39'-0"	39'-11"	40'-10"	41'-9"	42'-8"	43'-7"	44'-6"	45'-5"	46'-4"	47'-3"	48'-2"
A	1.5 :1																							
	2 :1																							
	2S+T																							
B	1.5 :1																							
	2 :1																							
	2S+T																							
C	1.5 :1																							
	2 :1																							
	2S+T																							
D	1.5 :1																							
	2 :1																							
	2S+T	7.55	7.99	8.45																				
E	1.5 :1	11.29																						
	2 :1	7.68	8.14	8.62	9.11	9.63	10.16	10.71																
	2S+T	6.18	6.49	6.81	7.14	7.49	7.84	8.20	8.58	8.98	9.38	9.80	10.23	10.68										
F	1.5 :1	9.02	9.63	10.25	10.89	11.54	12.22	12.93	13.65	14.40														
	2 :1	6.44	6.85	7.28	7.67	8.07	8.48	8.91	9.35	9.80	10.27	10.75	11.25	11.76	12.29	12.83	13.39							
	2S+T	5.47	5.76	6.05	6.31	6.58	6.86	7.14	7.43	7.73	8.04	8.35	8.68	9.01	9.35	9.70	10.07	10.44	10.82	11.21	11.61	12.03	12.46	12.89

LEGEND FOR TABLE

2S+T=2 Foot level surcharge with traffic loading.
2 :1 = 2 :1 Slope above wall
1½:1 = 1½:1 Slope above wall

115' Maximum difference in elevation from toe of wall to top of slope

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



LOADING CONDITIONS

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

REINFORCED CONCRETE CRIB WALL
FOUNDATION PRESSURE - VERTICAL WALL

NO SCALE

C7G

STD. PLAN C7G

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

REGISTERED CIVIL ENGINEER

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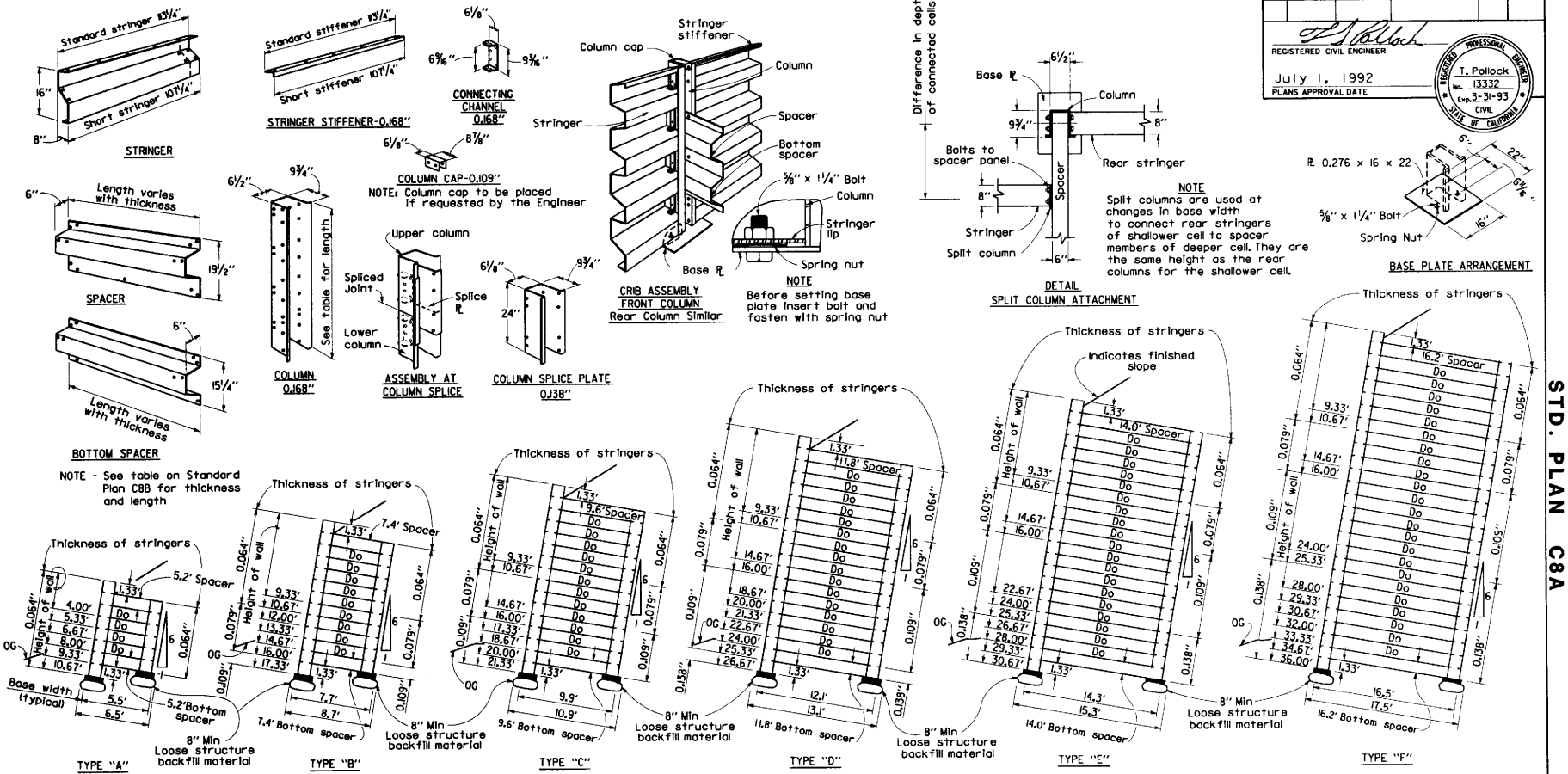
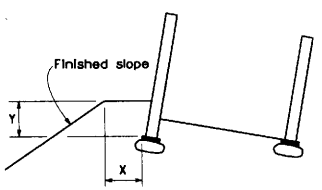
REGISTERED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA

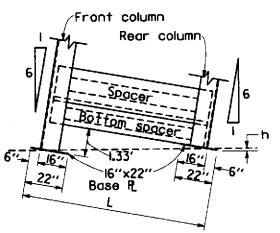


EMBEDMENT DATA		
Type Crib	X	Y
A	2'-0"	2'-6"
B	2'-6"	2'-6"
C	3'-0"	3'-0"
D	3'-6"	3'-0"
E	4'-0"	3'-0"
F	4'-6"	3'-0"

EMBEDMENT DETAIL



WALL TYPE	h	L
"A"	3"	6'-7⅝"
"B"	1⅜"	8'-9⅝"
"C"	5¹⁵⁄₁₆"	10'-11⅝"
"D"	10⁷⁄₁₆"	13'-2¹⁄₁₆"
"E"	14⅝"	15'-4⁹⁄₁₆"
"F"	18¾"	17'-8½"



DETAIL - BASE PLATE PLACEMENT

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 ⅝" with a minimum length of 1¼".

Thickness given in inches.

GENERAL NOTES

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

For design data see Standard Plans C8B and C8C.

LEGEND

Do = Ditto

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

STEEL CRIB WALL CONSTRUCTION DETAILS

NO SCALE

C8A

STD. PLAN C8A

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REGISTERED CIVIL ENGINEER

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PLANS APPROVAL DATE

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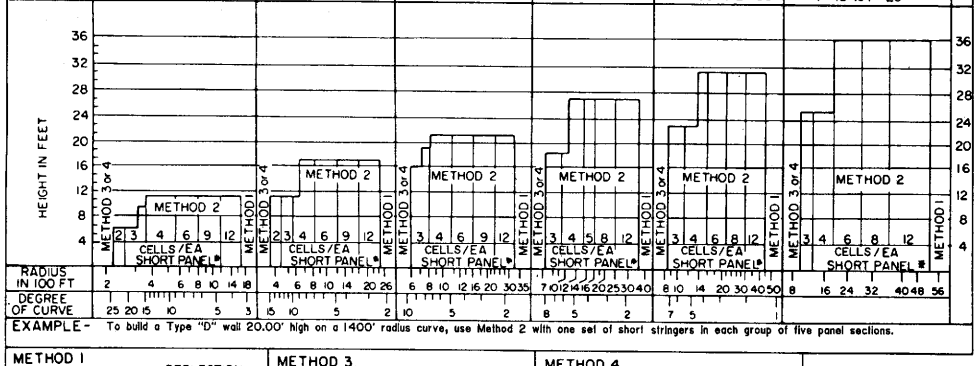
CURVATURE CHART - 1 TO 6 BATTER

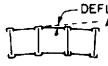
THIS DATA, OMITTING HEIGHT RESTRICTIONS, CAN BE USED FOR VERTICAL WALLS

DESIGN	TYPE "A" BASE WIDTH 5.5'	TYPE "B" BASE WIDTH 7.7'	TYPE "C" BASE WIDTH 9.9'	TYPE "D" BASE WIDTH 12.1'	TYPE "E" BASE WIDTH 14.3'	TYPE "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'



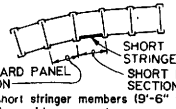
EXAMPLE - To build a Type "D" wall 20.00' high on a 1400' radius curve, use Method 2 with one set of short stringers in each group of five panel sections.

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

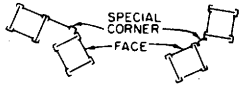


Use short stringer members (9'-6" face or rear) in addition to play in bolt holes. Curvature chart indicates number * of cells in each group, including a modified cell, necessary to build a curved wall at a required height and radius.

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 spacer member sections can be reduced 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 cells 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 spacer members for the face members.

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

NOTE - Use Graphs shown on Standard Plan C8C to determine the type of steel crib to use for the various surcharges on both vertical and batter walls.

STRINGER MEMBERS REQUIRED PER CELL

WALL HEIGHT	SHORT STRINGERS IN FRONT OF WALL .064" St'd	.064" Short	.079" St'd	.079" Short	.109" St'd	.109" Short	.138" St'd	.138" Short	St'l Str	SHORT STRINGERS IN REAR OF WALL .064" St'd	.064" Short	.079" St'd	.079" Short	.109" St'd	.109" Short	.138" St'd	.138" Short	St'd Str
FEET	9.5'	9.0'	9.5'	9.0'	9.5'	9.0'	9.5'	9.0'	St'l	9.5'	9.0'	9.5'	9.0'	9.5'	9.0'	9.5'	9.0'	St'l
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 stringers for both front and rear of a 9.5' length of wall.

NOTE - This table applies only to standard panel sections and includes stringer members for both front and rear of a 10' length of wall.

SPACER MEMBERS REQUIRED PER TRANSVERSE SECTION

WALL HEIGHT	BEARING PLATE	FRONT COLUMN HEIGHT IN FEET 1st Lift	2nd Lift	3rd Lift	Total Height	REAR COLUMN HEIGHT IN FEET 1st Lift	2nd Lift	3rd Lift	Total Height	Total Col. Ft. in Feet	Column Splice	Column Cap	SPACERS Thickness & Length .064 5.2	.064 7.4	.079 9.6	.109 11.8	.109 14.0	.109 16.2	BOT SPACER Thickness & Length .064 5.2	.064 7.4	.079 9.6	.109 11.8	.109 14.0	.109 16.2	STRINGERS .064 9.5'	.079 9.5'	.109 9.5'	.138 9.5'	St'r St'l 9.5'	WALL HEIGHT
FEET	16" x 22"																													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

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

STEEL CRIB WALL DESIGN DATA

NO SCALE

C8B

STD. PLAN C8B

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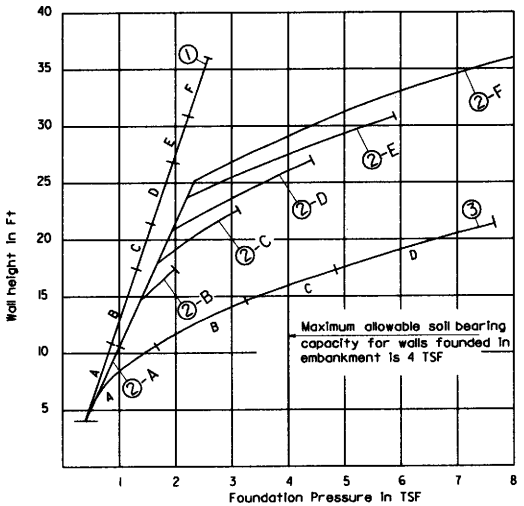
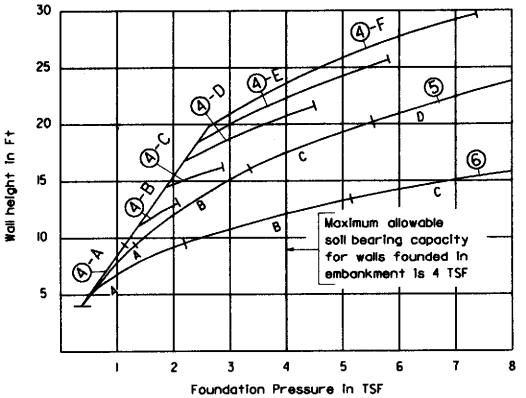


1:6 BATTERED WALL



VERTICAL 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 minimum).

Select: 1:6 Battered Wall. Vertical wall not permitted. Type "D" wall selected. Maximum height on graph is 26' at 4 TSF. Since the foundation pressure is 3.2 TSF at 24', 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 TSF.

Select: Battered Type "F" wall maximum height at 4 TSF is 29', therefore the replacement of 5 foot of excavation with "Structure Backfill" to increase the allowable soil bearing capacity to 4 TSF is required (See Design Note 1). A drainge 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 TSF.

Select: Loading condition 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 TSF (See Design Note 1).

Surcharge / Batter	Level 2' Min Surcharge	2 :1 With Finite* Surcharge	1½:1 With Finite* Surcharge
Wall on 1:6 Batter	① 2S, 2'	② 2 :1, 2:1	③ 1½:1, 1½:1
Wall Vertical	④ 2S, 2'	⑤ 2 :1, 2:1	⑥ 1½:1, 1½:1

* 115' maximum difference in elevation from toe of wall to top of slope.

A,B,C,D,E,F = Wall Type

▨ indicates 2' minimum 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 TSF, 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 be not to be founded in original ground having an allowable bearing capacity of less than 1.5 TSF. 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 PSI Ultimate
   33,000 PSI Yield
   @ 20% Elongation
   Bolts: ASTM A307 Grade A

NOTE - For Construction Details See Sheet C8A

STATE OF CALIFORNIA
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STEEL CRIB WALL DESIGN DATA

NO SCALE

C8C

STD. PLAN C8C

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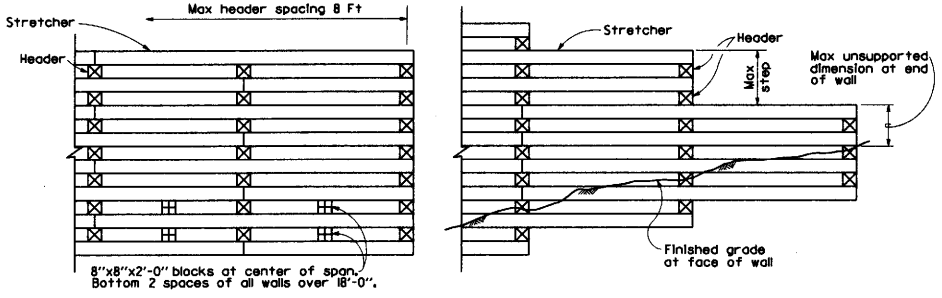
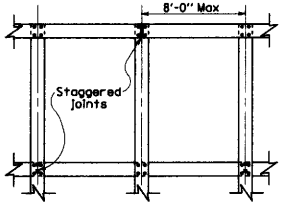
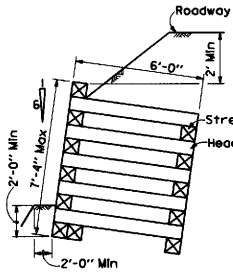


OPEN FACE CRIB PARTIAL ELEVATIONS



TYPICAL PLAN VIEW

TIMBER PER 8 FT CRIB SECTION					
HEIGHT	HEADERS				STRET-
OF WALL	6'-0"	8'-0"	10'-0"	12'-0"	CHERS
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



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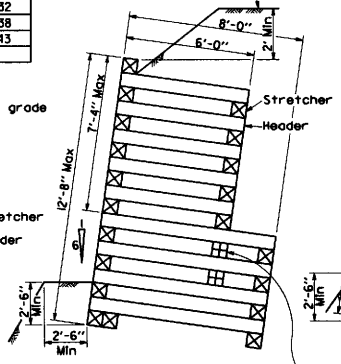

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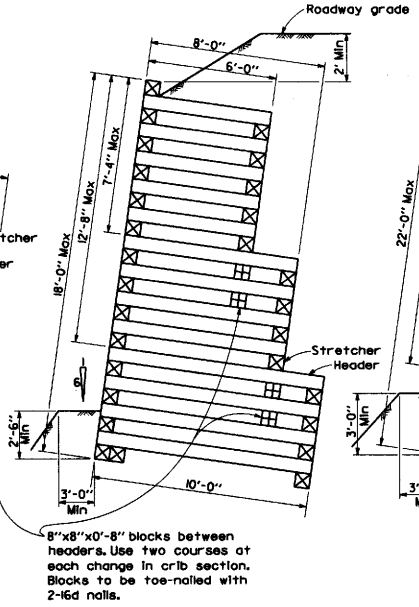

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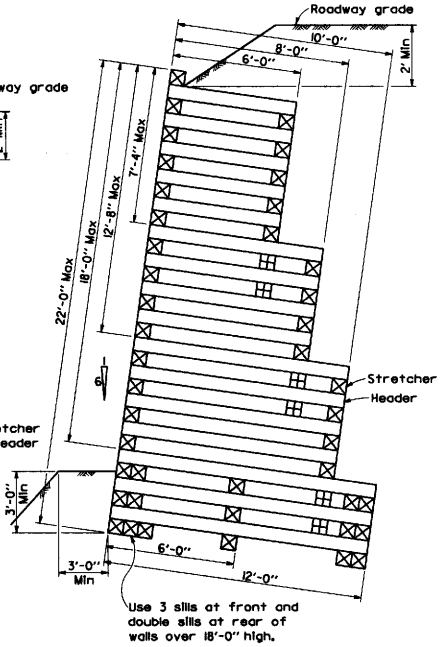
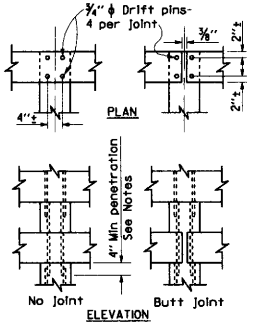


TYPE D



TYPICAL END CONNECTIONS

NOTES

1. All timber to be 8"x8" full sawn No. 1 grade douglas fir-larch.
2. Drift pins and holes to be ¾" ϕ.
3. Drift pins to be of sufficient length to penetrate thru 2 members and 4" minimum into the third member. Drift pins shall cross each contact joint between headers and stretchers. Pins may lap, provided edge or end distance to pins is not less than 1¾".
4. All stretchers to be laid horizontal.
5. Vertical walls are not permitted.
6. Maximum allowable 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.
8. For Design Data see Standard Plan C9B.

STATE OF CALIFORNIA
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TIMBER CRIB WALL TYPES A,B,C AND D

NO SCALE

C9A

STD. PLAN C9A

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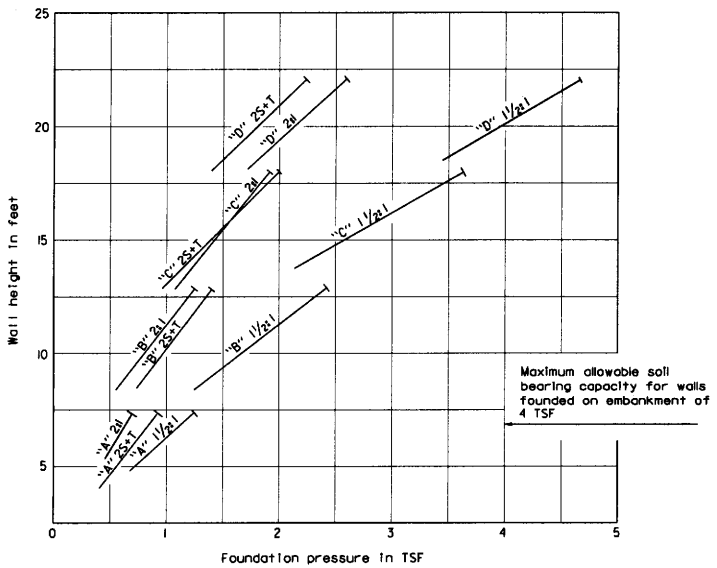


1:6 BATTERED WALL

DESIGN EXAMPLES

EXAMPLE NO. 1

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

Select: 1:6 batter "C" wall gives 1.25 TSF foundation pressure.
Vertical "C" wall gives 2.1 TSF foundation pressure.
See chart for required numbers and sizes of timber members.

EXAMPLE NO. 2

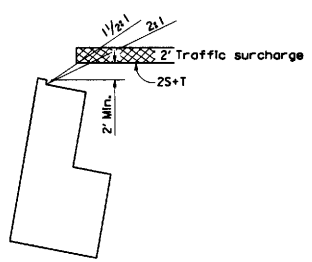
Given: Wall Height 19'-4"
1½:1 embankment to be retained. Base is in original ground.
Foundation site investigation determines the allowable soil bearing capacity at 3 TSF

Select: 1:6 batter "D" wall gives 3.75 TSF 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 TSF foundation pressure.
Vertical wall not permitted. Foundation pressure is greater than 2.5 TSF. Base material below wall shall consist of "Structure backfill." (See Note 1)



DESIGN SURCHARGES

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 TSF 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 TSF 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 pounds per cubic foot. For 2 foot level surcharge with traffic loading, an equivalent fluid pressure of 36 pounds per cubic foot was used. Earth pressures for 2:1 slope and 1½:1 slope determined from Rankine's formula with Ø = 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.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

TIMBER CRIB WALL TYPES A,B,C AND D DESIGN DATA

NO SCALE

STD. PLAN C9B

C9B

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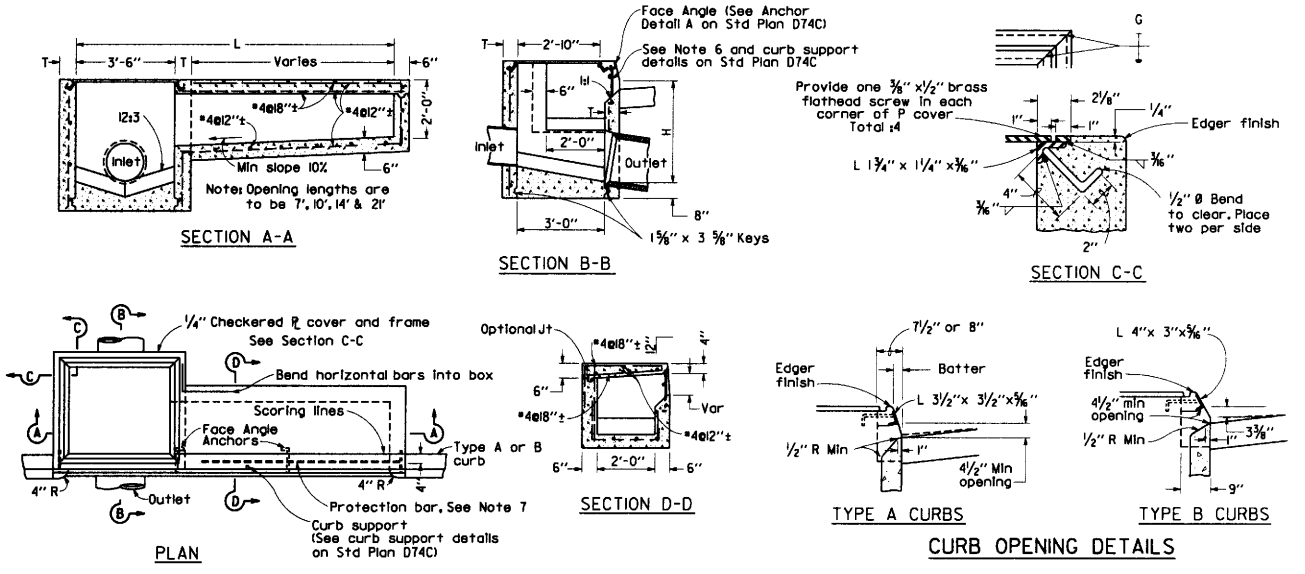
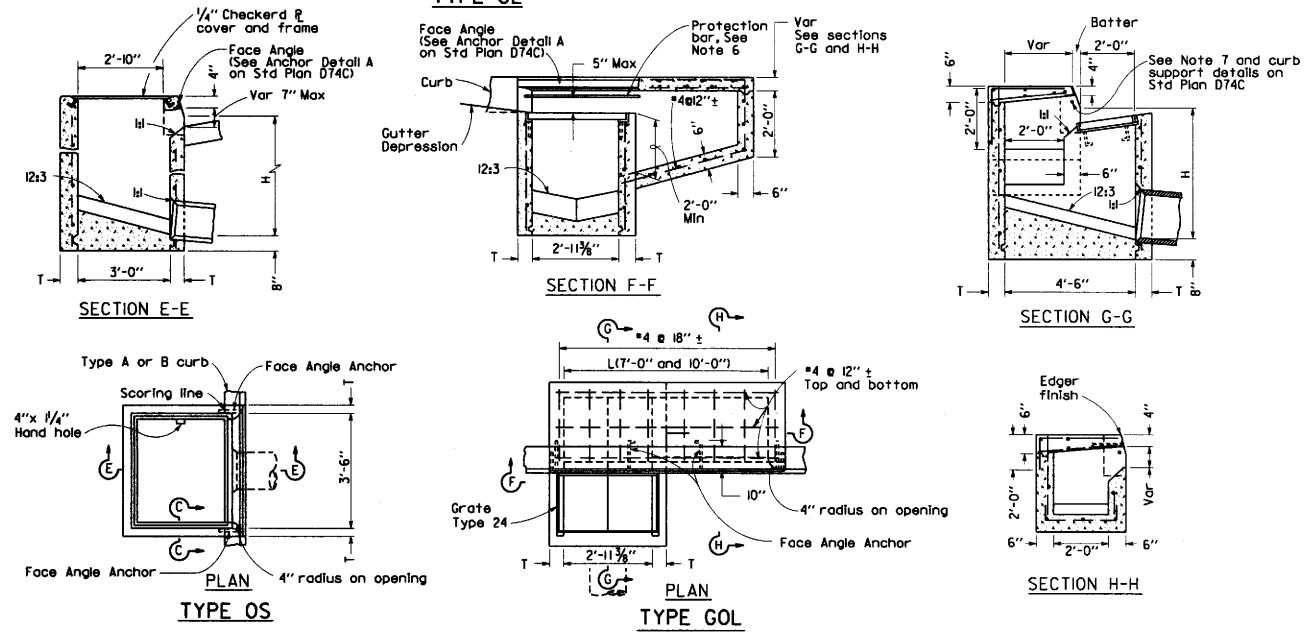
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER — John L. Wright

July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — J. L. Wright — No. 33937 — Exp. 6-30-94 — CIVIL — STATE OF CALIFORNIA





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 A below.
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" is 8' or less and the unsupported width or length is 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. Inlet bottom reinforcing not required. See Standard Plan D74C for alternative reinforced bottom.
6. 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 be uniform throughout the length of the wall. Place steps in the wall without an opening. Step inserts may be substituted for the bar steps. Step inserts shall comply with State Industrial Safety requirements. See Standard Plan D74C for step details.
7. 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.
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 Specifications or Special Provisions.
12. See Standard Plans D77A and D77B for grate and frame details and weights of miscellaneous iron and steel.
13. See Standard Plan D78 for gutter 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.

TABLE A
CONCRETE QUANTITIES

Type	H=3'-0" to 8'-0" (T=6")		H=8'-1" to 20'-0" (T=8")	
	H=3'-0" (CY)	Additional PCC per foot (CY)	H=8'-1" (CY)	Additional PCC per foot (CY)
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.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DRAINAGE INLETS

NO SCALE

D72

STD. PLAN D72

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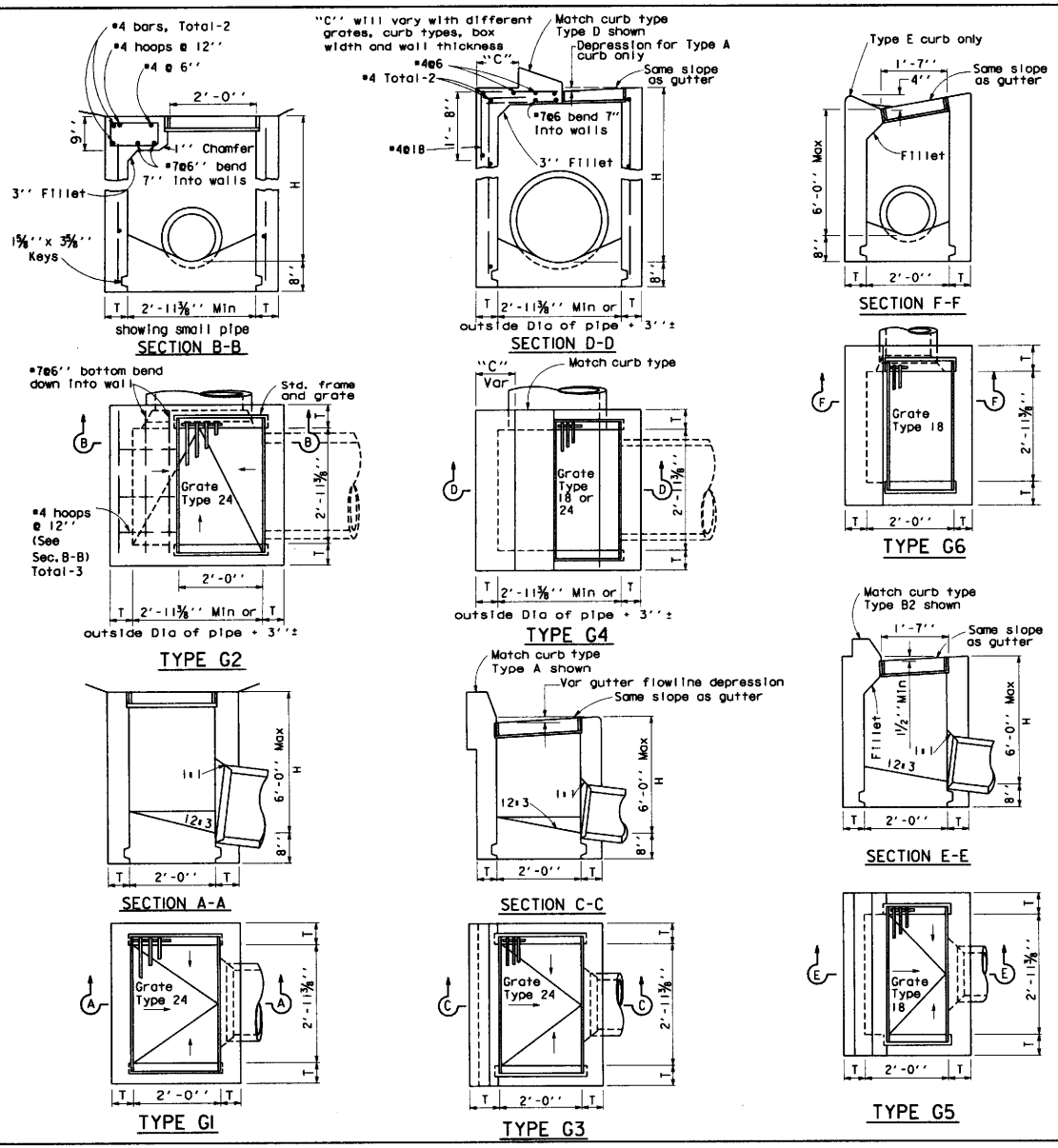
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER J. L. Wright No. 33937 Exp. 6-30-94 CIVIL STATE OF CALIFORNIA



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 below.
3. Wall reinforcing not required when "H" is 8' or less and the unsupported width or length is 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. Inlet bottom reinforcing not required. See Standard Plan D74C for alternative reinforced bottom and alternative half round bottom.
5. Steps-None required where "H" is less than 30". Where "H" is 30" or more, install steps with lowest rung 12" above the floor and highest rung not more than 6" below top of inlet. The distance between steps shall not exceed 12" and shall be uniform throughout the lenght of the wall. Place steps in the wall without an opening. Step inserts may be substituted for the bar steps. Step inserts shall comply with State Industrial Safety requirments. See Standard Plan D74C for step details.
6. Details shown apply to both metal and concrete pipe.
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. Cast-in-place or Precast alternative is optional with contractor, See Standard Specifications.
12. Set inlet so that grate bars are parallel to direction of principal surface flow.
13. See Standard Plans D77A and D77B for grate and frame details and weights of miscellaneous iron and steel.
14. See Standard Plan D78 for gutter depression details.

TABLE A

CONCRETE QUANTITIES				
	H=3'-0" to 8'-0"(T=6")		H=8'-1" to 20'-0"(T=8")	
Type	H=3'-0" (CY)	Additional PCC per Ft. (CY)	H=8'-1" (CY)	Additional PCC per Ft. (CY)
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. * Quantities for Type G-2 and G-4 inlets based on the minimum interior dimensions shown.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DRAINAGE INLET

NO SCALE

D73

STD. PLAN D73

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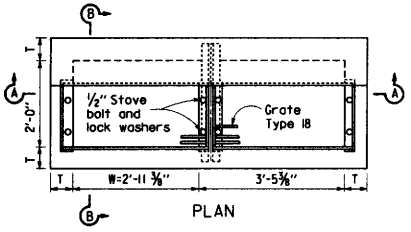
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER

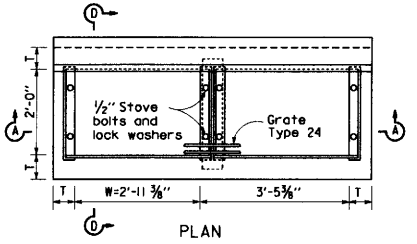
July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER J. L. Wright No. 33937 Exp. 6-30-94 CIVIL STATE OF CALIFORNIA



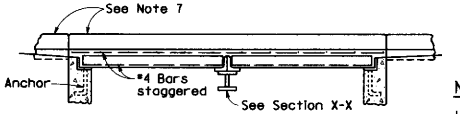
PLAN

TYPE GTI

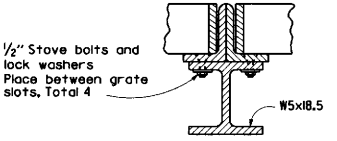


PLAN

TYPE GT3



SECTION A-A



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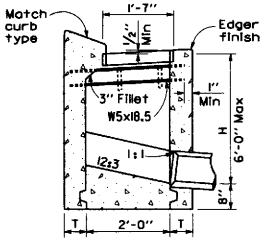
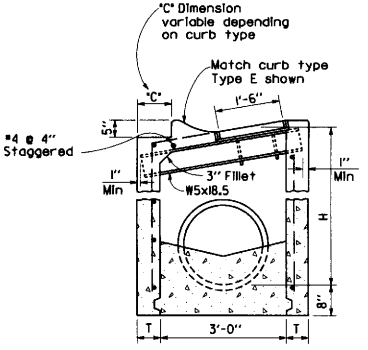


SECTION B-B



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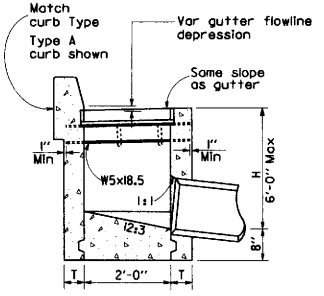

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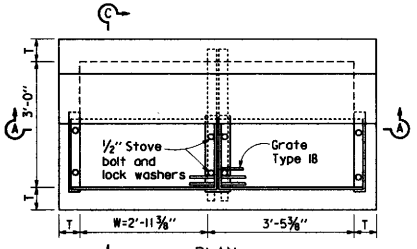
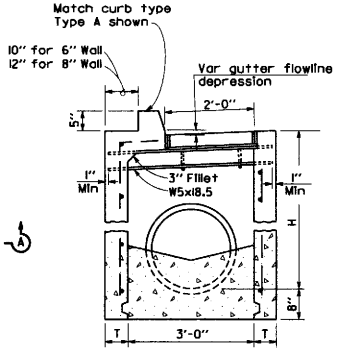
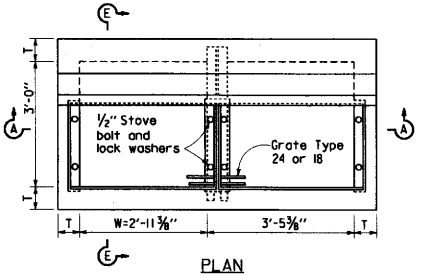


PLAN

TYPE GT2



SECTION E-E



PLAN

TYPE GT4

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 below.
3. Wall reinforcing not required when "H" is 8' or less and the unsupported width or length is 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. Inlet bottom reinforcing not required. See Standard Plan D74C for alternative reinforced bottom.
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. Step inserts may be substituted for the bar steps. Step inserts shall comply with State Industrial Safety requirement. See Standard Plan D74C for step details.
6. Pipe(s) can be placed in any wall.
7. Curb section shall match adjacent curb.
8. Basin floors shall have wood trowell finish and a minimum slope of 12:3 from all directions toward outlet pipe.
9. Galvanizing - See Standard Specifications or Special Provisions.
10. W = 2'-11 3/8" for one grate. Add 3'-5 3/8" for additional grates in tandem.
11. See Standard Plans D77A and D77B for grate and frame details and weights of miscellaneous iron and steel.
12. See Standard Plan D78 for gutter depression details.
13. Full penetration butt welds may be substituted for the fillet welds on all anchors.
14. Standard square, hexagon, round or equivalent headed anchors may be substituted for the right angle hooks on the achors shown on this plan.
15. Cast-in-place or precast alternative is optional with contractor. See Standard Specifications.

TABLE A

CONCRETE QUANTITIES				
TYPE	H=3'-0" TO 8'-0"(T=6")		H=8'-1" TO 20'-0"(T=8")	
	H=3'-0" (CY)	ADDITIONAL PCC PER FT. (CY)	H=8'-1"	ADDITIONAL PCC PER FT. (CY)
GTI	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.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DRAINAGE INLETS

NO SCALE

D74A

STD. PLAN D74A

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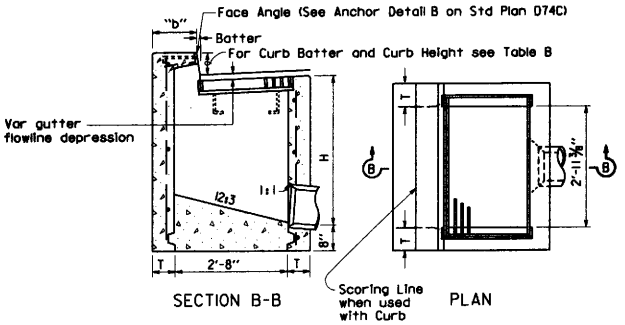
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

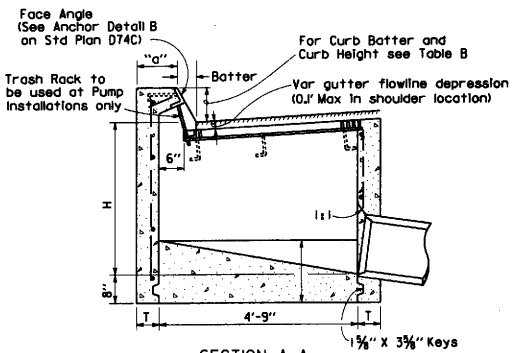
REGISTERED PROFESSIONAL ENGINEER J. L. Wright No. 33937 Exp. 6-30-94 CIVIL STATE OF CALIFORNIA



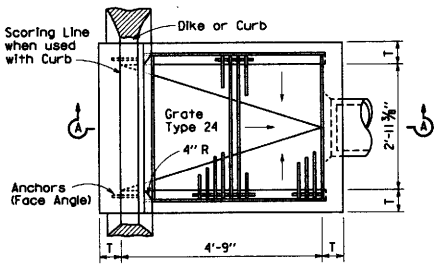
SECTION B-B

PLAN

TYPE GO

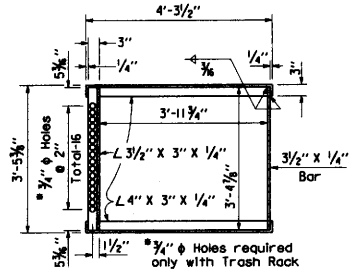


SECTION A-A

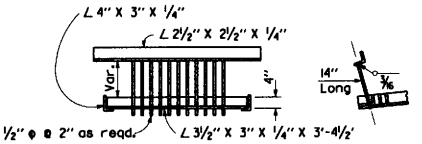


PLAN

TYPE GDO



GRATE FRAME FOR TYPE GDO INLET



TRASH RACK

(For use with Pump Installation)

TABLE B

CURB TYPE	NORMAL CURB HEIGHT	CURB BATTER	"a" DIMENSION	"b" DIMENSION
A-6	6"	1 1/2"	T+7 1/2"	12 1/2"
A-8	8"	2"	T+7"	12
B	6"	4"	T+5"	10
Dike	6"	3"	T+6"	

TABLE A

CONCRETE QUANTITIES				
TYPE	H=3'-0" TO 8'-0"(T=6")		H=8'-1" TO 20'-0"(T=8")	
	H=3'-0" (CY)	ADDITIONAL P.C.C. PER FT. (CY)	H=8'-1" (CY)	ADDITIONAL P.C.C. PER FT. (CY)
GO	1.24	0.245	3.39	0.346
GDO	1.62	0.322	4.36	0.446

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.

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 below.
3. Wall reinforcing not required when "H" is 8' or less and the unsupported width or length is 7' or less. Walls exceeding these limits shall be reinforced with #4 bars @ 18"± centers placed 1 1/2" clear to inside of box unless otherwise shown.
4. Inlet bottom reinforcing not required. See Standard Plan D74C for alternative reinforced bottom.
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. Step inserts may be substituted for the bar steps. Step inserts shall comply with State Industrial Safety requirements. See Standard Plan D74C for step details.
6. 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.
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'-11" for one grate. Add 3'-5 5/8" for additional grates in tandem.
12. See Standard Plan D77A and D77B for grate and frame details and weights of miscellaneous iron and steel.
13. See Standard Plan D78 for gutter 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.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DRAINAGE INLETS

NO SCALE

D74B

STD. PLAN D74B

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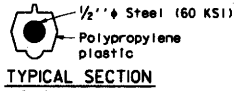
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

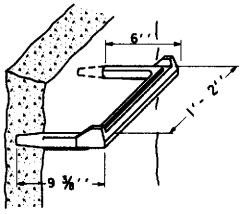
REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

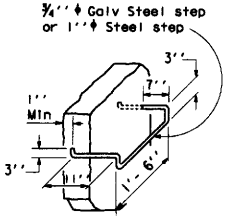
REGISTERED PROFESSIONAL ENGINEER J. L. Wright No. 33937 Exp. 6-30-94 CIVIL STATE OF CALIFORNIA



TYPICAL SECTION
(STEP INSERT)

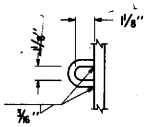


STEP INSERT

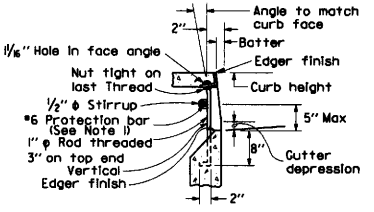


BAR STEP

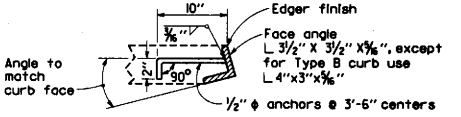
STEP DETAILS



STIRRUP

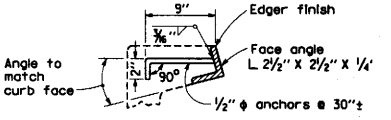


CURB SUPPORT DETAIL
See Note 2

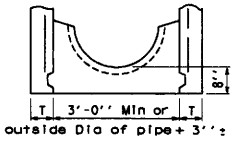


FACE ANGLE ANCHOR DETAIL A

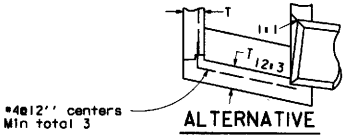
FACE ANGLE DETAIL A	
Length of Curb Opening	No of Anchors
3'-6'' or Less	2
7'-0''	3
10'-0''	4
14'-0''	5
21'-0''	7



FACE ANGLE ANCHOR DETAIL B



ALTERNATIVE
HALF ROUND BOTTOM



ALTERNATIVE
REINFORCED BOTTOM

NOTES

1. When shown on the project plans, place a #6 protection bar horizontally across length of the opening and bend back 4'' into the inlet wall on each side.

2. Curb supports shall be evenly spaced and minimal in number such that maximum span of unsupported curb is 7'.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DRAINAGE INLET DETAILS

NO SCALE

D74C

STD. PLAN D74C

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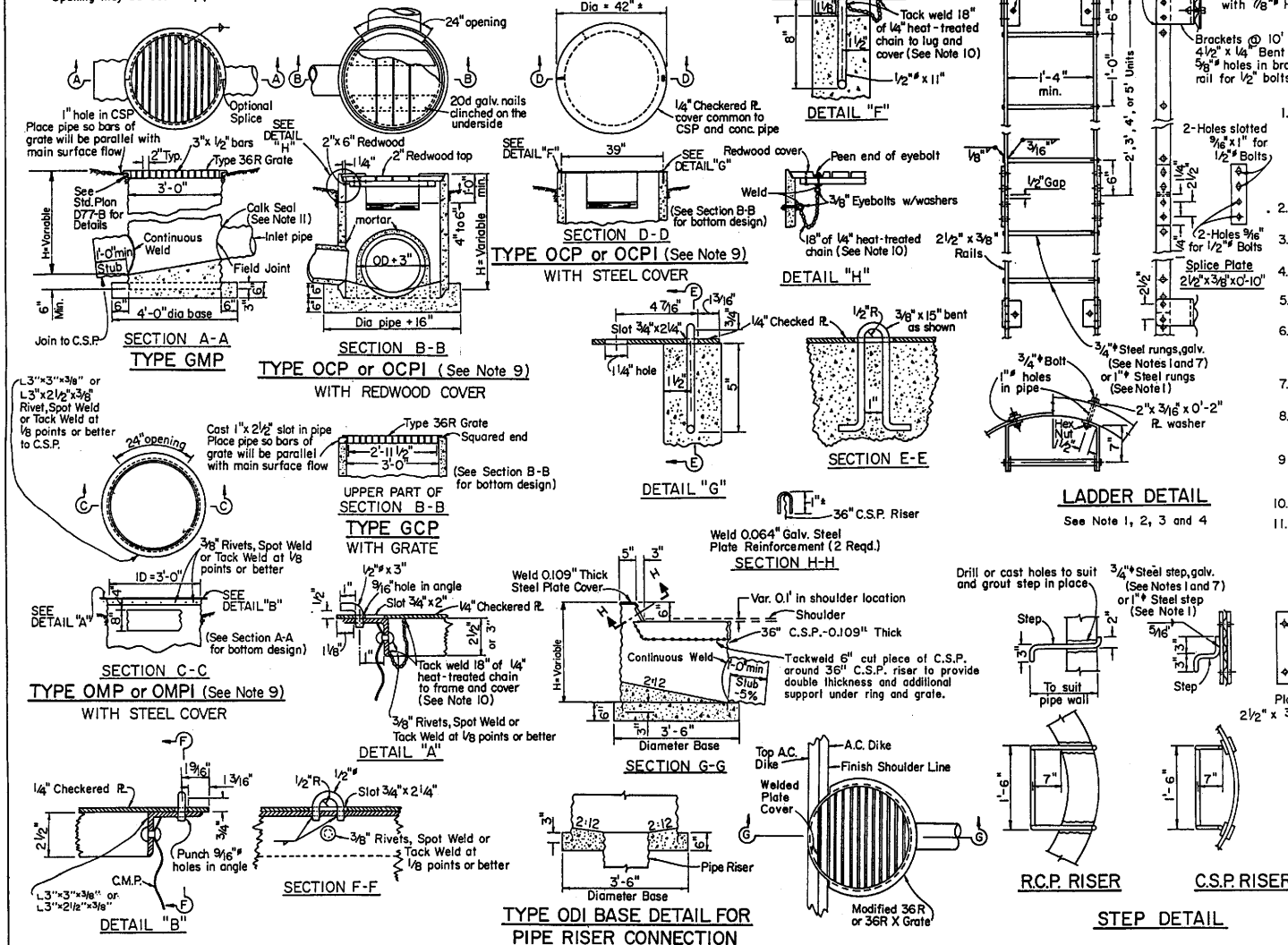
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER — July 1, 1992 — PLANS APPROVAL DATE

PROFESSIONAL ENGINEER — REGISTERED — J. L. Wright — No. 33937 — Exp. 6-30-94 — CIVIL — STATE OF CALIFORNIA

Note to Designer

Do not use redwood covers where there is a possibility of wheel loads. Where there is possibility of wheel loads 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.



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"# 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 pipes toward outlet pipe, and a wood trowel finish.
7. Galvanizing: See Standard Specifications or Special Provisions.
8. See Standard Plans D77A and D77B 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.)

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PIPE INLET
NO SCALE

D75

STD. PLAN D75

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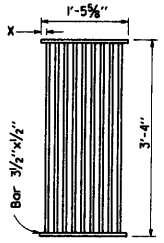
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

RECORDED PROFESSIONAL ENGINEER J. L. Wright No. 33937 Exp. 6-30-94 CIVIL STATE OF CALIFORNIA

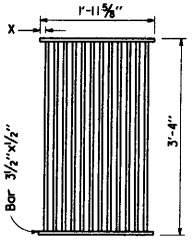


TYPE 18-9

1⅜" 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.

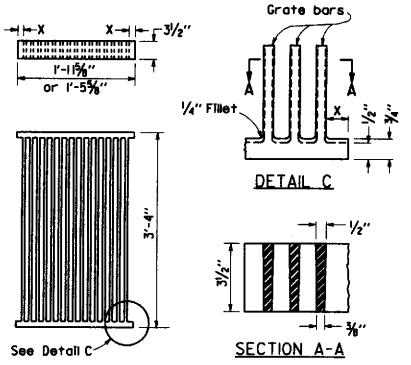


TYPE 24-12

1⅜" Clear Spacing
Use within the roadbed on highways where bicycles and pedestrians are excluded.

RECTANGULAR GRATE DETAILS

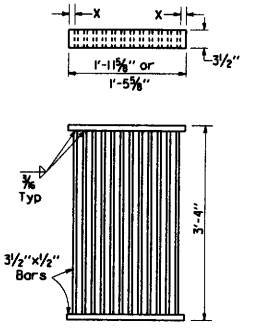
(SEE TABLE BELOW)



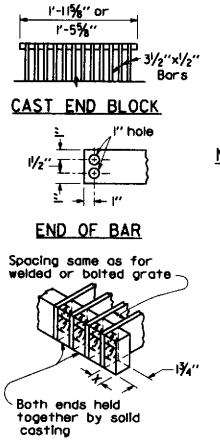
DETAIL C

SECTION A-A

ALTERNATIVE CAST NODULAR IRON GRATE OR CAST STEEL GRATE



ALTERNATIVE WELDED GRATE



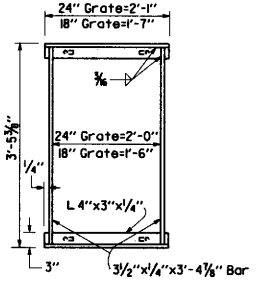
CAST END BLOCK

END OF BAR

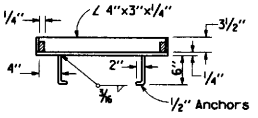
ALTERNATIVE CAST NODULAR IRON OR CAST STEEL END BLOCK GRATE

NOTES

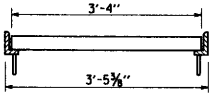
1. Grate type numbers refer to width of grate in inches and number of bars, respectively.
2. Contractor has the option of using cast nodular iron, cast steel, welded, bolted, or cast end block grate.
3. See Special Provisions for requirements pertaining to galvanizing or asphalt dipping of grates and 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).



TYPICAL FRAME



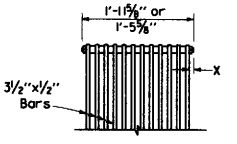
CROSS SECTION
(Thru Frame)



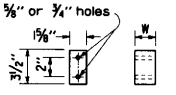
LONGITUDINAL SECTION
(Thru Frame and Grate)

RECTANGULAR FRAME DETAILS

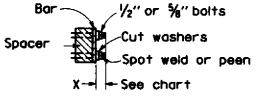
(FOR ALL RECTANGULAR GRATES)



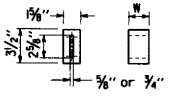
BOLTED END BLOCK



BAR SPACER



BOLTING DETAIL



ALTERNATIVE SPACER
1⅜" or 2"

ALTERNATIVE BOLTED GRATE

GRATE BAR SPACING TABLE

TYPE	NO. OF BARS	CLEAR BAR SPACING	X
18-9	9	1⅜"	1 1/16"
24-9	9	2"	1 9/16"
24-12	12	1⅜"	1¼"

INLET TYPE	COVER TYPE	WEIGHT (LB)
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

INLET TYPE	GRATE TYPE	NO. OF GRATES	WEIGHT (LB)
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

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

(See General Notes, No.8)

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

GRATE DETAILS
NO SCALE

D77A

STD. PLAN D77A

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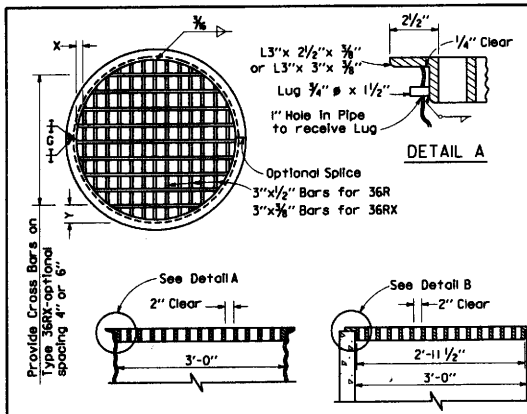
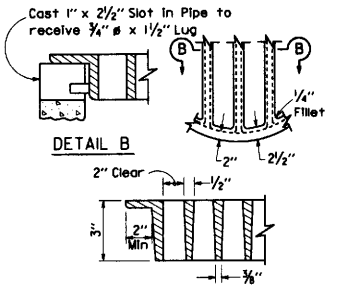
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER — PLANS APPROVAL DATE

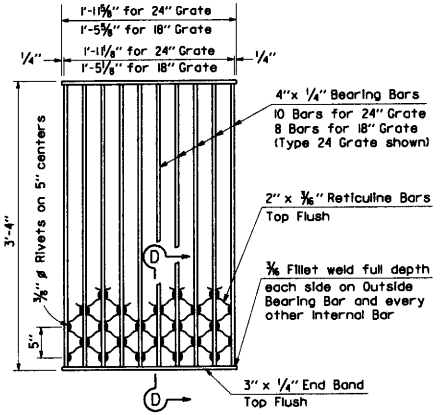
REGISTERED PROFESSIONAL ENGINEER — J. L. Wright — No. 33937 — Exp. 6-30-94 — CIVIL — STATE OF CALIFORNIA



TYPE 36R & 36RX GRATE DETAILS

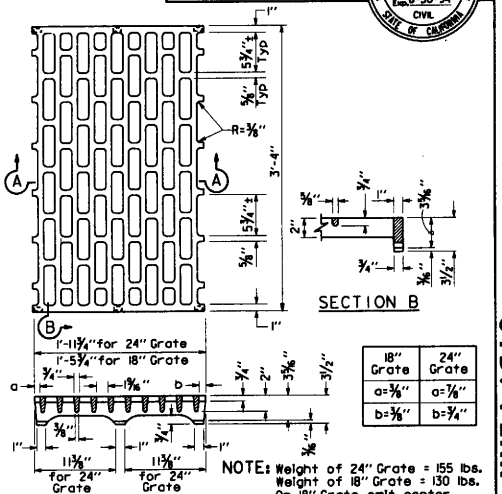


ALTERNATIVE CAST NODULAR IRON GRATE OR CAST STEEL GRATE TYPE 36R & 36RX



NOTE:
Weight of 24" Grate = 182 lbs.
Weight of 18" Grate = 145 lbs.

TYPE 18-8S & 24-10S GRATE
(WELDED STEEL)
RETICULINE TYPE

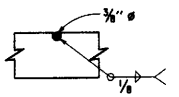


18" Grate	24" Grate
a=3/8"	a=7/8"
b=3/8"	b=3/4"

NOTE: Weight of 24" Grate = 155 lbs.
Weight of 18" Grate = 130 lbs.
On 18" Grate omit center bearing point.

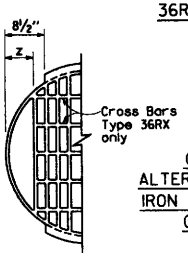
SECTION B

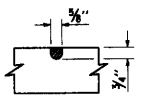
TYPE 18-8C & 24-10C GRATE
(CAST NODULAR IRON)



3/8" ø Cross Bars may be fillet welded, resistance welded or electroforged to Bearing Bars.

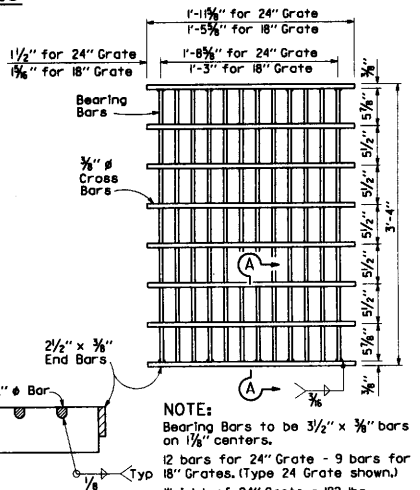
CROSS BAR DETAIL TYPE 36RX GRATE (WELDED STEEL)





CROSS BAR DETAIL
ALTERNATIVE CAST NODULAR IRON GRATE OR CAST STEEL GRATE TYPE 36RX

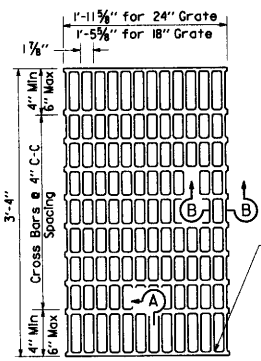
MODIFIED
TYPE 36R & 36RX GRATE FOR ODI INLET



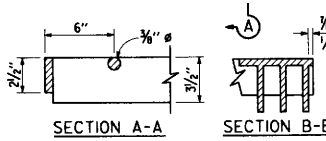
SECTION A-A

NOTE:
Bearing Bars to be 3 1/2" x 3/8" bars on 1 7/8" centers.
12 bars for 24" Grate - 9 bars for 18" Grates. (Type 24 Grate shown.)
Weight of 24" Grate = 192 lbs.
Weight of 18" Grate = 145 lbs.
3/8" ø Cross Bars may be fillet welded, resistance welded or electroforged to Bearing Bars.

TYPE 18-9X & 24-12X GRATE
(WELDED STEEL)



NOTE:
Bearing Bars to be 3 1/2" x 1/4" bars on 1 7/8" centers.
3/8" ø Cross Bars may be fillet welded, resistance welded or electroforged to Bearing Bars.
Weight of 24" Grate = 141 lbs.
Weight of 18" Grate = 107 lbs.
(Type 24 Grate shown)
3/16 Fillet Weld full depth each side on Outside Bearing Bars and on every third internal Bearing Bar.



SECTION A-A — SECTION B-B

TYPE 18-10 & 24-13 GRATE
(WELDED STEEL)

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

GRATE BAR SPACING TABLE

TYPE	NO. OF 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 1/8"
36RX Mod (Cast)	12	2"	2 1/8	3 3/4"	5 3/4"	5"

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

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 D77A.
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.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

BICYCLE PROOF GRATE DETAILS

NO SCALE

D77B

STD. PLAN D77B

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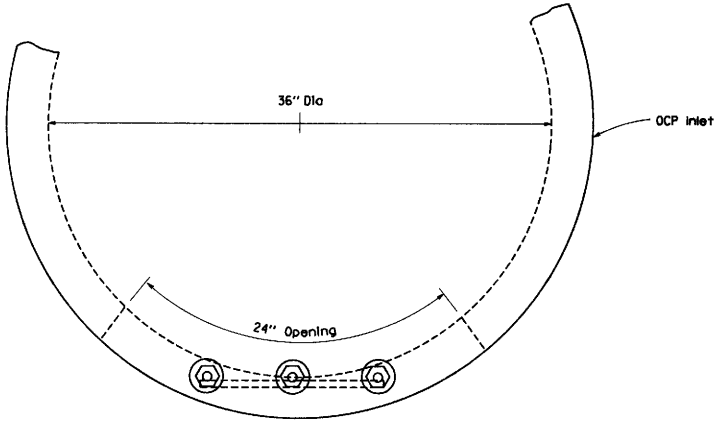
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

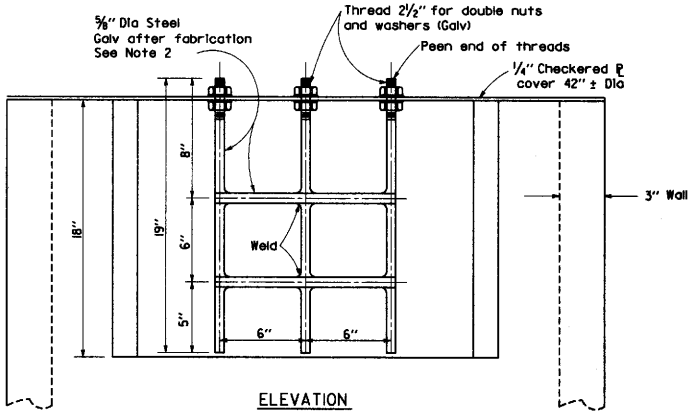
REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER J. L. Wright No. 33937 Exp. 6-30-94 CIVIL STATE OF CALIFORNIA



PLAN

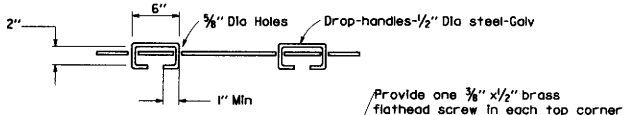


ELEVATION

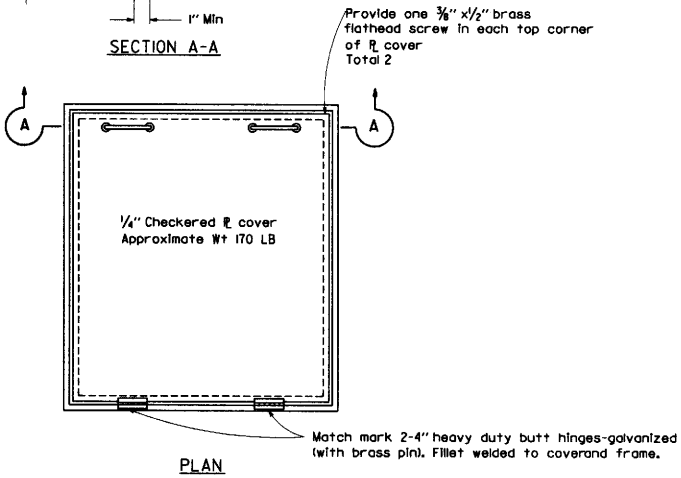
ALTERNATIVE
TRASH RACK FOR TYPE OCP INLET
Single or double opening

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.



SECTION A-A



PLAN

HINGED COVER FOR
TYPE OL AND INLETS

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

ALTERNATIVE
HINGED COVER FOR TYPE OL AND OS INLETS
AND TRASH RACK FOR TYPE OCP INLET

NO SCALE

D77C

STD. PLAN D77C

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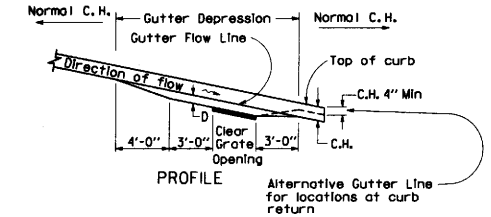
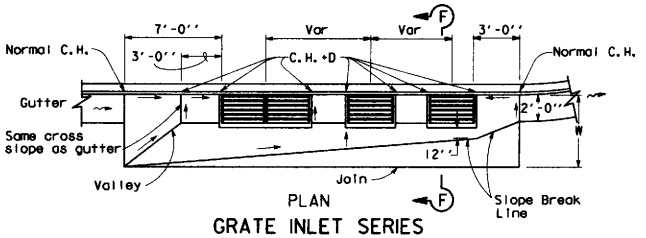
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

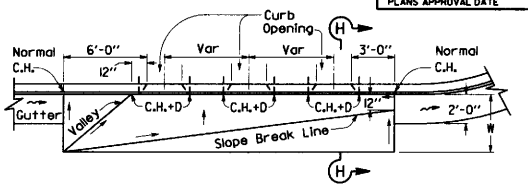
John L. Wright
REGISTERED CIVIL ENGINEER
July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER J. L. Wright No. 33937 Exp. 6-30-94 CIVIL STATE OF CALIFORNIA

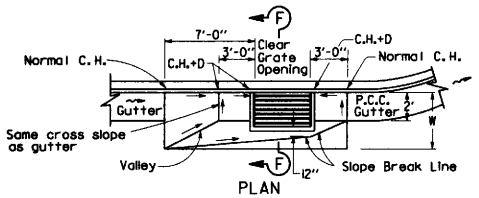




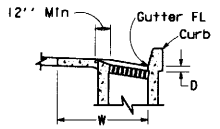
GRATE INLET SERIES



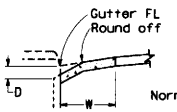
TYPE OS AND OL INLETS IN SERIES ON GRADE



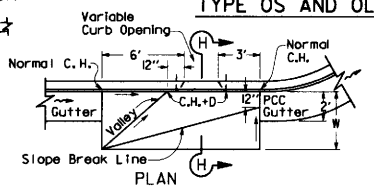
TYPE GI THRU G6 INLETS ON GRADE



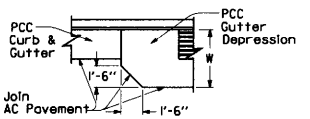
SECTION F-F



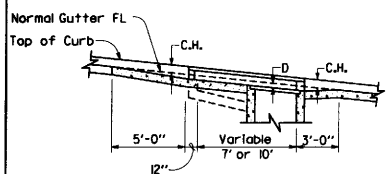
SECTION H-H



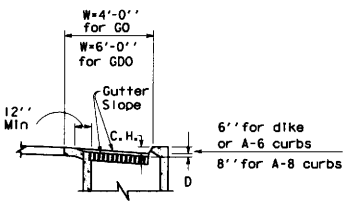
TYPE OS AND OL INLETS ON GRADE



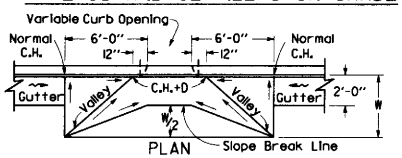
DETAIL OF ASPHALT CONCRETE PAVEMENT
(See Note 4)



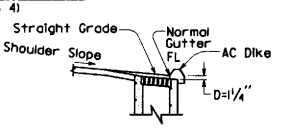
SECTION C-C



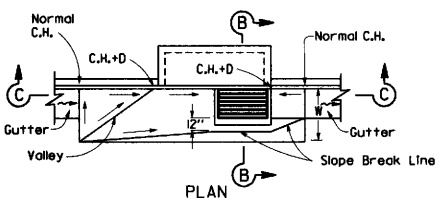
SECTION E-E



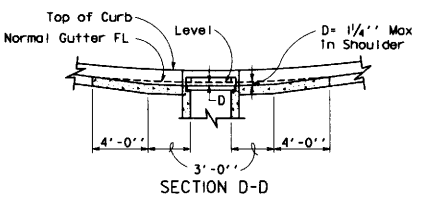
TYPE OS AND OL INLETS IN GRADE SAG



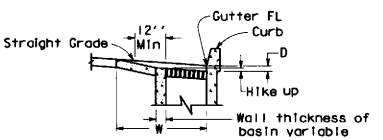
DETAIL OF INLET WITH DIKE
(Single Grate Shown)



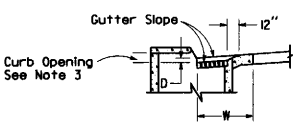
TYPE GOL INLET ON GRADE



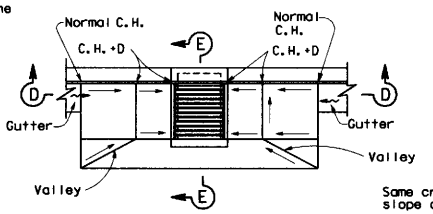
SECTION D-D



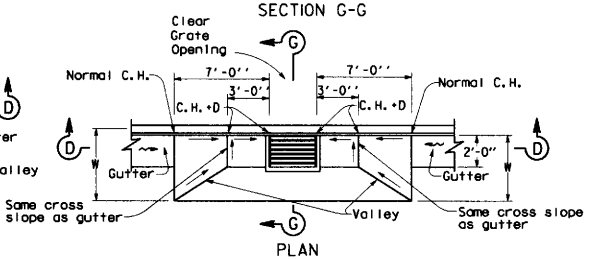
SECTION G-G



SECTION B-B



TYPE GO AND GDO INLET GRADE SAG
(GDO SHOWN)



TYPE GI THRU G6 GT3 AND GT4 INLETS IN GRADE SAG

NOTES

1. W= Width of depressed apron. Depressed aprons shall be 4' on shoulder and 4' to 6' in city street gutters unless otherwise shown.

   D= Gutter Depression. The gutter depression shall be 1¼" for shoulder and 1¼" to 3" in city street gutter or locations outside of shoulder unless otherwise shown.

   C.H. = Curb Height.
   → = Straight Grade, Downward Slope.
   ⇝ = Gutter or Shoulders direction of flow.

2. Gutter depressions shall be 8" thick.
3. Establish curb opening height at midpoint of grate.
4. Details shown for PCC pavement. When AC pavement is used, corners to be cut off as shown on Detail of Asphalt Concrete Pavement.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

GUTTER DEPRESSIONS

NO SCALE

D78

STD. PLAN D78

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

REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

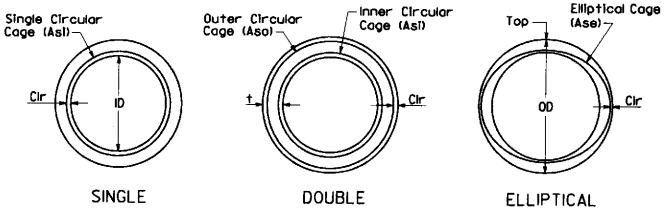
REGISTERED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA

f'c = 6000 psi

ID	t	WALL A																				
		10' MAX COVER									20' MAX COVER									40' MAX COVER	
		METHOD 1			METHOD 2			METHOD 3B			METHOD 1			METHOD 2			METHOD 3B			METHOD 3B	
IN INCHES		Asi	Aso	Ase	Asi	Aso	Ase	Asi	Aso	Ase	Asi	Aso	Ase	Asi	Aso	Ase	Asi	Aso	Ase	Asi	Aso
24	2½	.11	–	–	.07	–	–	.07	–	–	.25	–	–	.13	–	–	.10	–	–	.21	–
30	2¾	.15	–	–	.09	–	–	.07	–	–	.31	–	–	.17	–	–	.13	–	–	.28	–
36	3	.18	.09	.20	.10	.07	.11	.07	.07	.08	.41	.18	.41	.22	.14	.23	.15	.10	.16	.33	.22
42	3½	.20	.09	.21	.11	.07	.12	.08	.07	.09	.44	.20	.44	.23	.14	.25	.16	.10	.18	.35	.23
48	4	.22	.10	.23	.12	.08	.14	.09	.07	.10	.48	.21	.51	.25	.16	.27	.18	.11	.19	.37	.25
54	4½	.24	.11	.25	.14	.08	.15	.10	.07	.11	.53	.23	.56	.27	.17	.29	.19	.12	.21	.40	.26
60	5	.26	.12	.28	.15	.09	.16	.11	.07	.12	.57	.24	.61	.29	.18	.32	.21	.13	.22	.43	.28
66	5½	.28	.13	.30	.16	.10	.18	.12	.07	.13	.62	.26	.66	.31	.20	.34	.22	.14	.24	.47	.30
72	6	.30	.14	.32	.17	.11	.19	.13	.08	.14	.67	.28	.71	.34	.21	.37	.24	.15	.26	.50	.33
78	6½	.32	.15	.35	.19	.12	.20	.14	.09	.15	.72	.30	.77	.36	.23	.39	.26	.16	.28	.54	.35
84	7	–	–	–	.20	.13	.22	.15	.09	.16	–	–	–	.38	.24	.42	.27	.18	.30	.57	.37
90	7½	–	–	–	.22	.14	.24	.16	.10	.17	–	–	–	.41	.26	.45	.29	.19	.32	.61	.39
96	8	–	–	–	.23	.14	.25	.17	.11	.18	–	–	–	.44	.28	.47	.31	.20	.34	.65	.41
102	8½	–	–	–	.25	.15	.27	.18	.11	.20	–	–	–	.46	.29	.50	.33	.21	.36	.69	.44
108	9	–	–	–	.26	.16	.29	.19	.12	.21	–	–	–	.49	.31	.53	.35	.22	.38	.73	.46

f'c = 6000 psi, f'c = 6500 psi

ID	t	WALL AA
		80' MAX COVER
		METHOD 3C
IN INCHES		Asi	Aso
24	5¾	.15	.07
30	6	.19	.07
36	6½	.24	.07
42	7	.30	.10
48	7½	.36	.14
54	8	.41	.17
60	8½	.47	.22
66	9	.52	.25
72	9½	.58	.30
78	10	.65	.34
84	10½	.71	.38
90	11	.77	.43
96	11½	.83	.46
102	12	.92	.51
108	12½	1.01	.56



f'c = 5000 psi

ID	t	WALL B																				
		10' MAX COVER									20' MAX COVER									40' MAX COVER	
		METHOD 1			METHOD 2			METHOD 3B			METHOD 1			METHOD 2			METHOD 3B			METHOD 3B	
IN INCHES		Asi	Aso	Ase	Asi	Aso	Ase	Asi	Aso	Ase	Asi	Aso	Ase	Asi	Aso	Ase	Asi	Aso	Ase	Asi	Aso
24	3	.10	–	–	.07	–	–	.07	–	–	.23	–	–	.11	–	–	.08	–	–	.18	–
30	3½	.12	–	–	.08	–	–	.07	–	–	.27	–	–	.15	–	–	.11	–	–	.24	–
36	4	.13	.07	.14	.08	.07	.08	.07	.07	.07	.26	.11	.28	.15	.08	.16	.11	.07	.12	.24	.14
42	4½	.15	.07	.16	.09	.07	.10	.07	.07	.07	.30	.13	.32	.17	.10	.19	.13	.07	.14	.27	.16
48	5	.17	.08	.19	.10	.07	.11	.08	.07	.08	.34	.15	.37	.20	.11	.22	.15	.09	.16	.31	.19
54	5½	.19	.09	.21	.11	.07	.12	.09	.07	.10	.41	.18	.42	.22	.13	.24	.17	.10	.18	.35	.21
60	6	.21	.09	.24	.13	.07	.14	.10	.07	.11	.47	.20	.47	.24	.14	.27	.18	.11	.20	.38	.23
66	6½	.24	.11	.26	.14	.08	.15	.11	.07	.12	.54	.23	.56	.27	.16	.29	.20	.12	.22	.41	.26
72	7	.26	.12	.29	.15	.09	.17	.12	.07	.13	.61	.25	.67	.29	.18	.32	.22	.13	.24	.45	.29
78	7½	.29	.13	.31	.17	.10	.18	.13	.08	.14	.67	.27	.73	.32	.19	.35	.24	.15	.27	.49	.31
84	8	–	–	–	.18	.11	.20	.14	.08	.15	–	–	–	.35	.21	.38	.26	.16	.28	.52	.33
90	8½	–	–	–	.20	.12	.21	.15	.09	.16	–	–	–	.37	.22	.40	.28	.17	.30	.56	.36
96	9	–	–	–	.21	.13	.23	.16	.10	.18	–	–	–	.39	.24	.43	.30	.18	.33	.60	.38
102	9½	–	–	–	.23	.14	.25	.17	.10	.19	–	–	–	.42	.26	.46	.31	.19	.34	.63	.40
108	10	–	–	–	.24	.15	.26	.18	.11	.20	–	–	–	.45	.27	.49	.33	.21	.36	.67	.43

f'c = 5000 psi, f'c = 6000 psi, f'c = 6500 psi

ID	t	WALL BB
		80' MAX COVER
		METHOD 3C
IN INCHES		Asi	Aso
24	6¾	.12	.07
30	7	.17	.07
36	7½	.22	.07
42	8	.26	.07
48	8½	.32	.10
54	9	.37	.13
60	9½	.43	.17
66	10	.50	.22
72	10½	.54	.25
78	11	.60	.28
84	11½	.66	.32
90	12	.71	.36
96	12½	.76	.40
102	13	.82	.45
108	13½	.91	.50

f'c = 6000 psi

ID	t	WALL X																	
		10' MAX COVER						20' MAX COVER						30' MAX COVER					
		METHOD 3B			METHOD 3C			METHOD 3B			METHOD 3C			METHOD 3B			METHOD 3C		
IN INCHES		Asi	Aso	Ase	Asi	Aso	Ase	Asi	Aso	Ase	Asi	Aso	Ase	Asi	Aso	Ase	Asi	Aso	
24	1⅞	.07	–	–	.07	–	–	.11	–	–	.10	–	–	.19	–		.14	–	
30	2⅛	.07	–	–	.07	–	–	.13	–	–	.12	–	–	.21	–		.17	–	
36	2⅜	.07	.07	.07	.07	.07	.07	.15	.10	.15	.12	.08	.12	.22	.15		.17	.12	
42	2½	.09	.07	.10	.07	.07	.08	.19	.13	.20	.15	.10	.16	.32	.22		.23	.17	
48	2⅝	.11	.08	.12	.09	.07	.10	.24	.17	.26	.18	.14	.20	.36	.29		.30	.23	
54	2⅞	.13	.09	.14	.10	.07	.11	.26	.19	.28	.20	.15	.21	.42	.32		.32	.25	
60	3½	.11	.08	.12	.09	.07	.10	.23	.16	.25	.18	.13	.19	.36	.26		.27	.20	
66	3¾	.13	.09	.14	.10	.07	.11	.25	.18	.27	.19	.14	.21	.40	.29		.30	.23	
72	4¼	.13	.09	.14	.10	.07	.11	.25	.17	.28	.19	.14	.21	.39	.28		.30	.22	
78	4¾	.13	.09	.14	.10	.07	.11	.25	.17	.28	.20	.14	.21	.39	.27		.30	.22	
84	5¼	.15	.10	.15	.11	.07	.12	.26	.17	.28	.20	.14	.22	.39	.27		.30	.22	
90	5¾	.15	.10	.17	.12	.09	.13	.29	.20	.32	.23	.16	.25	.44	.31		.34	.25	
96	6	.17	.11	.17	.12	.08	.15	.29	.20	.32	.22	.16	.24	.44	.30		.33	.24	
102	6½	.18	.12	.19	.14	.10	.15	.32	.22	.35	.26	.18	.28	.49	.34		.38	.28	
108	7	.19	.13	.20	.15	.10	.16	.33	.23	.36	.27	.19	.29	.50	.35		.39	.29	

CAGE REINFORCEMENT

t = Pipe barrel wall thickness, inches

Asi = Inner cage reinforcement, or single circular cage reinforcement, square inch/LF

Aso = Outer cage reinforcement, square inch/LF

Ase = Elliptical single cage reinforcement, square inch/LF

ID = Inside Diameter, inches

OD = Outside Diameter, inches

Clr = Design clearance, inch (see Note 6)

DESIGN NOTES

Design: Bridge Design Specifications (1983 AASHTO with interims and revisions by Caltrans)

A. Earth Loading:
Earth Densities - Vertical: 140 LB/CF
Horizontal: Varies, see design lateral pressure chart (Circular Pipe only)

B. Unit Stresses: (Used in Design Tables)
fy = 65,000 psi
f'c = See Tables

C. The RCP as shown on this sheet is not intended to be used in a corrosive environment. Special Design Required.

CONSTRUCTION NOTES

1. For details of the method of excavation, backfill and bedding (Method 1, Method 2, etc.), see Standard Plan A62D.
2. The tables for minimum allowable classes and D-loads of RCP on Standard Plan A62D shall not apply to direct design RCP.
3. Notes 3, 9 and 10 on Standard Plan A62D shall apply to direct design RCP.
4. Throughout the length of any given culvert, the direct design selected by the Contractor shall be the same, including the method of excavation, backfill and bedding.
5. The embankment height prior to excavation specified in note 5 of the Standard Plan A62D shall apply to the direct design RCP installation when Method 2, 3A or 3B are used.
6. For wall thickness (t) less than 2½ inches, the minimum clearance (Clr) for reinforcement shall be ¾ inch, and for wall thickness (t) of 2½ inches or more the minimum clearance (Clr) for reinforcement shall be 1 inch.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PRECAST REINFORCED CONCRETE PIPE DIRECT DESIGN METHOD

NO SCALE

D79

STD. PLAN D79

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

REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

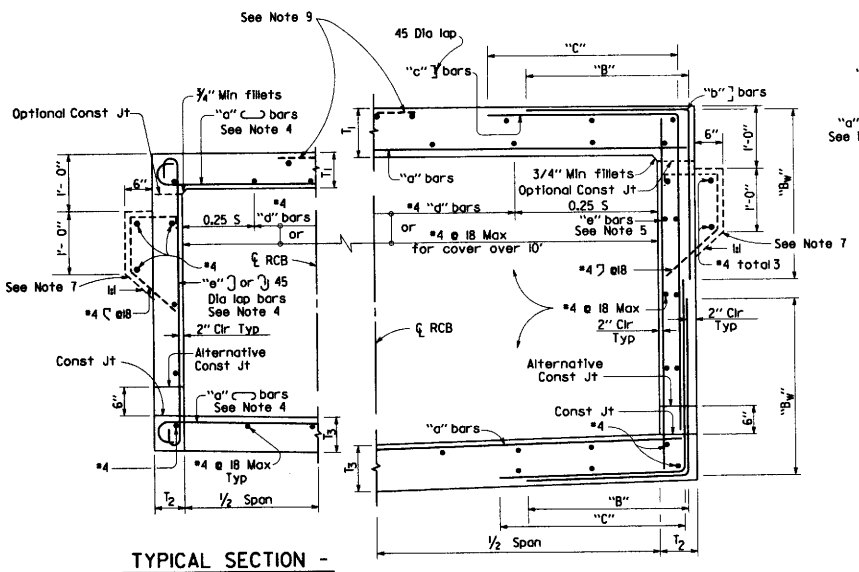
T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA

SPAN (Ft)	4						5								6								7								8							
HEIGHT (Ft)	2		3		4		2		3		4		5		3		4		5		6		3		4		5		6		7		4		5		6		7		8	
Maximum Earth Cover (Ft)	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20
Conc: Roof T_1 (inch)	7	7	7	7	7	7	7½	7½	7½	7½	7½	7½	7½	7½	8	8	8	8	8	8	8	8	8	9	8	9	8	9	8½	9	8½	9	8½	9½	8½	10	8½	10	8½	10
Conc: Walls T_2 (inch)	6	6	6	6	6	6½	6	6	6	6	6	7	6½	7½	6	6	6	7	6½	7½	7	8½	6	6	6	7	6½	7½	7	8½	8	9½	6	7	6½	7½	7	8½	8	9½	8½	10½
Conc: Invert T_3 (inch)	6	6	6	6	6	6½	6½	7	6½	7	6½	7	6½	7	7	8	7	8	7	8	7	8	8	9	8	9	8	9	8	9	8	9	8	9½	8	10	8	10	8	10
Reinf: Spacing (inch)	7	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	6½	5½	6½	5½	6½	5½	6	5	6	5	6	4½	6	5	6	4½
Reinf: "a" Size Bar *	6	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	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Reinf: "e" Size Bar *	4	4	4	5	5	6	4	4	4	4	5	5	6	6	4	4	5	5	6	6	7	6	4	4	5	5	6	6	6	7	7	7	5	5	5	6	6	6	7	7	7	7
Quantities: 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	13.7	14.9	14.6	16.8	16.1	18.5	18.1	21.0	20.7	23.8	16.4	19.0	17.9	21.1	19.5	24.1	22.1	26.9	24.1	30.1
Quantities: Reinforcement LB/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	121	147	130	177	160	192	123	151	131	171	137	198	160	215	192	252

SPAN (Ft)	10												12												14													
HEIGHT (Ft)	5		6		7		8		9		10		6		7		8		9		10		11		12		7		8		9		10		11		12		13		14	
Maximum Earth Cover (Ft)	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20
Conc: Roof T_1 (inch)	8	10½	8	10½	8	10½	8	10½	8	10½	8½	11	8½	12	8½	12	8½	12	8½	12	8½	12	9½	12	9½	12	9½	14	9½	14	9½	14	9½	14	10	14	10	14	10½	14	11	14
Conc: Walls T_2 (inch)	8	8	8	9	8	9	8	10	8½	11½	9½	12½	8	10	8½	10½	8½	10½	8½	11½	9	12½	10½	13½	11½	15	9½	11	9½	11½	9½	11½	10	12½	10½	14	11½	15	12½	16½	13½	17½
Conc: Invert T_3 (inch)	8	11	8	11	8	11	8	11	8	11	8½	11	8½	12½	9	12½	9	12½	9	12½	9	12½	9½	13	10	13	10	14½	10	14½	10	14½	10	14½	10½	14½	10½	15	11	15	11½	15
Reinforcement: Spacing (inch)	13	12	12	12	11	11	10	11	11	10	11	10	9	10	9	10	9	10	8	10	8	10	10	9	9	8	10	9	10	9	10	8	10	8	10	8	8	10	10	10	10	9
Reinforcement: ••"a" Size Bar *	6	7	6	7	6	7	6	7	6	6	6	6	6	7	6	7	6	7	6	7	6	7	6	6	6	6	7	7	7	7	7	7	7	7	7	7	6	7	6	7	6	7
Reinforcement: Size Bar *	6	7	6	7	6	7	6	7	6	6	7	7	6	7	6	7	6	7	6	7	6	7	7	7	6	7	6	7	7	7	7	7	7	7	7	7	6	8	7	8	7	8
Reinforcement: "b" Dimension "B" (Ft-inch)	2-11	2-11	2-11	3-0	2-11	3-9	2-11	3-9	2-11	3-9	2-11	3-9	3-1	3-2	3-9	3-9	3-9	3-9	3-9	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	3-4	4-6	3-6	4-6	3-6	4-6	3-6	4-6	4-9	6-0
Reinforcement: "b" Dimension "B_W" (Ft-inch)	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	4-11	4-4	4-4	6-5	7-0	7-0	8-4	7-0	8-4	6-0	6-0	6-0	6-0	6-0	6-0	5-0	6-0	4-6	6-0
Reinforcement: "c" Size Bar *	6	7	6	7	6	7	6	7	7	7	7	7	6	7	6	7	6	7	6	7	6	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	8	8	8	8	8	8
Reinforcement: "c" Dimension "C" (Ft-inch)	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	8-1	5-7	4-0	4-2	6-9	6-9	5-10	5-10	6-0	6-4	8-11	6-4	8-11	6-4	8-11	6-4	8-11	6-4
Reinforcement: •"e" Size Bar *	4	4	4	4	4	4	4	4	4	4	5	5	4	4	4	4	4	4	4	4	4	4	5	5	5	5	4	4	4	4	4	4	4	4	4	4	5	6	6	6	6	6
Quantities: 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	39.5	54.9	41.9	58.7	45.9	64.1	49.9	69.5	55.6	75.8	61.6	81.3
Quantities: Reinforcement LB/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	446	587	449	580	492	596	537	605	564	634	604	759

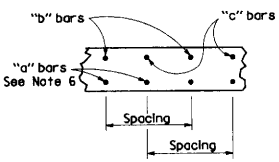
• See Note 5
•• See Note 6

"d" bars, for earth covers up to and including 10'								
Span	4'	5'	6'	7'	8'	10'	12'	14'
Number	5	6	7	8	9	10	12	16

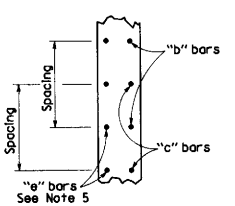


TYPICAL SECTION - SPANS 4' THRU 8'

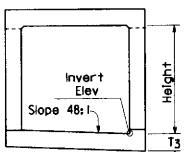
TYPICAL SECTION - SPANS 10' THRU 14'



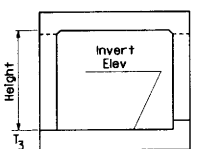
ROOF SECTION
SPANS 10' THRU 14'
INVERT SIMILAR



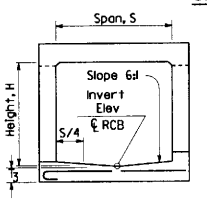
WALL SECTION
SPANS 10' THRU 14'



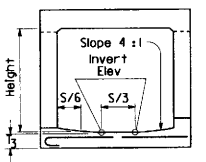
SLOPED INVERT



FLAT INVERT



V INVERT



TRAPEZOIDAL INVERT

ALTERNATIVE INVERTS

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 portland cement concrete, and adjust quantities.
8. For design and details not shown, see Standard Plan D82.
9. For exposed top, provide #4 @ 18 each way (2' lap "c" bars or full span) and adjust.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

CAST-IN-PLACE REINFORCED CONCRETE SINGLE BOX CULVERT

NO SCALE

D80

STD. PLAN D80

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

REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA

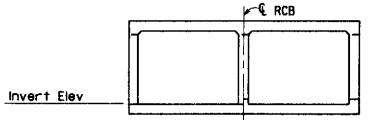
	SPAN (Ft)	4						5								6								7								8							
	HEIGHT (Ft)	2		3		4		2		3		4		5		3		4		5		6		3		4		5		6		7		4		5		6		7		8	
Maximum Earth Cover (Ft)		10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20
Conc	Roof T_1 (inch)	7	7	7	7	7	7	7	7½	7	7½	7	7½	7	7½	7	9	7	9	7	9	7	9	7½	10	7½	10	7½	10	8	10	8	11	8	11	8	11	8	11	8	11
	Exterior Walls T_2 (inch)	6	6	6	6	6	7	6	6	6	6	6	7	6½	7½	6	6	6	7	6½	8	7	8½	6	6	6	7	6½	7½	7	9	8	9½	6	7½	6½	8	7	9	8	10	8½	11
	Invert T_3 (inch)	7	7	7	7	7	7	7	8	7	8	7	8	7	8	7	9	7	9	7	9	7	9	7½	10½	7½	10½	7½	10½	7½	10½	7½	10½	8	11½	8	11½	8	11½	8	11½	8	11½
Reinf	Spacing (inch)	16	15	16	15	16	15	11½	14	11½	14	11½	14	11½	15	11½	12	11½	12	11½	12	11½	12	11	10½	11	10½	11	10½	11	10½	11	10½	9	10	9	10	9	10	9	10	9	10
	"g" Size Bar *	4	7	4	7	4	7	4	7	4	7	4	7	4	7	6	7	6	7	6	7	6	7	6	7	6	7	6	7	6	7	6	7	7	7	7	7	7	7	7	7	7	7
	"f" Size Bar *	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	6	5	6	5	6	5	6	5	6	5	5	5	5	5	5	5	5	5	5	5
	"a" Size Bar *	6	4	6	4	6	4	6	4	6	4	6	4	6	4	7	4	7	4	7	4	7	4	6	4	6	4	6	4	6	4	6	4	6	4	6	4	6	4	6	4	6	4
	• "e" Size Bar *	4	4	4	5	5	6	4	4	4	5	5	6	5	7	4	5	4	6	5	6	6	7	4	5	5	5	5	6	6	7	6	7	4	5	5	6	6	6	6	7	6	7
Quantity	Concrete CF/LF	14.0	14.0	15.5	15.5	17.0	17.8	16.3	17.8	17.8	19.3	19.3	21.6	21.3	23.8	20.1	24.6	21.6	27.0	23.6	29.7	25.8	32.2	23.7	30.8	25.2	33.3	27.2	35.5	29.4	39.1	32.4	41.8	29.2	40.1	31.2	42.4	33.4	45.5	36.4	48.9	39.0	52.6
	Reinforcement LB/LF	78	89	84	95	93	112	119	112	122	121	134	137	145	162	186	162	192	179	206	190	227	212	207	197	220	208	227	228	252	262	260	276	283	237	302	266	340	279	350	312	360	326

	SPAN (Ft)	10												12												14															
	HEIGHT (Ft)	5		6		7		8		9		10		6		7		8		9		10		11		12		7		8		9		10		11		12		13		14	
Maximum Earth Cover (Ft)		10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20
Conc	Roof T_1 (inch)	9	12½	9	12½	9	12½	9	12½	9½	12½	9½	12½	10	14½	10	14½	10	14½	10	14½	10	14½	10	14½	10	14½	11½	16½	11½	16½	11½	16½	11½	16½	11½	16½	11½	16½	11½	16½	11½	16½
	Exterior Walls T_2 (inch)	8	8	8	8½	8	9½	8	10½	8½	11½	9½	12½	8	8½	8	9	8½	10½	9	11½	9½	12½	10	14	11	15	8½	9½	8½	10½	9	11½	9½	12½	10½	14	11½	15	12½	16½	13	17½
	Invert T_3 (inch)	9	12½	9	12½	9	12½	9	12½	9	12½	9	12½	10	15	10	15	10	15	10	15	10	15	10	15	10	15	11½	17	11½	17	11½	17	11½	17	11½	17	11½	17	11½	17	11½	17
Reinf	Spacing (inch)	11	7½	10½	7½	10	8	10	8	10½	8	10½	8½	9	8	9	8	7½	8	7½	8½	7½	8½	8½	8	8½	8	8½	8	8½	8	8½	8	8½	8	8½	8	8½	8	8	8	8	8
	"g" Size Bar *	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
	"f" Size Bar *	7	5	6	5	6	5	6	5	6	5	6	5	7	7	7	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	"a" Size Bar *	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	"b" Size Bar *	5	5	4	5	5	5	6	5	6	6	6	6	5	5	5	6	5	6	5	6	6	6	5	6	6	6	5	6	6	6	5	6	6	6	6	6	6	7	7	7	7	7
	"b" Dim "B" (Ft-Inch)	1-9	2-7	2-0	2-9	2-3	2-9	2-7	3-1	2-7	3-1	2-7	3-1	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	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" Dim "Bw" (Ft-Inch)	4-0	4-11	4-0	4-11	4-0	4-11	4-0	4-11	4-0	4-11	4-0	4-11	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	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 *	5	5	6	6	6	6	6	6	7	6	7	6	6	6	6	6	6	6	6	6	6	6	7	7	7	7	6	6	6	7	7	7	7	7	7	7	7	7	7	7	8	8
	"c" Dim "C" (Ft-Inch)	3-1	2-9	3-9	3-3	4-6	4-3	5-6	4-6	6-0	4-9	6-0	4-9	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	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" Size Bar *	4	4	4	4	4	4	4	4	4	4	5	5	4	4	4	4	4	4	4	4	4	4	5	5	5	5	4	4	4	4	4	4	4	4	4	4	5	5	5	5	6	6
Quantity	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	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	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
	Reinforcement LB/LF	370	454	381	494	418	494	460	510	486	550	518	568	543	604	563	646	600	663	614	688	627	691	701	749	733	764	662	710	715	783	756	820	807	846	833	873	881	958	884	978	1002	1110

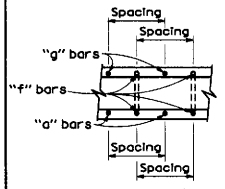
• See Note 5

NOTES

1. For boxes with span or height less than any of those shown in table, use next greater size box concrete dimensions and reinforcement. Make necessary changes in bar lengths and quantities.
2. For boxes with span or height or cover greater than those shown in tables, a special design is required.
3. Quantities are approximate and for design purposes only.
4. It is permissable 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 portland cement concrete, and adjust quantities.
7. For design and details not shown, see Standard Plan D82
8. This plan sheet may be used for multiple cell culverts by making necessary adjustments.



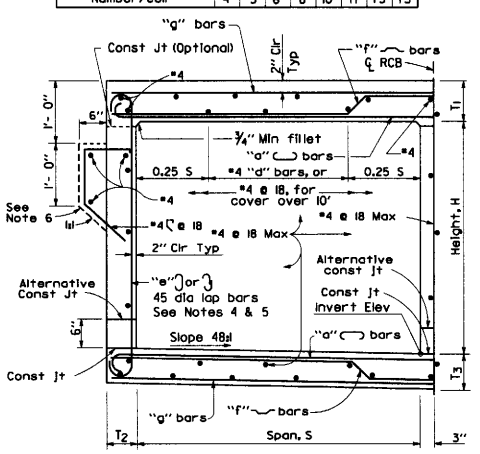
FLAT INVERT ALTERNATIVE



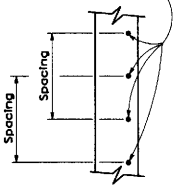
ROOF SECTION
SPANS 4' THRU 8'

INVERT SIMILAR

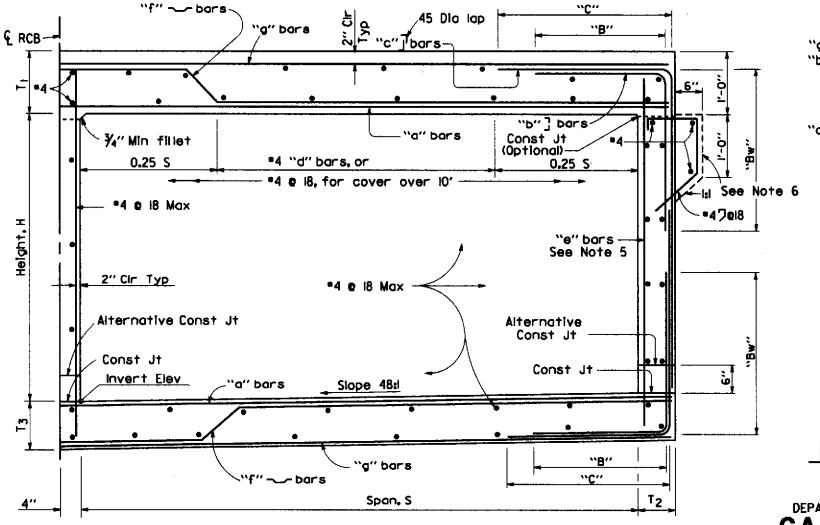
"d" bars, for earth covers up to and including 10'							
Span	4'	5'	6'	7'	8'	10'	12'	14'
Number/Cell	4	5	6	8	10	11	13	15



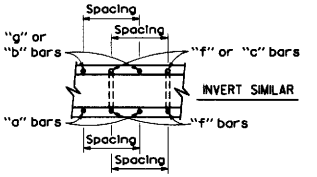
TYPICAL SECTION - SPANS 4' THRU 8'



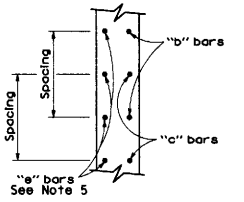
EXTERIOR WALL SECTION
SPANS 4' THRU 8'



TYPICAL SECTION - SPANS 10' THRU 14'



ROOF SECTION
SPANS 10' THRU 14'



EXTERIOR WALL SECTION
SPANS 10' THRU 14'

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

CAST-IN-PLACE REINFORCED CONCRETE DOUBLE BOX CULVERT

NO SCALE

D81

STD. PLAN D81

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

REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA

DESIGN NOTES

Specifications:
Design:
Bridge Design Specification (1983 AASHTO Specifications with revisions by Caltrans)
Load Factors: 1.5 D + 1.5 E + 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
Apply impact only to the roof slab.

Earth Cover (in feet)	Impact (%)
Up to 1.0	30
1.1 to 2.0	20
2.1 to 3.0	10
Over 3.0	0

No surcharge on walls due to live load.
Earth load:
Earth pressures for two conditions:
140 LB/CF vertical, 42 LB/CF horizontal.
140 LB/CF vertical, 140 LB/CF horizontal.

Unit stresses:
f'_c = 3¼ KSI
f_y = 60 KSI
n = 9

Distribution "d" bars:
Up to and including 10' cover
Expressed as a percent of main positive reinforcement required: $\frac{100}{\sqrt{S}}$, max 50% (unless traffic longitudinal).
Over 10' cover
#4 @ 18" maximum.

Shear:
Maximum allowable shear, $v_c = 3.5\sqrt{f'_c}$, psi

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 D88. 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 ½" expansion joint filler at 30'± centers outside the paved roadway lanes and place Bridge Detail 3-2, Standard Plan B0-3, at 30' centers under paved roadway lanes.
When cover is more than span length-
Place ½" expansion joint filler at 30'± centers and additional ½" 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 A62E.

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

GENERAL NOTES

Designation:
Standard single or multiple box culverts are shown on plans as span times height with maximum cover over roof thus: 8x5 RCB with 10' or DBL 10x5 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 of the "a", "f" and "g" bars is measured along the centerline. Stagger splices not shown. Hooks Hooks may be rotated or tilted, as necessary, for clearance.

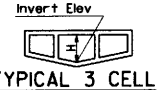
Special reinforcement coverage:
Box standard plans are not to be used for culverts in a corrosive environment or where there is a severe abrasive flow condition or in freeze-thaw locations.

Special design:
Required for culverts with conditions, loads, design bearing pressures or sizes greater than those given on this plan or Standard Plans D80 & D81. Also required for multiple cell culverts with unequal spans. For culverts with railroad loading, see the current AREA design specification.

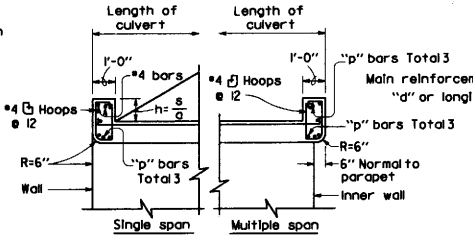
3 or more cells:
For culverts with more than two cells, use dimensions and reinforcement for the standard "double box culvert" and adjust quantities accordingly.

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)

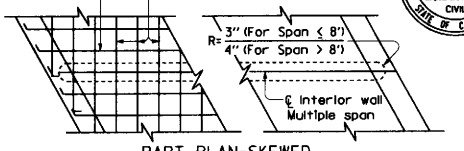


TYPICAL 3 CELL



PART SECTION

s = Clear span (Ft)
a = 12 cosine skew angle



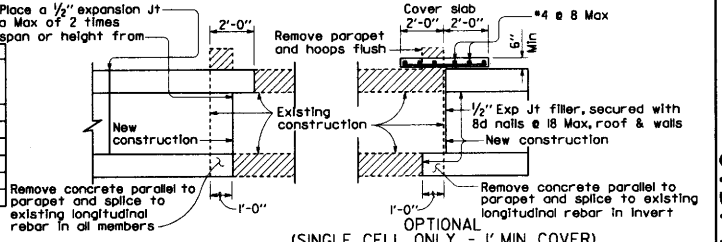
PART PLAN-SKEWED

PARAPET DETAIL

Span \ Skew Angle	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

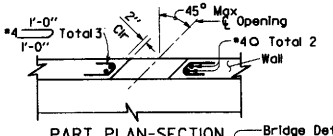
Parapet "p" bars

PARAPET REINFORCEMENT

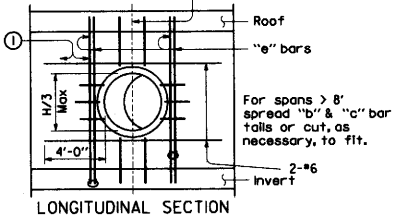


CULVERT EXTENSION

(SINGLE CELL ONLY - 1' MIN COVER)
20° Skew Max



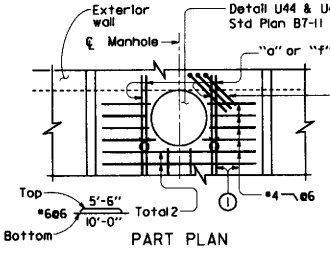
PART PLAN-SECTION



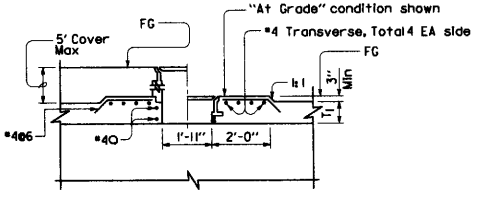
LONGITUDINAL SECTION

UTILITY OPENING-WALL

H= Height of box

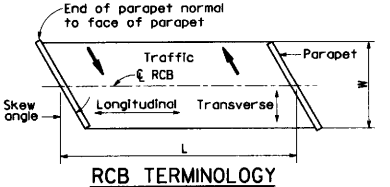


PART PLAN

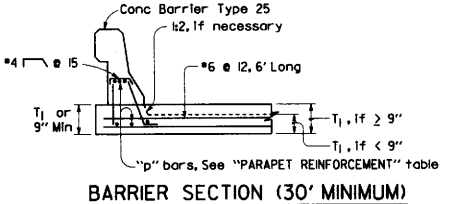


PART LONGITUDINAL SECTION

MANHOLE



RCB TERMINOLOGY



BARRIER SECTION (30' MINIMUM)

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
SPECIAL DETAILS

CAST-IN-PLACE REINFORCED CONCRETE BOX CULVERT MISCELLANEOUS DETAILS

NO SCALE

D82

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

STD. PLAN D82

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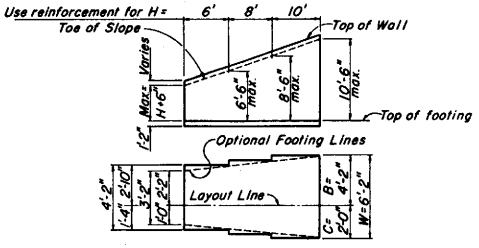
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER

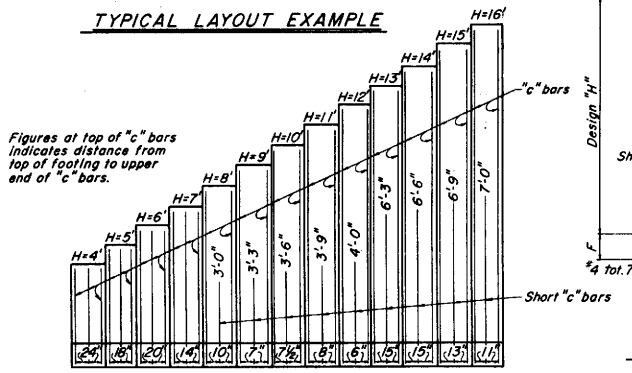
July 1, 1992
PLANS APPROVAL DATE

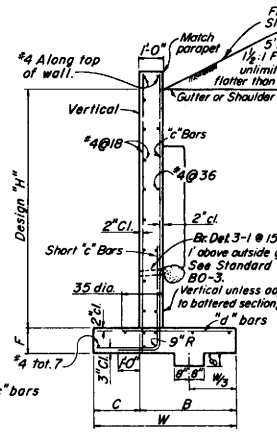
REGISTERED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA

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

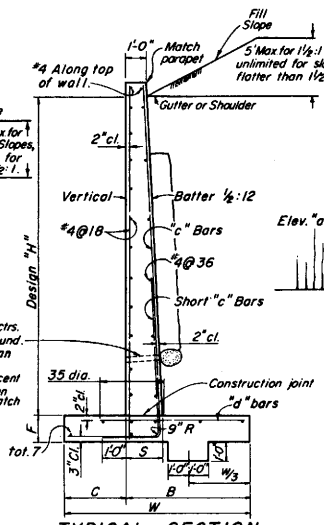


TYPICAL LAYOUT EXAMPLE

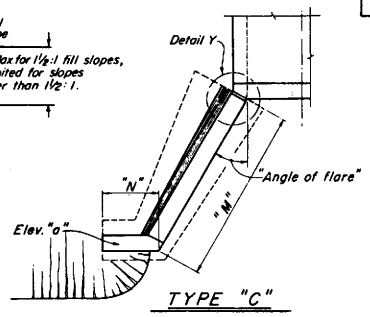




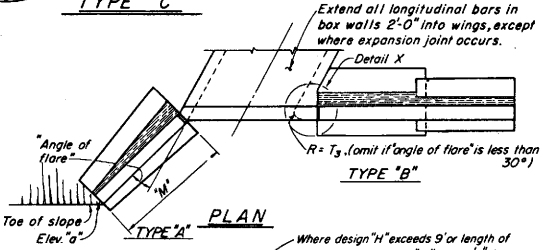
TYPICAL SECTION
H=4' THRU 12'



TYPICAL SECTION
H=13' THRU 16'



TYPE "C"



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. CY/L.F.	0.32	0.38	0.44	0.49	0.55	0.61	0.67	0.73	0.79	1.02	1.10	1.18	1.26
Reinf. lbs/L.F.	13	16	19	25	30	37	49	62	76	73	90	104	125

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

Design Notes:

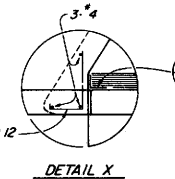
Unit Stresses: f_s = 24,000 p.s.i., f_c = 1,300 p.s.i., n=10

Maximum Toe Pressure = 1½ Tons/sq. ft.

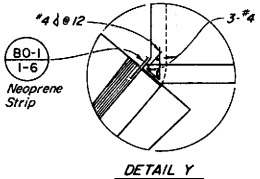
Elevations, length and angle of flare of wings may be varied by the Engineer to suit conditions encountered in the field. Walls designed for 2' liveload surcharge, 1½:1 sloping surcharge not to exceed 5' in elevation plus 2' liveload surcharge, or unlimited 2:1 surcharge. Dimensions "H", "L", "M" "N",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

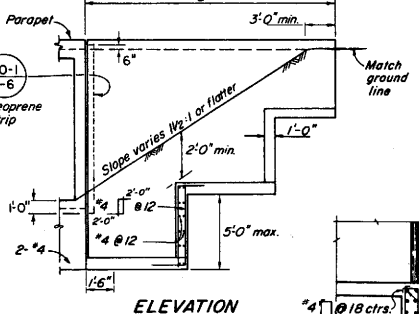
Eliminate cut-off wall if adjacent channel is paved and skew is 20° maximum.



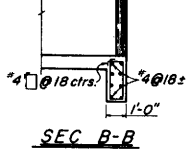
DETAIL X



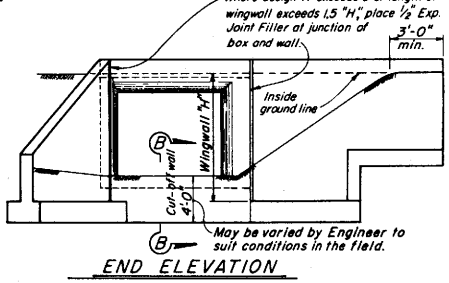
DETAIL Y



ELEVATION



SEC B-B



END ELEVATION

TYPE "A" TYPE "B"

STRAIGHT WINGWALLS

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

BOX CULVERT WINGWALLS TYPES A, B AND C

NO SCALE

D84

STD. PLAN D84

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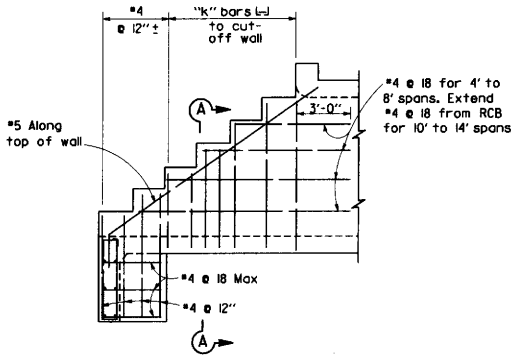
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

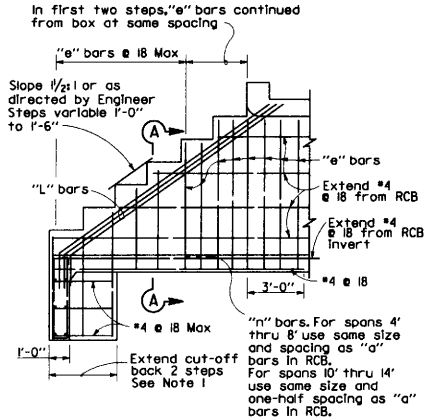
REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

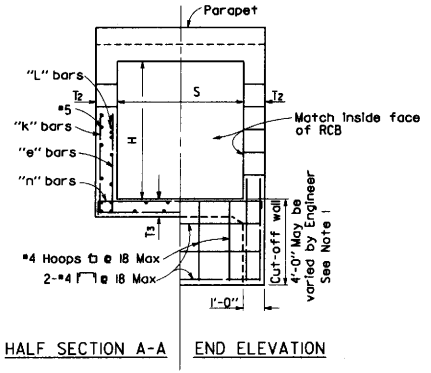
REGISTERED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA



LONGITUDINAL SECTION
Showing reinforcement in outside face

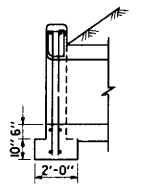


LONGITUDINAL SECTION
Showing reinforcement in inside face

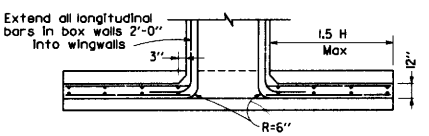


HALF SECTION A-A | END ELEVATION

Dimensions S and T_3 to be same as adjacent RCB.
T_2 = Same as adjacent RCB (8" Min).

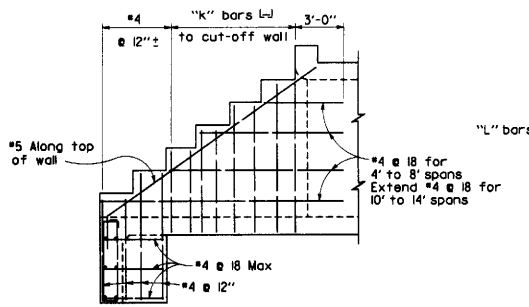


SECTION B-B

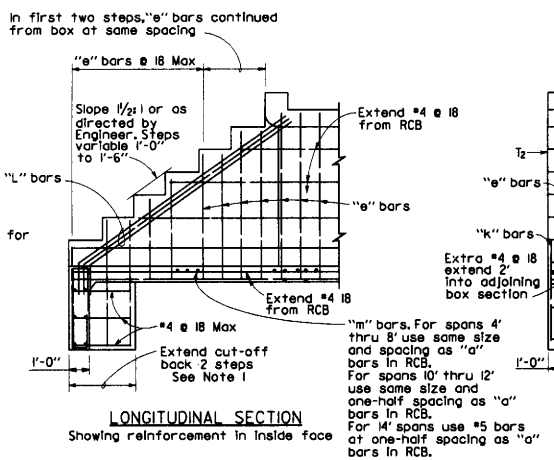


SECTION C-C

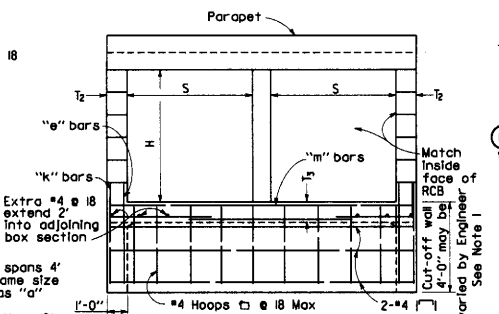
TYPE "E" STEPPED WINGWALL (SINGLE BOX CULVERT)



LONGITUDINAL SECTION
Showing reinforcement in outside face



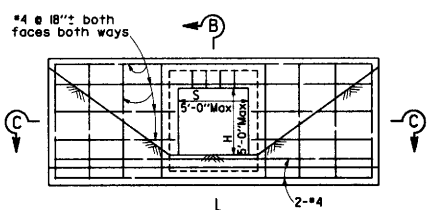
LONGITUDINAL SECTION
Showing reinforcement in inside face



END ELEVATION

Dimensions S and T_3 to be same as adjacent RCB.
T_2 = Same as adjacent RCB (8" Min).

TYPE "E" STEPPED WINGWALL (MULITPLE BOX CULVERT)



ELEVATION

TYPE "D" STRAIGHT WINGWALL

Details similar for multiple span boxes
For Parapet Details not shown see Standard Plan D-82

NOTES:

1. Eliminate cut-off walls if adjacent channel is paved.
2. For "H" not shown use reinforcement for next greater height.

TABLE OF REINFORCEMENT FOR TYPE "E" WINGWALLS										
H (See Note 2)		3'	4'	5'	6'	7'	8'	10'	12'	14'
"k" Bars	Bar No	4	4	5	5	5	5	5	5	5
	Spacing	12	12	12	10	9	8	7	5	4
"L" Bars	Bar No	5	5	6	6	7	7	7	7	7
	Number each wall	2	2	3	3	3	3	3	3	3

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

BOX CULVERT WINGWALLS TYPES "D" AND "E"

NO SCALE

D85

STD. PLAN D85

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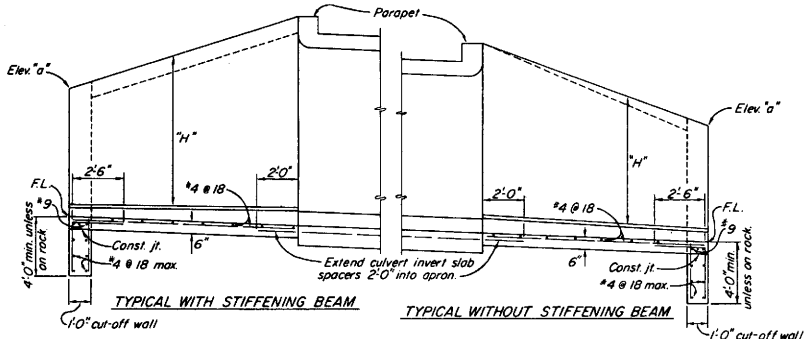
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

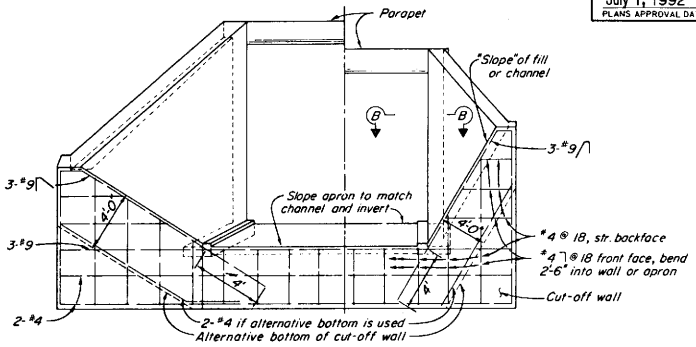
REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

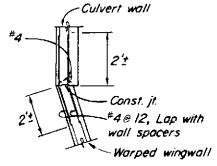
REGISTERED PROFESSIONAL ENGINEER
T. Pollock
No. 13332
Exp. 3-31-93
CIVIL
STATE OF CALIFORNIA



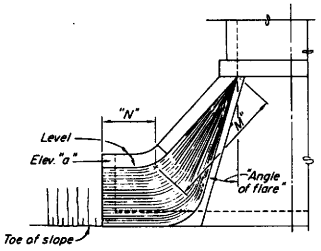
PART LONGITUDINAL SECTION



END ELEVATION

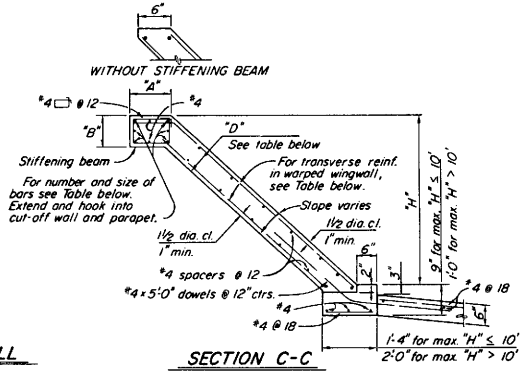


SECTION B-B

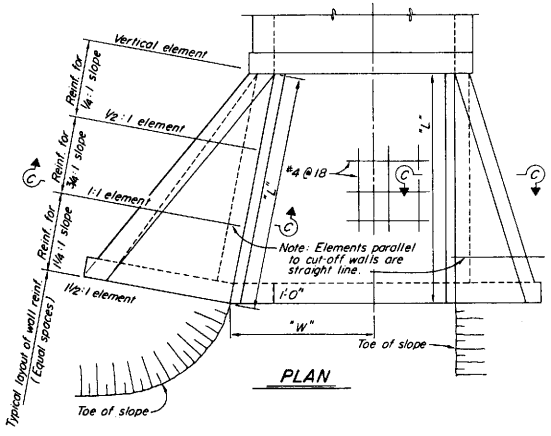


ALTERNATIVE WARPED WINGWALL

Use where additional protection to toe of embankment is required.



SECTION C-C



PLAN

WARPED WINGWALLS

WALL DIMENSIONS AND REINFORCING									STIFFENING BEAM DIMENSIONS AND REINFORCING									
Element Slope	"H"	8' or less	10'	12'	14'	16'	18'	20'	"H" "L" max.	12'	14'	16'	18'	20'	25'	30'	35'	40' or more
¼:1	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								
	Rear face reinf.	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	8'	face along top of								
¾:1	Front face reinf.	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 10	#4 @ 8	#4 @ 6	10'	wall	"A" = 1'-0"							
	Rear face reinf.	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 10	#4 @ 7	#4 @ 6	#5 @ 8	12'		"B" = 9"							
1¼:1	Front face reinf.	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	14'		Tot. 6-#6				"A" = 1'-6"			
	Rear face reinf.	#4 @ 8	#4 @ 8	#4 @ 5	#5 @ 6	#6 @ 7	#6 @ 6	#7 @ 6	16'			Tot. 6-#7			"B" = 1'-0"	"A" = 1'-10"		
"D" at Cut-off Wall		6"	6"	6"	7½"	8"	9½"	11"	18'						Tot. 6-#8	"B" = 1'-0"	"A" = 2'-0"	
"D" at Culvert		6"	6"	6"	8"	9½"	11"	1'-1"	20'							Tot. 8-#9	"B" = 1'-6"	

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

NO SCALE

D86A

STD. PLAN D86A

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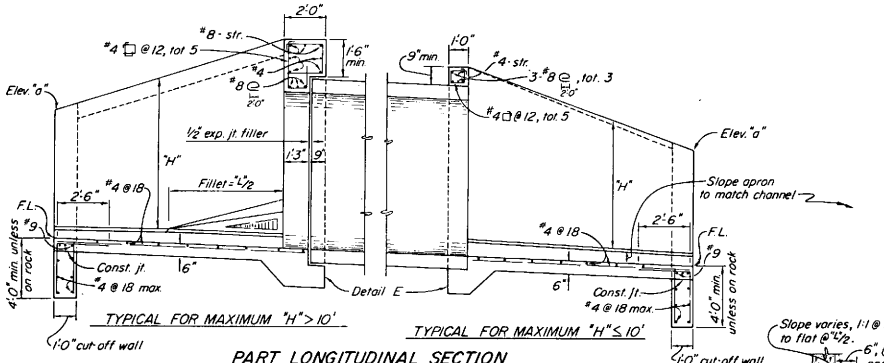
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER

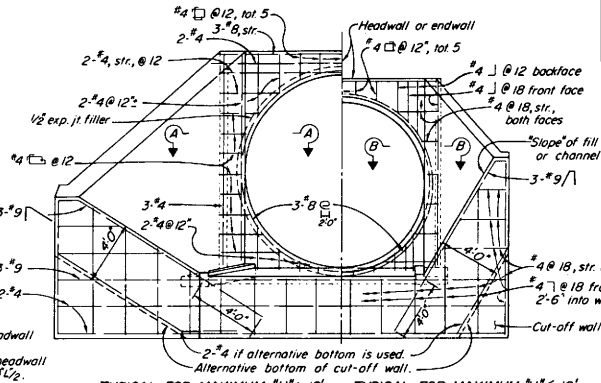
July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA



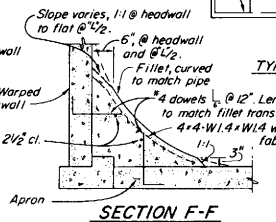
PART LONGITUDINAL SECTION

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

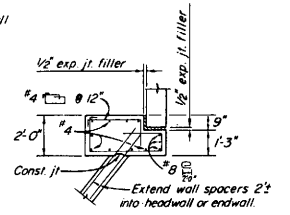


END ELEVATION

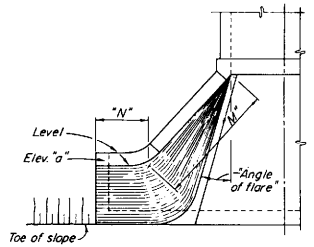
If at upstream end, fillet is not shown



SECTION F-F

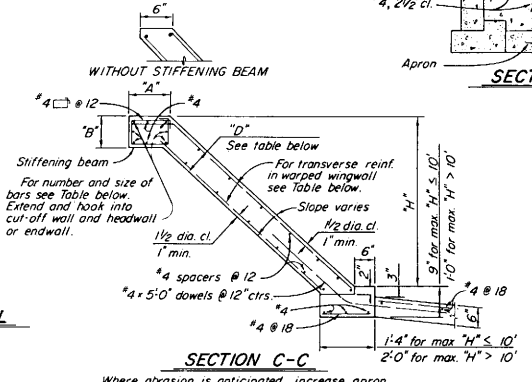


SECTION A-A



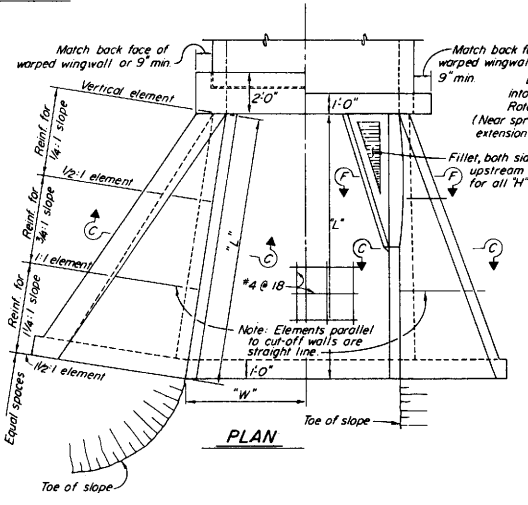
ALTERNATIVE WARPED WINGWALL

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

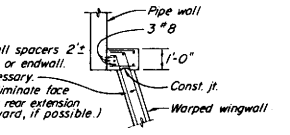


SECTION C-C

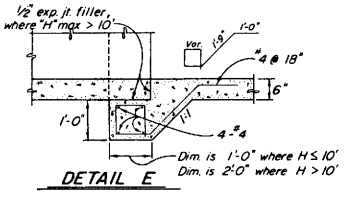
Where abrasion is anticipated, increase apron thickness to 7" min. to provide 2" min. reinforcement coverage.



PLAN



SECTION B-B



DETAIL E

WARPED WINGWALLS

Element Slope	"H"	WALL DIMENSIONS AND REINFORCING: 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 face along top of wall								
8'									
10'		"A" = 1'-0" "B" = 9" Tot. 6-#6							
12'						"A" = 1'-6" "B" = 1'-0" Tot. 6-#7			
14'							"A" = 1'-10" "B" = 1'-0" Tot. 6-#8		
16'								"A" = 2'-0" "B" = 1'-6" Tot. 8-#9	
18'									
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 TRANSPORTION

PIPE CULVERT HEADWALLS, ENDWALLS AND WARPED WINGWALLS

NO SCALE

D86B

STD. PLAN D86B

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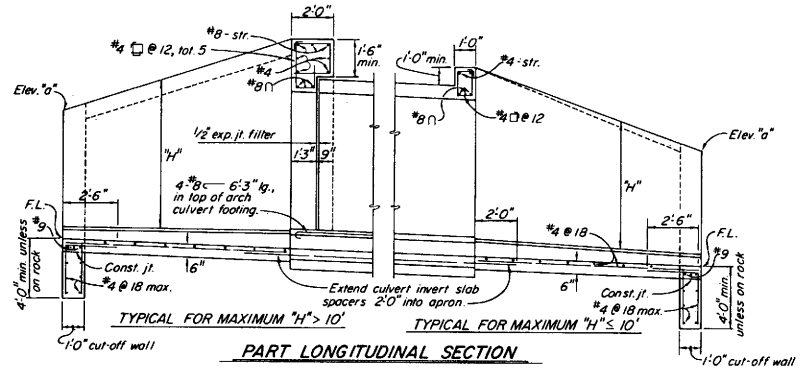
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER

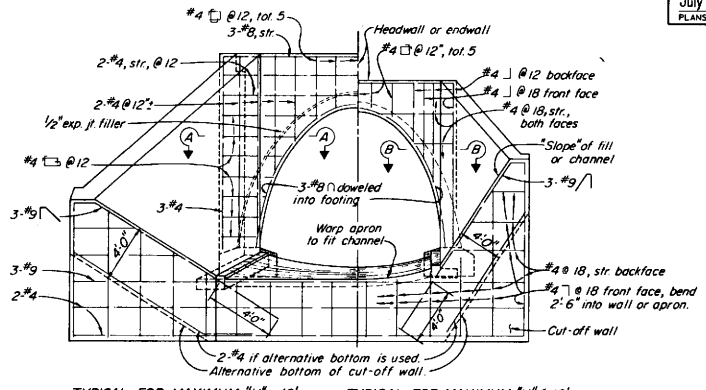
July 1, 1992

PLANS APPROVAL DATE

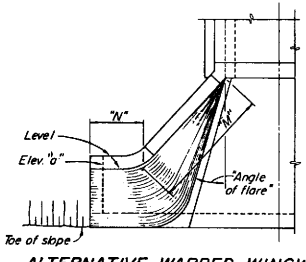
REGISTERED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA



PART LONGITUDINAL SECTION

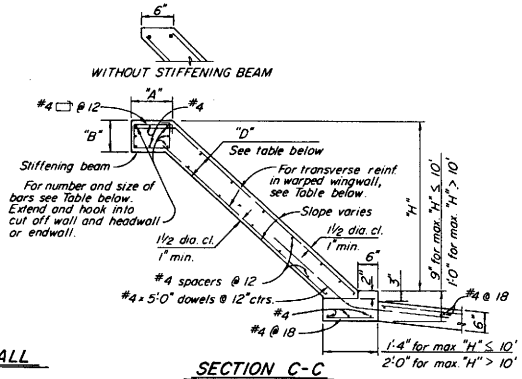


END ELEVATION



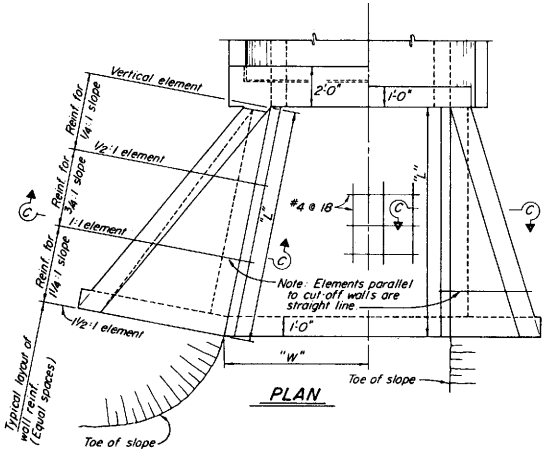
ALTERNATIVE WARPED WINGWALL

Use where additional protection to toe of embankment is required.

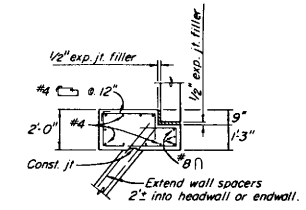


SECTION C-C

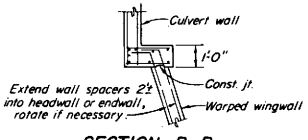
Where abrasion is anticipated, increase apron thickness to 7" min. to provide 2" min. reinforcement coverage.



PLAN



SECTION A-A



SECTION B-B

WARPED WINGWALLS

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

NO SCALE

D86C

STD. PLAN D86C

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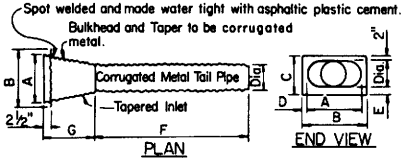
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

John L. Wright
REGISTERED CIVIL ENGINEER
July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER J. L. Wright No. 33937 Exp. 6-30-94 CIVIL STATE OF CALIFORNIA

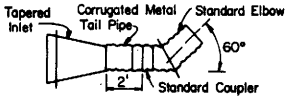


PLAN

END VIEW

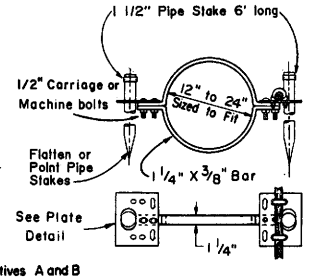
Bulkhead and Taper of same thickness as Tail Pipe with 0.079" Max. Tail Pipe of same thickness as Downdrain Pipe.

ENTRANCE TAPER-TYPE 1 ALTERNATIVE A

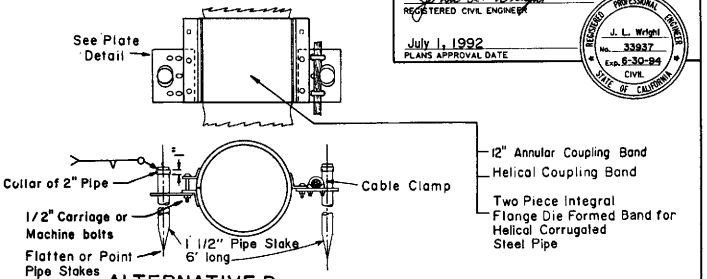


ENTRANCE TAPER-TYPE 2

NOTE: Tapered inlet of same construction and dimensions as Type 1-Alternative A or B. except tail pipe length will be 2 feet.



ALTERNATIVE A



ALTERNATIVE B

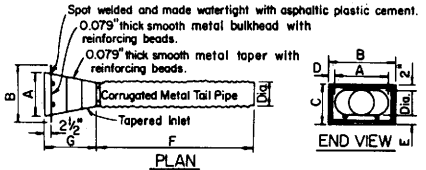
ANCHOR ASSEMBLY

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

NOTES:
Taper joints may be welded or riveted.
Dimensions to be as tabulated below for Type 1 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 1 ALTERNATIVE A&B



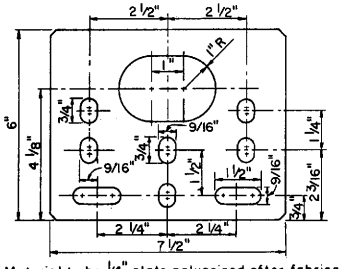
PLAN

END VIEW

Tail Pipe of same thickness as Downdrain Pipe.

ENTRANCE TAPER-TYPE 1 ALTERNATIVE B

NOTES
1. All Pipe Stakes and Hardware to be galvanized after fabrication.
2. Either Alternative A or Alternative B Anchor Assemblies and 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. Alternative A Anchor Assembly may be placed on annular 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.



Material to be 1/4" plate galvanized after fabrication

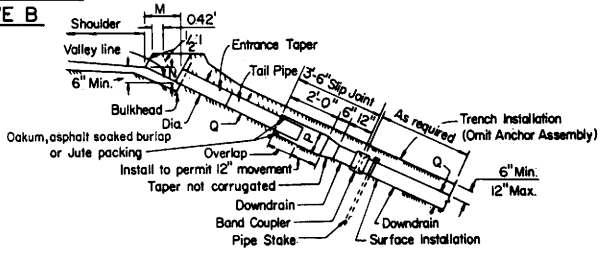
PLATE DETAIL

C.M.P. Dimensions as tabulated below

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

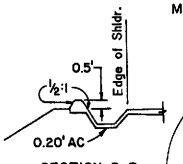
Slip joint to be same thickness as downdrain pipe.

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"

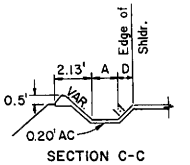


SECTION A-A (TYPE 1)

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 1 entrance taper shown. Type 2 similar.

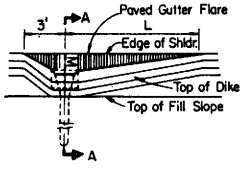


SECTION B-B



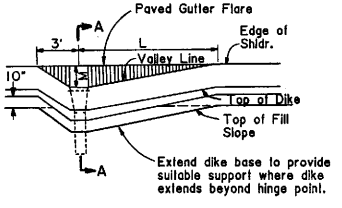
SECTION C-C

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

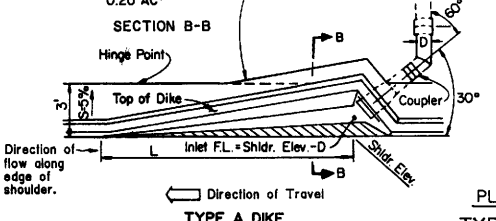


TYPE A DIKE

PLAN
TYPE 1



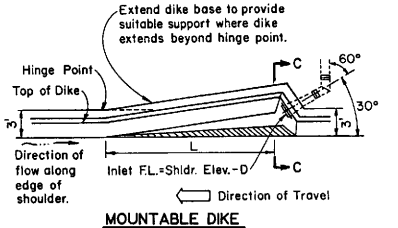
MOUNTABLE DIKE



TYPE A DIKE

PLAN
TYPE 2

(For use on full freeway sections only, with grades of 2% or greater)



MOUNTABLE DIKE

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERSIDE DRAINS

NO SCALE

ENTRANCE TAPER AND PIPE DOWNDRAIN

STD. PLAN D87A

D87A

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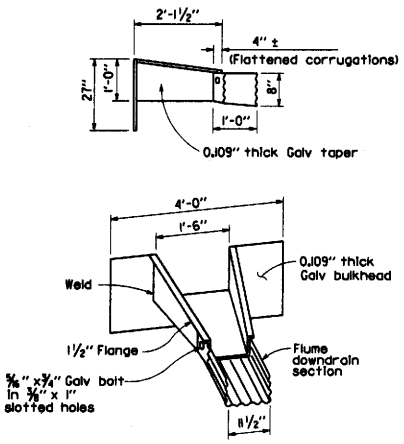
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

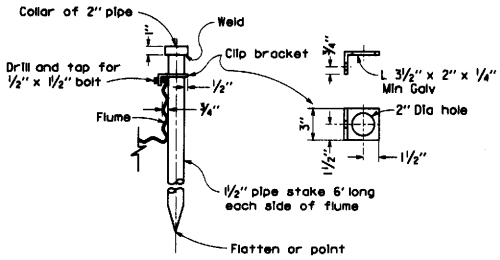
REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

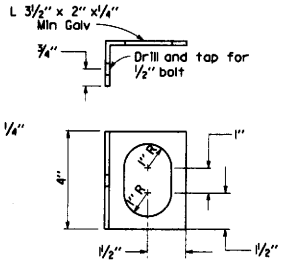
REGISTERED PROFESSIONAL ENGINEER J. L. Wright No. 33937 Exp. 6-30-94 CIVIL STATE OF CALIFORNIA



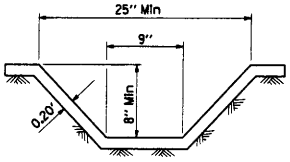
TAPERED INLET



PIPE STAKE ANCHOR DETAIL

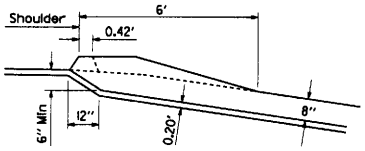


ALTERNATIVE CLIP BRACKET DETAIL

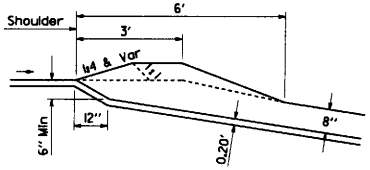


SECTION C-C
See Note 1

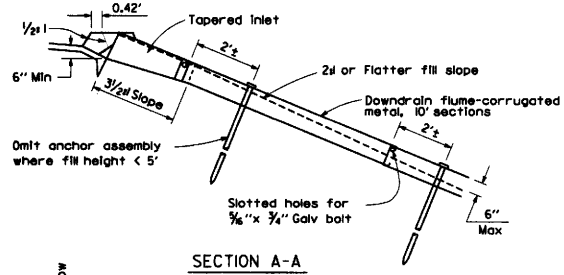
NOTE
1. Cross section of slope ditch may be semicircular, vee or trapezoidal



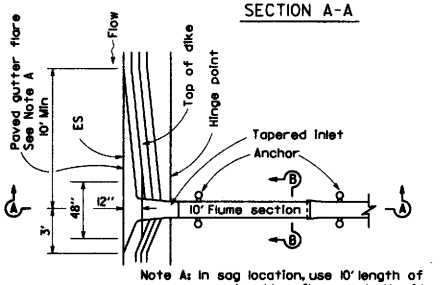
SECTION E-E



SECTION G-G



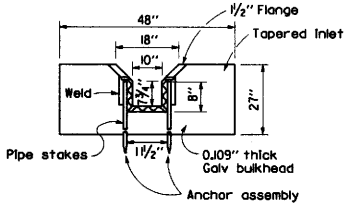
SECTION A-A



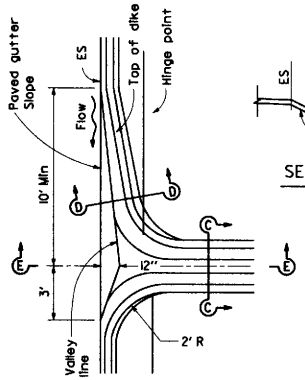
Note A: In sag location, use 10' length of paved gutter flare on both sides of inlet

PLAN

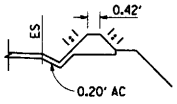
TAPERED INLET AND FLUME DOWNDRAIN



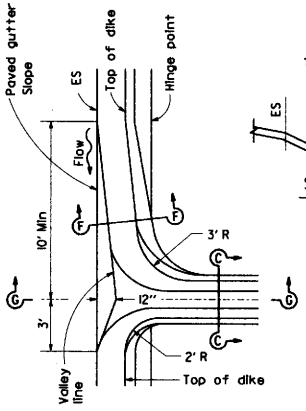
SECTION B-B



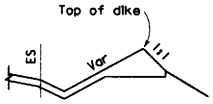
PLAN
TYPE A DIKE



SECTION D-D



PLAN
MOUNTABLE DIKE



SECTION F-F

ASPHALT CONCRETE OVERSIDE DRAINS

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERSIDE DRAINS

NO SCALE

D87B

STD. PLAN D87B

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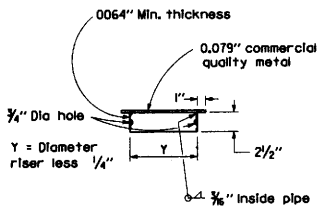
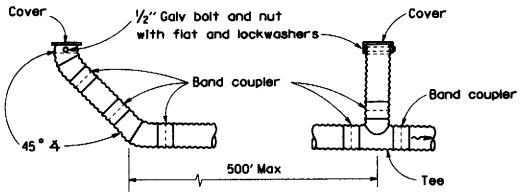
REGISTERED PROFESSIONAL ENGINEER J. L. Wright No. 33937 Exp. 6-30-94 CIVIL STATE OF CALIFORNIA

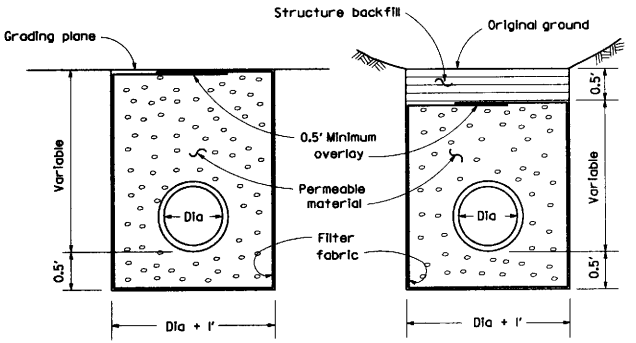


WELDED METAL COVER

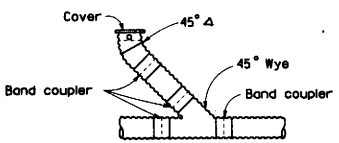


TERMINAL RISER VERTICAL RISER

Metal pipe risers and perforated metal pipe underdrain shown. Use type of pipe specified.

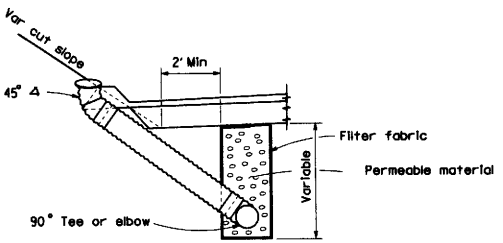


EXCAVATION AND BACKFILL



45° RISER

UNDERDRAIN RISERS



UNDERDRAIN LOCATION AND RISERS ANGLED TO CUT SLOPE

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

UNDERDRAINS

NO SCALE

STD. PLAN D87C

D87C

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REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — T. Pollock — No. 13332 — Exp. 3-31-93 — CIVIL — STATE OF CALIFORNIA

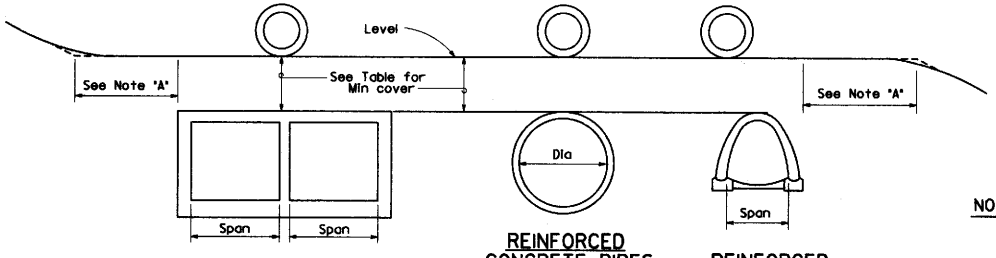
TABLE OF MINIMUM COVER AND STRUTTING REQUIREMENTS FOR CONSTRUCT LOADS

TYPE					18-50K AXLE		50-75K AXLE		75-110K AXLE		110-150K AXLE	
	MAXIMUM DESIGN FILL	SPAN	CELLS	MIN COVER	STRUTS REQUIRED	STRUT SIZE AND SPACING	STRUTS REQUIRED	STRUT SIZE AND SPACING	STRUTS REQUIRED	STRUT SIZE AND SPACING	STRUTS REQUIRED	STRUT SIZE AND SPACING
BOX CULVERTS	10' and 20'	4' to 8'	Single and Multiple	5'	—	—	—	—	—	—	—	—
	10'	10' to 14'	Single and Multiple	5'	—	—	1/3 Points	Struts 6x6 @ 3'-6" Sills 6x8	1/3 Points	Struts 6x8 @ 3'-6" Sills 6x8	1/3 Points	Struts 6x8 @ 3'-6" Sills 6x8
	20'	10' to 14'	Single and Multiple	5'	—	—	—	—	—	—	—	—

TABLE OF MINIMUM COVER FOR CONSTRUCTION LOADS

TYPE		DIA OR SPAN	18-50K AXLE	50-75K AXLE	75-110K AXLE	110-150K AXLE
REINFORCED CONCRETE CULVERTS	Pipes	Dia 12" to 39"	2'	3'	3'	3'
		Dia 42" to 108"	$\frac{Dia}{1.75}$ or 3'	$\frac{Dia}{1.75}$ or 3'	$\frac{Dia}{1.75}$ or 3'	$\frac{Dia}{1.75}$ or 3'
	Arches	Spans to 14'	$\frac{Span}{2.5}$ or 4'	$\frac{Span}{2.5}$ or 4'	$\frac{Span}{2.5}$ or 4'	$\frac{Span}{2.5}$ or 4'
		Spans 15' to 22'	$\frac{Span}{3.5}$ or 6'	$\frac{Span}{3.5}$ or 6'	$\frac{Span}{3.5}$ or 6'	$\frac{Span}{3.5}$ or 6'
METAL CULVERTS	Pipes	Dia to 120"	$\frac{Dia}{1.75}$ or 4'	$\frac{Dia}{1.75}$ or 4'	$\frac{Dia}{1.75}$ or 4'	$\frac{Dia}{1.75}$ or 4'
		Dia over 120"	$\frac{Dia}{3}$ or 6'	$\frac{Dia}{3}$ or 6'	$\frac{Dia}{3}$ or 6'	$\frac{Dia}{3}$ or 6'
	Pipe Arches	All Spans	$\frac{Span}{3}$ or 4'	$\frac{Span}{3}$ or 4'	$\frac{Span}{3}$ or 4'	$\frac{Span}{3}$ or 4'
	Structural Plate Pipe, Arches and Vehicular Undercrossings	All Spans	$\frac{Span}{3}$ or 5'	$\frac{Span}{3}$ or 5'	$\frac{Span}{3}$ or 5'	$\frac{Span}{3}$ or 5'
Plastic Pipe		Dia 12" to 48"	$\frac{Dia}{1.75}$ or 4'	$\frac{Dia}{1.75}$ or 4'	$\frac{Dia}{1.75}$ or 4'	$\frac{Dia}{1.75}$ or 4'

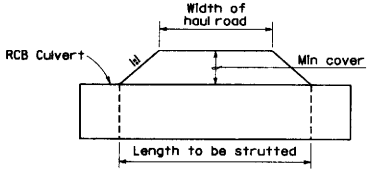
Note: Minimum cover shall be the greater value of alternatives shown. The diameter and spans shown in the table to calculate the minimum cover (Example: $\frac{Dia}{1.75}$) are the diameter or span of the facility expressed in number of feet.



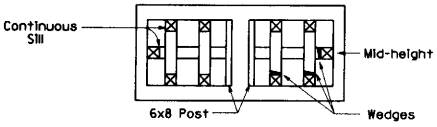
BOX CULVERTS

REINFORCED CONCRETE PIPES, PLASTIC PIPES AND METAL CULVERTS

REINFORCED CONCRETE ARCH CULVERTS



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 the 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 requirements of Structural Steel Plate Vehicular Undercrossing, Structural Steel Plate Arches and Structural Steel Plate Pipes during construction, see Standard Plans D88A.

NOTE "A"

Minimum distance equals 3 times the span or 3 times the diameter.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

CONSTRUCTION LOADS ON CULVERTS

NO SCALE

D88

STD. PLAN D88

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REGISTERED PROFESSIONAL ENGINEER
T. Pollock
No. 13332
Exp. 3-31-93
CIVIL
STATE OF CALIFORNIA

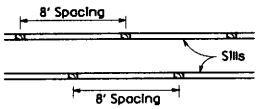
TABLE B

TIMBER STRUTS FOR STRUCTURAL STEEL PLATE VEHICULAR UNDERCROSSING		
SPAN	STRUT SIZE	SILL SIZE
13'-2" - 15'-6"	4"x4"	4"x6"
15'-9" - 17'-3"	4"x4"	4"x8"
Over 17'-3"	6"x6"	6"x8"

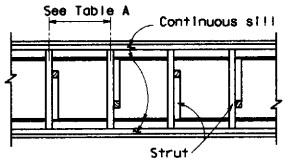
Tabular data in Table B based on 6"x2" corrugations. (Structural steelplate)

TABLE A

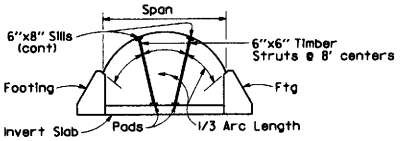
TIMBER STRUTS FOR STRUCTURAL STEEL PLATE PIPE			
PIPE DIA	STRUT SIZE	HEIGHT OF FILL	
		0 to 20 FEET	GREATER THAN 20 FEET
240" Thru 252"	8"x8"	5.0' SPACING	3.0' SPACING
	10"x10"	8.0' SPACING	4.5' SPACING



SECTION B-B



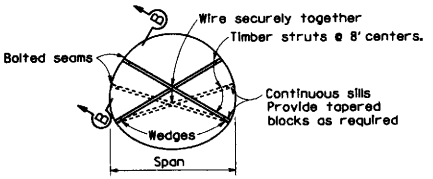
SECTION A-A



TYPICAL SECTION

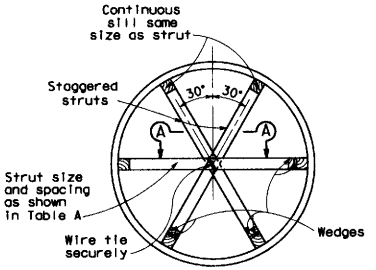
STRUCTURAL STEEL PLATE ARCHES

Struts required when span of structural steel plate arch exceeds 18 feet. Pad size as directed by Engineer.



TYPICAL SECTION

STRUCTURAL STEEL PLATE VEHICULAR UNDERCROSSING



TYPICAL SECTION

STRUCTURAL STEEL PLATE PIPES

NOTES

1. Struts shown are minimum required during construction and are for earth loads only.
2. Backfill shall be brought up uniformly on both sides of the structure.
3. For minimum cover over structure for construction loads, see Standard Plan D88.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

STRUT DETAILS FOR STRUCTURAL STEEL PLATE PIPES, ARCHES AND VEHICULAR UNDERCROSSINGS

NO SCALE

D88A

STD. PLAN D88A

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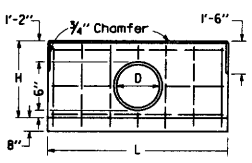
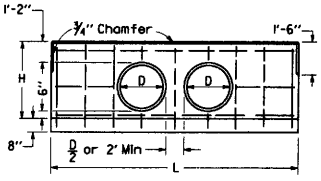


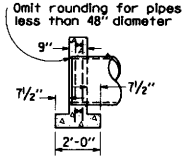
FRONT ELEVATION
SINGLE HEADWALL



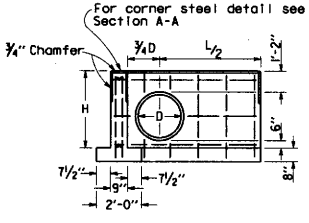
FRONT ELEVATION
DOUBLE HEADWALL

D	H	SINGLE L	SINGLE Steel LB	SINGLE Conc CY	DOUBLE L	DOUBLE Steel LB	DOUBLE Conc CY
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

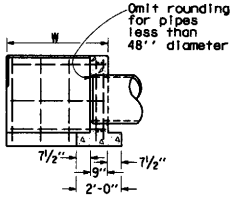
STRAIGHT HEADWALLS



SECTION, SINGLE &
DOUBLE HEADWALLS



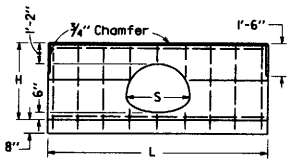
FRONT ELEVATION "L" HEADWALL



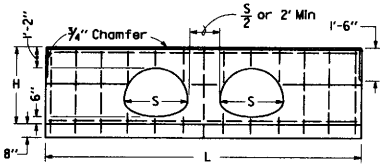
SECTION "L" HEADWALL

D	H	L/2	LENGTH OF W 3'-4" Steel LB	3'-4" Conc CY	4'-10" Steel LB	4'-10" Conc CY	6'-4" Steel LB	6'-4" Conc CY	7'-10" Steel LB	7'-10" Conc CY	9'-4" Steel LB	9'-4" Conc CY
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
CIRCULAR PIPE CULVERT HEADWALLS



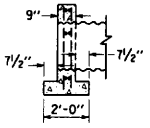
FRONT ELEVATION
SINGLE HEADWALL



FRONT ELEVATION
DOUBLE HEADWALL

CMP ARCH SIZE	H	SINGLE L	SINGLE Steel LB	SINGLE Conc CY	DOUBLE L	DOUBLE Steel LB	DOUBLE Conc CY
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

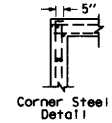
STRAIGHT HEADWALLS



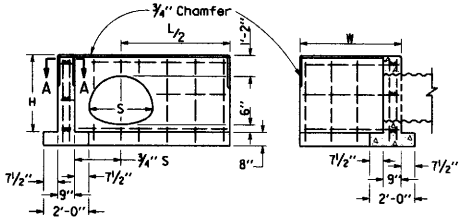
SECTION, SINGLE &
DOUBLE HEADWALLS

NOTES

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



SECTION A-A



FRONT ELEVATION
"L" HEADWALL

SECTION "L"
HEADWALL

CMP ARCH SIZE	H	L/2	LENGTH OF W 3'-4" Steel LB	3'-4" Conc CY	4'-10" Steel LB	4'-10" Conc CY	6'-4" Steel LB	6'-4" Conc CY	7'-10" Steel LB	7'-10" Conc CY	9'-4" Steel LB	9'-4" Conc CY
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

NO SCALE

STD. PLAN D89

D89

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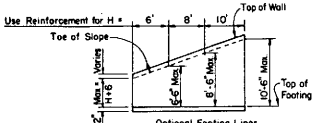
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — T. Pollock — No. 13332 — Exp. 3-31-93 — CIVIL — STATE OF CALIFORNIA

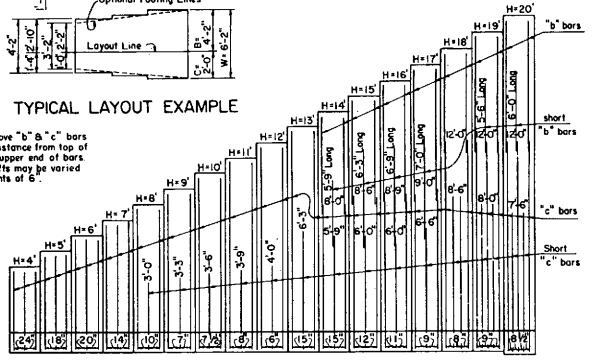
Use Reinforcement for H = 6' 8' 10'

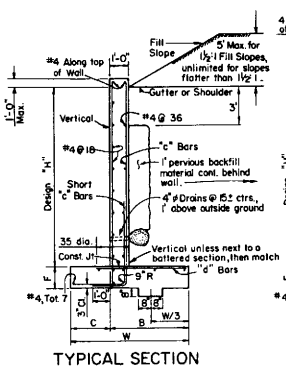


TYPICAL LAYOUT EXAMPLE

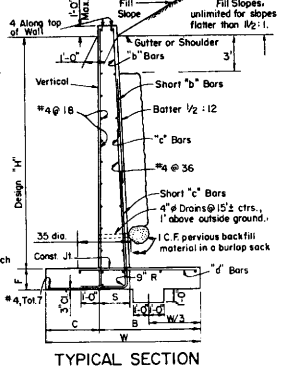
Design Notes:
Unit Stresses: f_s = 24,000 psi, f_c = 1,300 psi, n = 10
Maximum Toe Pressure = 1 ½ Tons/sq.ft.
Elevations, length and angle of flare of wings may be varied by the Engineer to suit conditions encountered in the field.
Walls designed for 2' live load surcharge, 1 ½ : 1 sloping surcharge 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".

Number above "b" & "c" bars indicates distance from top of footing to upper end of bars. Bar cut-offs may be varied in increments of 6".

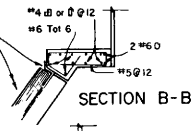




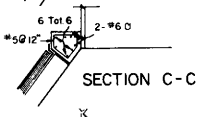
TYPICAL SECTION
H=4' THRU 12'



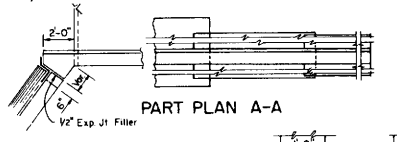
TYPICAL SECTION
H=13' THRU 20'



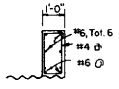
SECTION B-B



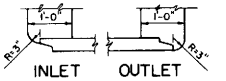
SECTION C-C



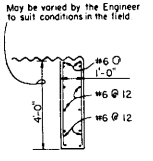
PART PLAN A-A



SECTION D-D



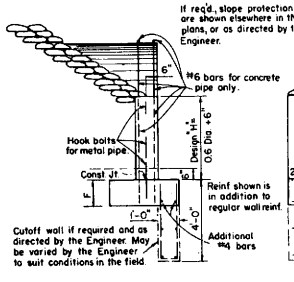
INLET OUTLET
R.C. PIPE DETAILS



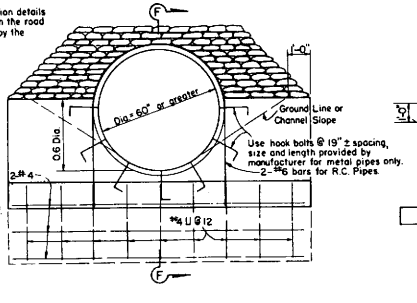
SECTION E-E

REINFORCED CONCRETE WINGWALLS

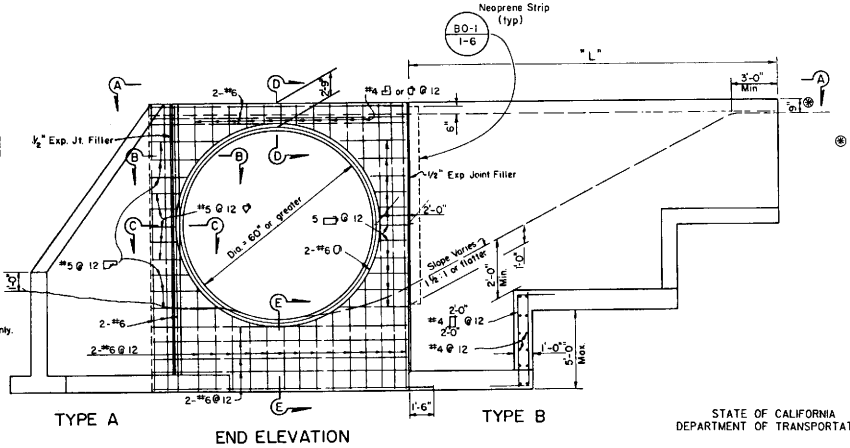
Design H	4'	5'	6'	7'	8'	9'	10'	11'	12'	13'	14'	15'	16'	17'	18'	19'	20'
W	3'-2"	3'-8"	4'-2"	4'-6"	5'-2"	5'-8"	6'-2"	6'-8"	7'-2"	7'-8"	8'-0"	8'-8"	9'-4"	10'-0"	10'-8"	11'-4"	12'-0"
C	1'-0"	1'-2"	1'-4"	1'-6"	1'-8"	1'-10"	2'-0"	2'-2"	2'-4"	2'-6"	2'-8"	3'-0"	3'-4"	3'-8"	4'-0"	4'-4"	4'-8"
B	2'-2"	2'-6"	2'-10"	3'-2"	3'-6"	3'-10"	4'-2"	4'-6"	4'-10"	5'-2"	5'-4"	5'-8"	6'-0"	6'-4"	6'-8"	7'-0"	7'-4"
F	1'-2"																1'-4"
Batter	None									1/2 : 12							
S	1'-0"									1'-6½"	1'-7"	1'-7½"	1'-8"	1'-8½"	1'-9"	1'-9½"	1'-10"
"b" bars	None									#5@15	#5@12	#5@11	#5@9	#6@24	#6@18	#7@17	
"c" bars	#4@24	#4@18	#5@20	#5@14	#5@10	#5@7	#6@7½	#7@8	#7@6	#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. CY/L.F.	0.32	0.38	0.44	0.49	0.55	0.61	0.67	0.73	0.79	1.02	1.10	1.18	1.26	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 AND WINGWALLS TYPES A, B AND C

NO SCALE

D90

STD. PLAN D90

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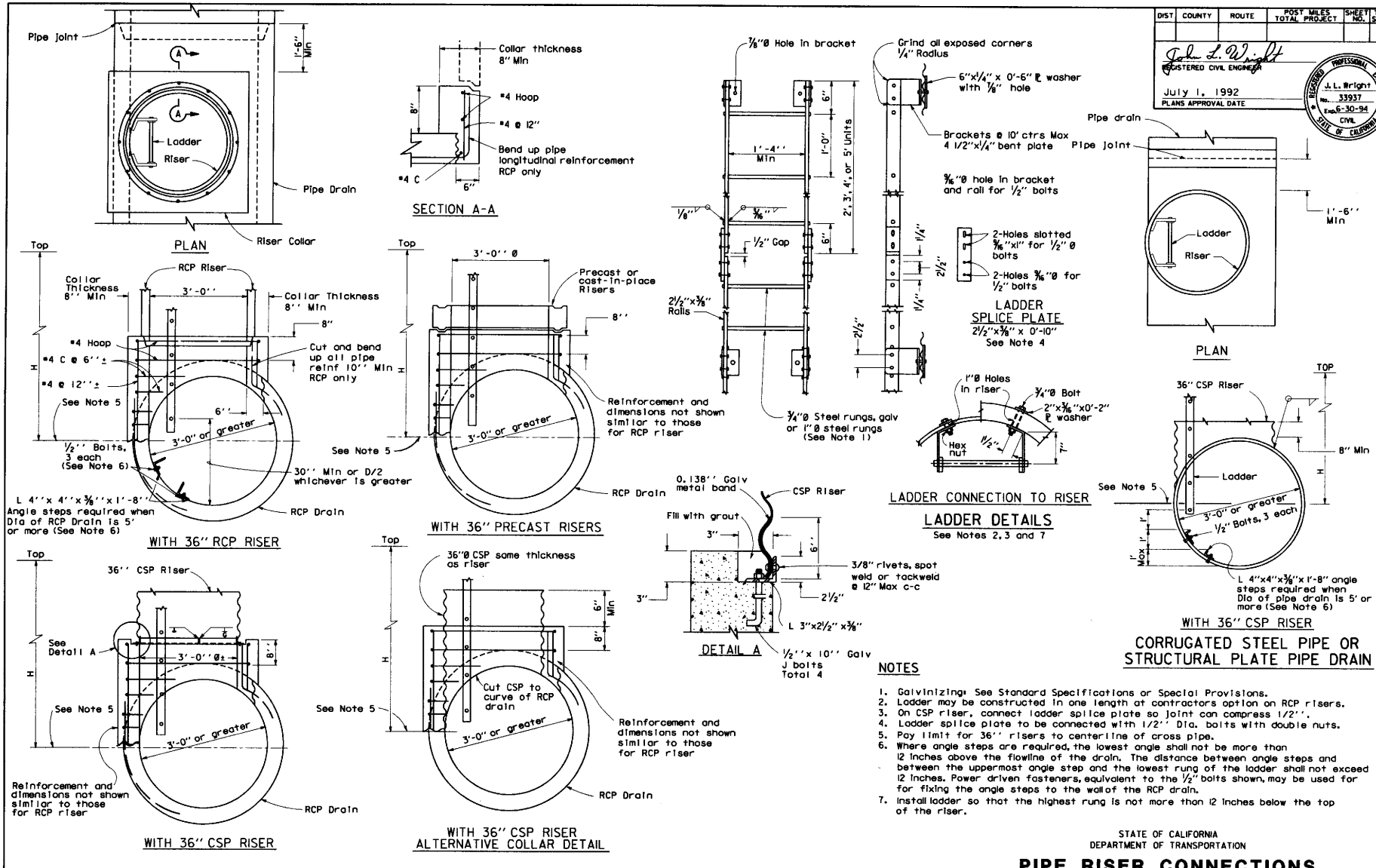
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER J. L. Wright No. 33937 Exp. 6-30-94 CIVIL STATE OF CALIFORNIA



NOTES

1. Galvinizing: See Standard Specifications or Special Provisions.
2. Ladder may be constructed in one length at contractors option on RCP risers.
3. On CSP riser, connect ladder splice plate so joint can compress 1/2".
4. Ladder splice plate to be connected with 1/2" Dia. bolts with double nuts.
5. Pay limit for 36" risers to centerline of cross pipe.
6. Where angle steps are required, the lowest angle shall not be more than 12 inches above the flowline of the drain. The distance between angle steps and between the uppermost angle step and the lowest rung of the ladder shall not exceed 12 inches. Power driven fasteners, equivalent to the 1/2" bolts shown, may be used for for fixing the angle steps to the wall of the RCP drain.
7. Install ladder so that the highest rung is not more than 12 inches below the top of the riser.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PIPE RISER CONNECTIONS

NO SCALE

D93A

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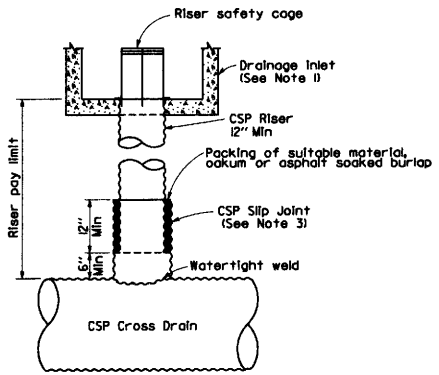
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

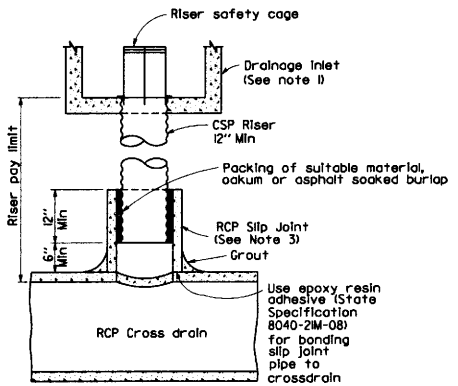
John L. Wright
REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

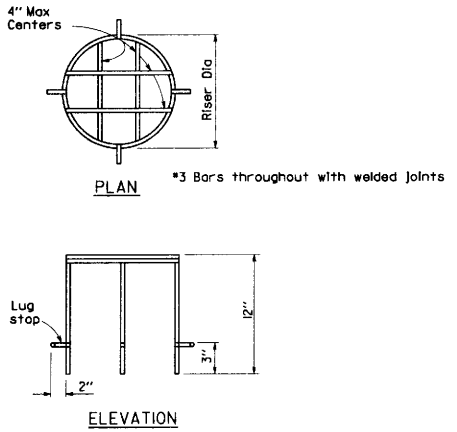
REGISTERED PROFESSIONAL ENGINEER
J. L. Wright
No. 33937
Exp. 6-30-94
CIVIL
STATE OF CALIFORNIA



CSP RISER FOR DRAINAGE INLET



CSP RISER FOR DRAINAGE INLET



RISER SAFETY CAGE DETAIL

NOTES

1. Structure at top of riser may be any standard drainage inlet or pipe inlet
2. Galvanizing: See Standard Specifications or Special Provision.
3. Diameter of Slip Joint to be 3" greater than diameter of riser.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DRAINAGE INLET RISER CONNECTIONS

NO SCALE

D93B

STD. PLAN D93B

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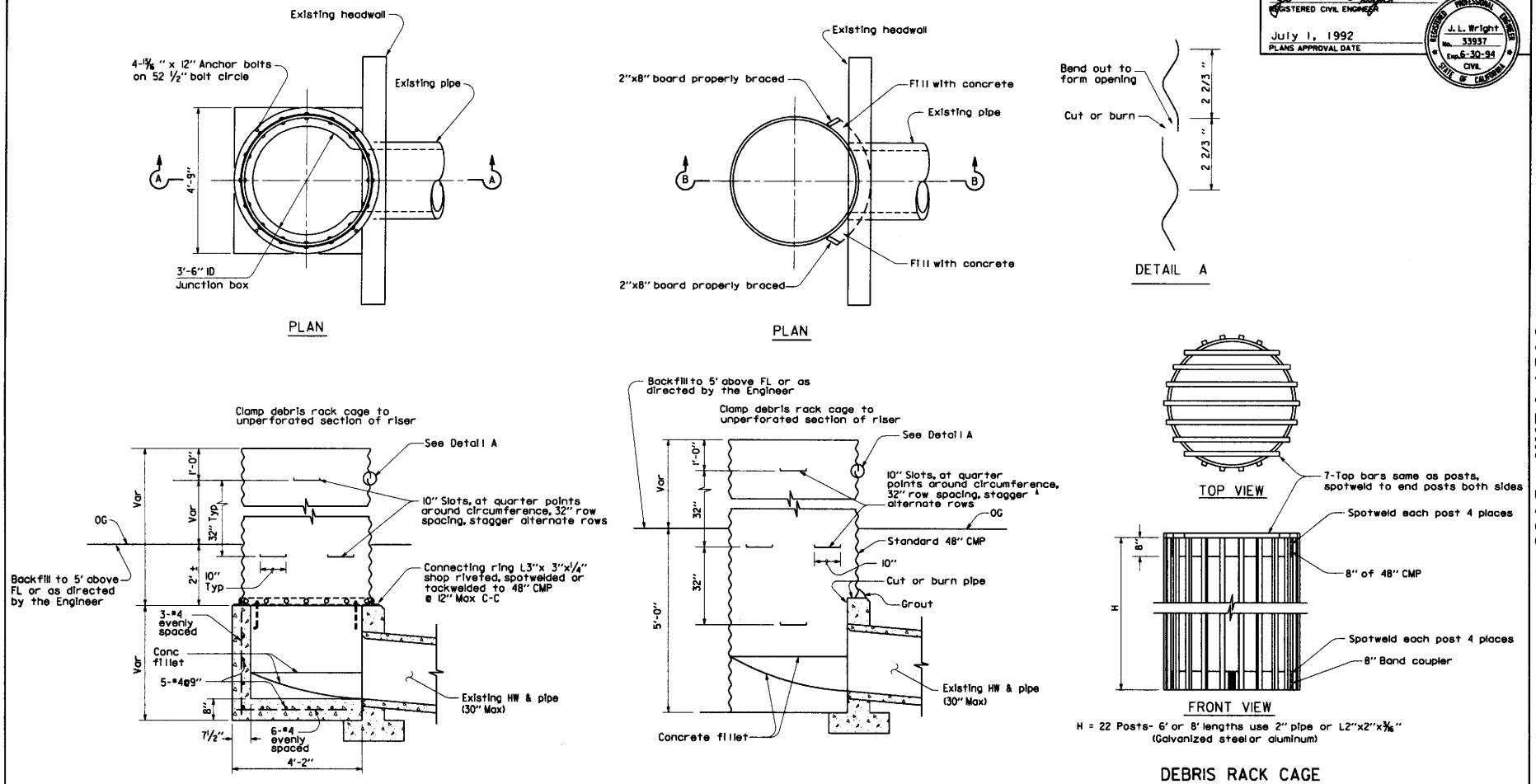
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

John L. Wright
REGISTERED CIVIL ENGINEER
July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
J. L. Wright
No. 33937
Exp. 6-30-94
CIVIL
STATE OF CALIFORNIA



STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PIPE RISER WITH DEBRIS RACK CAGE

NO SCALE

STD. PLAN D93C

D93C

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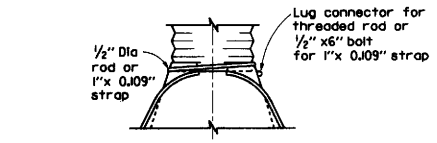
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

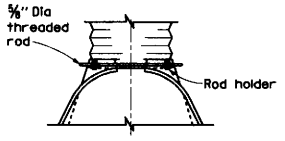
REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

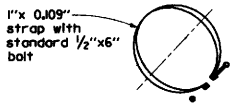
REGISTERED PROFESSIONAL ENGINEER J. L. Wright No. 33937 Exp. 6-30-94 CIVIL STATE OF CALIFORNIA



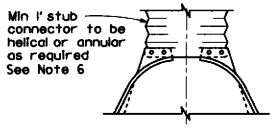
TYPE I



TYPE II



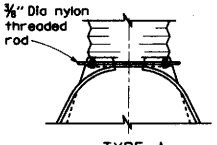
CONNECTOR STRAP DETAIL



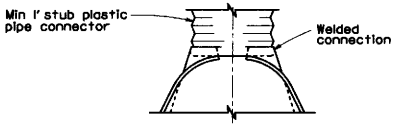
TYPE III

ALTERNATIVE CONNECTIONS FOR PIPE TO METAL FLARED END SECTIONS

See Note 7

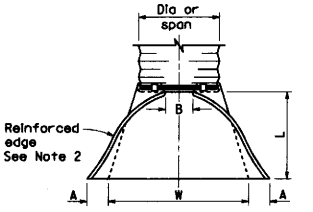


TYPE A
12" - 24"

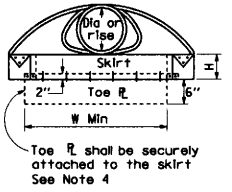


TYPE B
30" - 36"

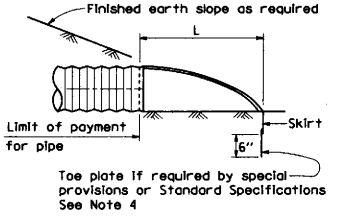
ALTERNATIVE CONNECTIONS FOR PIPE TO PLASTIC FLARED END SECTIONS



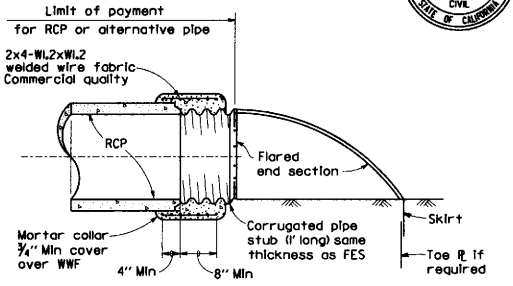
PLAN



ELEVATION



TYPICAL CROSS-SECTION



FLARED END SECTION CONNECTION TO RCP

CIRCULAR PIPES						
PIPE DIA	END SECTION THICKNESS	DIMENSION-INCHES				
		A	B	H	L	W
		1"±	Max	1"±	1 1/2"±	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

* Equivalent plastic FES to meet AASHTO M-294 and ASTM D-1248 Specifications

PIPE-ARCHES							
INCHES		END SECTION THICKNESS	DIMENSION-INCHES				
			A	B	H	L	W
SPAN	RISE		1"±	Max	1"±	1 1/2"±	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

FLARED END SECTIONS FOR CORRUGATED METAL AND PLASTIC PIPE CULVERTS

NOTES

1. All 3-piece 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 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"x1/4" for the 60" thru 72" round, 77"x52" and 83"x57" pipe-arch sizes and 2 1/2"x2 1/2"x1/4" for 78" and 84" round. The angles to be attached by 3/8" nuts and bolts.
3. Angle reinforcement shall 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 accessary when specified.
5. End of pipe to be finished with annular corrugations to conform flared end section so that minimal leakage results from the connection. Other designs may be used with approval of the Engineer.
6. 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 D97C.
7. The types of alternative connections for pipe to metal flared end sections shall conform to the following:

   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

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

METAL AND PLASTIC FLARED END SECTIONS

NO SCALE

D94A

STD. PLAN D94A

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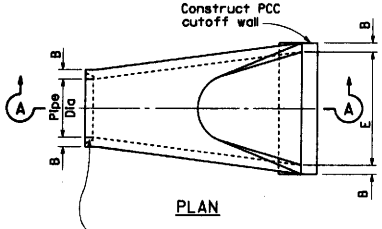
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

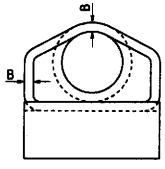
John L. Wright
REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

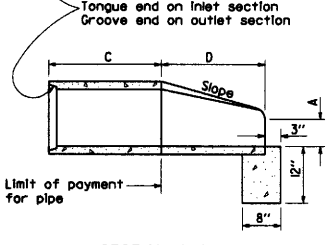
REGISTERED PROFESSIONAL ENGINEER
J. L. Wright
No. 33937
Exp. 6-30-94
CIVIL
STATE OF CALIFORNIA



PLAN



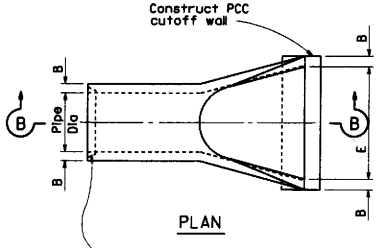
END VIEW



SECTION A-A

MINIMUM DIMENSIONS						
PIPE DIA	A	B	C	D	E	SLOPE
12"	4"	2"	See Note 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"	

PRECAST CONCRETE FLARED END SECTION TYPE A



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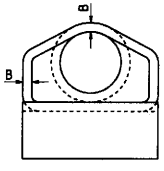
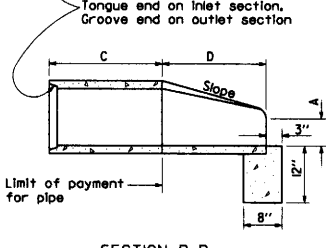


END VIEW



SECTION B-B

MINIMUM DIMENSIONS						
PIPE DIA	A	B	C	D	E	SLOPE
12"	4"	1¾"	See Note 2	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"	

PRECAST CONCRETE FLARED END SECTION TYPE B

NOTES

1. Contractor has the option of using either Type A or B precast concrete flared end section.
2. C dimension varies by manufacturer and will be paid for as concrete pipe.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

CONCRETE FLARED END SECTIONS

NO SCALE

D94B

STD. PLAN D94B

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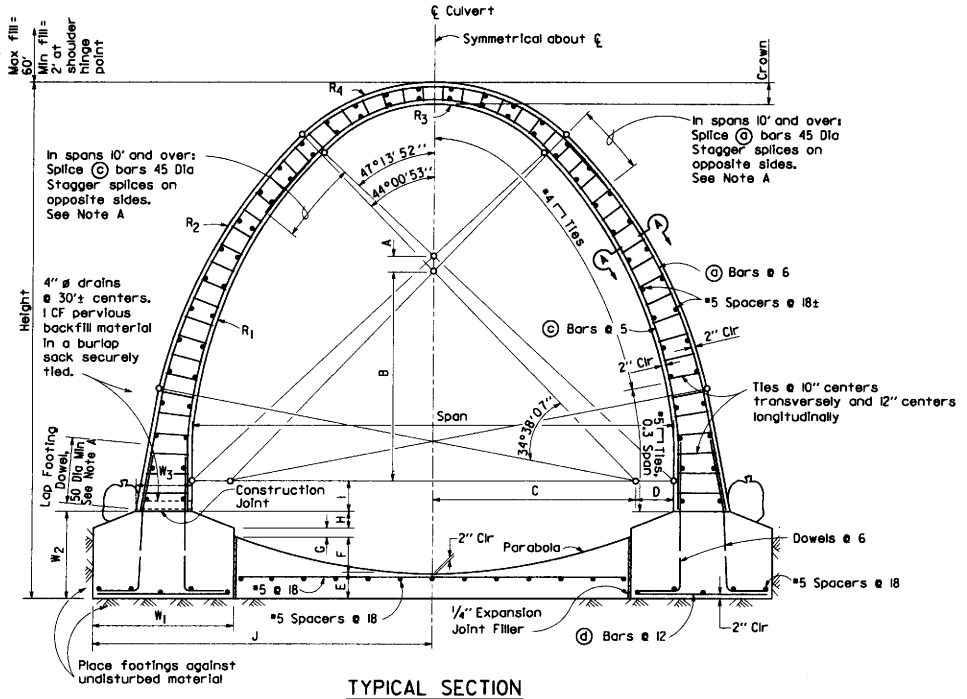
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA



TYPICAL SECTION

FOOTING PRESSURE																		
Span		6'	7'	8'	9'	10'	11'	12'	13'	14'	15'	16'	17'	18'	19'	20'	21'	22'
Footing Pressure Tons Per Square Foot	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

NOTES:

DESIGN:
Bridge Design Specifications (1983 AASHTO Specifications with revisions by Caltrans).

EARTH LOADING:
Earth Pressures - 140 LB/CF Vert, 140 LB/CF Horiz
- 140 LB/CF Vert, 42 LB/CF Horiz

UNIT STRESSES:
Fy = 60,000 psi
F'_c = 3,250 psi

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

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

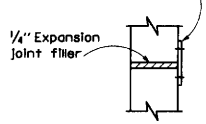
MAXIMUM OVERFILL:
60'

EXCAVATION AND BACKFILL:
See Standard Plan A62E

NOTE A:

If lap splicing is used, main reinforcement shall 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.

0.052" galvanized flashing 18" wide at expansion joints. Tack to concrete to prevent movement during backfilling.



SECTION A-A

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

Span	Waterway Area SQFT	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 LB/LF	Concrete CY/LF
6	27	6'-10 9/16"	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 11/16"	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 7/16"	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'-1 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 3/16"	6"	2'-6"	1'-7"	1'-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 9/16"	6"	2'-9"	1'-8"	1'-1 1/4"	9'-0"	9'-5/8"	2'-10 1/2"	3'-7 1/8"	3 3/8"	3'-10 3/16"	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'-3/8"	3'-2 1/4"	4'-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 5/16"	8 3/16"	4'-3"	2'-4"	1'-7 5/16"	14'-0"	14'-0"	4'-5 1/2"	5'-7 1/4"	5 3/8"	6'-7/16"	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 5/16"	9"	4'-6"	2'-6"	1'-9"	15'-0"	15'-0"	4'-9 3/8"	6'-0"	5 5/8"	6'-5 5/16"	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'-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 9/16"	6'-8"	1'-4"	7"	1'-3"	3"	7"	1'-3/4"	11'-4 3/16"	#7	#7	#6	#7	616	2.92
17	217	18'-2 9/16"	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 11/16"	11 3/8"	5'-8 1/2"	3'-3"	2'-2 5/8"	19'-0"	19'-0"	6'-3/4"	7'-7 1/4"	7 1/8"	8'-2 5/16"	7'-11"	1'-7"	9"	1'-6"	4"	8"	1'-3 1/4"	13'-5 9/16"	#8	#8	#6	#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'-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'-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'-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	1,020	5.47

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

CONCRETE ARCH CULVERTS

NO SCALE

D95

STD. PLAN D95

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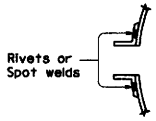
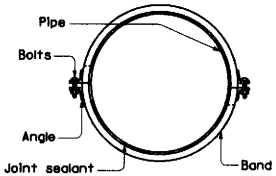
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER

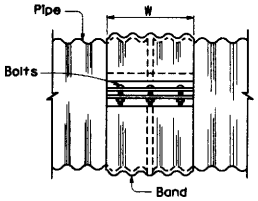
July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER J. L. Wright No. 33937 Exp. 6-30-94 CIVIL STATE OF CALIFORNIA



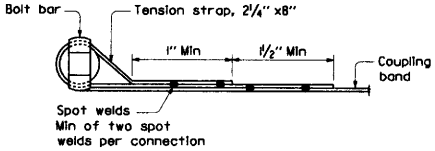


END VIEW

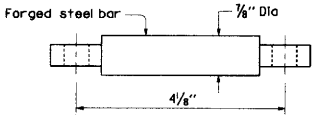


SIDE VIEW

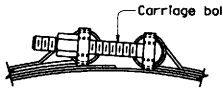
ANNULAR BAND



STRAP DETAIL

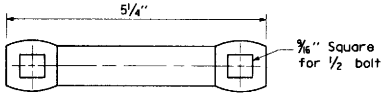


TOP VIEW



BOLT DETAIL

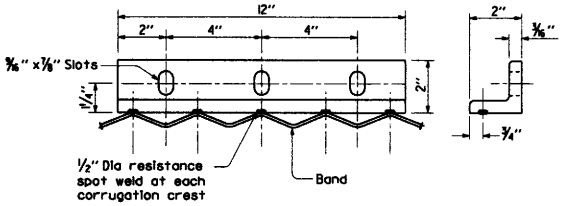
LEFT SIDE VIEW



FRONT VIEW

BAR DETAIL

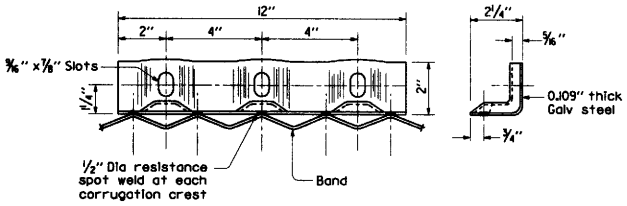
BAR AND STRAP CONNECTOR



SIDE VIEW END VIEW

2" X 2" X 3/16" ANGLE

See tables on Standard Plans D97E, D97F and D97G for width, W=12" shown



SIDE VIEW END VIEW

DIE-FORMED ANGLE

See tables on Standard Plans D97E and D97G for width, W=12" shown

Alternate only for standard joints on pipes through 72" diameter and downdrains through 24" diameter

ANGLE CONNECTORS

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.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

CORRUGATED METAL PIPE COUPLING DETAILS NO. 1 ANNULAR COUPLING BAND BAR AND STRAP AND ANGLE CONNECTORS

NO SCALE

D97A

STD. PLAN D97A

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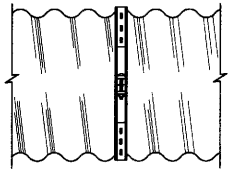
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

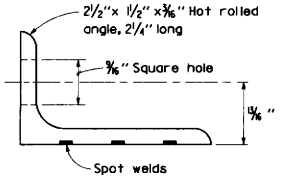
John L. Wright
REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

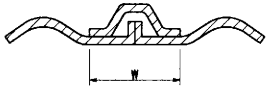
REGISTERED PROFESSIONAL ENGINEER
J. L. Wright
No. 33937
Exp. 6-30-94
CIVIL
STATE OF CALIFORNIA



SIDE VIEW



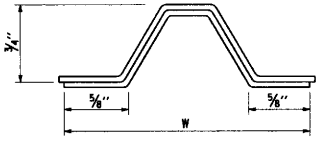
ANGLE



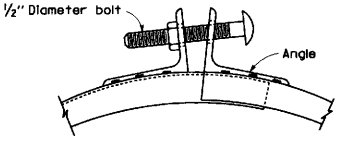
HAT BAND

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.



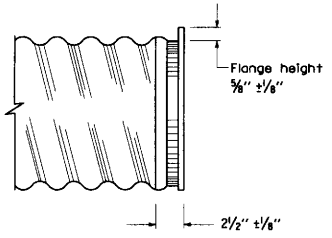
SECTIONAL VIEW



BOLT DETAIL

HAT BAND COUPLER

Angle connector shown



SIDE VIEW

FLANGE DETAILS

Required for Hat band coupler

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

CORRUGATED METAL PIPE COUPLING DETAILS NO. 2 HAT BAND COUPLER AND FLANGE DETAILS

NO SCALE

D97B

STD. PLAN D97B

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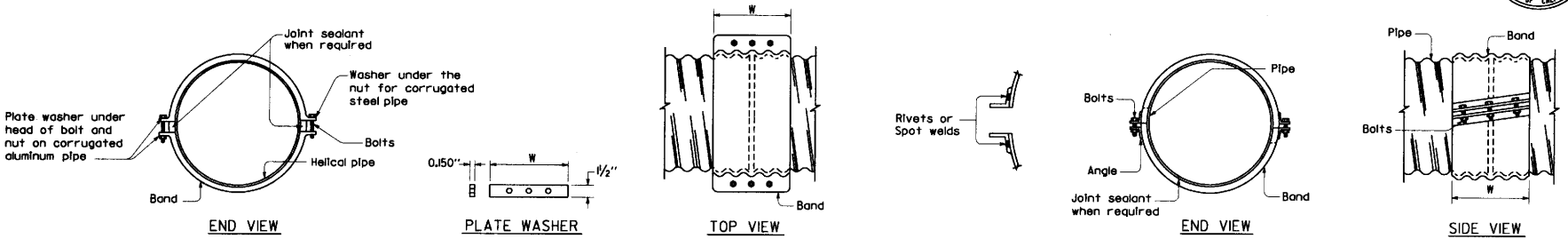
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

John L. Wright
REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

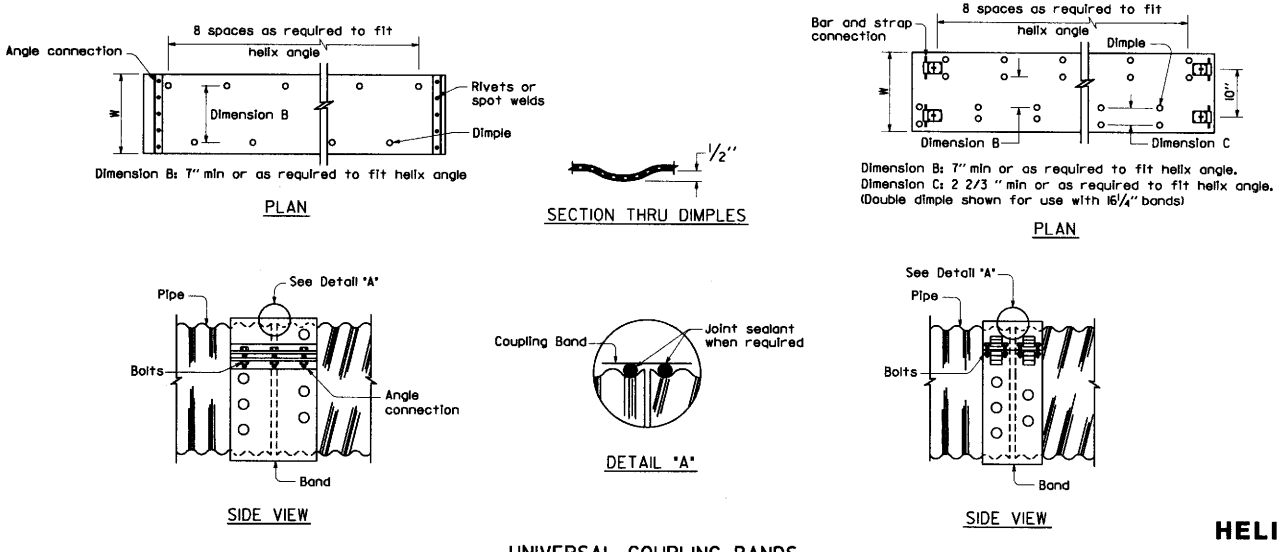
REGISTERED PROFESSIONAL ENGINEER
J. L. Wright
No. 33937
Exp. 6-30-94
CIVIL
STATE OF CALIFORNIA



TWO PIECE INTEGRAL FLANGE DIE FORMED BAND

HELICAL BAND

HELICAL COUPLING BANDS



UNIVERSAL COUPLING BANDS

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.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

CORRUGATED METAL PIPE COUPLING DETAILS NO. 3 HELICAL AND UNIVERSAL COUPLERS

NO SCALE

D97C

STD. PLAN D97C

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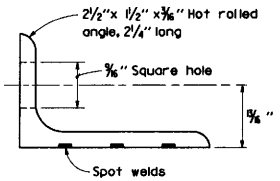
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

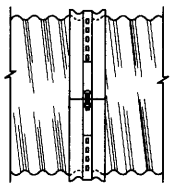
REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

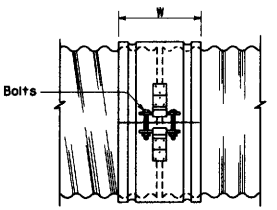
REGISTERED PROFESSIONAL ENGINEER
J. L. Wright
No. 33937
Exp. 6-30-94
CIVIL
STATE OF CALIFORNIA



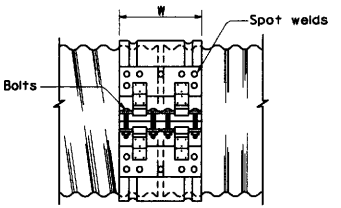
ANGLE



SIDE VIEW
ANGLE



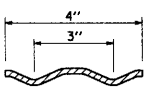
SIDE VIEW
SINGLE BAR AND STRAP



SIDE VIEW
DOUBLE BAR AND STRAP

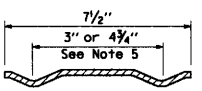
NOTES

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.
5. Dimension depends upon whether end condition is lips up or lips down.



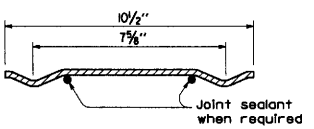
SECTION

H-4 HUGGER BAND



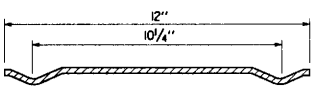
SECTION

H-6 HUGGER BAND



SECTION

H-10 HUGGER BAND



SECTION

H-12 HUGGER BAND

HUGGER COUPLING BANDS

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

CORRUGATED METAL PIPE COUPLING DETAILS NO. 4 HUGGER COUPLING BANDS

NO SCALE

D97D

STD. PLAN D97D

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

John L. Wright
REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
J. L. Wright
No. 33937
Exp. 6-30-94
CIVIL
STATE OF CALIFORNIA

COUPLING TYPE	PIPE CORRUGATION	PIPE SIZE	W OR A	PIPE WALL THICKNESS CSP (IN)	PIPE WALL THICKNESS CAP (IN)	BAND THICKNESS CSP (IN)	BAND THICKNESS CAP (IN)	BAR AND STRAP (CSP ONLY) STRAP THICKNESS (IN)	BAR AND STRAP (CSP ONLY) BOLTS	BAR AND STRAP (CSP ONLY) BAR DIA	BAR AND STRAP (CSP ONLY) BAR YIELD STRENGTH (PSI)	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"	
HUGGER	2 2/3"x1/2" REROLLED END	12"-54"	4"	0.052-0.109		0.052						2 1/2"x1 1/2"x3/16"	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"	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"	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" REROLLED END	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" REROLLED END	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"	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"	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"	12" SEE	0.064-0.109		0.064		0.079	1/2"	7/8"	32,000							
		48"-84"	12" NOTE	0.138		0.064		0.079	1/2"	7/8"	32,000							
		90"-120"	12" 11	0.138		0.064		DOUBLE 0.079	1/2"	7/8"	32,000							
HAT BAND	2 2/3"x1/2" REROLLED END	12"-54"	2 3/4"	0.052-0.109		0.064						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"	2 1/2"x1 1/2"x3/16"	1 1/2"				3 1/2"
		THROUGH 42"	2 3/4"	0.138		0.064						2 1/2"x1 1/2"x3/16"	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						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							

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 Corrugated Steel Pipe.
   (II) 2 standard thicknesses lighter than the thickness of the pipe and in no case lighter than 0.060-inch for Corrugated Aluminum Pipe.
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 strenght 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"x 1/2" 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"x 1/2" corrugations.
11. In the case of H-12 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.
13. The 2 1/4" x 2" x 0.109" thick galvanized die-formed angle connector may be used in lieu of the 2" x 2" x 3/16" angle connector for standard joints only on pipes through 72" diameter.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

CORRUGATED METAL PIPE COUPLING DETAILS NO. 5 STANDARD JOINT

NO SCALE

D97E

STD. PLAN D97E

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

REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
J. L. Wright
No. 33937
Exp. 6-30-94
CIVIL
STATE OF CALIFORNIA

COUPLING TYPE	PIPE CORRUGATION	PIPE SIZE	W OR A	PIPE WALL THICKNESS CSP (IN)	PIPE WALL THICKNESS CAP (IN)	BAND THICKNESS CSP (IN)	BAND THICKNESS CAP (IN)	BAR AND STRAP (CSP ONLY) STRAP THICKNESS (IN)	BAR AND STRAP (CSP ONLY) BOLTS	BAR AND STRAP (CSP ONLY) BAR DIA	BAR AND STRAP (CSP ONLY) BAR YIELD STRENGTH (PSI)	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"x 1/4"	6"-10"	7"	0.064-0.079	0.060	0.064	0.060							2 3/8"	2 3/8"			
	2 2/3" x 1/2"	12"-24"	12"		0.060-0.105		0.060								3 1/2"			
UNIVERSAL	2 2/3" x 1/2"	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" x 1/2"	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"x 1"	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" x 1/2"	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"x 1"	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"	

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 corrugated steel pipe.
   (ii) 2 standard thicknesses lighter than the thickness of the pipe and in no case lighter than 0.060-inch for corrugated aluminum pipe.
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" x 1/2" 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" x 1/2" corrugations.
11. In the case of H-12 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

CORRUGATED METAL PIPE COUPLING DETAILS NO. 6 POSITIVE JOINT

NO SCALE

D97F

STD. PLAN D97F

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

John L. Wright
REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
J. L. Wright
No. 33937
Exp. 6-30-94
CIVIL
STATE OF CALIFORNIA

POSITIVE JOINTS

COUPLING TYPE	PIPE CORRUGATION	PIPE SIZE	W OR A	PIPE WALL THICKNESS CSP (IN)	PIPE WALL THICKNESS CAP (IN)	BAND THICKNESS CSP (IN)	BAND THICKNESS CAP (IN)	BAR AND STRAP (CSP ONLY) STRAP THICKNESS (IN)	BOLTS	BAR DIA	BAR YIELD STRENGTH (PSI)	ANGLE DIMENSIONS CSP	ANGLE DIMENSIONS CAP	BOLTS CSP	BOLTS CAP	RIVETS ANGLE TO BAND CSP	RIVETS ANGLE TO BAND CAP	SPOT WELDS ANGLE TO BAND CSP
HUGGER	2 2/3"x 1/2" 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"x 1" 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"x 1/2" REROLLED END	12" - 30"	2 3/4"	0.064 - 0.079		0.064						2 1/2"x 1 1/2"x3/16"		1 1/2"				3 1/2"
		36" - 48"	2 3/4"	0.064		0.064						2 1/2"x 1 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							

DOWNDRAIN

COUPLING TYPE	PIPE CORRUGATION	PIPE SIZE	W OR A	PIPE WALL THICKNESS CSP (IN)	PIPE WALL THICKNESS CAP (IN)	BAND THICKNESS CSP (IN)	BAND THICKNESS CAP (IN)	BAR AND STRAP (CSP ONLY) STRAP THICKNESS (IN)	BOLTS	BAR DIA	ANGLE DIMENSIONS CSP	ANGLE DIMENSIONS CAP	BOLTS CSP	BOLTS CAP	RIVETS ANGLE TO BAND CSP	RIVETS ANGLE TO BAND CAP	SPOT WELDS ANGLE TO BAND CSP
TWO PIECE INTEGRAL FLANGE	1 1/2"x 1/4"	6"	7"	0.064		0.052							3 3/8"				
	1 1/2"x 1/4"	8" - 10"	7"	0.064	0.060	0.064	0.060						3 3/8"	3 3/8"			
	2 2/3"x 1/2"	12" - 24"	12"	0.064	0.060	0.064	0.060						3 1/2"	3 1/2"			
ANNULAR	2 2/3"x 1/2"	THROUGH 24"	12"	0.064	0.060	0.064	0.060				2"x2"x 3/16"	2"x2"x 3/16"	3 1/2"	3 1/2"	3 3/8"	3 3/8"	3 1/2"
HAT BAND	2 2/3"x 1/2" REROLLED END	THROUGH 24"	2 3/4"	0.064 - 0.079		0.064					2 1/2"x 1 1/2"x3/16"		1 1/2"				3 1/2"
HUGGER	2 2/3"x 1/2" REROLLED END	THROUGH 24"	10 1/2"	0.064		0.064		0.079	1/2"	7/8"							
HELICAL	2 2/3"x 1/2"	THROUGH 24"	12"	0.064	0.060	0.064	0.060				2"x2"x 3/16"	2"x2"x 3/16"	3 1/2"	3 1/2"	3 3/8"	3 3/8"	3 1/2"

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 straps 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 thickness lighter than the thickness of the pipe for corrugated steel pipe.
   (II) 2 standard thickness lighter than the thickness of the pipe and in no case lighter than 0.060-inch for corrugated aluminum pipe.
6. Dimensions, thickness 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" x 1/2" 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" x 1/2" corrugations.
11. In the case of H-12 huggerbands, two piece bands are required for diameters through 96" and three piece bands are required for diameters 102" through 120".
12. Two piece band are required for pipes greater than 42" diameter.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

CORRUGATED METAL PIPE COUPLING DETAILS NO. 7 POSITIVE JOINTS AND DOWNDRAINS

NO SCALE

D97G

STD. PLAN D97G

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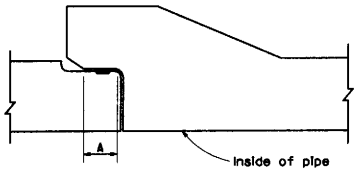
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

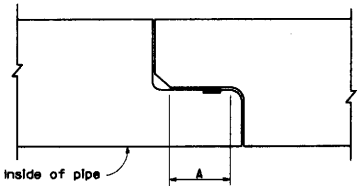
John L. Wright
REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

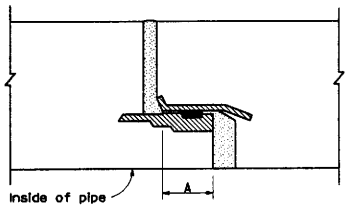
REGISTERED PROFESSIONAL ENGINEER
J. L. Wright
No. 33937
Exp. 6-30-94
CIVIL
STATE OF CALIFORNIA



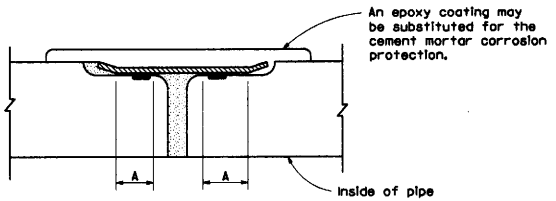
CONCRETE JOINT-FLARED BELL DESIGN



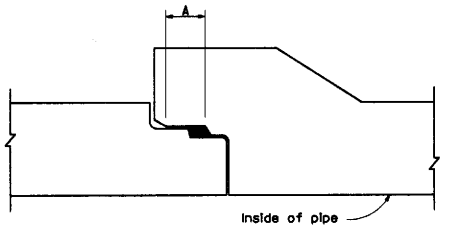
CONCRETE JOINT-FLUSH BELL DESIGN



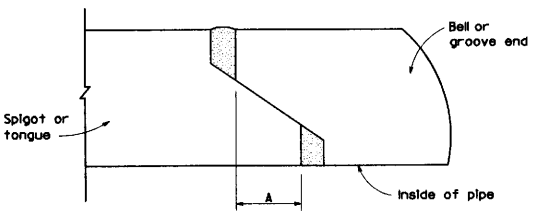
STEEL JOINT-FLUSH BELL DESIGN



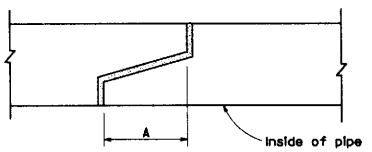
CONCRETE JOINT-DOUBLE GASKET DESIGN



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



SELF-CENTERING TONGUE & GROOVE



TONGUE & GROOVE DESIGN

LEGEND

- Cement Mortar
- Rubber Gasket
- Steel

DIMENSION	STANDARD	POSITIVE	PIPE DIAMETER LIMITS
A	1/4" Min	1/2" Min	6" through 12" Dia
A	1/2" Min	3/4" Min	15" through 33" Dia
A	3/4" Min	1" Min	Greater than 33" Dia

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

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

NO SCALE

D97H

STD. PLAN D97H

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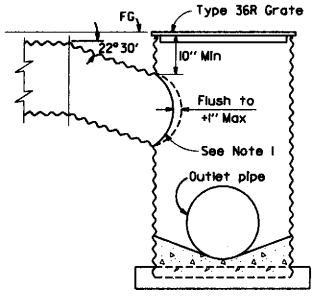
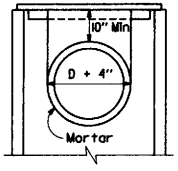
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER
July 1, 1992
PLANS APPROVAL DATE

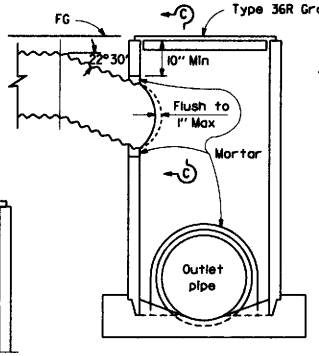
PROFESSIONAL ENGINEER J. L. Wright No. 33937 Exp. 6-30-94 CIVIL STATE OF CALIFORNIA



TYPE GMP INLET
See Standard Plans D75 and D77B for additional inlet details

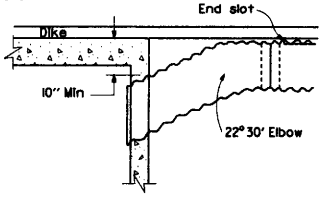


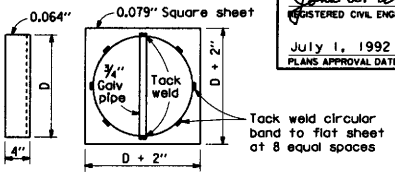
SECTION C-C



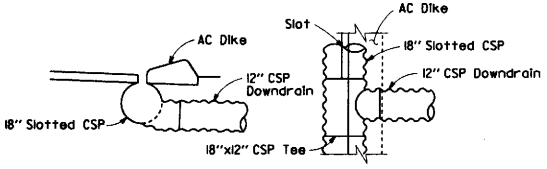
TYPE GMP INLET
See Standard Plans D75 and D77B for additional inlet details

SLOTTED DRAIN CONNECTIONS TO STANDARD INLET STRUCTURES



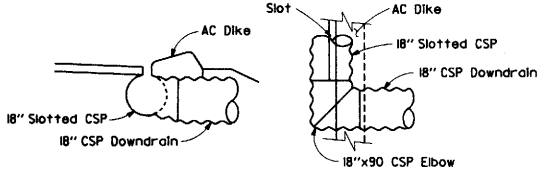


METAL CAP DETAIL
See Note 2



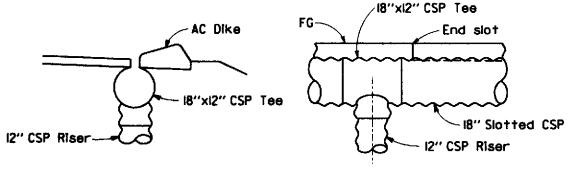
ELEVATION PLAN

SHOULDER INSTALLATION 18" SLOTTED CSP TO 12" CSP DOWNDRAIN



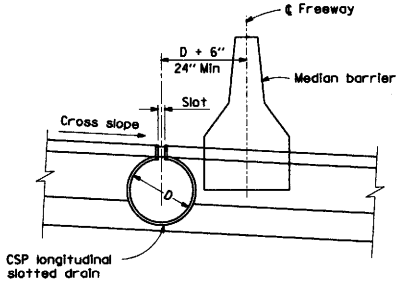
ELEVATION PLAN

SHOULDER INSTALLATION 18" SLOTTED CSP TO 18" CSP DOWNDRAIN

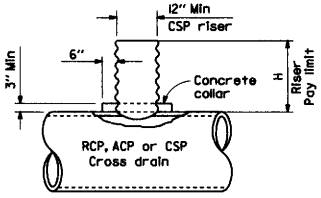


ELEVATION-END VIEW ELEVATION-SIDE VIEW

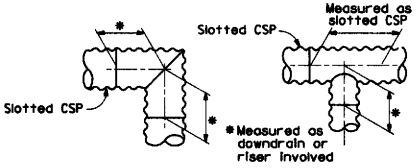
SHOULDER INSTALLATION 18" SLOTTED CSP TO 12" CSP RISER



TYPICAL CROSS SECTION



RISER CONNECTION DETAIL



MEASUREMENT OF CORRUGATED STEEL PIPE ELBOWS AND TEES USED WITH SLOTTED DRAINS
See Note 3

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 1/2 parts SS1 emulsified asphalt), or continuous weld.
2. "D" equals nominal pipe diameter.
3. Length of elbows and tees is included in the linear feet of pipe involved shown on the Drainage List of the project plans.
4. Watertight joints require on all Slotted CSP connections.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SLOTTED CORRUGATED STEEL PIPE DRAIN DETAILS

NO SCALE

D98A

STD. PLAN D98A

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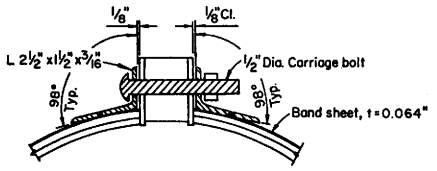
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

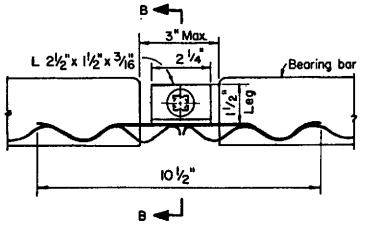
REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER J. L. Wright No. 33937 Exp. 6-30-94 CIVIL STATE OF CALIFORNIA

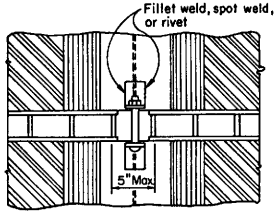


SECTION B-B

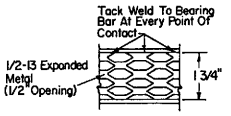


ELEVATION

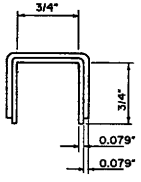
MODIFIED HUGGER BAND



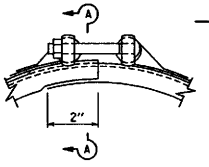
PART PLAN



HEEL GUARD
(See Note 11)

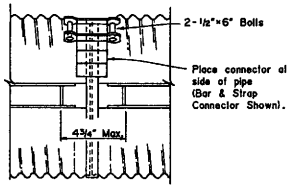


PARTIAL SECTION A-A

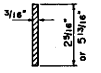


NOTE: As an alternate to swaged end an oversized bridge clip may be used.

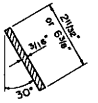
SIDE VIEW



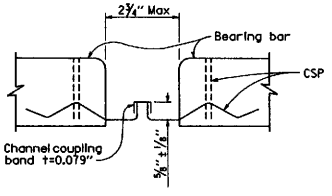
PART PLAN



SECTION E-E

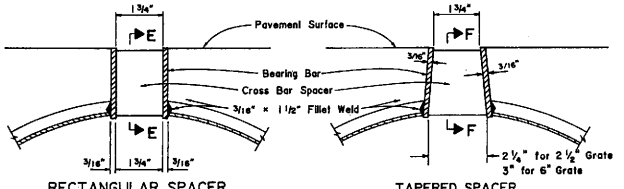


SECTION F-F



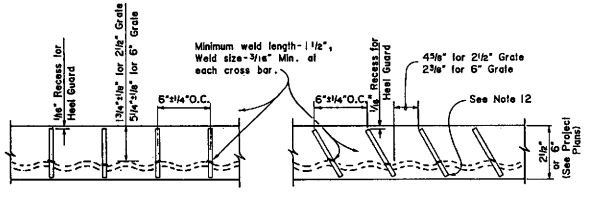
ELEVATION

BAR & STRAP CONNECTOR (SEE STANDARD PLAN D97A)



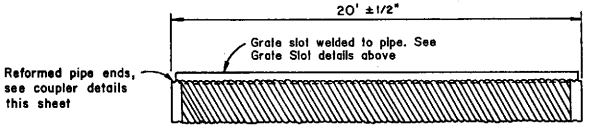
RECTANGULAR SPACER TAPERED SPACER

GRATE SLOT-SECTION

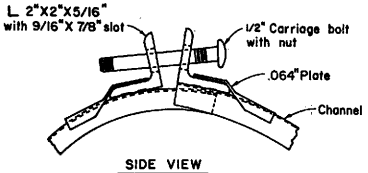


RECTANGULAR SPACER TAPERED SPACER

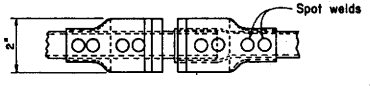
GRATE SLOT-LONGITUDINAL ELEVATION VIEW
(See Note 13)



SLOTTED CORRUGATED STEEL PIPE



SIDE VIEW



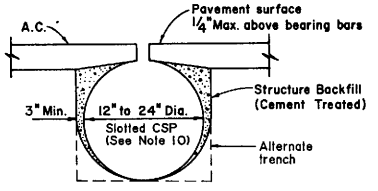
PART PLAN

ANGLE CONNECTOR

CHANNEL COUPLING BAND

NOTES

1. Drain pipe seams may be continuous helical lock seam or helical weld seam.
2. Drain sections shall be assembled with either of the coupling bands shown.
3. The cross bar spacer shall be welded to the bearing bars in such a manner as to develop a minimum tensile strength of 12,000 lbs. normal to the longitudinal axis of the bearing bars.
4. The maximum variance from a straight line between the extreme top corners of the bearing bars shall be 1/2" in 20 feet.
5. All coupling band connections shall be galvanized or coated in accordance with the Standard Specifications.
6. Spot welds shall develop minimum required strength of strap.
7. Dimensions shown are minimums.
8. Contractor to provide an adequate method of keeping the A.C. out of pipe, during paving operations.
9. Minimum pipe wall thickness is 0.064 inch.
10. 24" Dia. Will Not Support Normal Highway Wheel Loads.
11. Use Heel Guard when specified.
12. Bottom edge of cross bar spacer offset in direction of flow.
13. Unless otherwise shown on the plans or specified in the special provisions, cross bar spacers shall be either rectangular or tapered at the contractor's option.



BACKFILL

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SLOTTED CORRUGATED STEEL PIPE DRAIN DETAILS

NO SCALE

D98B

STD. PLAN D98B

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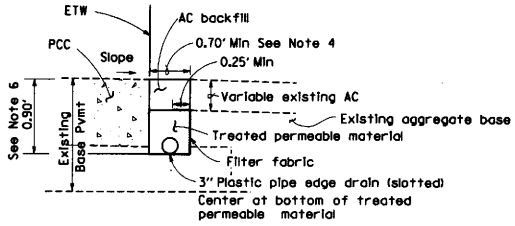
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

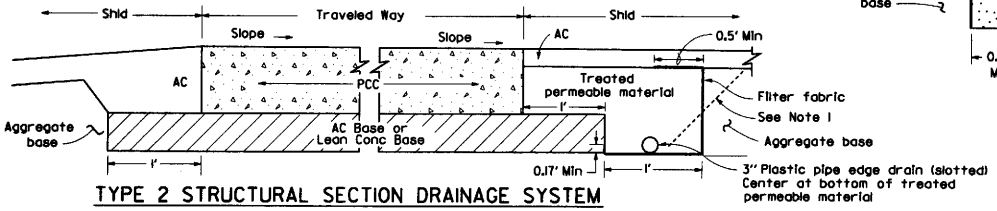
Kenneth Y. Mori
REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

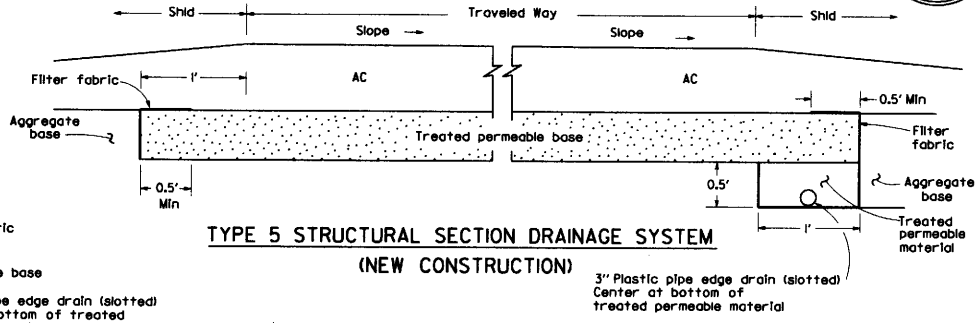
REGISTERED PROFESSIONAL ENGINEER K. Mori No. 14733 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA



TYPE 1 STRUCTURAL SECTION DRAINAGE SYSTEM
(FOR EXISTING HIGHWAY FACILITY)



TYPE 2 STRUCTURAL SECTION DRAINAGE SYSTEM
(NEW CONSTRUCTION)



TYPE 5 STRUCTURAL SECTION DRAINAGE SYSTEM
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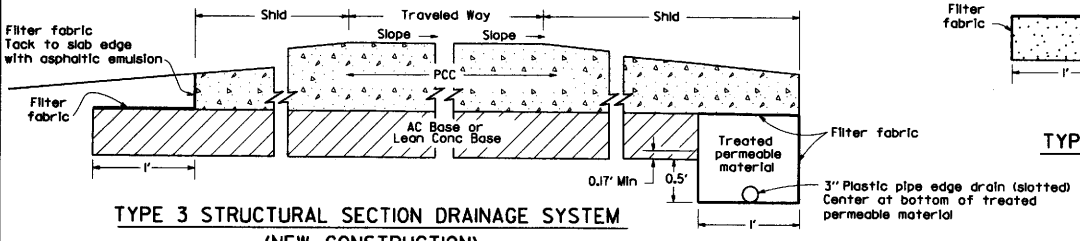
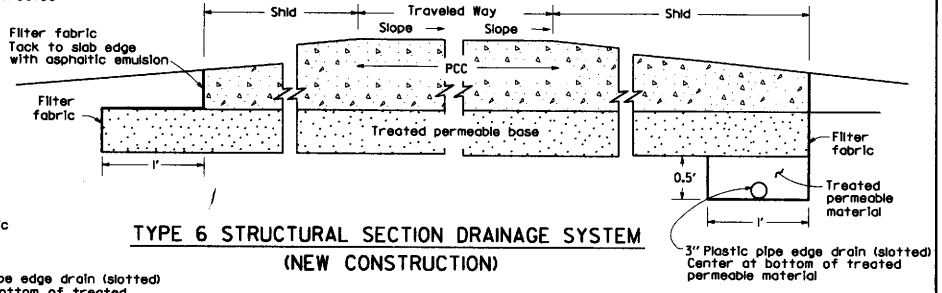
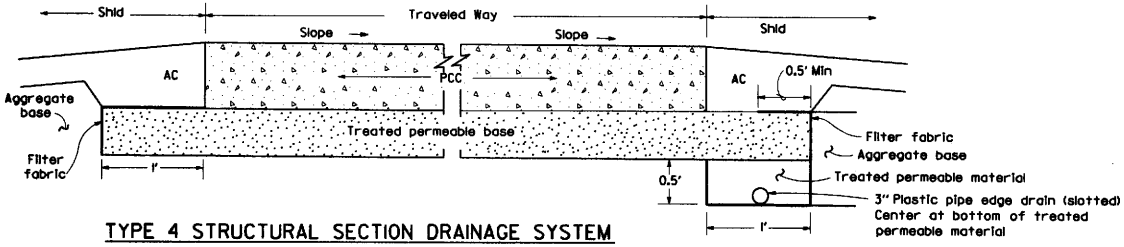


TYPE 3 STRUCTURAL SECTION DRAINAGE SYSTEM
(NEW CONSTRUCTION)



TYPE 6 STRUCTURAL SECTION DRAINAGE SYSTEM
(NEW CONSTRUCTION)



TYPE 4 STRUCTURAL SECTION DRAINAGE SYSTEM
(NEW CONSTRUCTION)

NOTES

1. At the Contractor's option, on new construction, the vertical jointline (including the filter fabric) between the treated permeable material and the shoulder base/subgrade material may be rotated about its midpoint to a slope not flatter than 1:1 as shown by the dashed lines.
2. See the project plans and typical cross sections for pavement structural section details.
3. The plan layout for structural section drainage collector and outlet systems for new portland cement concrete pavement and new asphalt concrete pavement is the same as that shown on Standard Plan D99B.
4. For plastic pipe edge drain diameter larger than 3 inches, the minimum trench width shall be equal to the outside diameter of the plastic pipe plus 4 inches.
5. For plastic pipe edge drain diameters larger than 3 inches, all details for 3" plastic pipe edge drain shall apply.
6. For pavements thicker than 9 inches, the minimum trench depth is 1.00 foot.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

STRUCTURAL SECTION DRAINAGE SYSTEM DETAILS

NO SCALE

D99A

STD. PLAN D99A

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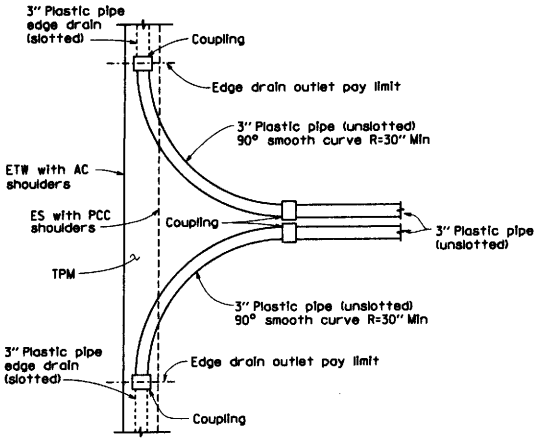
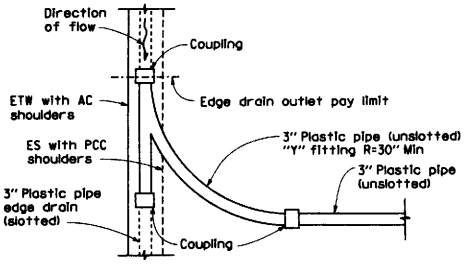
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

Kenneth Y. Mori
REGISTERED CIVIL ENGINEER
July 1, 1992
PLANS APPROVAL DATE

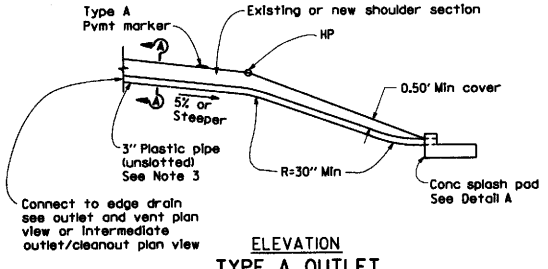
REGISTERED PROFESSIONAL ENGINEER K. Mori No. 14733 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA



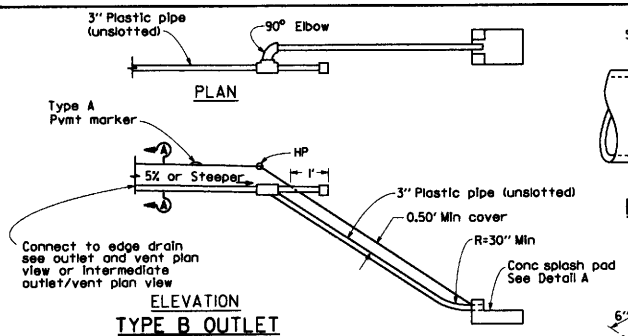
PLAN
DUAL OUTLET AND/OR VENT
See Note 2



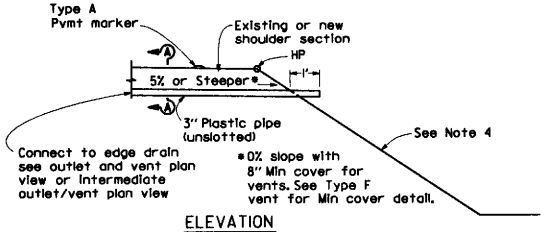
PLAN
INTERMEDIATE OUTLET
See Note 2



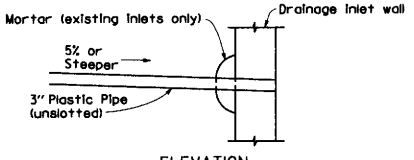
ELEVATION
TYPE A OUTLET



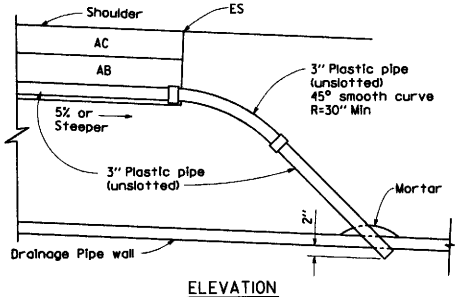
ELEVATION
TYPE B OUTLET



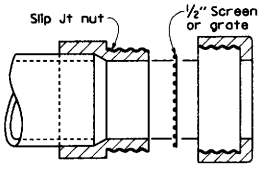
ELEVATION
TYPE C OUTLET AND/OR VENT



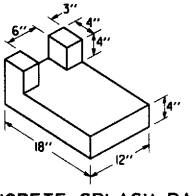
ELEVATION
TYPE D OUTLET CONNECTION TO DRAINAGE INLET



ELEVATION
TYPE E OUTLET CONNECTION TO DRAINAGE PIPE



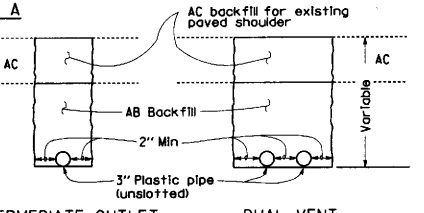
EDGE DRAIN OUTLET AND VENT COVER



CONCRETE SPLASH PAD
DETAIL A

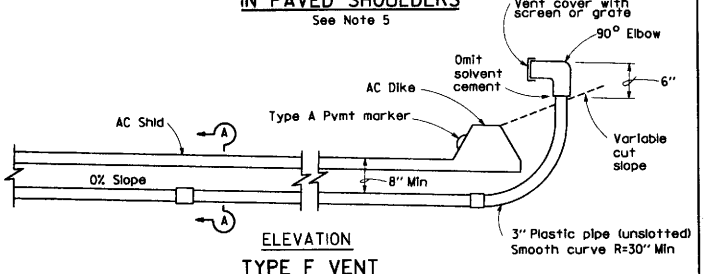
NOTES

1. See project plans for location and type of outlet and/or vent installations.
2. The position of slotted plastic pipe and limits of treated permeable material shown are for the Type I structural section drainage system shown on Standard Plan D99A.
3. The maximum length of plastic pipe outlet shall be 50 feet (±) measured from the longitudinal centerline of the collector trench to the pipe outlet. For pipe lengths greater than 50 feet use Type B Outlets.
4. See project plans for slope protection details at Type C pipe outlets.
5. Backfill with aggregate base from outside edge paved shoulder to hinge point, and backfill with native material in slope area.
6. See Standard Plan D99C for Type G vent detail used with Portland Cement Concrete shoulders.



INTERMEDIATE OUTLET OR CLEANOUT — DUAL VENT AND/OR OUTLET

SECTION A-A
OUTLET EXCAVATION AND BACKFILL IN PAVED SHOULDERS
See Note 5



ELEVATION
TYPE F VENT

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

EDGE DRAIN OUTLET AND VENT DETAILS

NO SCALE

D99B

STD. PLAN D99B

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July 1, 1992
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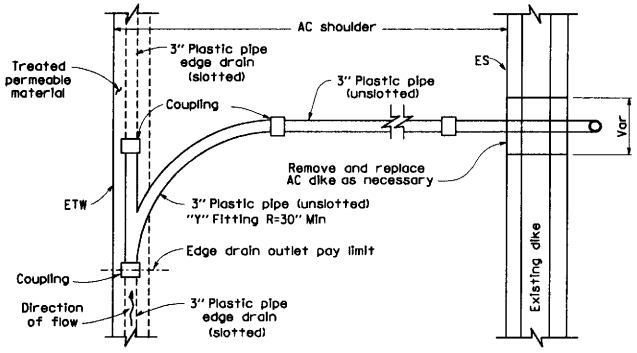
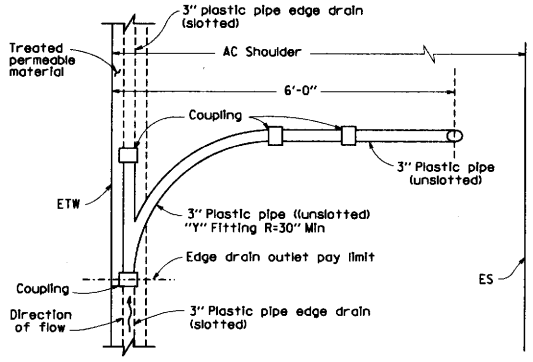
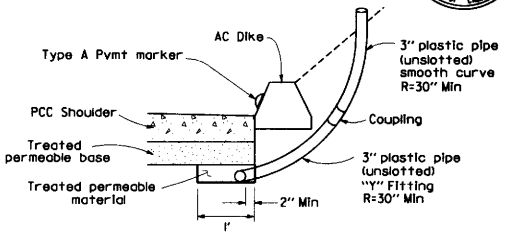
REGISTERED PROFESSIONAL ENGINEER K. Mori No. 14733 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA



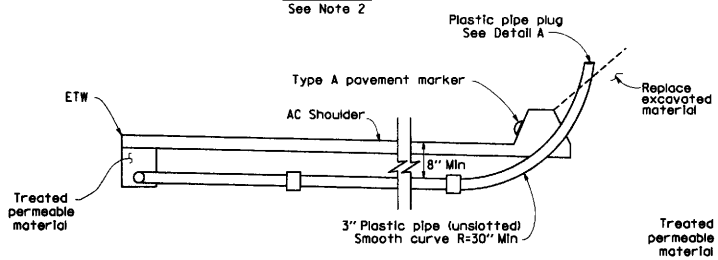
TYPE 1 CLEANOUT
PLAN VIEW
See Note 2



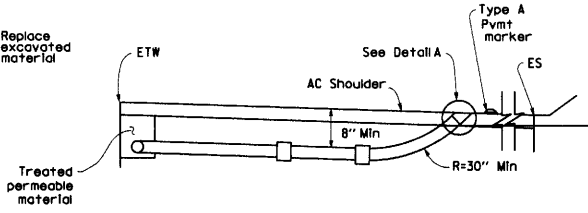
TYPE 2 CLEANOUT
PLAN VIEW
See Note 2



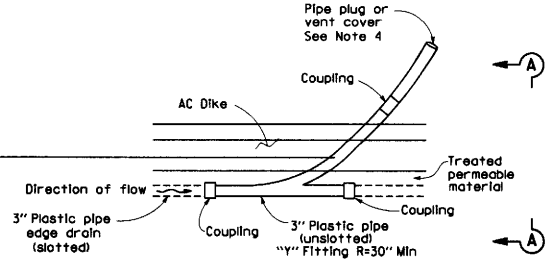
TYPE 3 CLEANOUT/TYPE G VENT
SECTION A-A



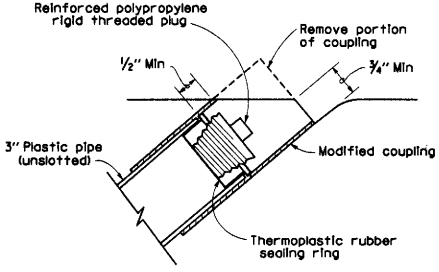
TYPE 1 CLEANOUT
ELEVATION



TYPE 2 CLEANOUT
ELEVATION

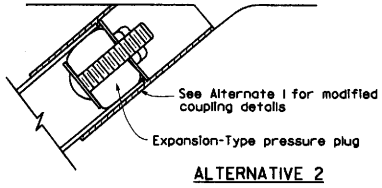


TYPE 3 CLEANOUT/TYPE G VENT
PLAN VIEW
See Note 4



ALTERNATIVE 1

DETAIL A
PLASTIC PIPE PLUG
See Note 3



ALTERNATIVE 2

NOTES

1. See project plans for location and type of cleanout or vent installations.
2. The position of slotted plastic pipe and limits of treated permeable material shown are for the Type 1 structural section drainage system shown on Standard Plan D99A.
3. Other types of plugs may be substituted with the Engineer's approval.
4. The Type 3 Cleanout and Type G Vent is for use with Portland Cement Concrete shoulders. The Type 6 structural section drainage system from Standard Plan D99A is shown. Use plastic pipe plug shown in Detail A with Type 3 Cleanouts. Use vent cover shown on Standard Plan D99B with Type G Vents.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

EDGE DRAIN CLEANOUT AND VENT DETAILS

NO SCALE

D99C

STD. PLAN D99C

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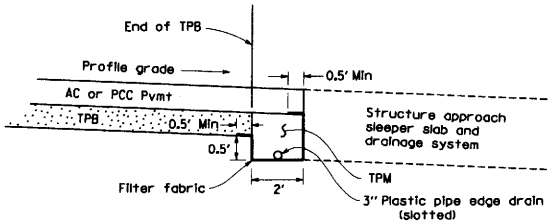
Kenneth Y. Mori
REGISTERED CIVIL ENGINEER

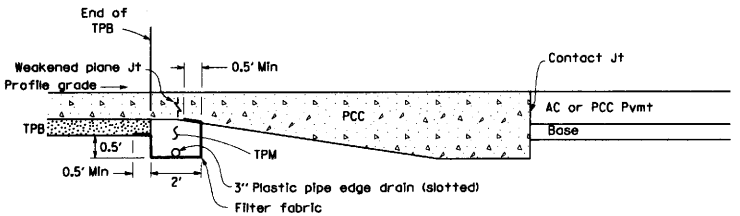
July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER K. Mori No. 14733 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA



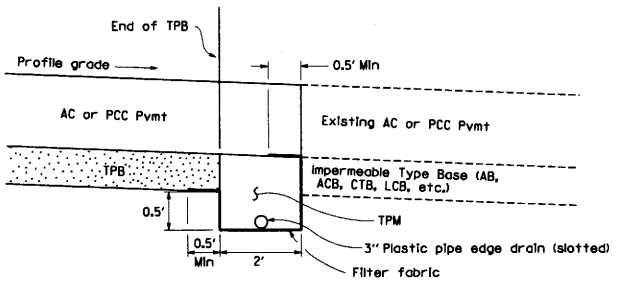
CROSS DRAIN INTERCEPTOR AT STRUCTURE APPROACH

LONGITUDINAL SECTION



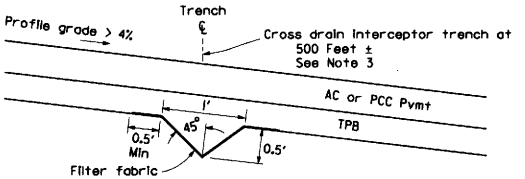
CROSS DRAIN INTERCEPTOR AT END ANCHOR OR PRESSURE RELIEF JOINT

LONGITUDINAL SECTION
See Note 2



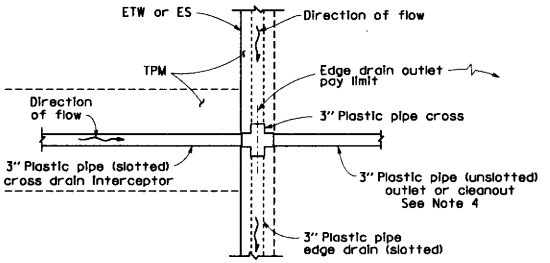
TERMINAL CROSS DRAIN INTERCEPTOR

LONGITUDINAL SECTION



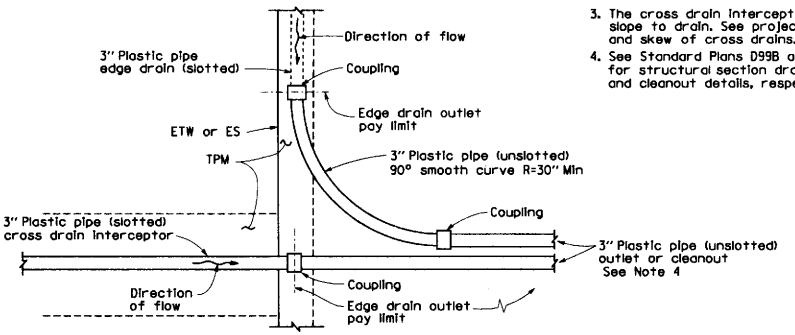
INTERMEDIATE CROSS DRAIN INTERCEPTOR

LONGITUDINAL SECTION



CROSS DRAIN INTERCEPTOR OUTLET CONNECTION DETAILS

PLAN VIEW



COMBINED CROSS DRAIN INTERCEPTOR/ EDGE DRAIN OUTLET DETAILS

PLAN VIEW

NOTES

1. Cross Drain Interceptors are for use with treated permeable bases.
2. See Standard Plan A35A for Pavement End Anchor and Pressure Relief Joint construction details. A typical pavement end anchor is shown.
3. The cross drain interceptor trench shall slope to drain. See project plans for location and skew of cross drains.
4. See Standard Plans D99B and D99C, for structural section drainage system outlet and cleanout details, respectively.

STATE OF CALIFORNIA
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CROSS DRAIN INTERCEPTOR DETAILS

NO SCALE

D99D

STD. PLAN D99D

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REGISTERED LANDSCAPE ARCHITECT

July 1, 1992
PLANS APPROVAL DATE

REGISTERED LANDSCAPE ARCHITECT
F. SALVISBERG
No. 1469
Exp. 12-31-92
STATE OF CALIFORNIA

A

AB	Aggregate Base
ABM	Air Blown Mortar
ABS	Acrylonitrile-Butadiene-Styrene
AC	Asphalt Concrete
ADJ	Adjacent/Adjustable
AIC	Auxiliary Irrigation Controller
ALT	Alternative
AMEND	Amendment
ARV	Air Release Valve
AUTO	Automatic
AUX	Auxiliary
AVB	Atmospheric Vacuum Breaker

B

B&B	Balled and Burlapped
B/B	Brass/Bronze
B/B/PL	Brass/Bronze/Plastic
B/PL	Brass/Plastic
BIT CTD	Bituminous Coated
BP	Booster Pump
BPA	Backflow Preventer Assembly
BPAE	Backflow Preventer Assembly in Enclosure
BV	Ball Valve

C

CARV	Combination Air Release Valve
CEC	Controller Enclosure Cabinet
CF	Cubic Foot/Feet
CL	Chain Link
CNC	Control and Neutral Conductors
CONC	Concrete
COND	Conduit
CSP	Corrugated Steel Pipe
CST	Center Strip
CV	Check Valve

D

DIA	Diameter
DIP	Ductile Iron Pipe

E

EA	Each
ELEC	Electric/Electrical
ELEV	Elevation
ENCL	Enclosure
EP	Edge of Pavement
EST	End Strip
ESTB	Establishment
ETW	Edge of Traveled Way

F

F	Full Circle
F/P	Full/Part Circle
FAU	Filter Assembly Unit
FCV	Flow Control Valve
FERT	Fertilizer
FG	Finished Grade
FIPT	Female Iron Pipe Thread
FIS	Fertilizer Injector System
FL	Flow Line
FM	Flow Monitor
FT	Foot/Feet
FV	Flush Valve

G

GAL	Gallon(s)
GALV	Galvanized
GARV	Garden Valve
GPH	Gallons Per Hour
GPM	Gallons Per Minute
GSP	Galvanized Steel Pipe
GV	Gate Valve

H

H	Half Circle
HB	Hose Bib
HP	Horse Power/Hinge Point
HPL	High Pressure Line
HWY	Highway

I

IC	Irrigation Controller
ICC	Irrigation Controller(s) In Controller Enclosure Cabinet
ID	Inside Diameter
IFS	Irrigation Filtration System
IN	Inch(es)
IPS	Iron Pipe Size
IPT	Iron Pipe Thread
IRR	Irrigation

L

L	Length
LB	Pound(s)
LF	Linear Feet

M

MAX	Maximum
MBGR	Metal Beam Guard Railing
MCV	Manual Control Valve
MIC	Master Irrigation Controller
MIN	Minimum
MIPT	Male Iron Pipe Thread
MISC	Miscellaneous
MTL	Material

N

NL	Nozzle Line
NO.	Number
NPT	National Pipe Thread

O

O/C	On Center
OD	Outside Diameter
OZ	Ounce

P

P	Part Circle
PB	Pull Box
PCC	Portland Cement Concrete
PE	Polyethylene
PL	Plastic
PLT	Plant/Planting
PLT ESTB	Plant Establishment
PM	Post Mile
PR	Pressure Rated
PRLV	Pressure Relief Valve
PRV	Pressure Reducing Valve
PSI	Pounds Per Square Inch
PVC	Polyvinyl Chloride
PVMT	Pavement

Q

Q	Quarter Circle
QCV	Quick Coupling Valve

R

R	Radius
RCP	Reinforced Concrete Pipe
RCV	Remote Control Valve
RCVM	Remote Control Valve (Master)
RCW	Reclaimed Water
REQ	Required
R/W	Right of Way

S

S	Slip
SCH	Schedule
SF	State Furnished
SHLD	Shoulder
SQFT	Square Foot/Feet
SQYD	Square Yard(s)
SST	Side Strip
STA	Station
STD	Standard
SW	Sidewalk/Sound Wall

T

T	Third Circle/ Thread
TAB	Tablet(s)
TLS	Truck Loading Standpipe
TQ	Three Quarter Circle
TRVD	Traveled
TT	Two Third Circle
TYP	Typical

U

UG	Underground

W

W	Width
W/	With
WM	Water Meter
WS	Wye Strainer
WSP	Welded Steel Pipe

NOTE:
FOR ADDITIONAL ABBREVIATIONS SEE STANDARD PLAN A10A.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PLANTING AND IRRIGATION ABBREVIATIONS

STD. PLAN H1

H1

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REGISTERED LANDSCAPE ARCHITECT
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No. 1469
Exp. 12-31-92
STATE OF CALIFORNIA

EXISTING	PROPOSED	ITEM DESCRIPTION
		WATER METER (WM) (BY OTHERS)
		BACKFLOW PREVENTER ASSEMBLY (BPA)
		BACKFLOW PREVENTER ASSEMBLY IN ENCLOSURE (BPAE)
		BOOSTER PUMP (BP)
		TRUCK LOADING STANDPIPE (TLS)
	F	FERTILIZER INJECTOR SYSTEM (FIS)
		MASTER IRRIGATION CONTROLLER (MIC)
		AUXILIARY IRRIGATION CONTROLLER (AIC)
		IRRIGATION CONTROLLER (IC)/ IRRIGATION CONTROLLER (IC) (BATTERY)
		IRRIGATION CONTROLLER(S) IN CONTROLLER ENCLOSURE CABINET (ICC)
		CONTROL AND NEUTRAL CONDUCTORS (CNC)
----S----	——S——	SPRINKLER CONTROL CONDUIT
		CONDUIT
---DIP--	—DIP—	DUCTILE IRON PIPE (DIP) (SUPPLY LINE) (MAIN)
		GALVANIZED STEEL PIPE (GSP) (SUPPLY LINE) (MAIN)
		GALVANIZED STEEL PIPE (GSP) (SUPPLY LINE) (LATERAL)
		PLASTIC PIPE (PR 200) (SUPPLY LINE) (MAIN)
		PLASTIC PIPE (PR 200) (SUPPLY LINE) (LATERAL)
		PLASTIC PIPE (IRRIGATION LINE)
		REMOTE CONTROL VALVE (RCV)/ REMOTE CONTROL VALVE (MASTER) (RCVM)
		MANUAL CONTROL VALVE (MCV)
		VALVE ASSEMBLY UNIT (VAU)
		WYE STRAINER (WS)
		FILTER ASSEMBLY UNIT (FAU)
		GATE VALVE (GV)
		BALL VALVE (BV)

EXISTING	PROPOSED	ITEM DESCRIPTION
		QUICK COUPLING VALVE (QCV)
		PRESSURE REDUCING VALVE (PRV)
		PRESSURE RELIEF VALVE (PRLV)
		FLOW CONTROL VALVE (FCV)
		COMBINATION AIR RELEASE VALVE (CARV)
		CHECK VALVE (CV)
		FLUSH VALVE (FV)
		NOZZLE LINE (NL)
		IRRIGATION SYSTEM
		IRRIGATION SYSTEM TO BE REMOVED
		GATE
	3	SPRINKLER W/SPRINKLER PROTECTOR
		QUICK COUPLING VALVE W/SPRINKLER PROTECTOR
		CONNECT TO EXISTING SYSTEM
		CAP

VALVE CODE

- RCV SIZE
- IRRIGATION CONTROLLER
- CONTROLLER STATION
- VALVE IN PARALLEL (IF APPLICABLE)
- GPM
- QUANTITY OF TYPE C, D, OR E SPRINKLERS

* 2 1/2"-A-2b-40-60

- MCV SIZE
- VALVE NUMBER
- GPM
- QUANTITY OF TYPE C, D, OR E SPRINKLERS

* 2"-3-30-50

* VALVE CODES FOR EXISTING VALVES ARE SHOWN IN A DASHED ENCLOSURE

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PLANTING AND IRRIGATION SYMBOLS

NO SCALE

H2

STD. PLAN .H2

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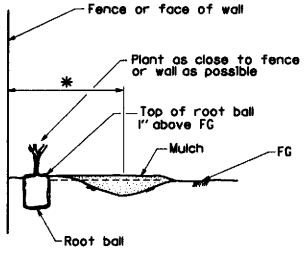
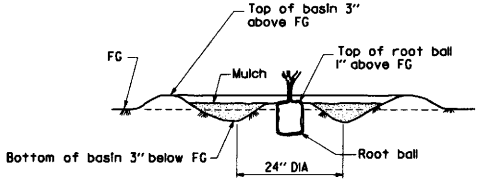
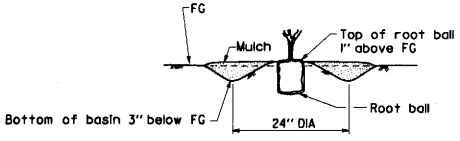
Exp. 12-31-92
STATE OF CALIFORNIA



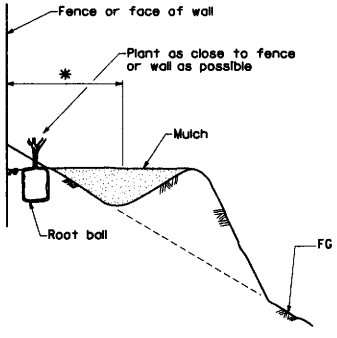
SECTION
(FLAT AREA)



SECTION
(FLAT AREA)

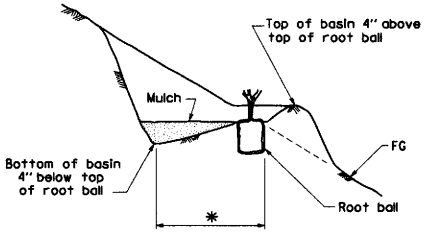


SECTION
(FLAT AREA)



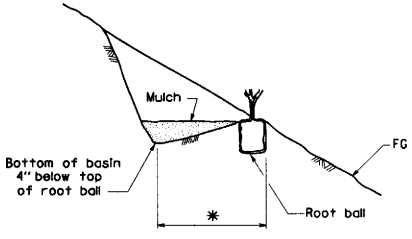
SECTION
(SLOPE AREA)

BASIN TYPE III



SECTION
(SLOPE AREA)

BASIN TYPE II



SECTION
(SLOPE AREA)

BASIN TYPE I

* Basin area equivalent to 24" DIA

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PLANTING AND IRRIGATION DETAILS

NO SCALE

H3

STD. PLAN H3

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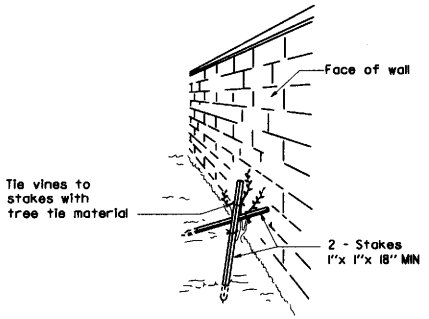
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

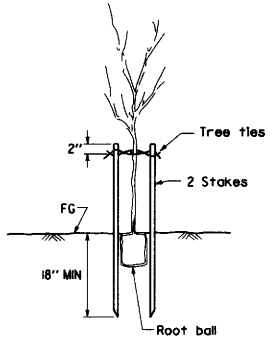
REGISTERED LANDSCAPE ARCHITECT

July 1, 1992
PLANS APPROVAL DATE

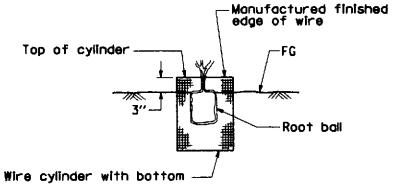
REGISTERED LANDSCAPE ARCHITECT
F. SALYISBERG
No. 1469
Exp. 12-31-92
STATE OF CALIFORNIA



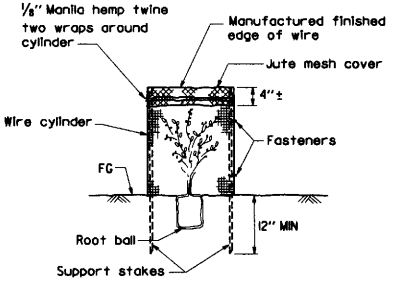
PERSPECTIVE
VINE STAKING



SECTION
TREE STAKING



SECTION
ROOT PROTECTOR



SECTION
FOLIAGE PROTECTOR

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PLANTING AND IRRIGATION DETAILS

NO SCALE

H4

STD. PLAN H4

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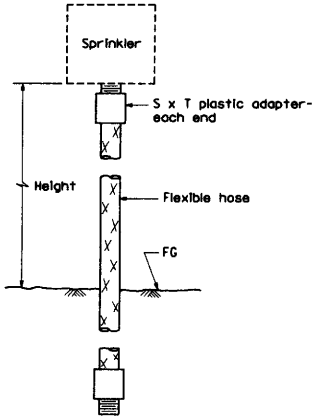
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

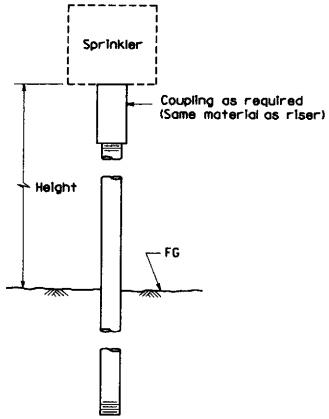
REGISTERED LANDSCAPE ARCHITECT

July 1, 1992
PLANS APPROVAL DATE

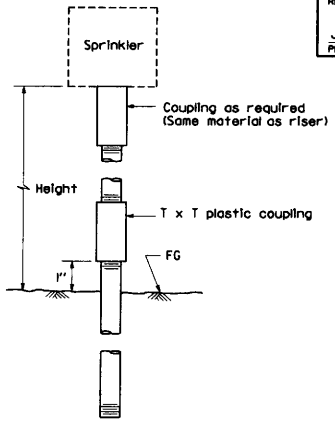
REGISTERED LANDSCAPE ARCHITECT
F. SALYISBERG
No. 1469
Exp. 12-31-92
STATE OF CALIFORNIA



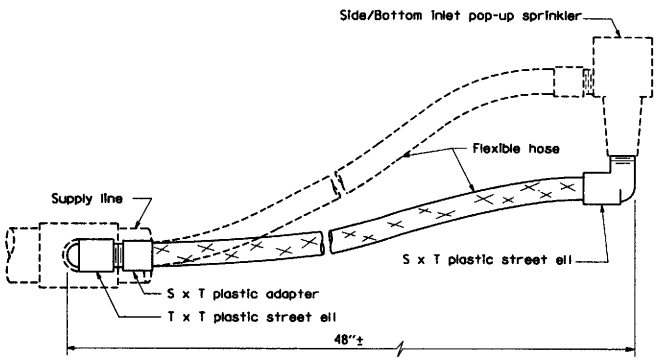
ELEVATION
RISER TYPE III



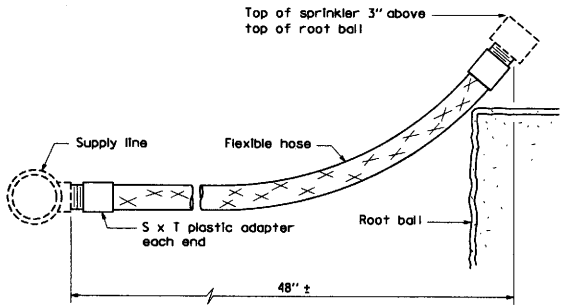
ELEVATION
RISER TYPE II



ELEVATION
RISER TYPE I



ELEVATION
RISER TYPE V



ELEVATION
RISER TYPE IV

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PLANTING AND IRRIGATION DETAILS

NO SCALE

H5

STD. PLAN H5

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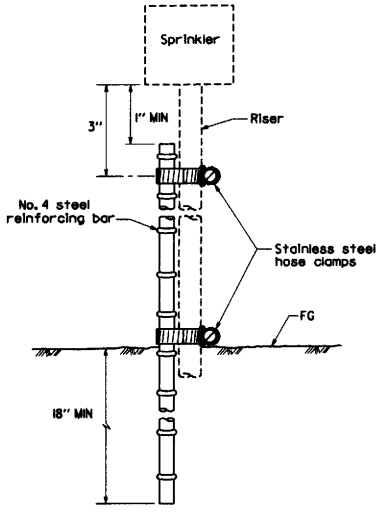
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED LANDSCAPE ARCHITECT

July 1, 1992

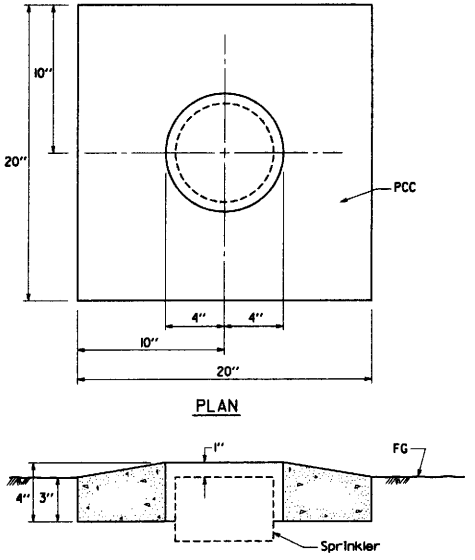
PLANS APPROVAL DATE

REGISTERED LANDSCAPE ARCHITECT F. SALVISBERG No. 1469 Exp. 12-31-92 STATE OF CALIFORNIA



ELEVATION

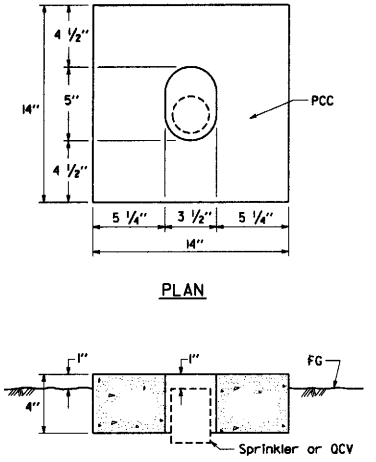
RISER SUPPORT



PLAN

SECTION

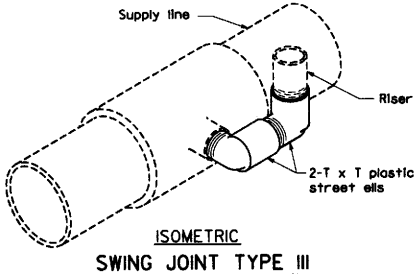
SPRINKLER PROTECTOR TYPE II



PLAN

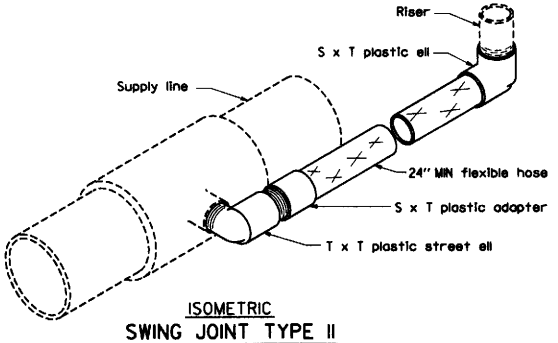
SECTION

SPRINKLER PROTECTOR TYPE I



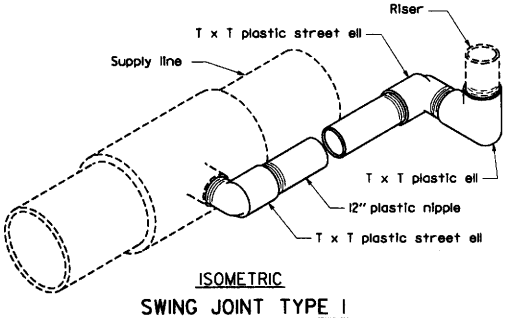
ISOMETRIC

SWING JOINT TYPE III



ISOMETRIC

SWING JOINT TYPE II



ISOMETRIC

SWING JOINT TYPE I

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PLANTING AND IRRIGATION DETAILS

NO SCALE

H6

STD. PLAN H6

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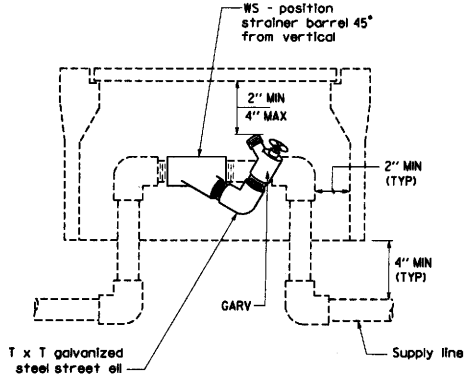
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED LANDSCAPE ARCHITECT

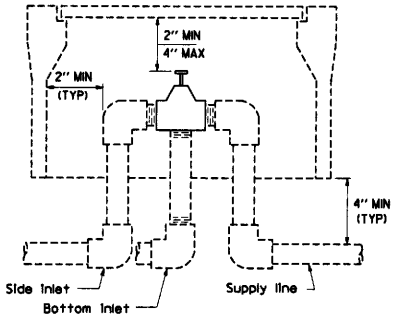
July 1, 1992
PLANS APPROVAL DATE

REGISTERED LANDSCAPE ARCHITECT
F. SALVISBERG
No. 1469
Exp. 12-31-92
STATE OF CALIFORNIA



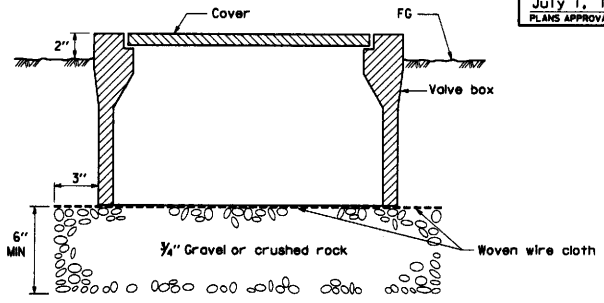
ELEVATION

WYE STRAINER



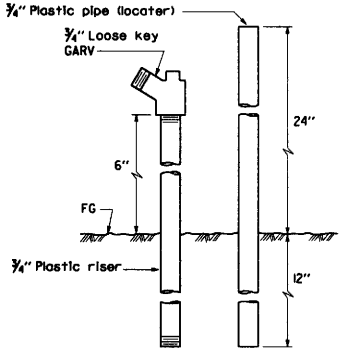
ELEVATION

VALVE



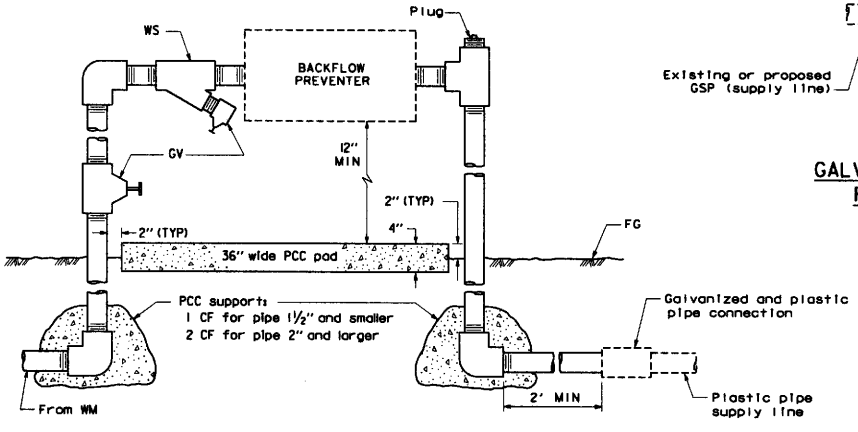
SECTION

VALVE BOX



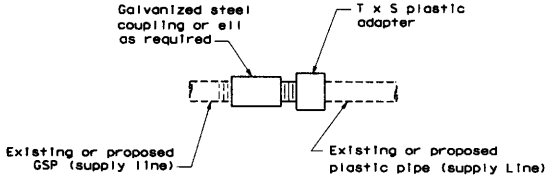
ELEVATION

FLUSH VALVE



ELEVATION

BACKFLOW PREVENTER ASSEMBLY



PLAN

GALVANIZED AND PLASTIC PIPE CONNECTION

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PLANTING AND IRRIGATION DETAILS

NO SCALE

H7

STD. PLAN H7

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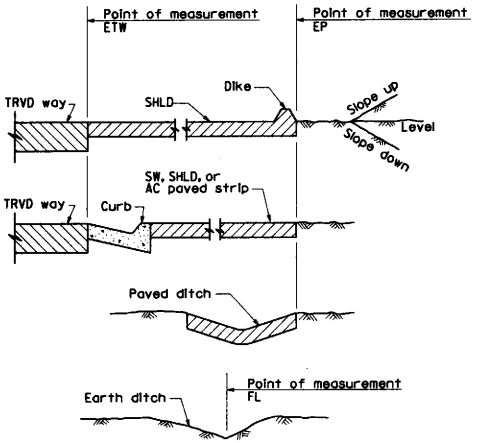
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER

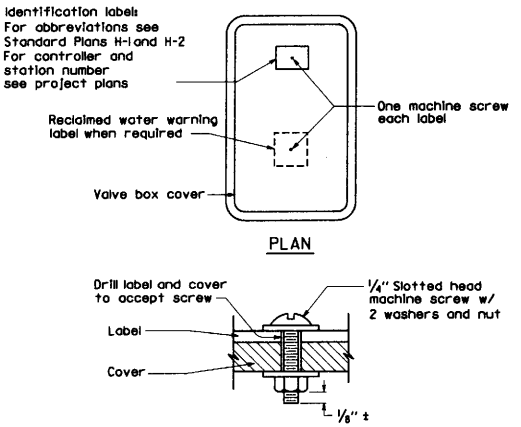
July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER F. SALVISBERG No. 1469 Exp. 12-31-92 CIVIL STATE OF CALIFORNIA



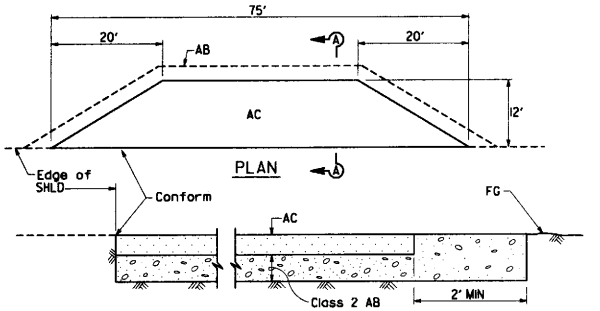
SECTION

POINTS OF MEASUREMENT



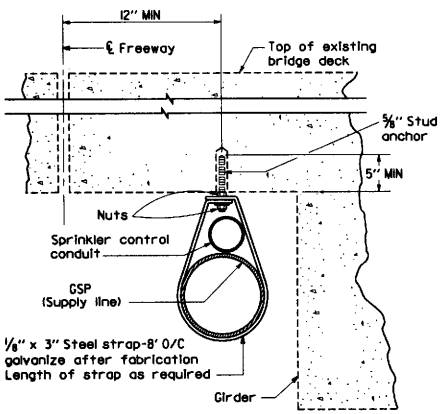
SECTION

VALVE BOX IDENTIFICATION

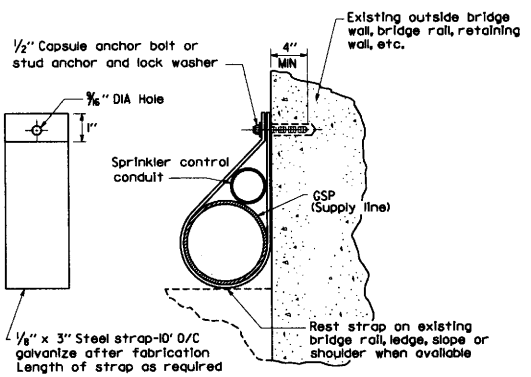


SECTION A-A

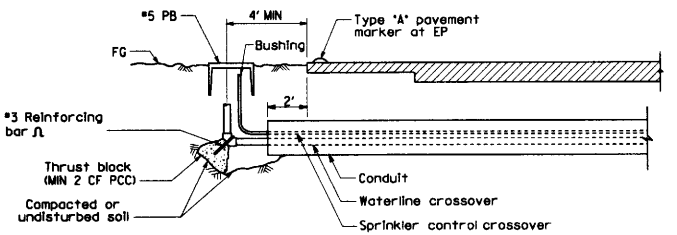
MAINTENANCE VEHICLE PULLOUT



PIPE ANCHOR TYPE II



PIPE ANCHOR TYPE I



SECTION

WELDED STEEL PIPE CONDUIT
(JACKED OR DRILLED)

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PLANTING AND IRRIGATION DETAILS

NO SCALE

H8

STD. PLAN H8

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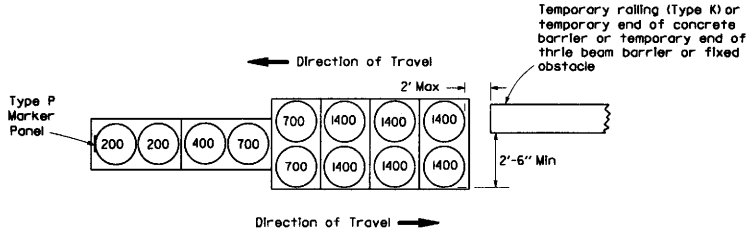
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER

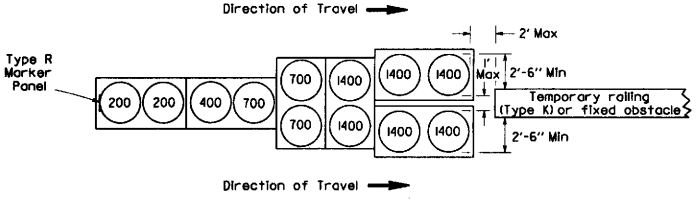
July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER J. E. Summers No. 29741 Exp. 3-31-95 CIVIL STATE OF CALIFORNIA



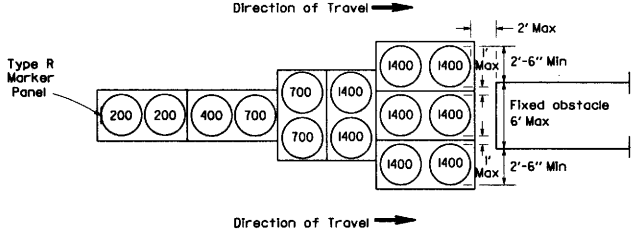
ARRAY 'TA'

(APPROACH SPEED 45 MPH OR GREATER)



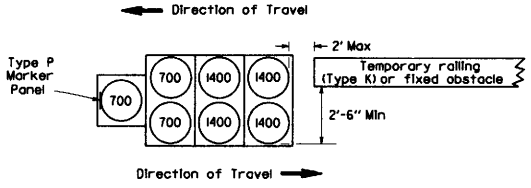
ARRAY 'TB'

(APPROACH SPEED 45 MPH OR GREATER)



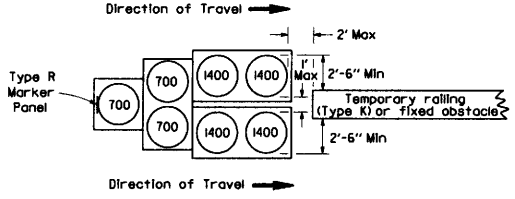
ARRAY 'TC'

(APPROACH SPEED 45 MPH OR GREATER)



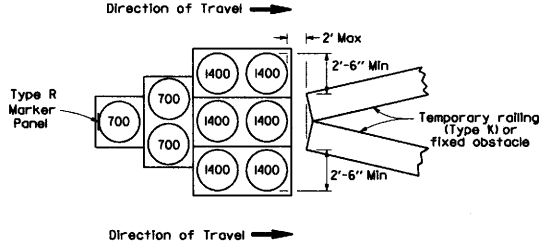
ARRAY 'TD'

(APPROACH SPEED 40 MPH OR LESS)
(FOR SPEEDS GREATER THAN 40 MPH USE ARRAY 'TA')



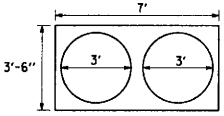
ARRAY 'TE'

(APPROACH SPEED 40 MPH OR LESS)
(FOR SPEEDS GREATER THAN 40 MPH USE ARRAY 'TB')

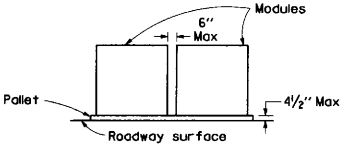


ARRAY 'TF'

(APPROACH SPEED 40 MPH OR LESS)
(FOR SPEEDS GREATER THAN 40 MPH USE ARRAY 'TC')



PLAN



ELEVATION

CRASH CUSHION PALLET DETAIL

NOTES

1. (XXX) indicates module location and weight of sand in pounds for each module.
2. All sand weights are nominal.
3. A single row of modules similar to that shown for array 'TI' and array 'TJ' on Standard Plan T2 shall not be used in locations where there will be traffic on both sides of the temporary crash cushion array.
4. If the fixed obstacle or approach end of the temporary railing is less than 15 feet from the edge of traveled way, a temporary crash cushion is required.
5. Temporary crash cushion arrays shall not encroach on the traveled way.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

TEMPORARY CRASH CUSHION SAND FILLED

NO SCALE

T1

STD. PLAN T1

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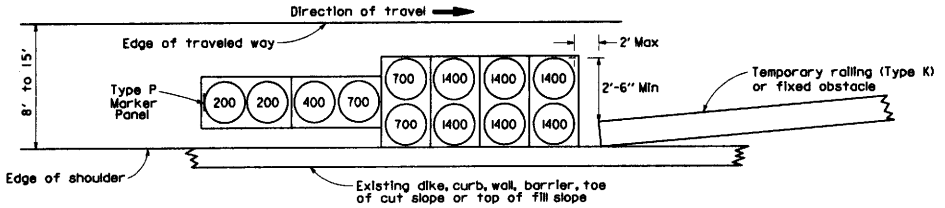
REGISTERED CIVIL ENGINEER

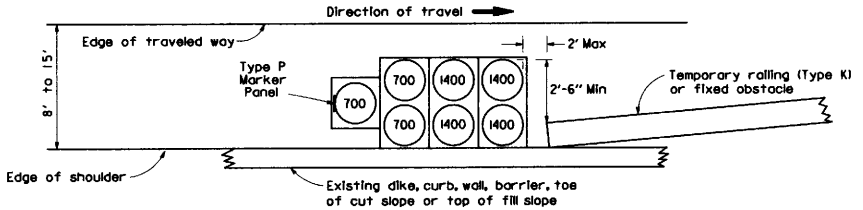
July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER J. E. Summers No. 29741 Exp. 3-31-95 CIVIL STATE OF CALIFORNIA



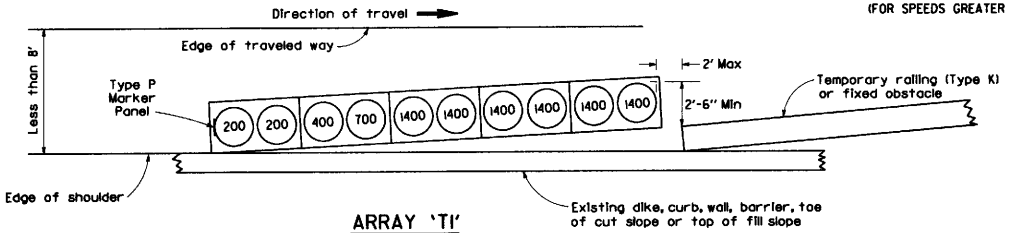
ARRAY 'TG'

(APPROACH SPEED 45 MPH OR GREATER)



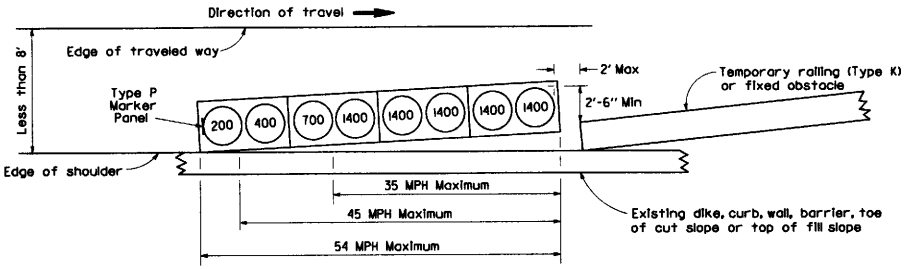
ARRAY 'TH'

(APPROACH SPEED 40 MPH OR LESS)
(FOR SPEEDS GREATER THAN 40 MPH USE ARRAY 'TG')



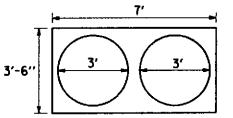
ARRAY 'TI'

(APPROACH SPEED 55 MPH OR GREATER)

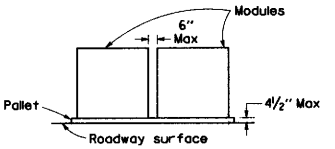


ARRAY 'TJ'

(APPROACH SPEED LESS THAN 55 MPH)



PLAN



ELEVATION

CRASH CUSHION PALLET DETAIL

NOTES

1. (XXX) indicates module location and weight of sand in pounds for each module.
2. All sand weights are nominal.
3. A single row of modules similar to those shown for array 'TI' and array 'TJ' shall be used only in locations where there will be traffic on one side of the temporary crash cushion array.
4. If the fixed obstacle or approach end of the temporary railing is less than 15 feet from the edge of traveled way, a temporary crash cushion is required.
5. Temporary crash cushion arrays shall not encroach on the traveled way.
6. Arrays for median shoulders shall conform to details shown on this plan for outside shoulders.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

TEMPORARY CRASH CUSHION SAND FILLED

NO SCALE

T2

STD. PLAN T2

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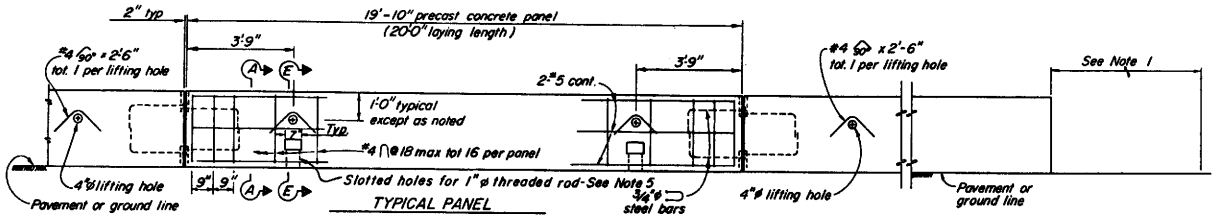
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

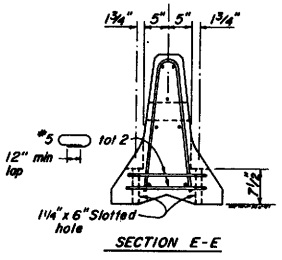
REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

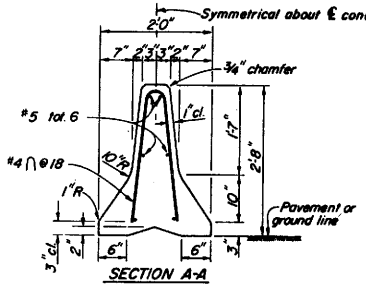
REGISTERED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA



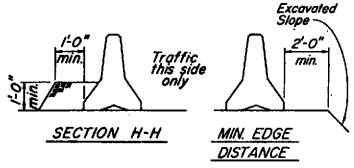
ELEVATION



SECTION E-E

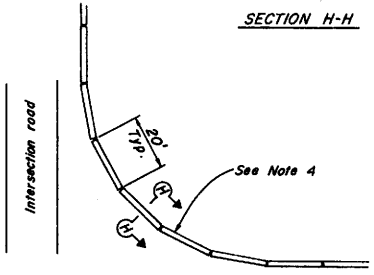


SECTION A-A



SECTION H-H

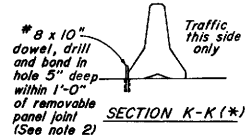
MIN. EDGE DISTANCE



CURVED LAYOUT

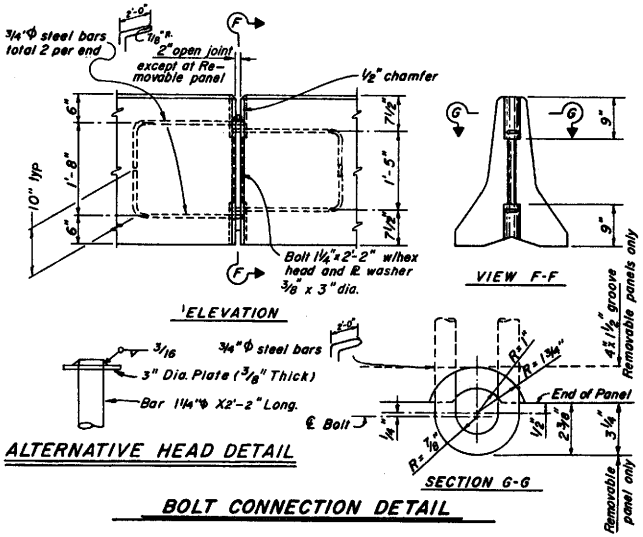
NOTES:

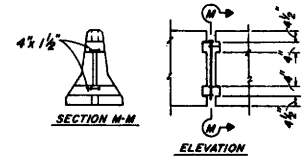
1. For end treatment, layout and crash cushions, where needed, see Project Plans or Special Provisions.
2. All 3 1/2" gaps at removable panels are to be backed at the base with # 8x10" dowel or 1"ø pin each side of joint. See Section K-K.
3. Alternative details for lifting the precast concrete panels of the Temporary Railing may be submitted by the Contractor for the Engineer's approval.
4. Where Temporary Railing (Type K) is placed on curves and radii that are too severe to connect panels with bolted joints, the railing is to be backed continuously with earth fill. See Section H-H.
5. Attach units to deck slabs when required by Bridge Plans.



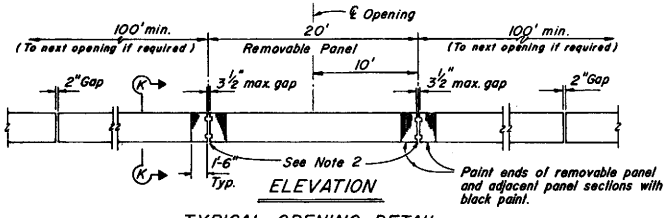
SECTION K-K (*)

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





REMOVABLE PANEL GROOVE DETAILS



TYPICAL OPENING DETAIL

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

TEMPORARY RAILING (TYPE K)

NO SCALE

T3

STD. PLAN T3

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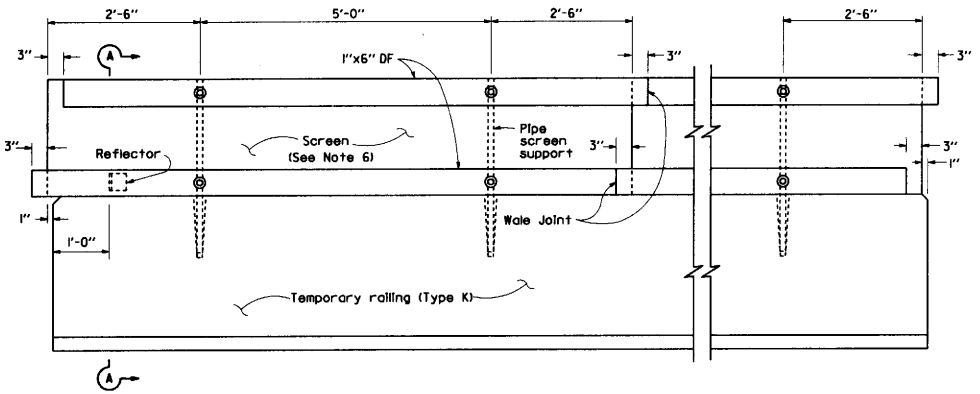
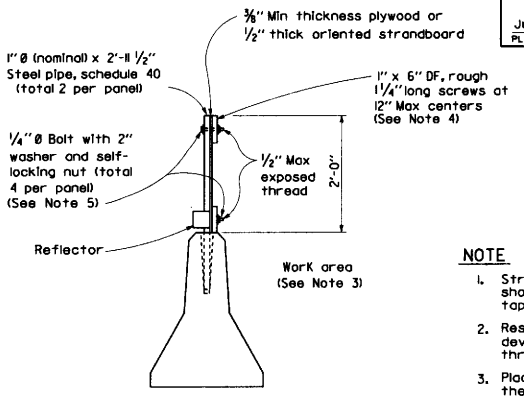
July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER P. Lowden Jr. No. 12284 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA



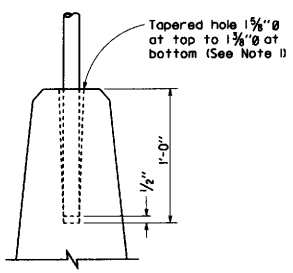
ELEVATION



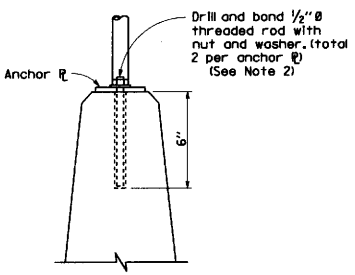
SECTION A-A

NOTE

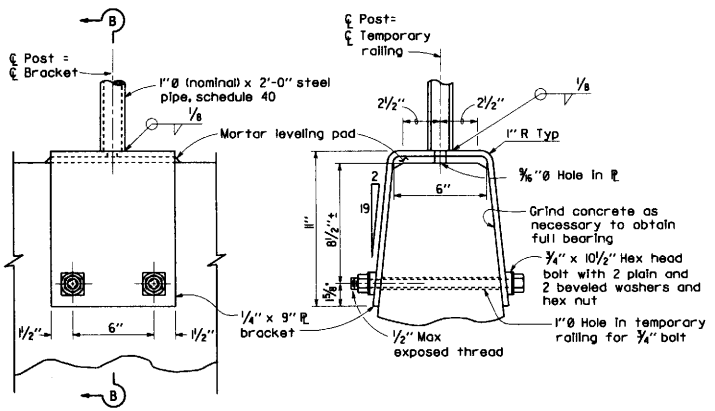
1. Straight holes 1 1/2" Ø of the depth shown may be used in lieu of the tapered holes.
2. Resin capsule-type anchorage devices may be substituted for threaded rods.
3. Place screen on work area side of the temporary railing where traffic will only be on one side of the temporary railing. Where traffic will be on both sides of the temporary railing, the screen may be placed on either side of the pipe support.
4. Clinched 8d box nails may be substituted for screws. The nails shall be clinched on the work area side of the screen where traffic will only be on one side of the temporary railing.
5. U-bolts may be substituted for 1/4" Ø bolts.
6. Three-foot openings in the screen shall be provided at 200-foot intervals.



SCREEN ANCHORAGE DETAIL



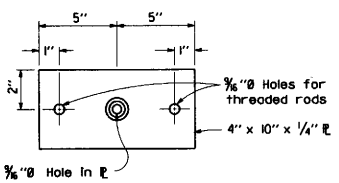
SCREEN ANCHORAGE DETAIL
ALTERNATIVE 'A'



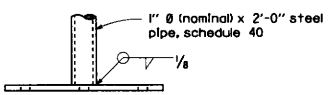
ELEVATION

SECTION B-B

SCREEN ANCHORAGE DETAIL
ALTERNATIVE 'B'



PLAN



ELEVATION

ANCHOR PLATE DETAIL
ALTERNATIVE 'A'

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

TEMPORARY TRAFFIC SCREEN

NO SCALE

T4

STD. PLAN T4

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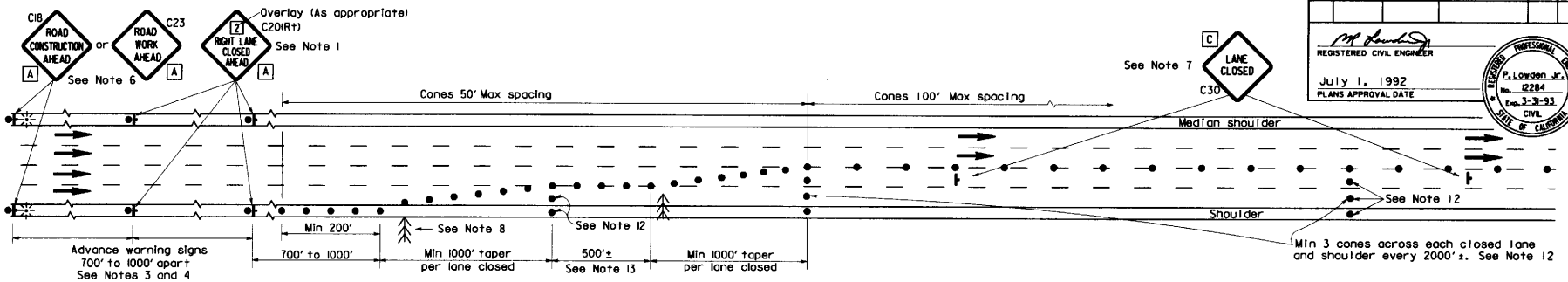
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

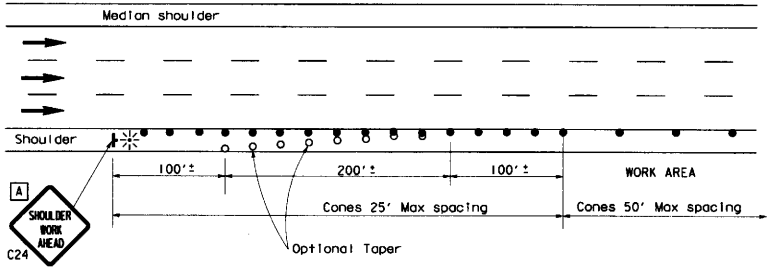
REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

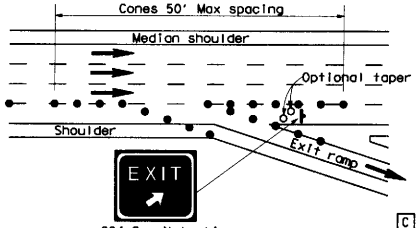
REGISTERED PROFESSIONAL ENGINEER P. Lowden Jr. No. 12284 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA



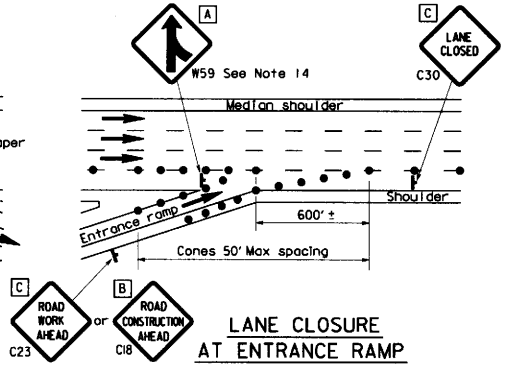
LANE CLOSURE



SHOULDER CLOSURE



LANE CLOSURE AT EXIT RAMP



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 day-time closures exceeding one mile in length, including taper.
3. Duplicate sign installations are not required:
   a) On opposite shoulder if at least one-half of the available lanes remain open to traffic.
   b) In the median if the width of the median shoulder is less than 8 feet and the outside lanes are to be closed.
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. Place a C30 sign every 2,000 feet throughout length of lane closure.
8. One flashing arrow sign for each lane closed. The first flashing arrow sign shall be Type I. All others may be either Type I or Type II.
9. 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.
10. All cones used for night lane closures shall be fitted with 13" reflective sleeves as specified in the specifications.
11. Portable delineators, placed at one-half the spacing indicated for traffic cones, may be used in lieu of cones for daytime closures only.
12. Unless otherwise specified in the special provisions, a minimum of 3 cones shall be placed transversely across each closed lane and shoulder at each location where a taper across a traffic lane ends and every 2000 feet as shown on the "Lane Closure" detail. Two Type II barricades may be used instead of the 3 cones. The transverse alignment of the cones or barricades on the closed shoulder may be shifted from the transverse alignment to provide access to the work.
13. Unless otherwise specified in the special provisions, the 500-foot section of the lane closure shown along lanelines shall be used between the 1000-foot lane closure tapers when two or more adjacent traffic lanes are to be closed.
14. Unless otherwise specified in the special provisions, the G84 and W59 signs shall be used as shown.

SIGN PANEL SIZE (Min)

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

LEGEND

- Traffic Cone
- Traffic Cone (optional taper)
- Portable Sign
- Flashing Arrow Sign
- Direction of Travel
- Portable Flashing Beacon

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

TRAFFIC CONTROL SYSTEM FOR LANE CLOSURE ON FREEWAYS AND EXPRESSWAYS

NO SCALE

T10

STD. PLAN T10

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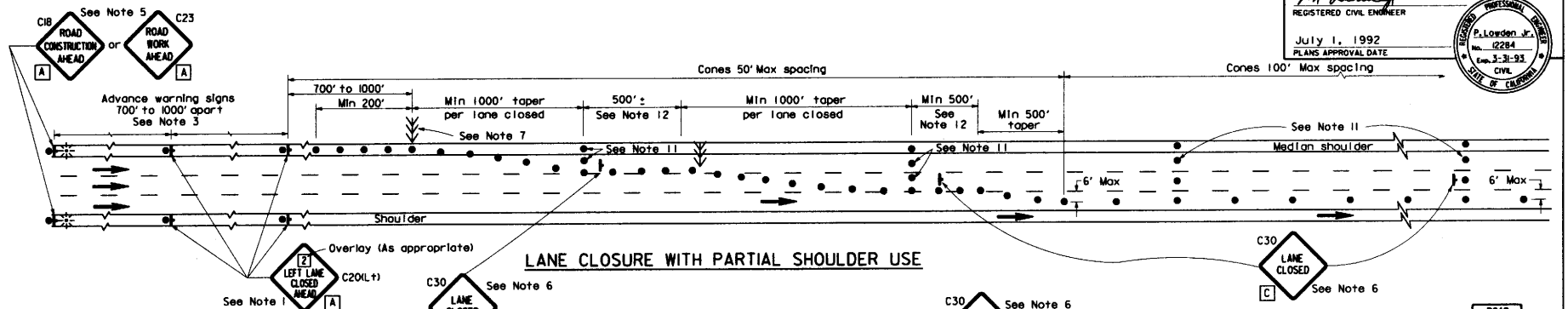
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER

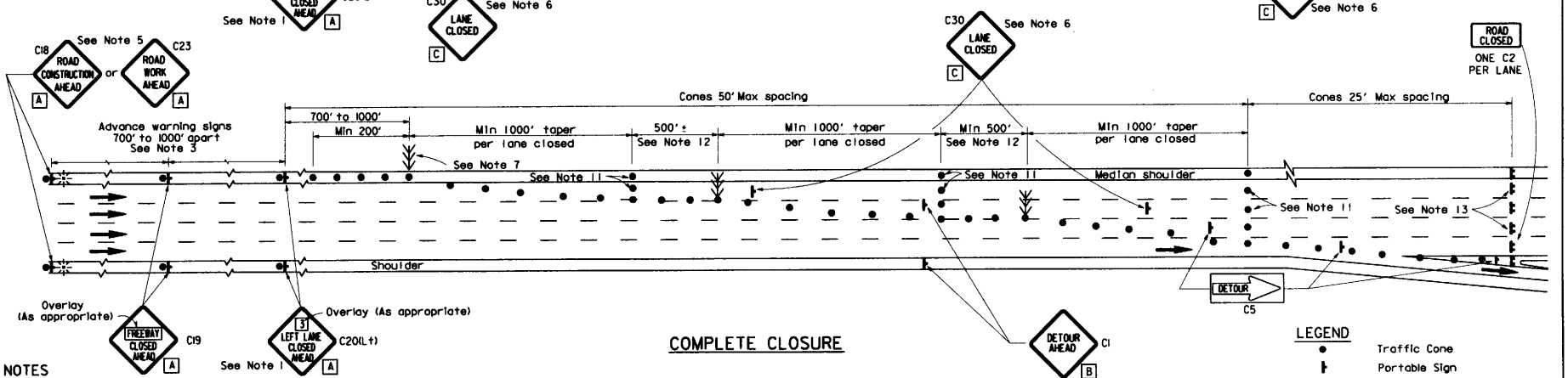
July 1, 1992

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER P. Lowden Jr. No. 12284 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA



LANE CLOSURE WITH PARTIAL SHOULDER USE



COMPLETE CLOSURE

NOTES

1. Lane closures on the right side using partial median shoulder as a traffic lane shall conform to the details for inside lane closure except that C20(Rt) signs shall be used.
2. Not less than one person shall be assigned to full time maintenance of traffic control devices on all complete closures, on all night lane closures, and daytime closures exceeding one mile in length, including taper.
3. All advance warning sign installations shall be equipped with flags for daytime closure. Flashing beacons shall be placed at the locations indicated during night lane 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. Place a C30 sign every 2,000 feet throughout length of lane closure.
7. One flashing arrow sign for each lane closed. The first flashing arrow sign shall be Type I. All others may be either Type I or Type II.
8. 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 the top of crest vertical curve or on a horizontal curve.
9. All cones used for night lane closures shall be fitted with 13" reflective sleeves as specified in the specifications.
10. Portable delineators, placed at one-half the spacing indicated for traffic cones, may be used in lieu of cones for daytime closures only.
11. Unless otherwise specified in the special provisions, a minimum of 3 cones shall be placed transversely across each closed lane and shoulder at each location where a taper across a traffic lane ends and every 2000 feet as shown on the "Lane Closure With Partial Shoulder Use" detail. Two Type II barricades may be used instead of the 3 cones. The transverse alignment of the cones or barricades on the closed shoulder may be shifted from the transverse alignment to provide access to the work.
12. Unless otherwise specified in the special provisions, the 500-foot section of the lane closure shown along lanelines shall be used between the 1000-foot lane closure tapers when two or more adjacent traffic lanes are to be closed.
13. A minimum of Two Type II barricades shall be placed across each closed lane and shoulder at the location shown and every 2000 feet within the complete closure area. Within the complete closure area, the transverse alignment of the barricades on the closed shoulder may be shifted from the transverse alignment to provide access to the work.

LEGEND

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

SIGN PANEL SIZE (Min)	
A	48"x48"
B	36"x36"
C	30"x30"

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

TRAFFIC CONTROL SYSTEM FOR LANE AND COMPLETE CLOSURES ON FREEWAYS AND EXPRESSWAYS

NO SCALE

T10A

STD PLAN. T10A

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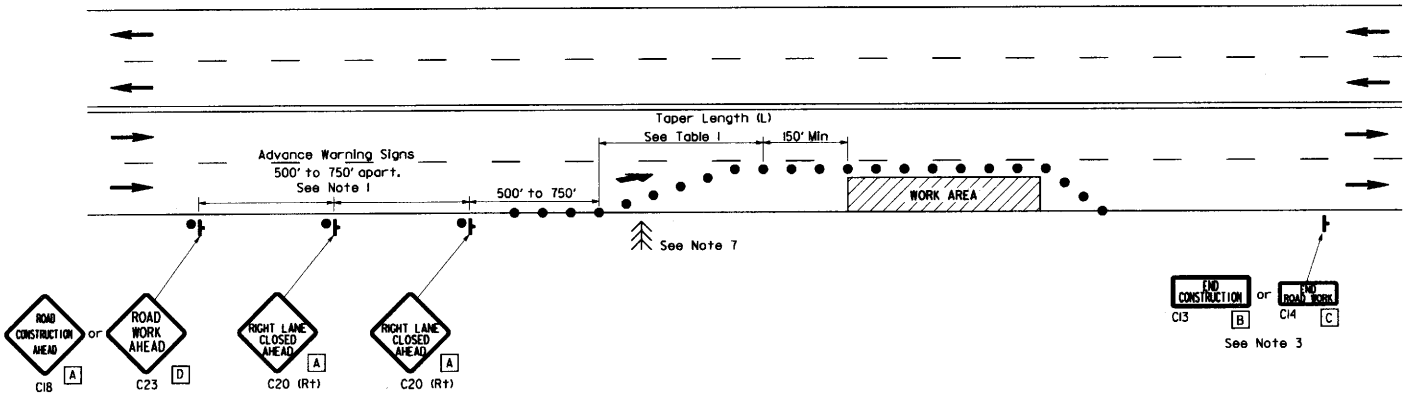
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
P. Lowden Jr.
No. 12284
Exp. 3-31-93
CIVIL
STATE OF CALIFORNIA

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
- Direction of Travel
- Flashing Arrow Sign

NOTES

1. Where approach speeds are low, signs may be placed at 300 foot spacing, and in urban areas, closer.
2. All advance warning sign installations shall be equipped with flags for daytime closures.
3. 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.
4. 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.
5. All cones used for night lane closures shall be illuminated traffic cones or fitted with 13" reflective sleeves as specified in the specifications.
6. Portable delineators, placed at one-half the spacing indicated for traffic cones, may be used in lieu of cones for daytime closures only.
7. Flashing arrow sign shall be either Type I or Type II.
8. The maximum spacing between cones in a taper shall be approximately as shown in Table I and 50 foot maximum spacing on tangent.
9. 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 I

Approach Speed (MPH)	* 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 9		

* 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

NO SCALE

T11

STD. PLAN T11

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

REGISTERED CIVIL ENGINEER

July 1, 1992
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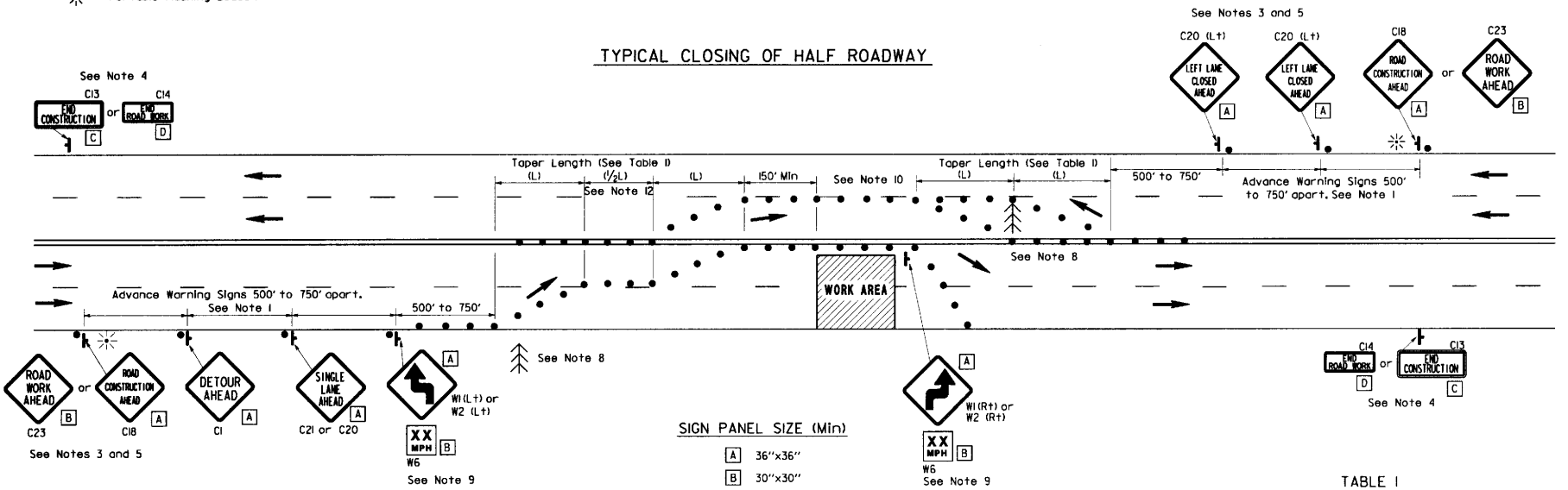
REGISTERED PROFESSIONAL ENGINEER
P. Lowden Jr.
No. 12284
Exp. 3-31-93
CIVIL
STATE OF CALIFORNIA

LEGEND

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

TYPICAL CLOSING OF HALF ROADWAY



SIGN PANEL SIZE (Min)

A	36"x36"
B	30"x30"
D	36"x18"
C	48"x18"

TABLE I

Approach Speed (MPH)	* 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 11		

* Based on 12 foot wide lane. This column is also appropriate for lane widths less than 12 feet.

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 sign installations shall be equipped with flags for daytime closures. Flashing beacons shall be placed at the locations indicated during night lane 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, 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 fitted with 13 inch reflective sleeves as specified in the specifications.
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 signs shall be either Type I or Type II.
9. Advisory speed will be determined by the Engineer. The W6 Sign will not be required when advisory speed is more than the posted or maximum speed limit.
10. The maximum spacing between cones within a taper shall be approximately as shown in Table I and the maximum spacing on tangent shall be 50 feet.
11. 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.
12. Unless otherwise specified in the special provisions, the (½L) shown between the two (L) lane closure tapers shall be used.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

TRAFFIC CONTROL SYSTEM FOR LANE CLOSURE ON MULTILANE CONVENTIONAL HIGHWAYS

NO SCALE

T12

STD. PLAN T12

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

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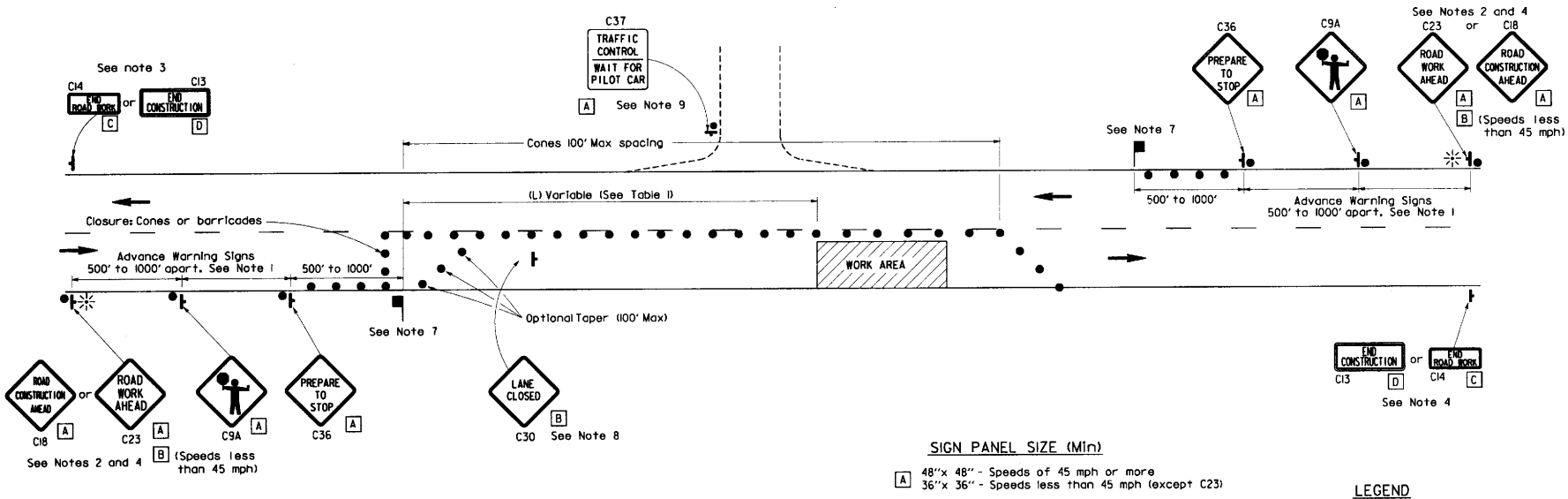
July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
P. Lowden Jr.
No. 12284
Exp. 3-31-93
CIVIL
STATE OF CALIFORNIA

TYPICAL LANE CLOSURE WITH REVERSIBLE CONTROL



NOTES

1. Where approach speeds are low, signs may be placed at 300 foot spacing, and in urban areas, closer.
2. 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.
3. A 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.
4. 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.
5. All cones used for night lane closures shall be illuminated traffic cones or fitted with 13" reflective sleeves as specified in the specifications.
6. Portable delineators, placed at one-half the spacing indicated for traffic cones, may be used in lieu of cones for daytime closures only.
7. Additional advance flaggers may be required. Flagger station for work at night shall be illuminated as noted in Section 5-07 of the current edition of the "Manual of Traffic Controls" published by the State of California, Department of Transportation.
8. Place C30 "LANE CLOSED" sign at 500'-1000' intervals throughout extended work areas. They are optional if the work area visible from the flagger station.
9. When a pilot car is used, place a C37 "TRAFFIC CONTROL-WAIT FOR PILOT CAR" sign.

SIGN PANEL SIZE (Min)

A 48"x 48" - Speeds of 45 mph or more
36"x 36" - Speeds less than 45 mph (except C23)

B 30"x 30"

C 36"x 18"

D 48"x 18"

TABLE I

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

* Increase by 20 percent on sustained downgrades steeper than 3 percent and longer than 1 mile.

LEGEND

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

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

TRAFFIC CONTROL SYSTEM FOR LANE CLOSURE ON TWO LANE CONVENTIONAL HIGHWAYS

NO SCALE

T13

STD. PLAN T13

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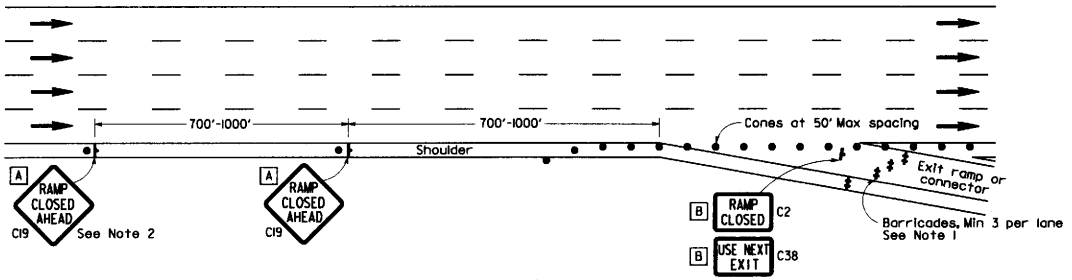
REGISTERED CIVIL ENGINEER

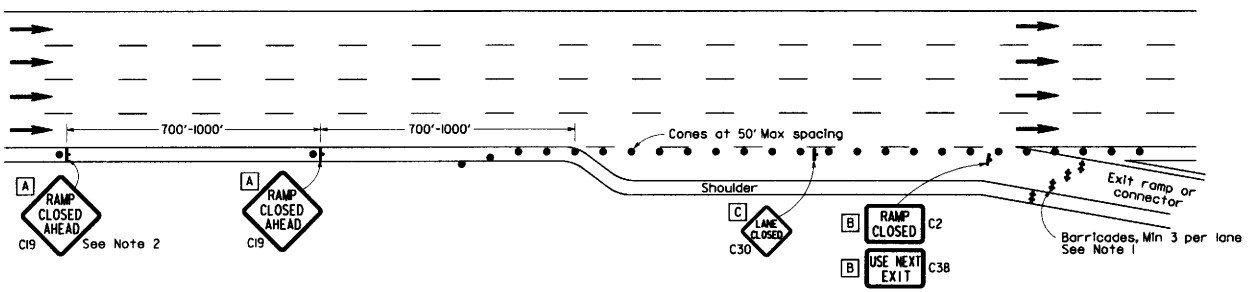
July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
P. Lowden Jr.
No. 12284
Exp. 3-31-93
CIVIL
STATE OF CALIFORNIA

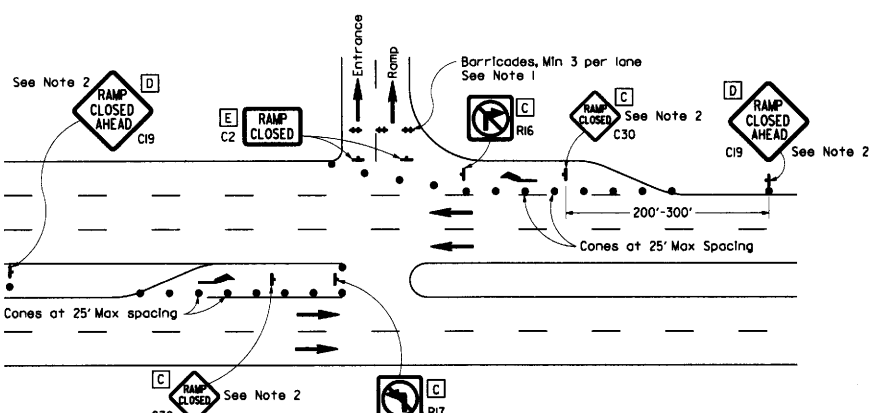
TYPICAL RAMP CLOSURES



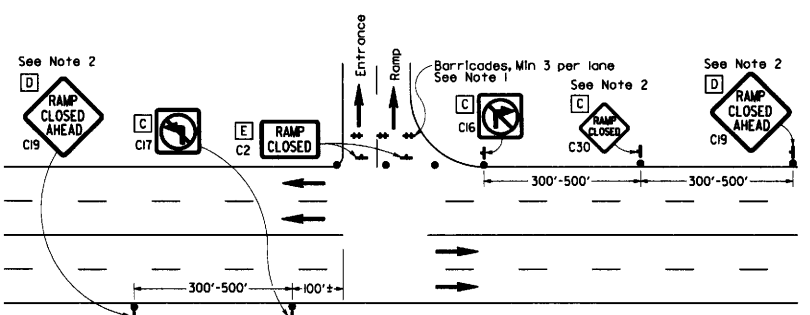
EXIT RAMP OR CONNECTOR



EXIT RAMP OR CONNECTOR WITH ADDITIONAL LANE



ENTRANCE RAMP WITH TURNING POCKETS



ENTRANCE RAMP WITHOUT TURNING POCKETS

NOTES

1. Barricades shall be Type I, II, or III for closures lasting one week or less and 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.
4. All cones used for night lane closures shall be illuminated traffic cones or fitted with 13" reflective sleeves as specified in the specifications.
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	SIGN PANEL SIZE (Min)
● Cone	A 48"x 48"
⊢ Sign	B 48"x 30"
‡ Barricades	C 30"x 30"
← Direction of Travel	D 36"x 36"
↙ Turn Arrow	E 36"x 24"

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TRAFFIC CONTROL SYSTEM FOR RAMP CLOSURES

NO SCALE

T14

STD. PLAN T14

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July 1, 1992
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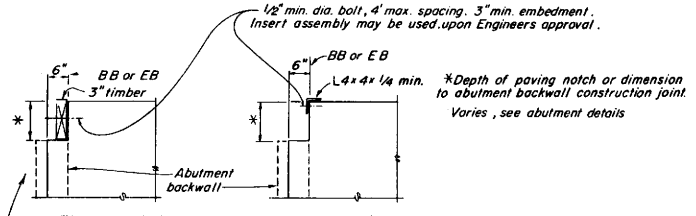
REGISTERED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA

BRIDGE PLAN ABBREVIATIONS

See Standard Plan AIOA For Additional Abbreviations

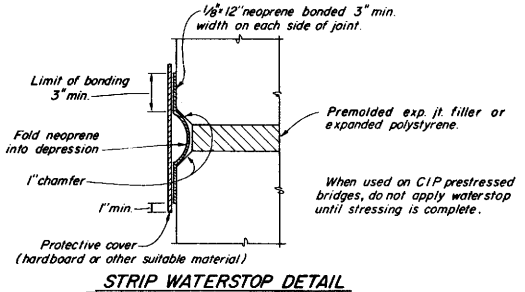
Brg	Bearing
CG	Center of Gravity
CIP	Cast-in-Place
Cont	Continuous
FS	Far side
IF	Inside face
NS	Near side
OF	Outside face
J	Outer, outer left bridge
K	Outer left bridge
S	Outer right bridge
T	Outer, outer right bridge
T&B	Top and Bottom



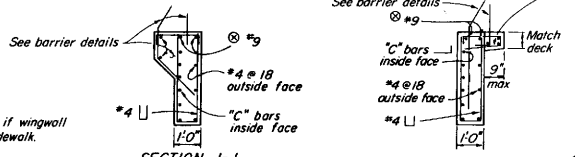
ALTERNATIVE 1 ALTERNATIVE 2

TEMPORARY BUMPERS
BRIDGE DETAIL 1-2

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.



STRIP WATERSTOP DETAIL
BRIDGE DETAIL 1-3

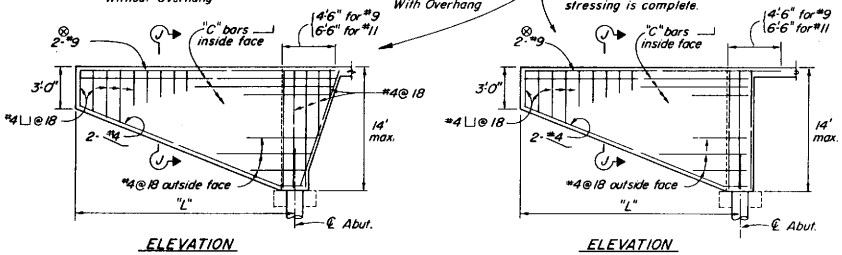


⊗ Use #11 bars if wingwall supports a sidewalk.

SECTION J-J Without Overhang

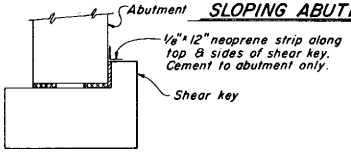
SECTION J-J With Overhang

On CIP prestressed bridges, do not place wingwall until stressing is complete.



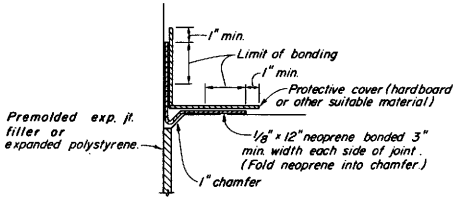
ELEVATION SLOPING ABUTMENT

ELEVATION VERTICAL ABUTMENT



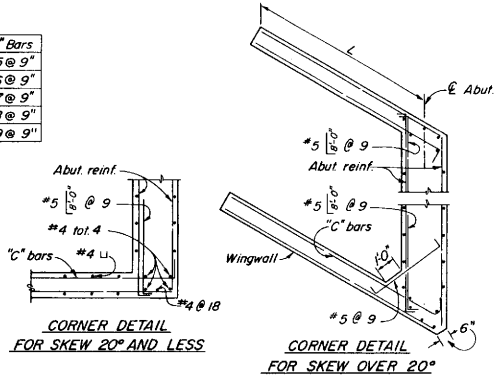
SHEAR KEY JOINT PROTECTION
BRIDGE DETAIL 1-6

"L"	"C" Bars
12'	#5 @ 9"
14'	#6 @ 9"
16'	#7 @ 9"
18'	#8 @ 9"
20'	#9 @ 9"



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

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

BRIDGE DETAILS

NO SCALE

B0-1

STD. PLAN B0-1

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No. 13332
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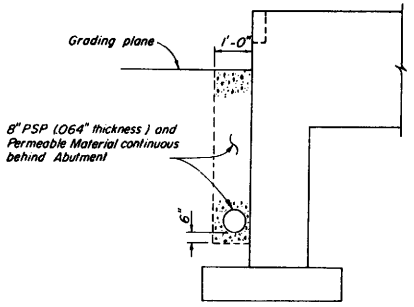
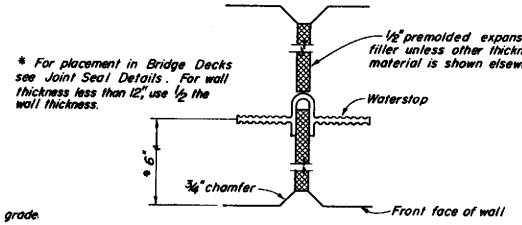
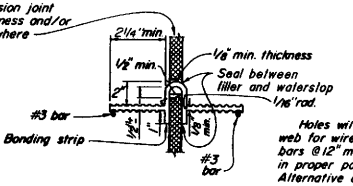


8" PSP AND PERMEABLE MATERIAL
BRIDGE DETAIL 3-5



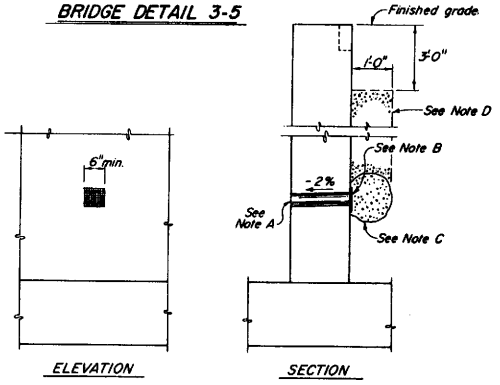
WALL EXPANSION JOINT
BRIDGE DETAIL 3-4

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.

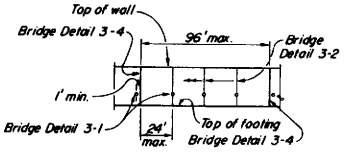


Holes will be permitted in the outer 1/2" of the web for wire, rings, etc.. Tie web to #3 reinforcing bars @ 12" max. intervals to support the waterstop in proper position during concrete placement. Alternative detail may be submitted for approval of the Engineer.

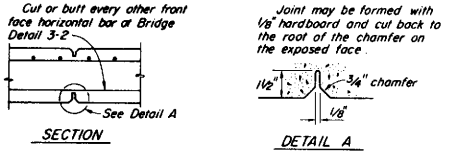
WATERSTOP
BRIDGE DETAIL 3-6



WEEP HOLE AND PERVIOUS BACKFILL
BRIDGE DETAIL 3-1



WALL EXPANSION JOINTS
AND WEAKENED PLANES
BRIDGE DETAIL 3-3



WEAKENED PLANES
BRIDGE DETAIL 3-2

Notes :

A. 4"ø 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" plastic pipe under the sidewalk to discharge thru curb face. Exposed wall drains shall be located 3" ± above finished grade.

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.

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BRIDGE DETAILS

NO SCALE

BO-3

STD. PLAN BO-3

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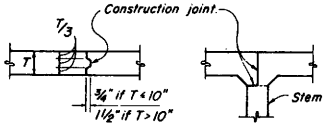
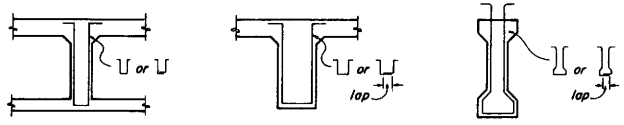


BRIDGE DETAIL 5-2 — TOP OR BOTTOM SLAB

BRIDGE DETAIL 5-3

DECK CONSTRUCTION JOINTS



REINFORCED BOX GIRDER — Girder or diaphragm.

T-BEAM — Girder, bent cap or diaphragm.

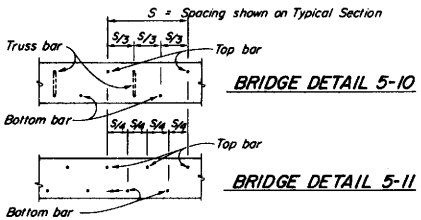
PRECAST GIRDER

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

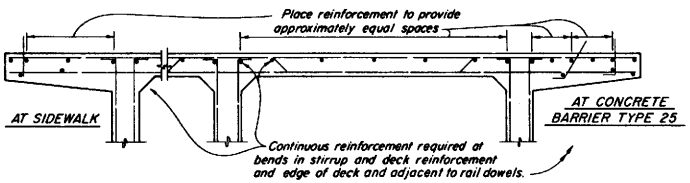
BRIDGE DETAIL 5-5



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.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

BRIDGE DETAILS

NO SCALE

BO-5

STD. PLAN BO-5

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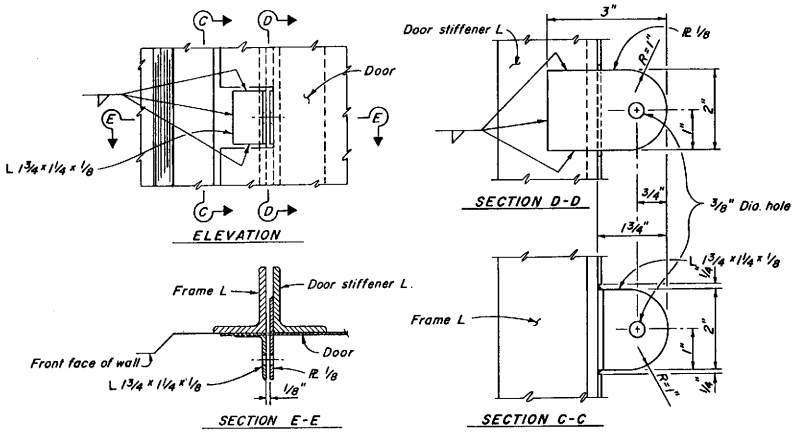
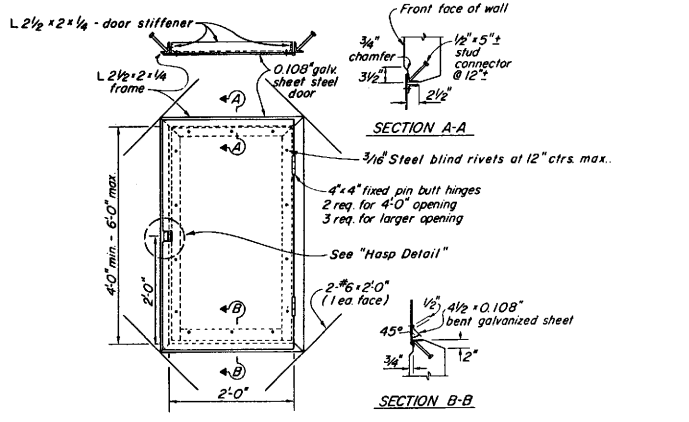


HASP DETAIL

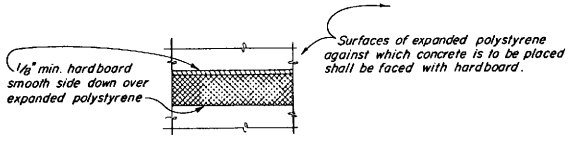


ACCESS DOOR

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

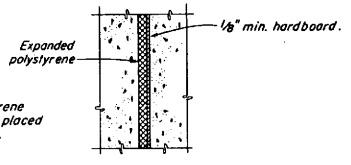
Attach door stiffener angles and bent sheet to steel door with blind rivets.

BRIDGE DETAIL 13-3



PROTECTION OF HORIZONTAL POLYSTYRENE

BRIDGE DETAIL 13-1



PROTECTION OF VERTICAL POLYSTYRENE

BRIDGE DETAIL 13-2

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

BRIDGE DETAILS

NO SCALE

BO-13

STD. PLAN BO-13

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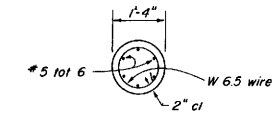
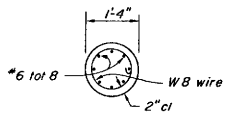
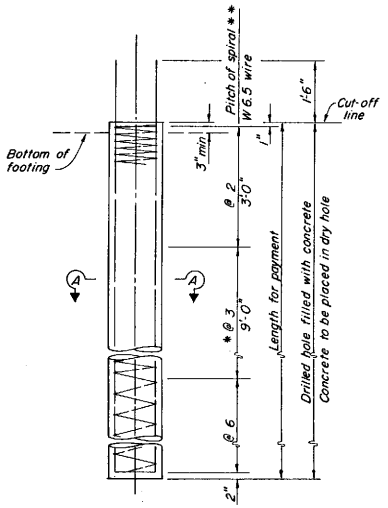


SECTION A-A
3/4" = 1'-0"

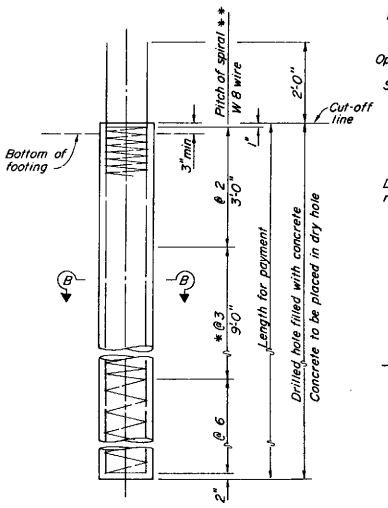


SECTION B-B
3/4" = 1'-0"



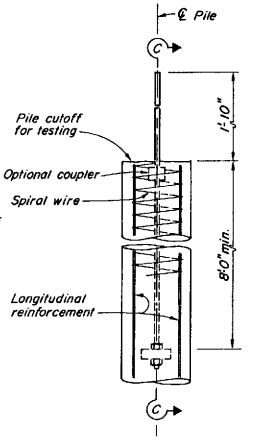
ELEVATION

45 & 70 TON DESIGN LOAD
3/4" = 1'-0"

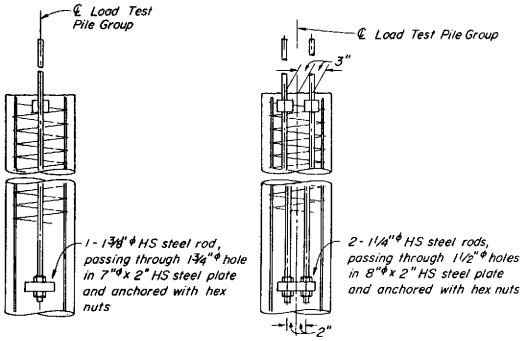


ELEVATION

100 TON DESIGN LOAD
3/4" = 1'-0"



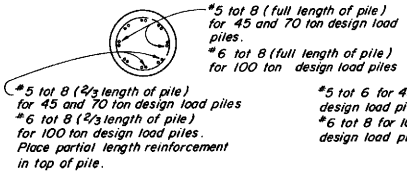
ANCHOR PILE CONNECTION



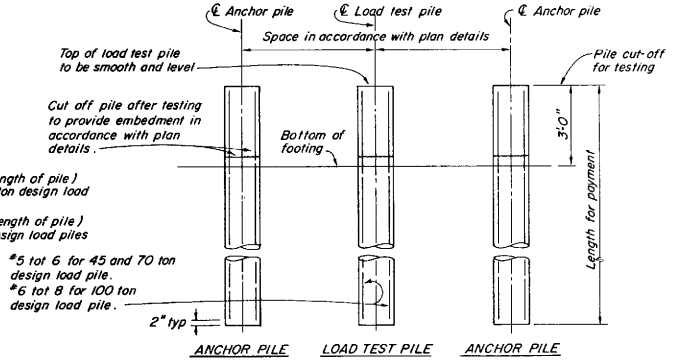
45 TON and 70 TON DESIGN LOAD

100 TON DESIGN LOAD

SECTION C-C



ANCHOR PILE



LOAD TEST PILE GROUP

* @ 2 at option of contractor

** Extend at 2" pitch to top of anchor piles and load test piles. For longitudinal reinforcement for anchor piles and load test piles, see "Load Test Pile Group" detail.

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" tail hooked around a longitudinal bar.

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

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16" CAST-IN-DRILLED-HOLE CONCRETE PILE

NO SCALE

B2-3

STD. PLAN B2-3

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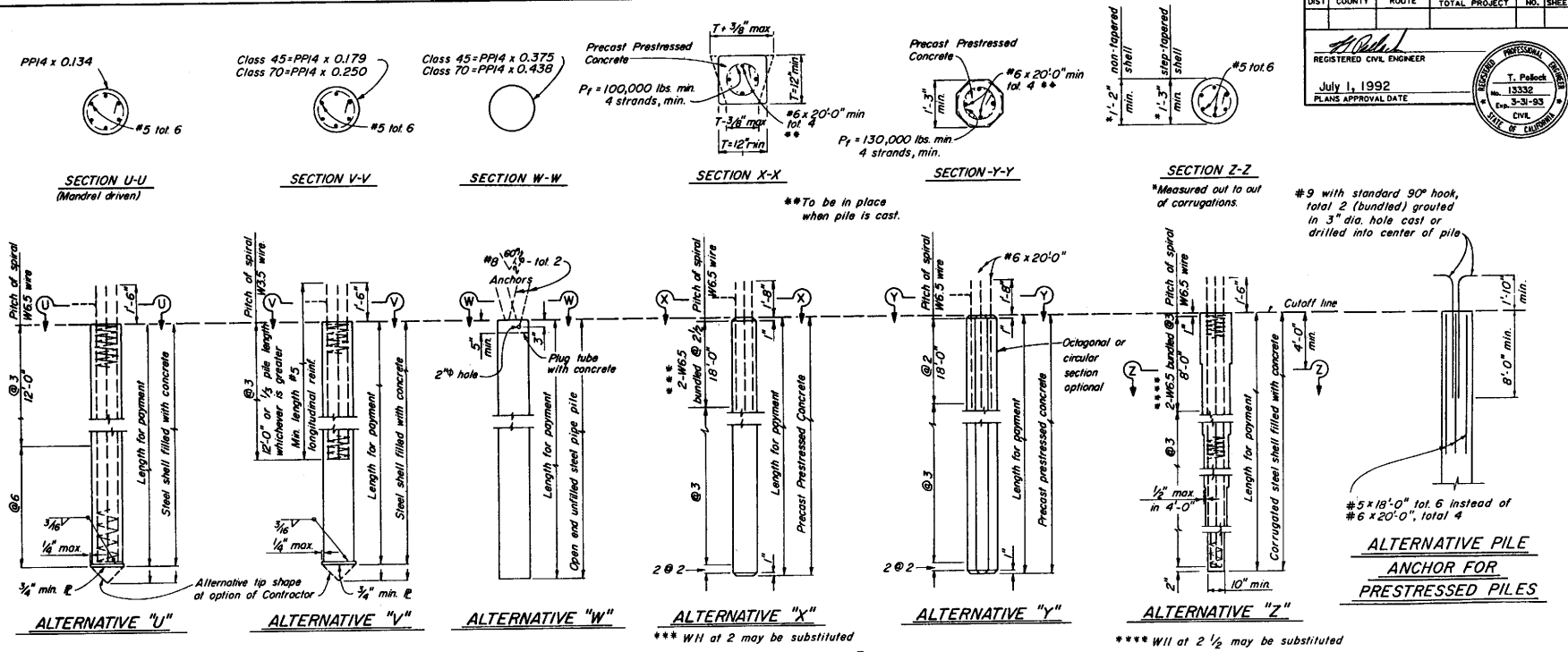


PRECAST PRESTRESSED PILES:

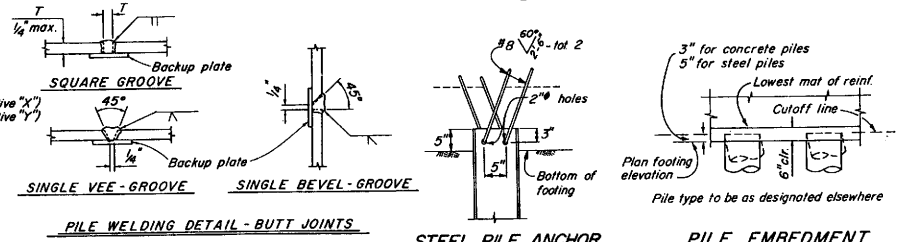
P_f = Prestressing Force (after losses)

If section used is larger than the min. section shown, then "P_f" shall provide 700 psi min.

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

Notes:

1. Details are the same for both Class 45 and Class 70 piles unless noted otherwise.
2. A 10" minimum diameter pipe extention (thickness = 0.179" minimum for Class 45 and 0.250" minimum for Class 70) may be used at the tip of Alternative "Z" when taper is 30' or more in length.
3. For steel shells and pipe piles (PP) shown, the Contractor has the option of substituting piles with equivalent cross section, wall thickness and section modulus.
4. Pile reinforcement and steel pile anchor 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.
5. 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.
6. 2" clearance to spiral reinforcement shall be maintained if section used is larger than the minimum section shown.
7. Maximum cut-off length at the top of the Alternative "X" and Alternative "Y" Piles is 10'-0".

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PILE DETAILS
CLASS 45 AND CLASS 70

NO SCALE

B2-5

STD. PLAN B2-5

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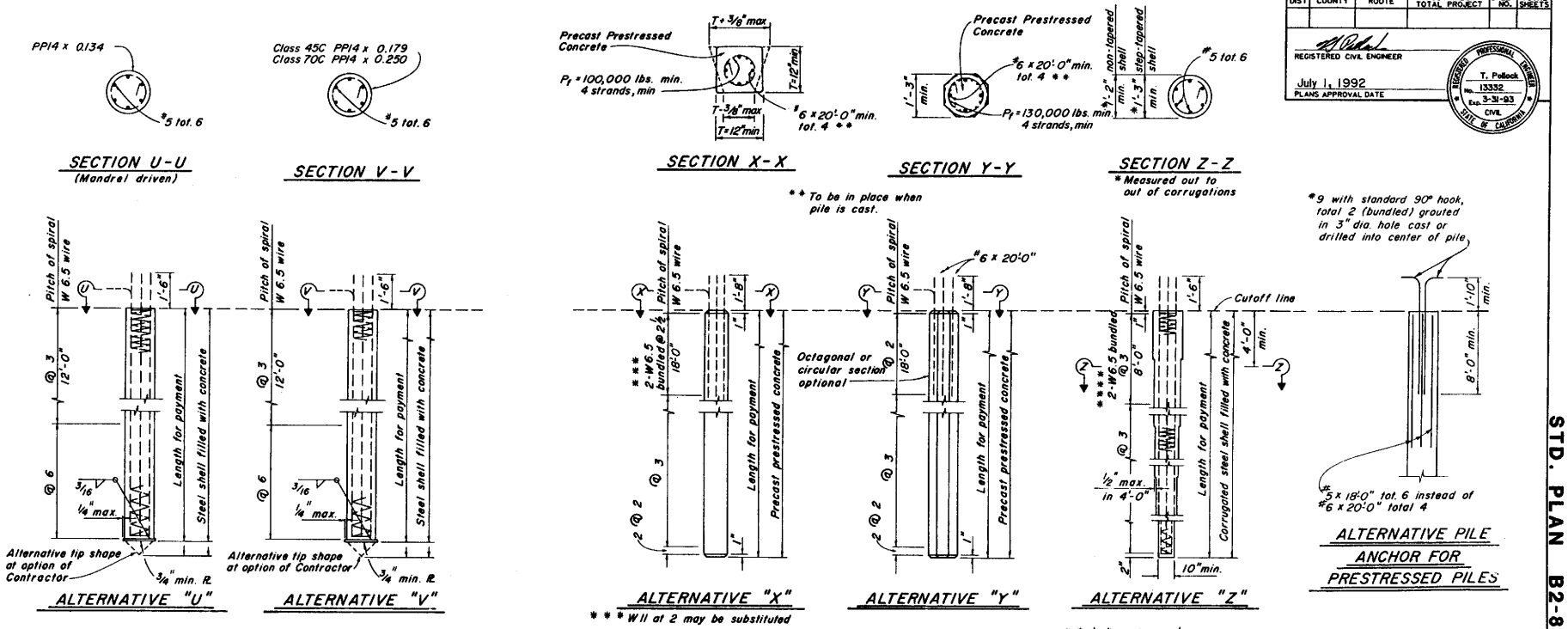
REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA



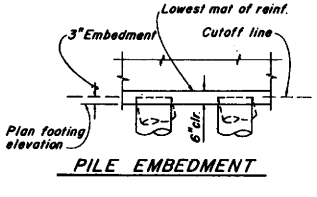
PRECAST PRESTRESSED PILES:

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

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 45C = 45 tons
Class 70C = 70 tons



PILE EMBEDMENT

NOTES:

1. Details are the same for both Class 45C and Class 70C piles unless noted otherwise.
2. A 10" minimum diameter pipe extension (thickness =0.179" minimum for Class 45C and 0.250" minimum for Class 70C) may be used at the tip of Alternative "Z" when taper is 30' or more in length.
3. Pile reinforcement extending into 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.
4. 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.
5. For steel shells (PP) shown, the Contractor has the option of substituting piles with equivalent cross section, wall thickness and section modulus.
6. All concrete in piles shall contain not less than 752 pounds of cement per cubic yard.
7. 2" clearance to spiral reinforcement shall be maintained if section used is larger than the minimum section shown.
8. Maximum cut-off length at the top of the Alternative "X" and Alternative "Y" piles is 10'-0".

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PILE DETAILS
CLASS 45C AND CLASS 70C

NO SCALE

B2-8

STD. PLAN B2-8

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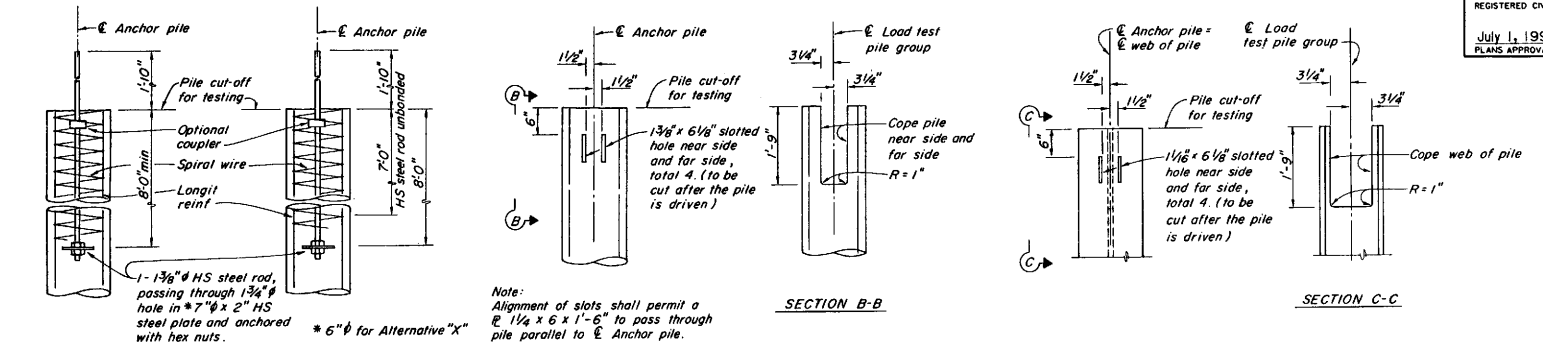


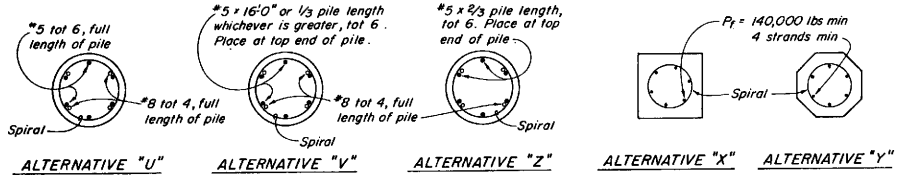
ALTERNATIVE "U"
ALTERNATIVE "V"
and
ALTERNATIVE "Z"

ALTERNATIVE "X"
and
ALTERNATIVE "Y"

ALTERNATIVE "W"

STEEL PILE

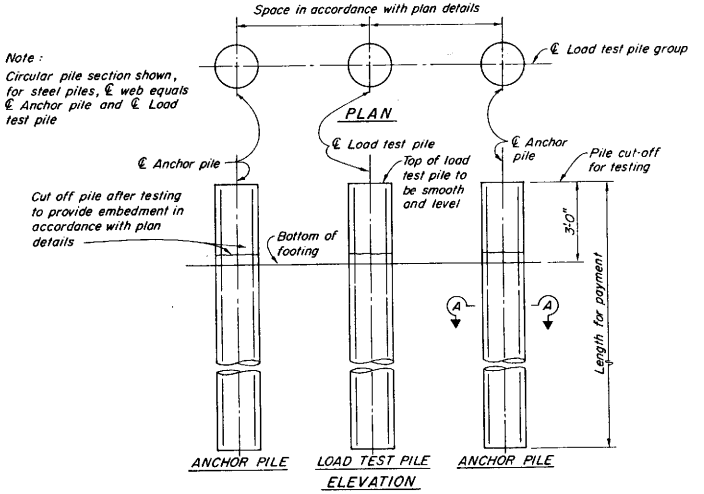
ANCHOR PILE CONNECTION



ALTERNATIVE "U" ALTERNATIVE "V" ALTERNATIVE "Z" ALTERNATIVE "X" ALTERNATIVE "Y"

SECTION A-A
ANCHOR PILE

NOTE: HS steel rod not shown.
After completion of test, #8 longitudinal pile reinforcement may be cut-off at the level of final pile cut-off.



LOAD TEST PILE GROUP

NOTES:

1. Details not shown shall be the same as shown on Pile Details - Class 45, Class 45C, Class 70, and Class 70C of the Standard Plans.
2. The spiral reinforcement for the Alternative "U", Alternative "V", and Alternative "Z" above the final cut-off shall be of the same size and placed at the same pitch as detailed for the top of the pile on the Pile Details - Class 45, Class 45C, Class 70, and Class 70C of the Standard Plans.
3. The Load Test Pile shall be as detailed on Pile Details - Class 45, Class 45C, Class 70 and Class 70C of the Standard Plans, except that placement of longitudinal reinforcement and spirals shall start at level of pile cut-off for testing.
4. Maximum permissible tensile force per anchor pile equals 175 kips.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

LOAD TEST ANCHOR PILE DETAILS

NO SCALE

B2-9

STD. PLAN B2-9

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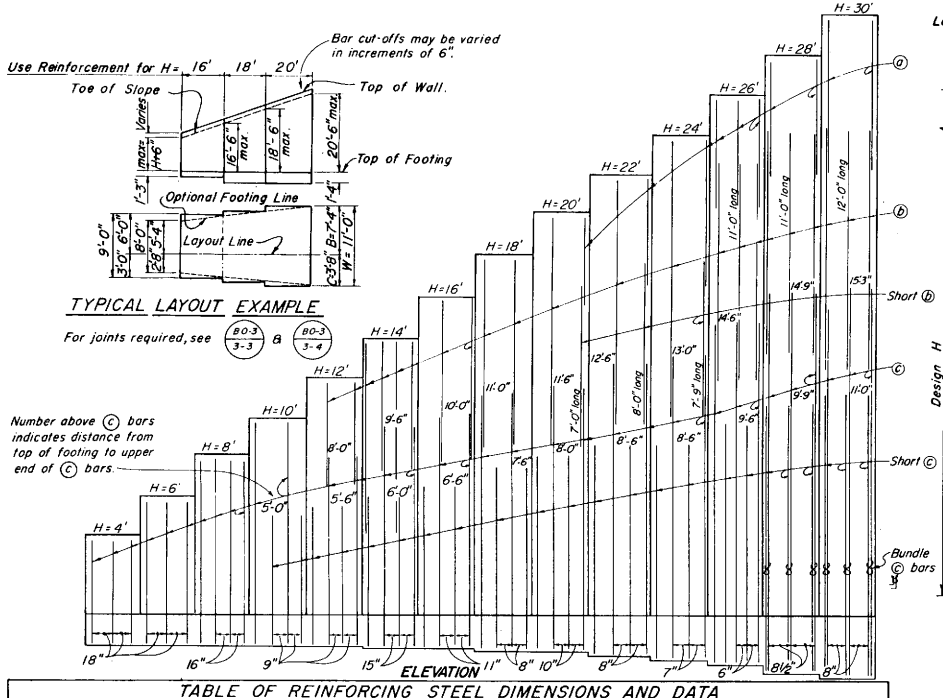

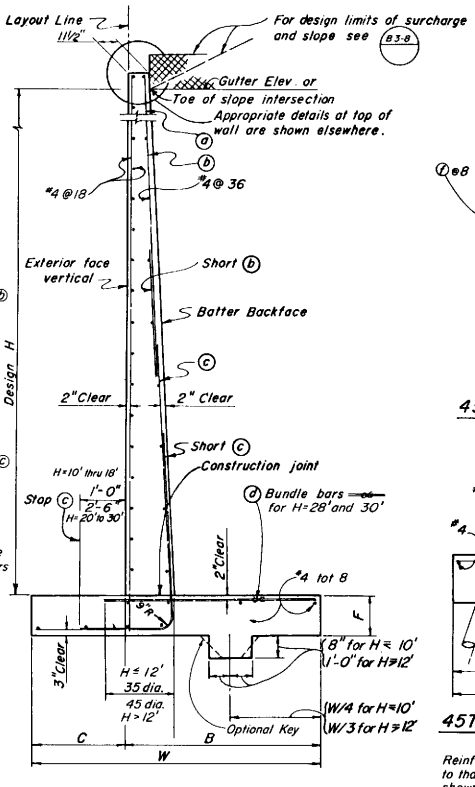

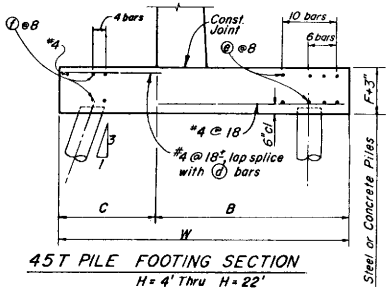

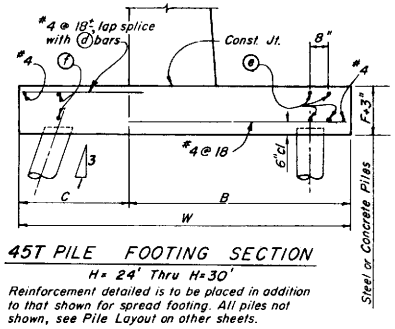

Reinforcement detailed is to be placed in addition to that shown for spread footing. All piles not shown, see Pile Layout on other sheets.

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 (e)	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 (f)	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

℣ Denotes a bundle of 2 bars

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'.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

RETAINING WALL TYPE 1 H = 4'-30'

NO SCALE

B3-1

STD. PLAN B3-1

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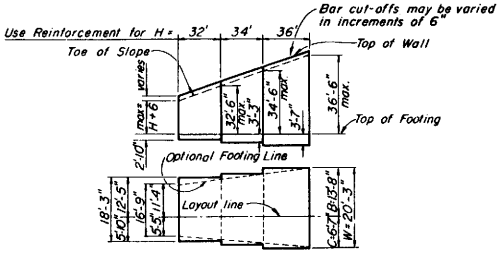
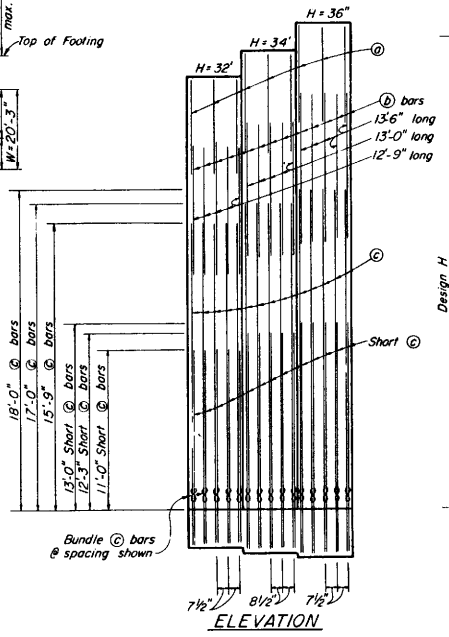
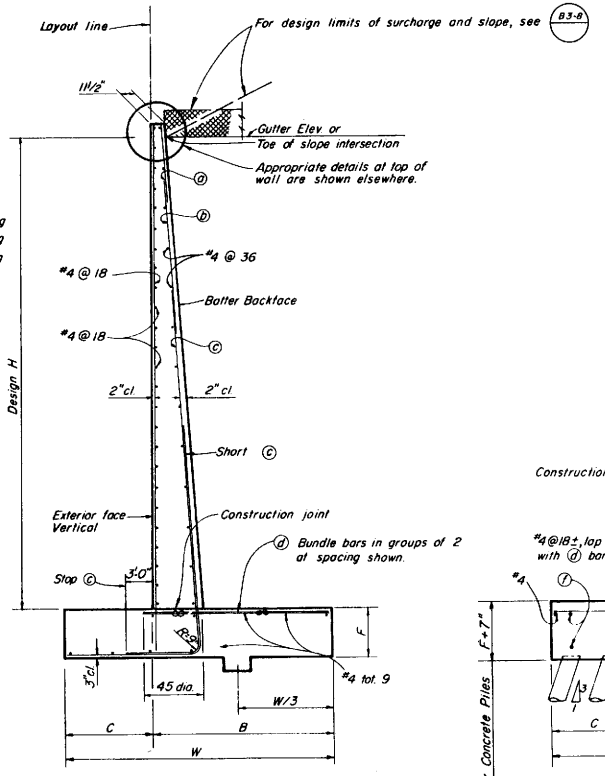


TYPICAL LAYOUT EXAMPLE

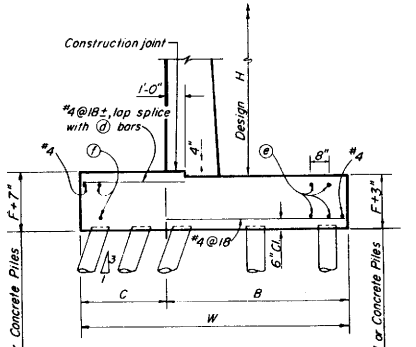
For joints required, see B0-3 3-3 & B0-3 3-4



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. cf/ft	129.4	147.8	165.7
Pile Footing	Steel lbs/ft	590.3	694.3	779.0
	Conc. cf/ft	134.2	153.0	171.3

¥ Denotes a bundle of 2 bars.

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.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

RETAINING WALL TYPE 1 H = 32'-36'

NO SCALE

B3-2

STD. PLAN B3-2

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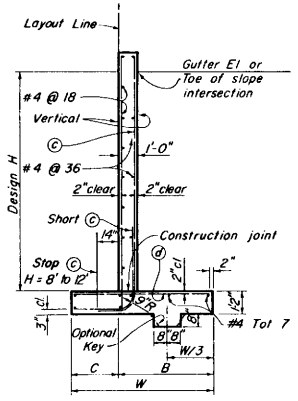
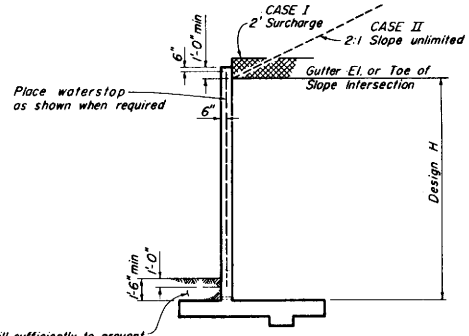


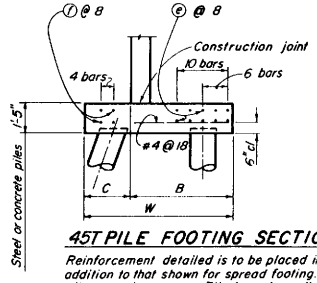
SPREAD FOOTING SECTION

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



DESIGN

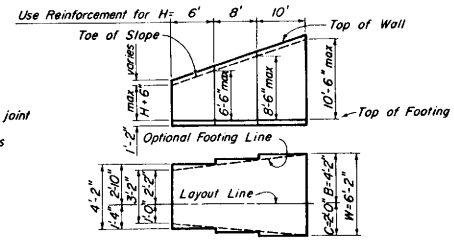
For drainage notes and other details, see B3-8



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".

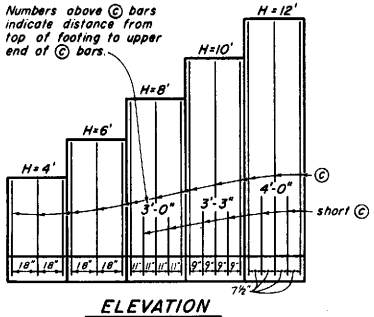
TYPICAL LAYOUT EXAMPLE

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

f_c = 1300 psi f'_c = 3250 psi f_s = 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'.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

RETAINING WALL TYPE 1A

NO SCALE

B3-3

STD. PLAN B3-3

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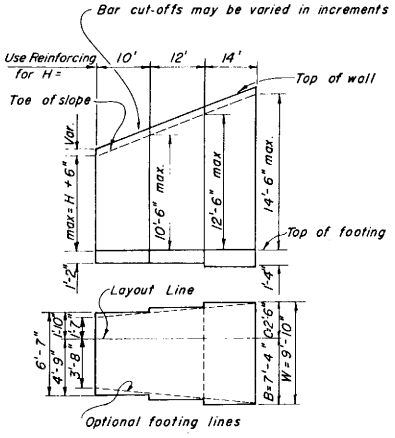
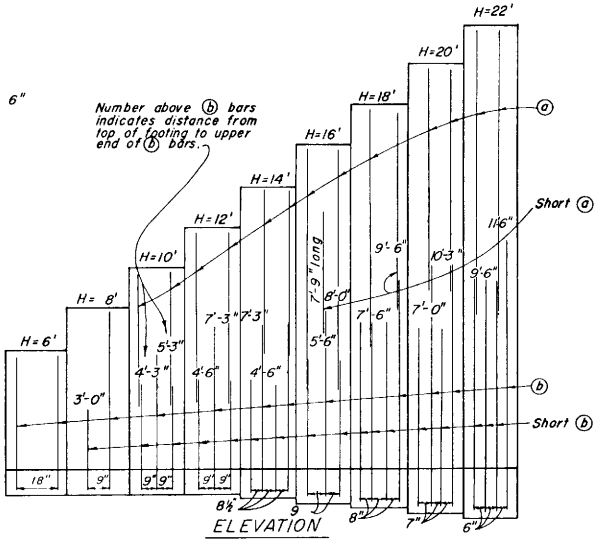


TYPICAL LAYOUT EXAMPLE



ELEVATION

For joints required, see (BO-3 3-3) & (BO-3 3-4)

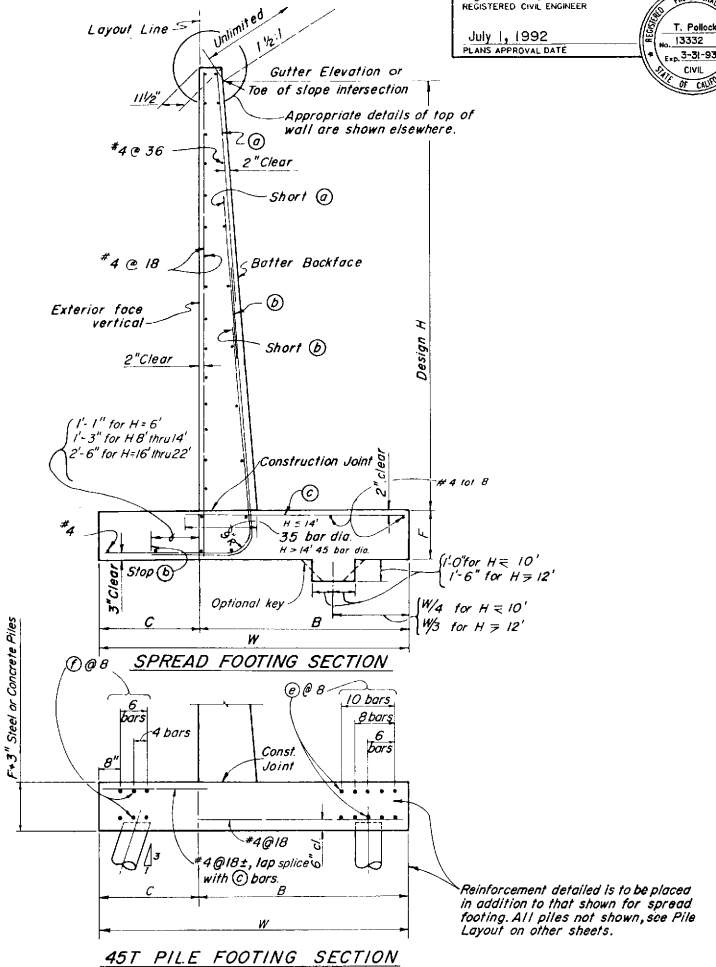
TABLE OF REINFORCING STEEL DIMENSIONS AND DATA

	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	⅜:12	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. (a) 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. cf./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. cf./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

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

RETAINING WALL TYPE 2

NO SCALE

B3-4

STD. PLAN B3-4

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

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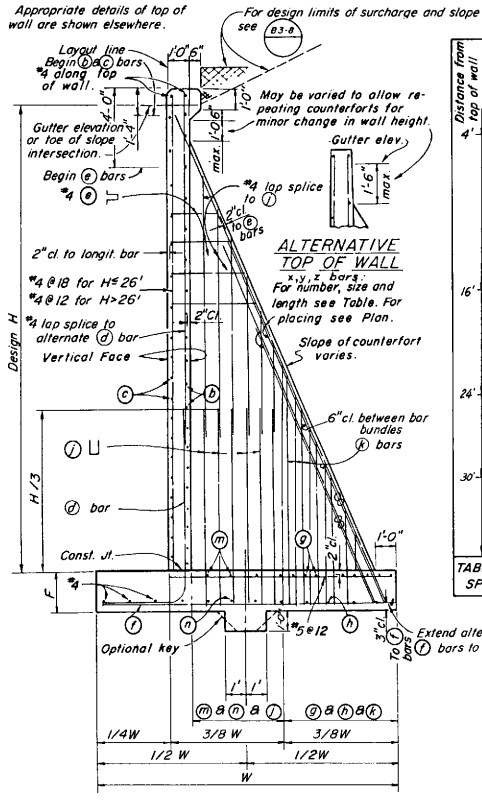
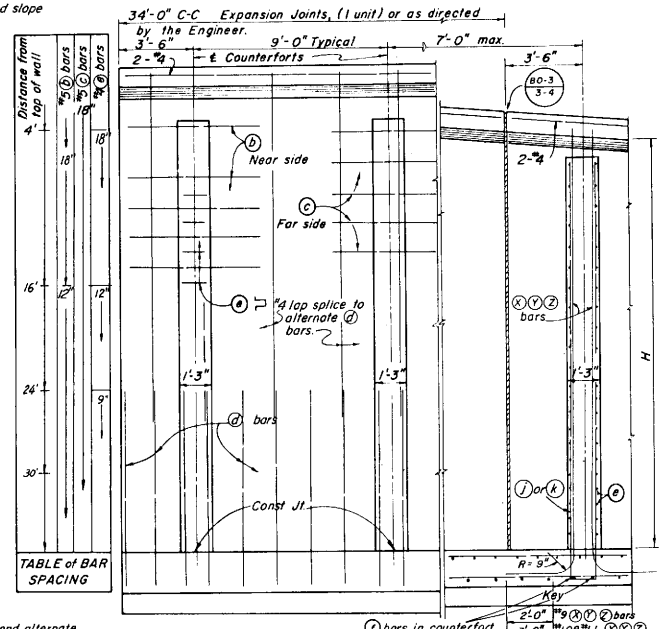


SPREAD FOOTING SECTION

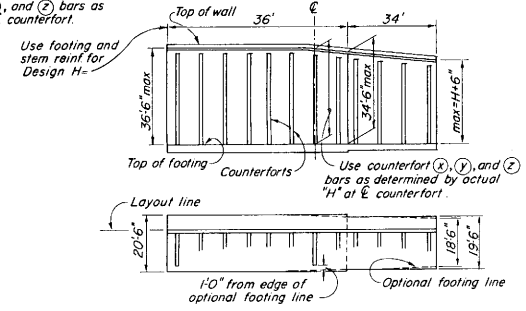


ELEVATION

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 ⓧ, ⓨ, and ⓩ 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"
ⓓ bars, cntrfort stem	#4 @ 12	#5 @ 12	#5 @ 11	#6 @ 12	#6 @ 11	#6 @ 10	#7 @ 11	#7 @ 10	#8 @ 12	#8 @ 11
ⓕ bars, bottom toe	#6 @ 12	#7 @ 12	#8 @ 11	#9 @ 12	#9 @ 11	#9 @ 10	#9 @ 11	#9 @ 10	#10 @ 12	#10 @ 11
ⓕ bars, length	5'-6"	6'-0"	6'-9"	7'-8"	8'-0"	8'-3"	8'-6"	9'-0"	9'-9"	10'-0"
ⓕ bars, length Alt.	11'-0"	12'-0"	13'-0"	14'-0"	15'-0"	16'-0"	17'-0"	18'-0"	19'-0"	20'-0"
ⓖ bars, top of heel	#6 @ 7									
ⓗ bars, bottom heel	#6 @ 10									
ⓘ bars, cntrfort heel	#5 @ 24	#6 @ 24	#6 @ 24	#6 @ 20	#6 @ 18	#7 @ 22	#7 @ 22	#7 @ 20	#7 @ 18	#7 @ 18
ⓚ bars, cntrfort heel	#5 @ 12	#6 @ 12	#6 @ 12	#6 @ 10	#6 @ 9	#7 @ 11	#7 @ 11	#7 @ 10	#7 @ 9	#7 @ 9
ⓜ bars, top of heel	#6 @ 14									
ⓝ bars, bottom of heel	#6 @ 20									
ⓧ bar,	2-#9	2-#9	2-#9	2-#9	2-#10	2-#10	2-#10	2-#10	2-#11	2-#11
ⓧ bar, length	20'-0"	22'-3"	24'-3"	26'-6"	28'-9"	30'-9"	33'-0"	35'-0"	37'-3"	39'-0"
ⓨ bar,	2-#9	2-#9	4-#9	4-#9	4-#10	4-#10	4-#10	4-#10	4-#11	4-#11
ⓨ bar, length	9'-3"	12'-0"	14'-3"	15'-9"	17'-9"	20'-8"	22'-6"	24'-10"	26'-3"	27'-9"
ⓩ bar,							2-#10	2-#10	2-#11	2-#11
ⓩ 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. cu.ft./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
1½:1 limited	4160	4690	5290	5850	6450	6900	7340	7740	8130	8640

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

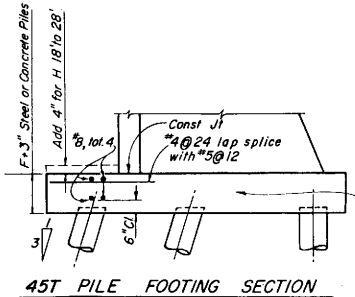
For H=18' to 28' 45T pile footing see '45T Pile Footing Section'.

NOTES:

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

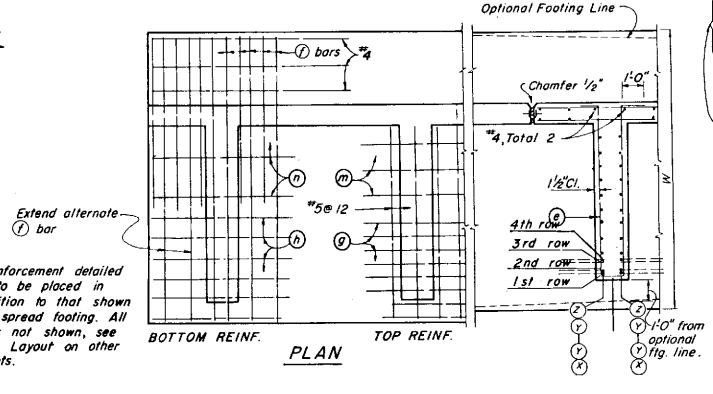
Quantities do not include the wall portion above "Gutter Elevation" and are for design purposes only.

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



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.



PLAN

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

COUNTERFORT RETAINING WALL TYPE 3

NO SCALE

B3-5

STD. PLAN B3-5

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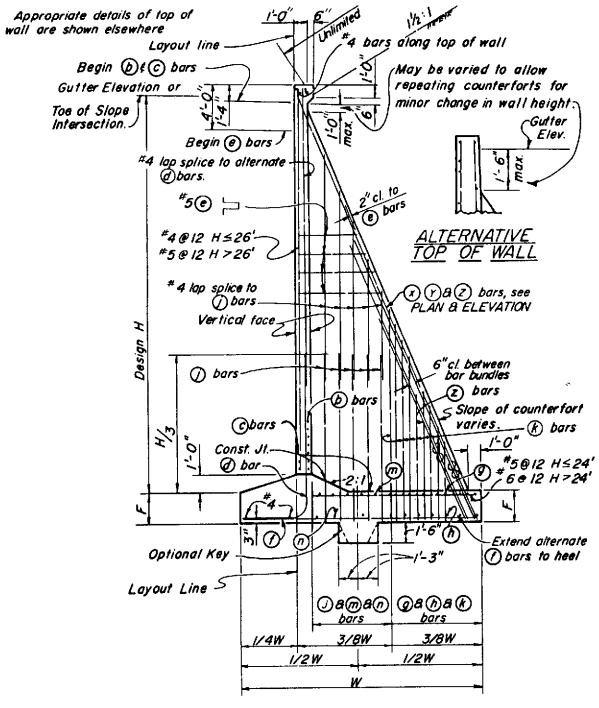
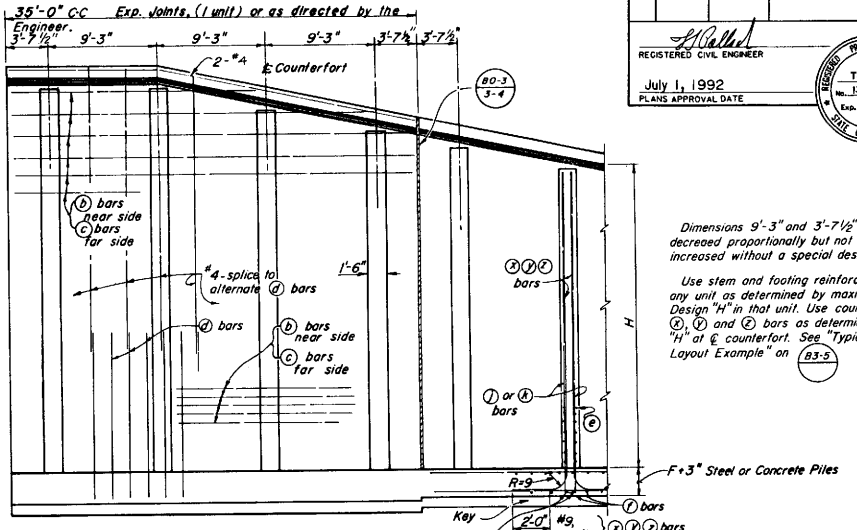


SPREAD FOOTING SECTION

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

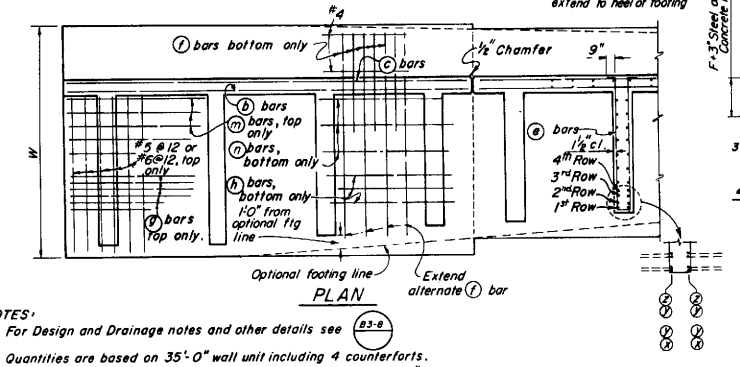
TABLE OF SPACING FOR ⓑ ⓒ & ⓔ BARS
Distance below top of wall



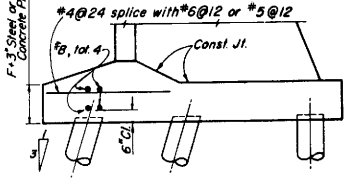
ELEVATION

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 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.

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.

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
	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
	Steel lbs/lin.ft.	203	229	284	355	414	491	572
	Toe Pressure, lbs per sq.ft.	6510	7450	8010	8650	9450	10150	10890

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

REGISTERED CIVIL ENGINEER
July 1, 1992
PLANS APPROVAL DATE
REGISTERED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

COUNTERFORT RETAINING WALL TYPE 4

NO SCALE

B3-6

STD. PLAN B3-6

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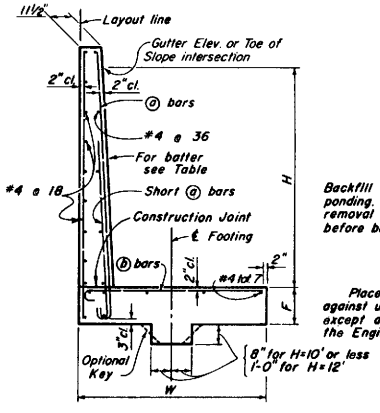
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

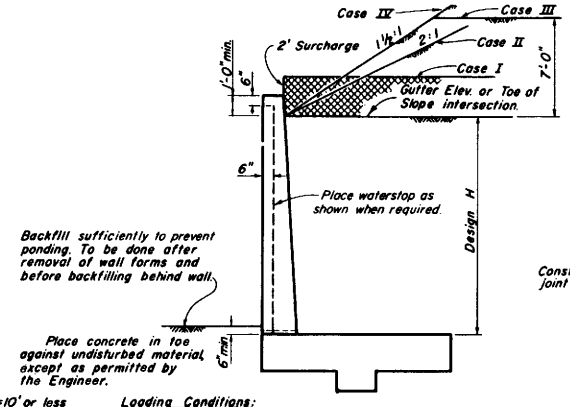
REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA



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

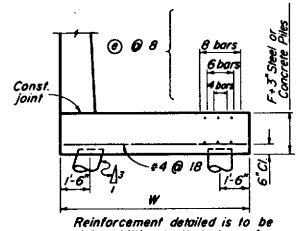
For drainage notes and other details, see B3-8

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"

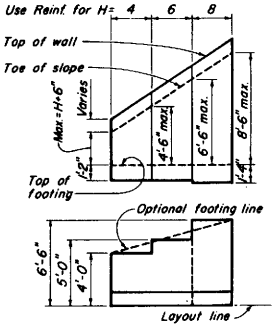
For actual spacing, see Wall Layout.

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.

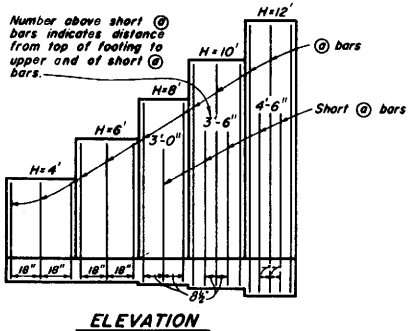
45T PILE FOOTING SECTION



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	3/16 : 12	3/4 : 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
Toe 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 ⅜	16	22	35	55	73
	Conc. ⅜	9.4	12.5	17.2	24.4	36.1
Pile Footing	Steel ⅜	31	36	54	70	85
	Conc. ⅜	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 ϕ = 33°-42'.

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

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

RETAINING WALL TYPE 5

NO SCALE

B3-7

STD. PLAN B3-7

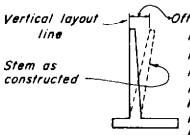
Return to Table of Contents

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

REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

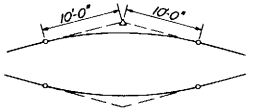
REGISTERED PROFESSIONAL ENGINEER — T. Pollock — No. 13332 — Exp. 3-31-93 — CIVIL — STATE OF CALIFORNIA



APPROX. WALL OFFSET VALUES

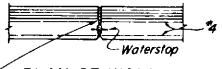
Not required for wall types 3 and 4

Values for offsetting forms to be determined by the Engineer.



20' VC AT TOP OF WALL SLOPE CHANGE

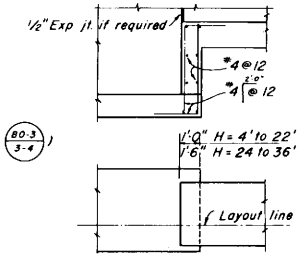
WHERE SHOWN ON THE PLANS



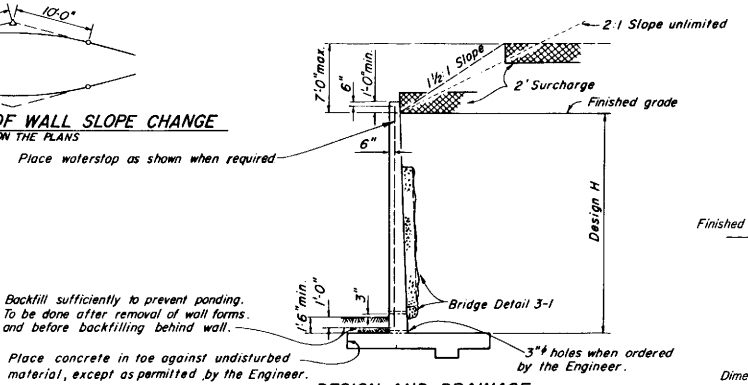
PLAN OF WALL WITH BR. DETAIL 3-4 (see B0-3 / 3-4)

1/2" premolded expansion joint filler

PLAN OF WALL WITH EXPANSION JOINT ONLY

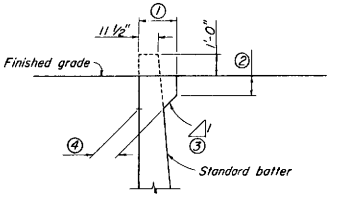


FOOTING STEP



DESIGN AND DRAINAGE

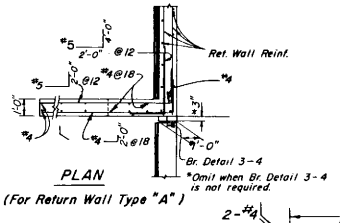
Surcharge limits shown apply to Retaining walls Type 1 and 3.



Dimensions ①, ② and ③ to be as shown elsewhere in the Project Plans.

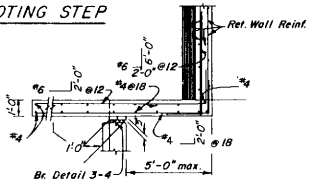
④ Stem width at base of haunch to be determined as shown.

STEM WIDTH AT BASE OF HAUNCH



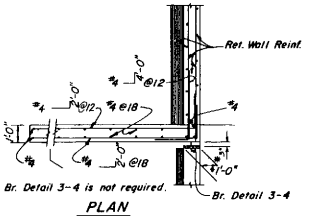
PLAN

(For Return Wall Type "A")



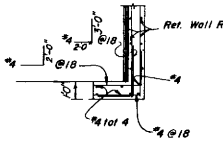
PLAN

(For Return Wall Type "B")



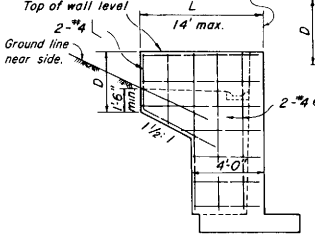
PLAN

(For Return Wall Type "C")



PLAN

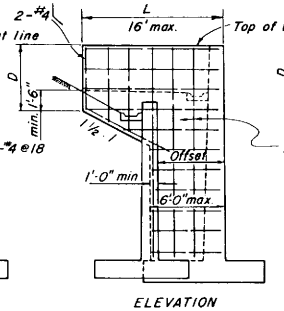
(For Return Wall Type "D")



ELEVATION

RETURN WALL TYPE "A"

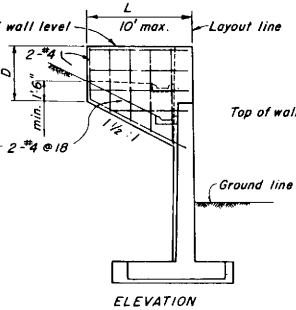
Use where H = 8' or less



ELEVATION

RETURN WALL TYPE "B"

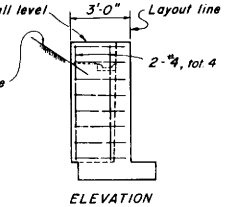
Use where H = 10' or more on offset walls



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 fc = 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'.

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RETAINING WALL DETAILS NO. 1

NO SCALE

B3-8

STD. PLAN B3-8

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PLANS APPROVAL DATE

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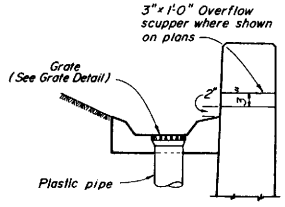
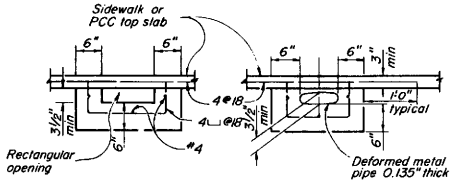
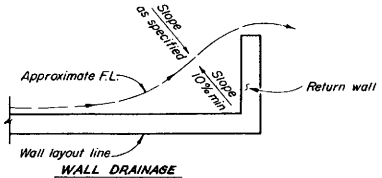


WALL DRAIN DETAIL
Scale: 1"= 1'-0"

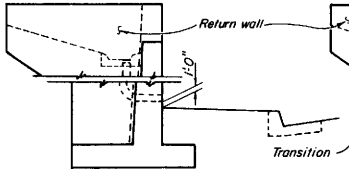


Note: Area of opening to be not less than that of pipe from wall gutter. Make opening transition in wall. Edge opening in curb face to 3/4" min radius.

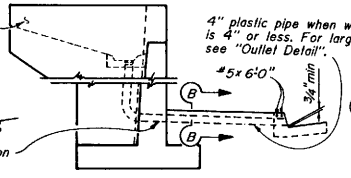
OUTLET DETAIL - SECTION B-B
Scale: 1"= 1'-0"



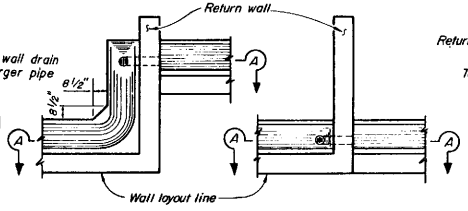
WALL DRAINAGE
WHERE GUTTER NOT REQUIRED
Scale: 3/8"= 1'-0"



RETAINING WALL, FACE OF WALL OUTLET
Scale: 3/8"= 1'-0"

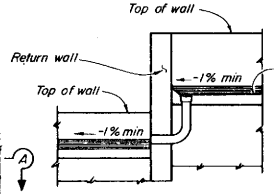


RETAINING WALL, GUTTER OUTLET
Scale: 3/8"= 1'-0"

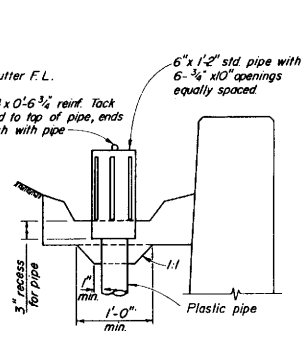


PLAN-OFFSET WALL
PLAN-CONTINUOUS WALL

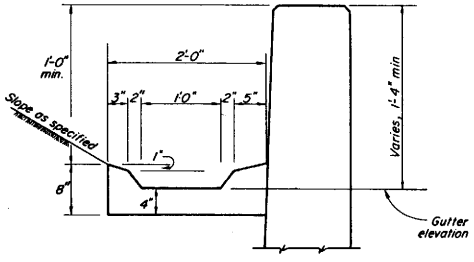
DRAIN THROUGH RETURN WALL
Scale: 3/8"= 1'-0"



SECTION A-A

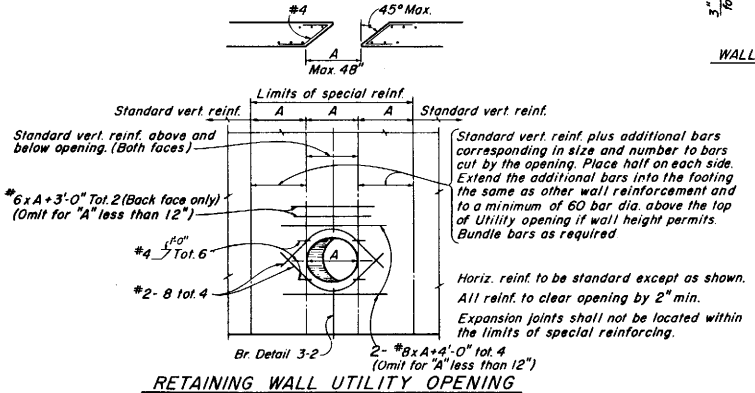


WALL DRAIN WITH PIPE DOME



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

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

RETAINING WALL DETAILS NO. 2

NO SCALE

B3-9

STD. PLAN B3-9

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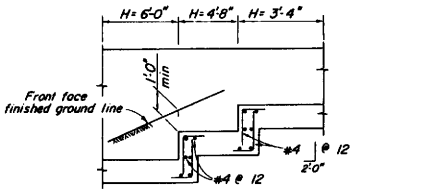
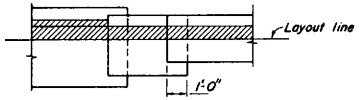
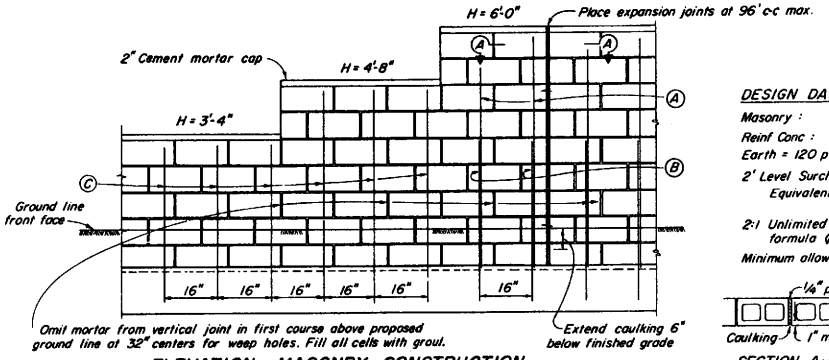


ELEVATION



PLAN

FOOTING STEP DETAILS



ELEVATION—MASONRY CONSTRUCTION

DESIGN DATA:

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

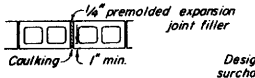
Reinf Conc: f_c = 1300 psi f'_c = 3250 psi f_s = 24,000 psi n = 10

Earth = 120 pcf.

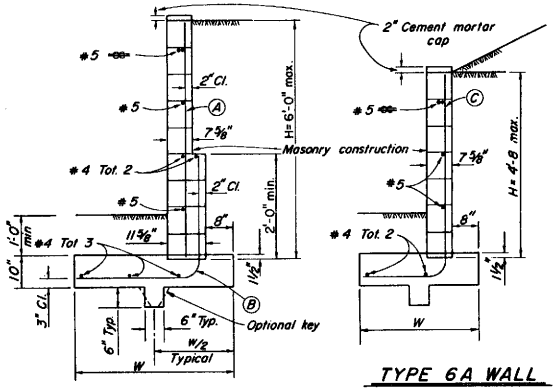
2' Level Surcharge:
Equivalent fluid pressure = 36 pcf for determination of toe pressure.
27 pcf for determination of heel pressure.

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

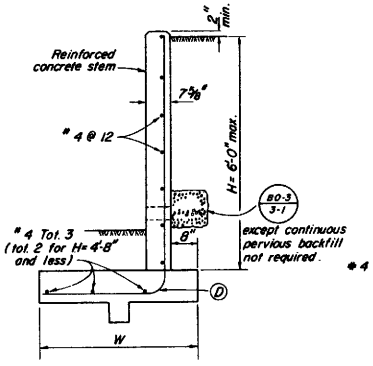
Minimum allowable soil bearing capacity of foundation material = 1 TSF.

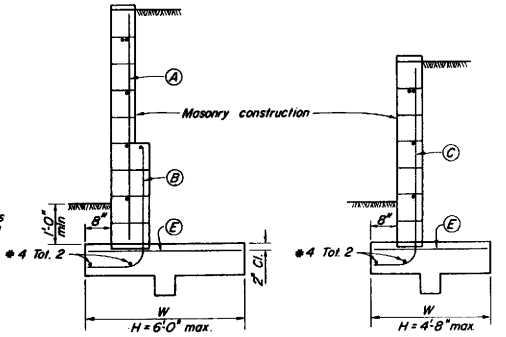


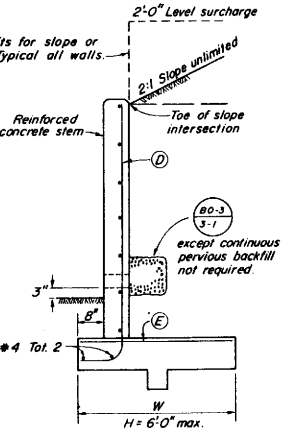
SECTION A-A



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 Reinf. Conc. Stem		8.5 6.6	8.9 7.7	11.6 9.8	12.8 13.7	15.0 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 Reinf. Conc. Stem		9.1 6.6	9.6 7.7	11.8 9.8	12.9 13.7	15.4 16.7

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

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RETAINING WALL
TYPE 6
6'-0" MAXIMUM

NO SCALE

B3-11

STD. PLAN B3-11

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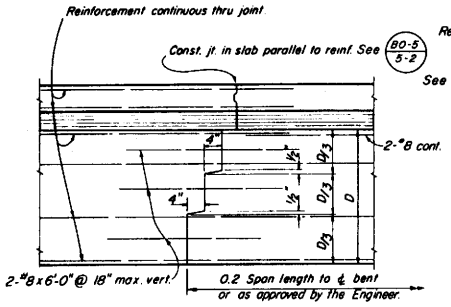
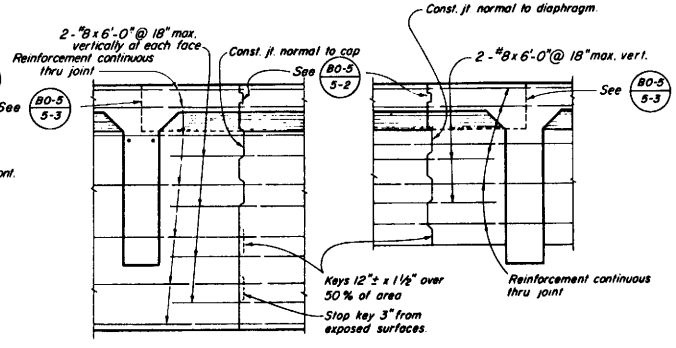
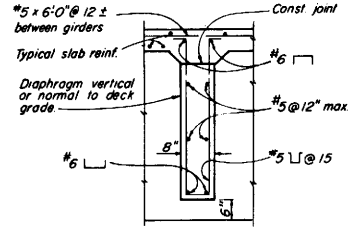


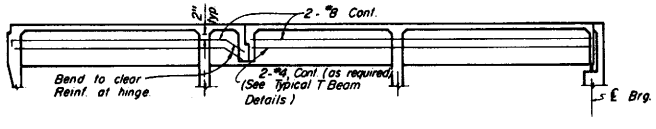
TRANSVERSE GIRDER CONSTRUCTION JOINTS
DETAIL J-3



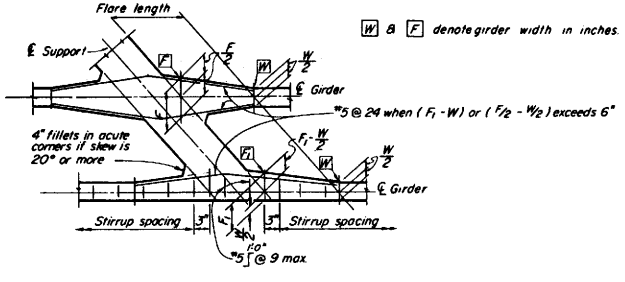
BENT CAP DIAPHRAGMS
LONGITUDINAL CONSTRUCTION JOINTS
DETAIL J-4



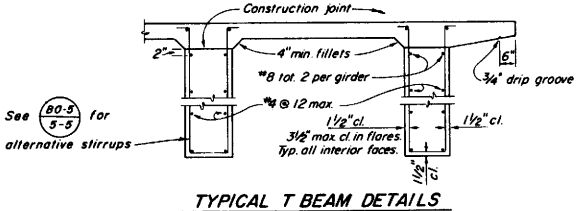
INTERMEDIATE DIAPHRAGM SECTION
DETAIL D-1



GIRDER WEB REINFORCEMENT
DETAIL J-1



TYPICAL GIRDER FLARE AND STIRRUP SPACING DIAGRAM
DETAIL S-3



TYPICAL T BEAM DETAILS
DETAIL T-1

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

T-BEAM DETAILS

NO SCALE

B6-1

STD. PLAN B6-1

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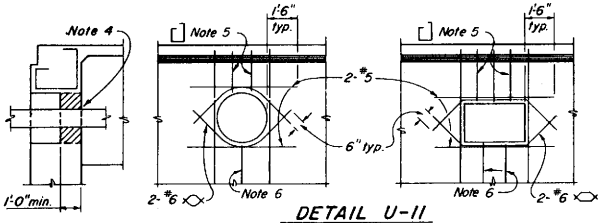
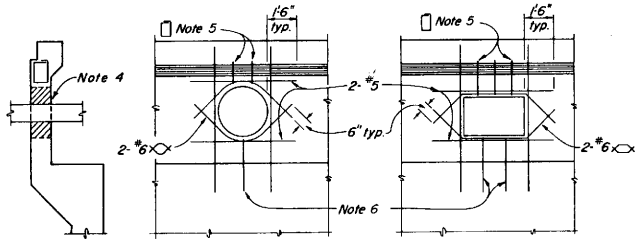
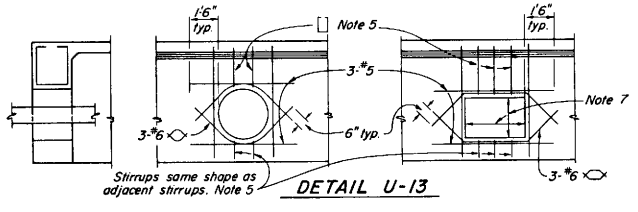
ABUTMENT DIAPHRAGMS



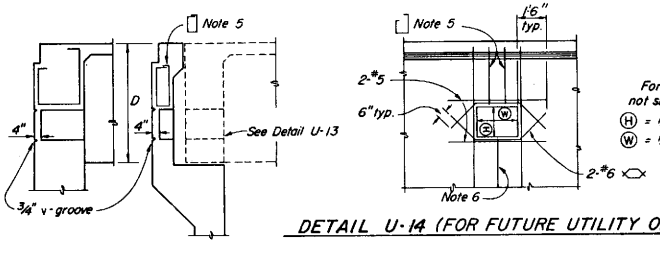
DETAIL U-11



DETAIL U-12



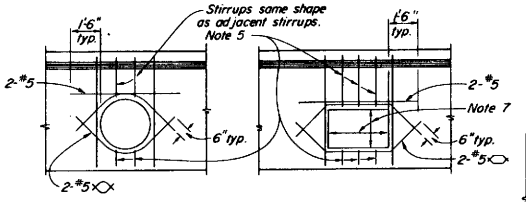
DETAIL U-13



DETAIL U-14 (FOR FUTURE UTILITY OPENING)

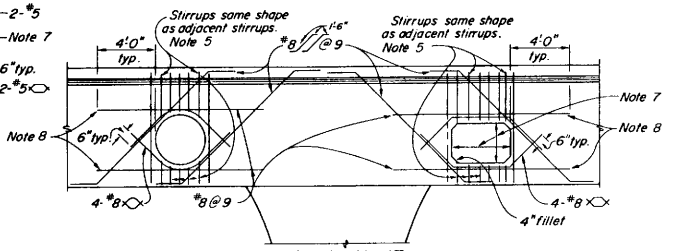
For future utility opening dimensions not shown on Project Plans use:
(H) = 1/3 D or 1'-3" min., whichever is greater.
(W) = 1/3 D or 1'-3" min., whichever is greater.

INTERMEDIATE DIAPHRAGMS



DETAIL U-15

BENT CAPS



DETAIL U-17
NEAR OR BETWEEN COLUMNS

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. Reinf. to be same bar size, and 2/3 the spacing of adjacent reinf. shown on Project Plans.
6. Reinf. to be same bar size and shape as adjacent reinf. shown on Project Plans.
7. For future utility opening dimensions, see Project Plans and Detail U-14.
8. When there is insufficient space to place reinf. as shown, hook reinf. into exterior girder.

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UTILITY OPENINGS
T-BEAM

NO SCALE

B6-10

STD. PLAN B6-10

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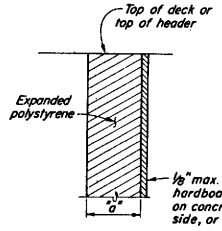
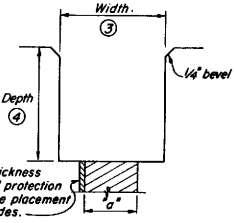
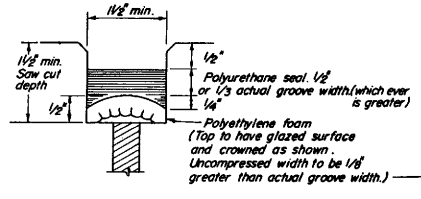


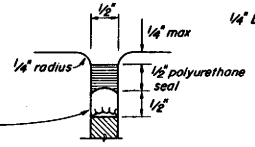
FORMING DETAIL



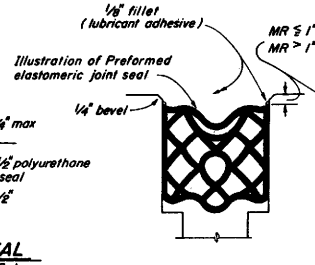
SAWCUT DETAIL



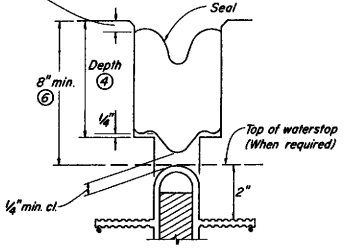
TYPE A SEAL
Movement Rating = 1/2" max.



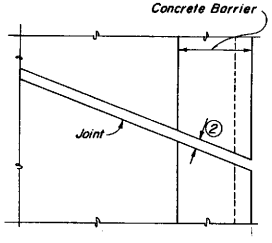
TYPE AL SEAL
Longitudinal Joints Only



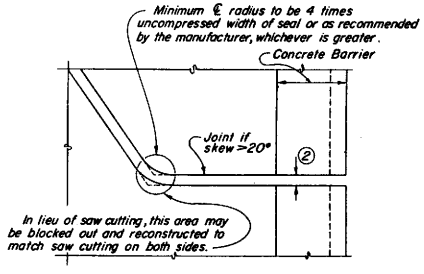
TYPE B SEAL
Movement Rating > 1/2"



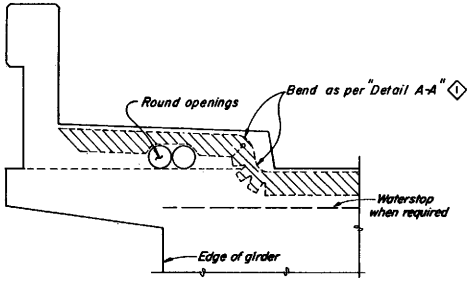
TYPE B JOINT SEAL
IN MINIMUM WIDTH POSITION (W_2)



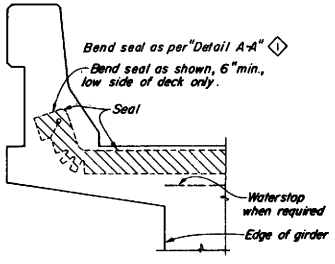
PLAN OF JOINT



PLAN OF ANGLED JOINT



CONCRETE BARRIER & SIDEWALK



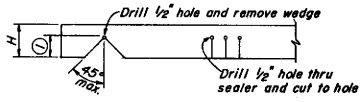
CONCRETE BARRIER

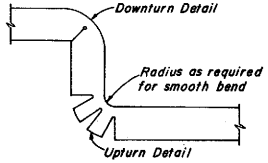
Note: Type "B" Seal shown. Type "A" seals to conform to the general path of seal shown.

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"





DETAIL A-A

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.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

JOINT SEALS
(MAXIMUM MOVEMENT RATING = 2")

NO SCALE

B6-21

STD. PLAN B6-21

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July 1, 1992
PLANS APPROVAL DATE

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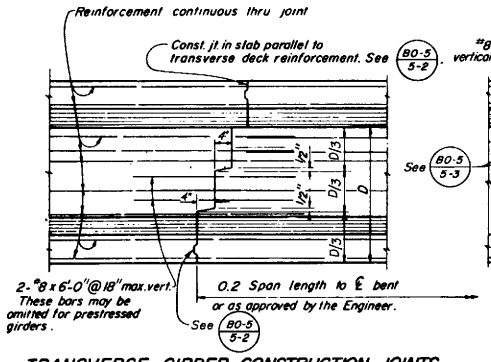
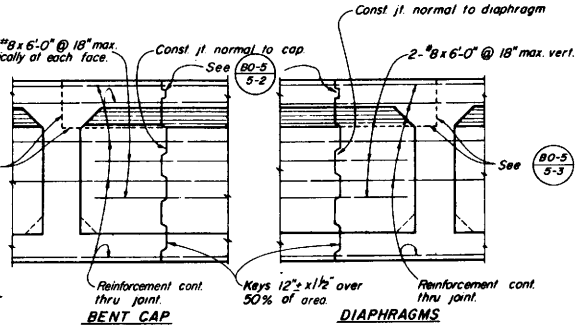
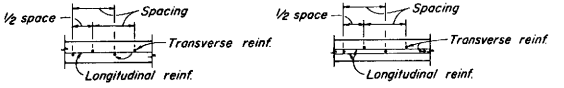


TRANSVERSE GIRDER CONSTRUCTION JOINTS
DETAIL J-3

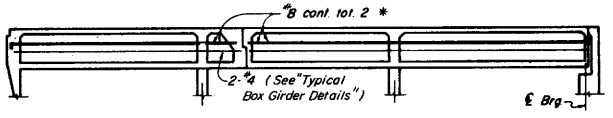


LONGITUDINAL CONSTRUCTION JOINTS
DETAIL J-4

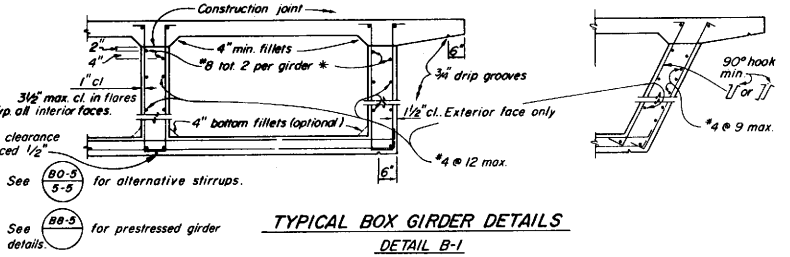


DETAIL S-1 DETAIL S-2

BOTTOM SLAB TRANSVERSE REINFORCEMENT SPACING DIAGRAMS

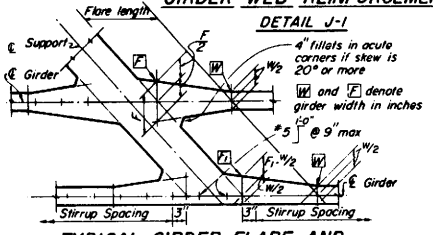


GIRDER WEB REINFORCEMENT
DETAIL J-1

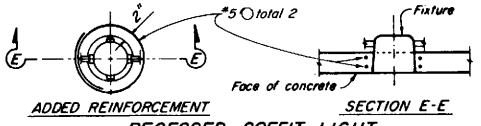


TYPICAL BOX GIRDER DETAILS
DETAIL B-1

* At all web construction joints

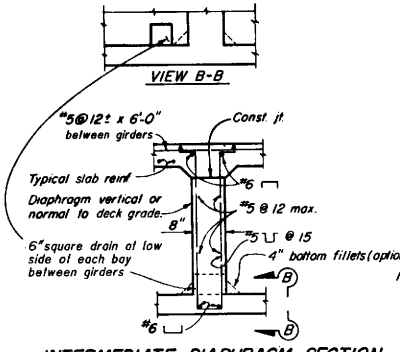


TYPICAL GIRDER FLARE AND STIRRUP SPACING DIAGRAM
DETAIL S-3

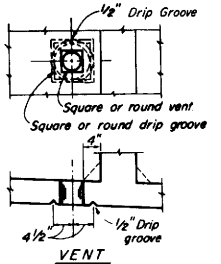


ADDED REINFORCEMENT SECTION E-E

RECESSED SOFFIT LIGHT
DETAIL F-1



INTERMEDIATE DIAPHRAGM SECTION
DETAIL D-1



VENT
DETAIL V-1

Note: 5" ϕ or ϕ vent in lower slab.
Min. of two vents per span in each bay between girders. One vent to be located at low point of span and other vent to be located at opposite end of span @ 1'-6" from face of Abutment or Bent.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

BOX GIRDER DETAILS

NO SCALE

B7-1

STD. PLAN B7-1

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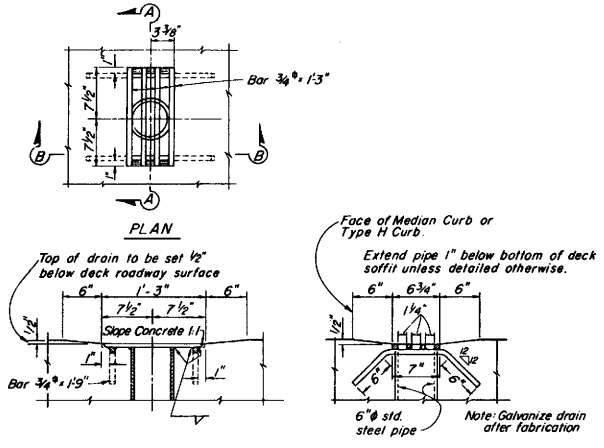
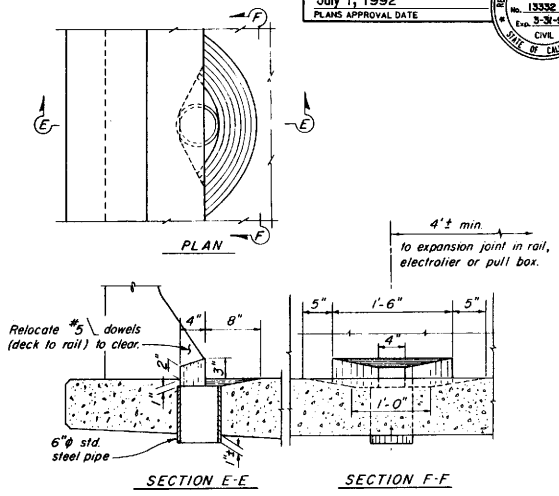
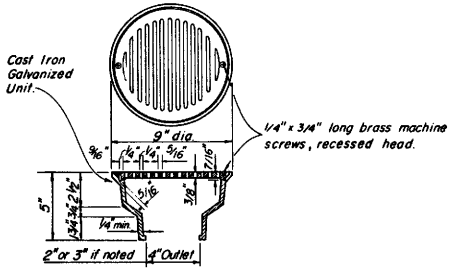


DRAIN - TYPE "A" DETAIL 7-1

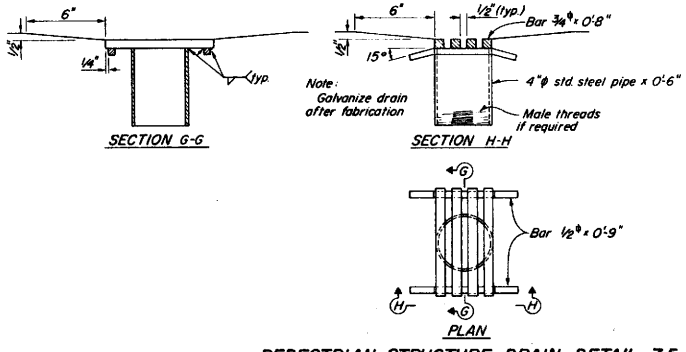


DRAIN - TYPE "B" DETAIL 7-3

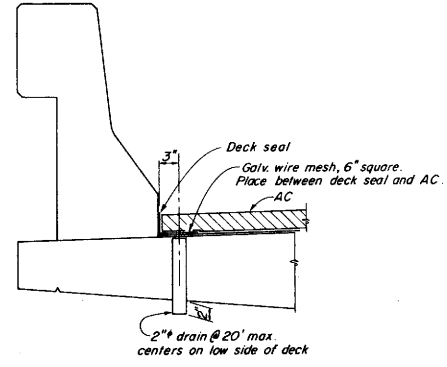
For Type 25 Barrier Railing



AREA DRAIN DETAIL 7-4



PEDESTRIAN STRUCTURE DRAIN DETAIL 7-5



DECK BLEEDER DRAIN DETAIL 7-6

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DECK DRAINS

NO SCALE

B7-5

STD. PLAN B7-5

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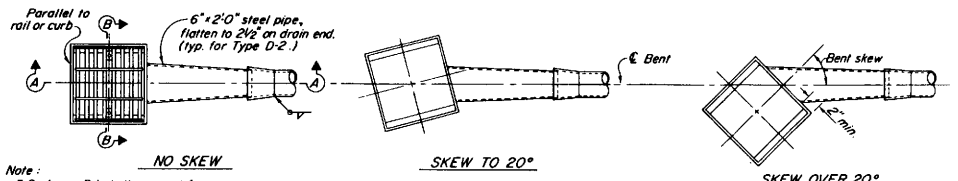
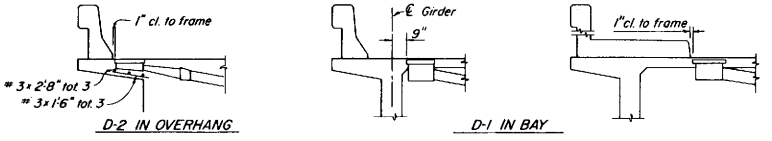
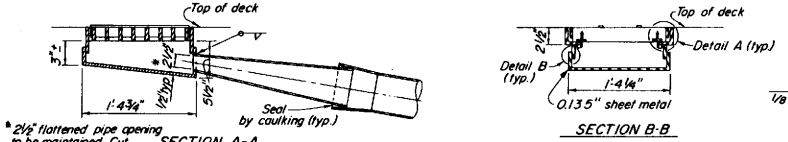


Note: D-2 shown, D-1 similar except for pan depth & pipe not flattened.

PLAN-DECK DRAIN ASSEMBLY

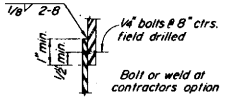


ELEVATION-DECK DRAIN LOCATIONS

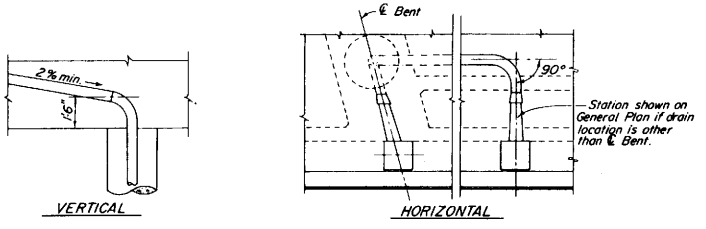


* 2½" flattened pipe opening to be maintained. Cut skirt of frame if it encroaches on the opening.

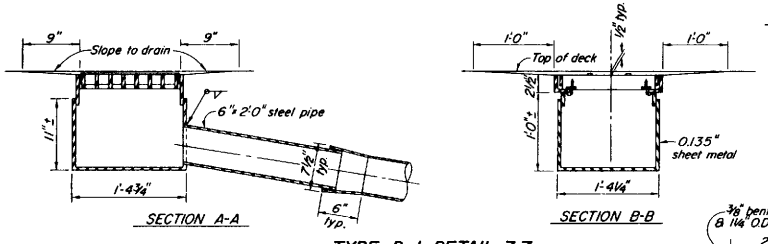
TYPE D-2 DETAIL 7-8



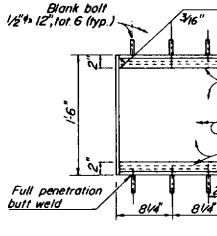
DETAIL B

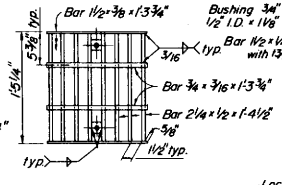


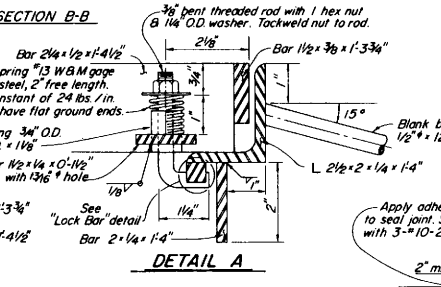
DRAIN PIPE ALIGNMENT

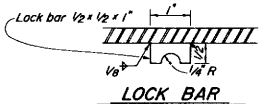


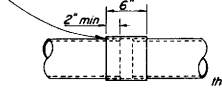
TYPE D-1 DETAIL 7-7

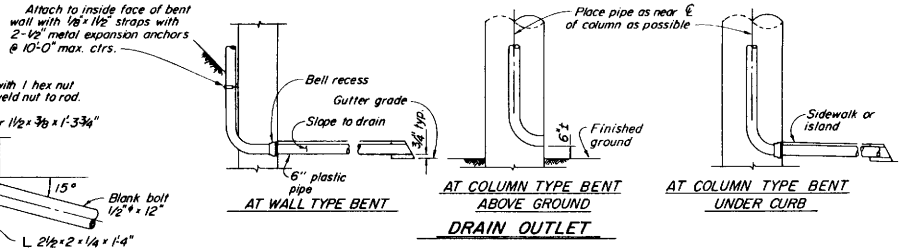












DRAIN OUTLET

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.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DECK DRAINS
TYPES D-1 AND D-2

NO SCALE

B7-6

STD. PLAN B7-6

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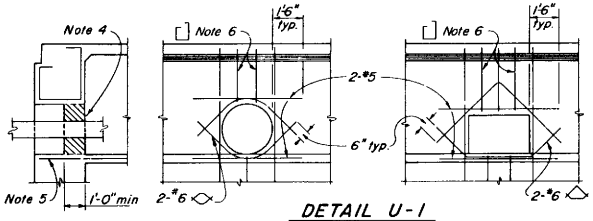
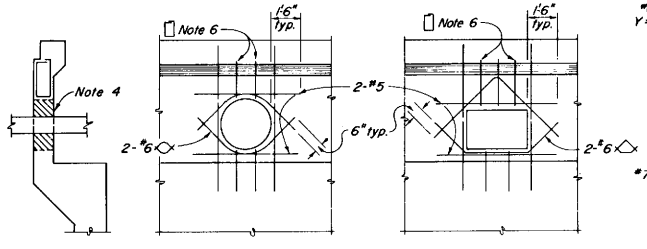
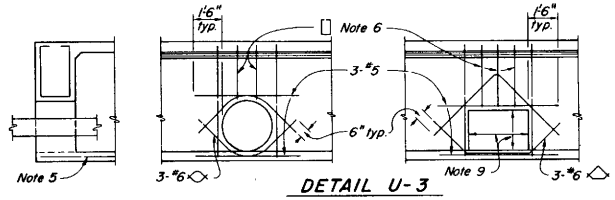
ABUTMENT DIAPHRAGMS



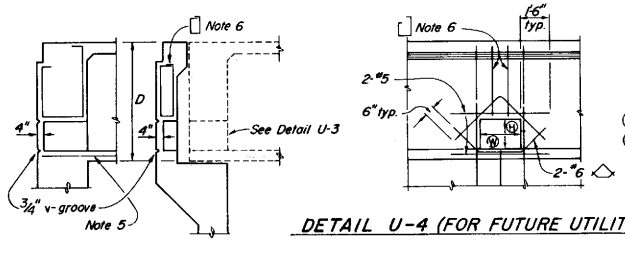
DETAIL U-1



DETAIL U-2



DETAIL U-3



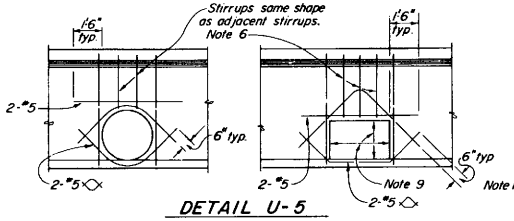
DETAIL U-4 (FOR FUTURE UTILITY OPENING)

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

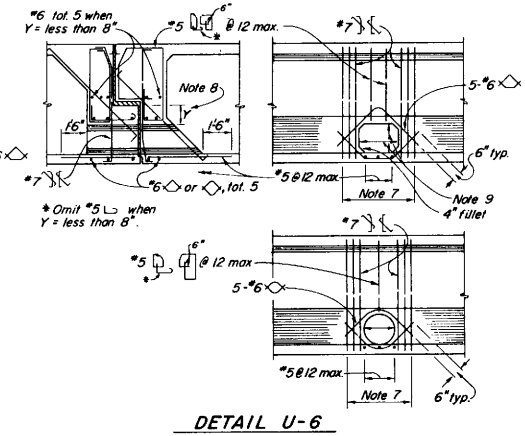
(H) = 1/3 D or 1'-6" min., whichever is greater.

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

INTERMEDIATE DIAPHRAGMS AND HINGES

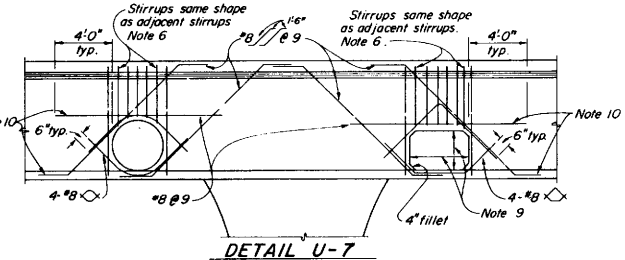


DETAIL U-5
AT INTERMEDIATE DIAPHRAGM



DETAIL U-6
AT HINGE

BENT CAPS



DETAIL U-7
NEAR OR BETWEEN COLUMNS

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. Replace each set of 4-#7 bars cut off by opening. Place 1/2 on each side of opening.
8. When "Y" is less than 8", extend top of opening to bottom of bearing seat elevation.
9. For future utility opening dimensions, see Project Plans and Detail U-4.
10. When there is insufficient space to place reinf. as shown, hook reinf. into exterior girder.

STATE OF CALIFORNIA
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UTILITY OPENING BOX GIRDER

NO SCALE

B7-10

STD. PLAN B7-10

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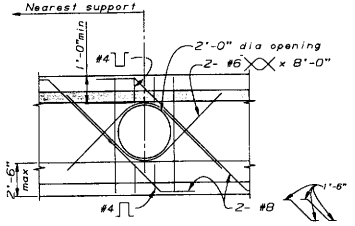
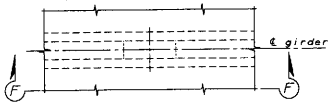


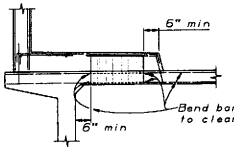
ELEVATION F-F



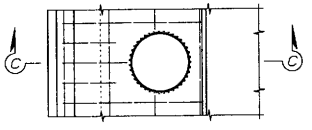
PART PLAN

GIRDER STEM ACCESS OPENING

DETAIL U41



SECTION C-C

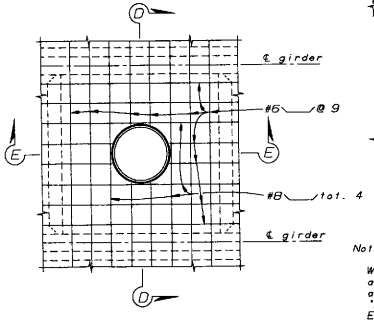


PART PLAN

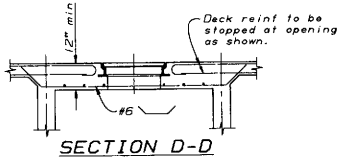
SIDEWALK ACCESS OPENING

DETAIL U42

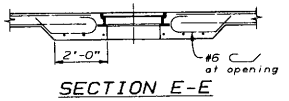
1. For exact location of openings see other sheets.
2. Location and size of manholes may be modified as directed by the Engineer, provided minimum dimensions are maintained.
3. All reinforcement detailed to be placed in addition to reinforcement shown on other sheets.



PART PLAN



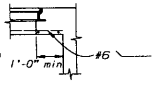
SECTION D-D



SECTION E-E

Note:

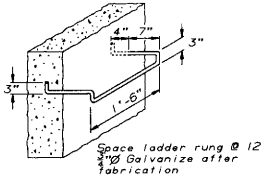
Where manhole is located adjacent to a diaphragm or abut, substitute Half Section "E-E" on one side of Section E-E:



HALF SECTION E'-E'

DECK ACCESS OPENING

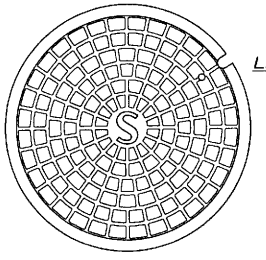
DETAIL U43



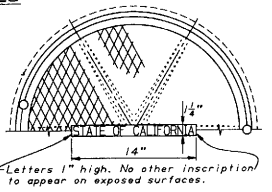
BAR STEP

LADDER RUNG DETAILS

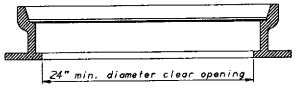
DETAIL U44



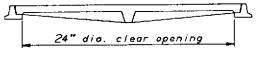
TOP OF MANHOLE COVER



TOP OF MANHOLE FRAME & COVER



SECTION THROUGH FRAME



SECTION THROUGH FRAME & COVER

NON-ROCKING MANHOLE FRAME & COVER FOR DECKS

DETAIL U45

Notes:

1. The manhole frame and cover shall be made of gray cast iron. Weight for payment is 435 lbs.
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 weight shall not vary more than ten percent from the weight for payment.
6. Step inserts may be substituted for the standard step detail. Step inserts shall comply with State Industrial Safety requirements.

MANHOLE FRAME & COVER FOR SIDEWALKS

DETAIL U46

Note-

Frame and cover shall be cast iron. Weight for payment is 235 lbs.

Galvanize complete assembly after fabrication.

The weight shall not vary more than ten percent from the weight for payment.

Cover shall be supplied with bolt down or locking devices.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

UTILITY DETAILS

NO SCALE

B7-11

STD. PLAN B7-11

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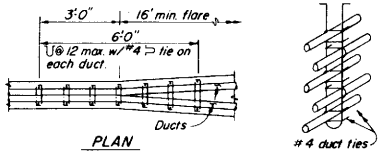
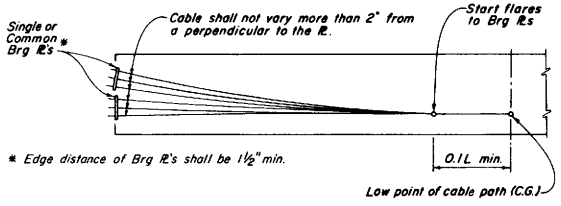


Note: Place closed end of duct ties in direction of flare

STIRRUP REINFORCEMENT AT FLARE OF GIRDER STEM



BEARING PLATE PRESTRESSING PATH

Distribution of prestressing force:

Unless otherwise noted, the prestressing force 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:

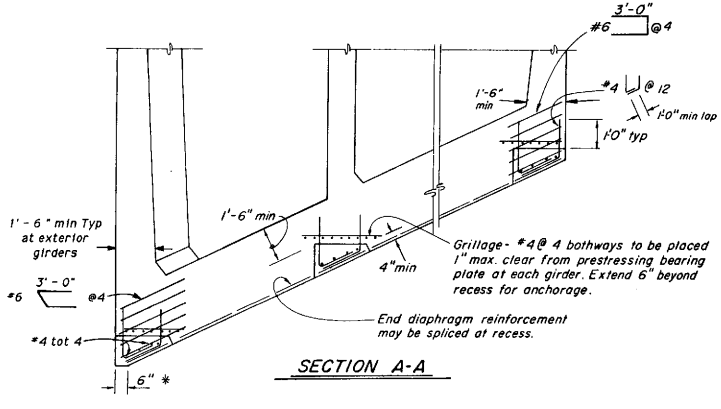
No more than ½ of the prestressing force in any girder may be applied before an equal force is applied in all of the girders. At no time during the stressing operations will more than ⅙ of the total prestressing force be applied eccentrically about the center line of the structure.

Girder stem may be flared near anchorage to provide minimum clearances. 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.

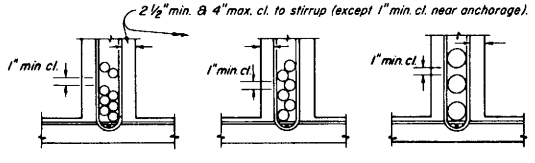
Bar reinforcement interfering with the prestressing tendon alignment shall be adjusted, as approved by the Engineer.

The contractor shall submit working drawings to the Engineer for approval. The working drawings shall include any additions or rearrangement of reinforcing steel from that shown on the plans. Sufficient points shall be shown on the working drawings to place ducts accurately.



SECTION A-A

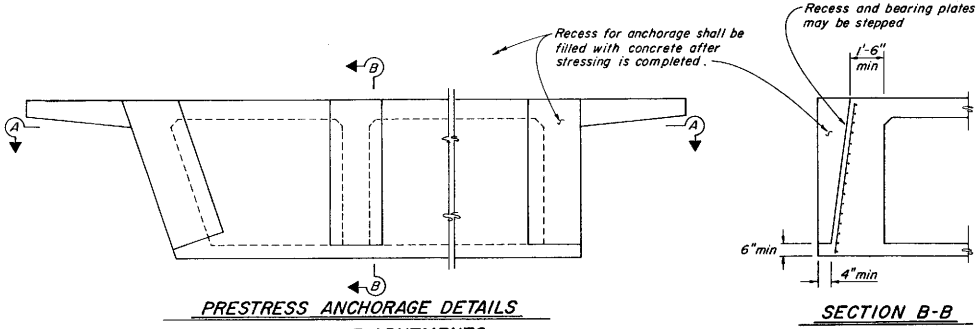
* Omit for skew < 20°



DUCTS 3" O.D. & LESS | DUCTS OVER 3" O.D. to 4½" O.D. | DUCTS OVER 4½" O.D.

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 #5 minimum reinforcing bar must be placed inside of each stirrup hook or 90° bend.
3. For additional details see (BT-1)
4. Approval of the Engineer is required for deviations.



PRESTRESS ANCHORAGE DETAILS AT SEAT TYPE ABUTMENTS

SECTION B-B

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

CAST-IN-PLACE PRESTRESSED GIRDER DETAILS

NO SCALE

B8-5

STD. PLAN B8-5

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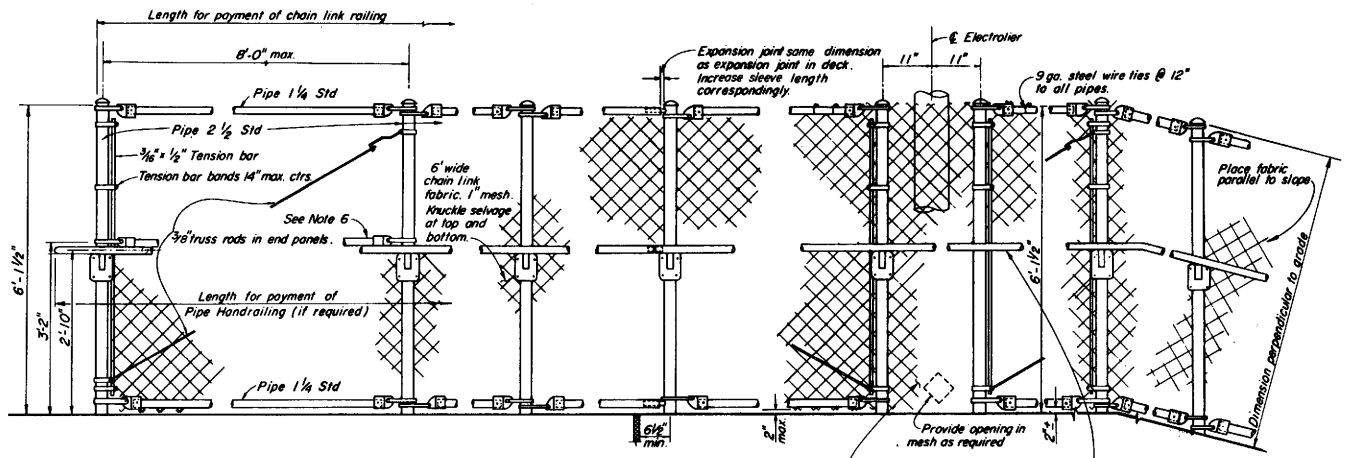


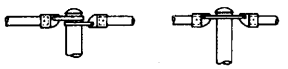
END POST

INTERMEDIATE POSTS

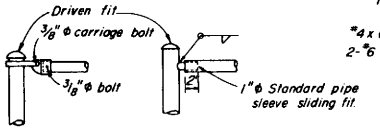
AT DECK EXPANSION JOINTS

AT ELECTROLIER

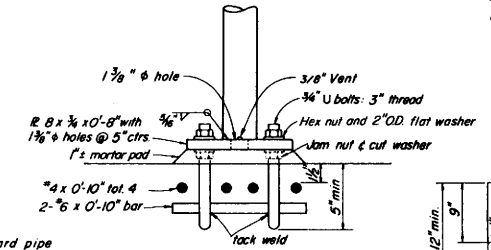
ON SLOPES



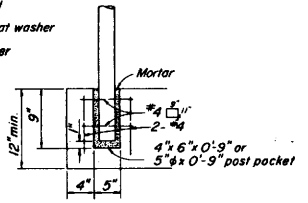
ALTERNATIVE DETAILS



TYPICAL CONNECTION DETAILS

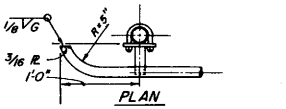


ANCHORAGE DETAIL

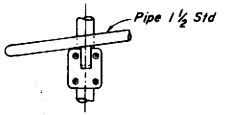


ALTERNATIVE ANCHORAGE DETAIL

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

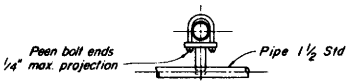


PLAN

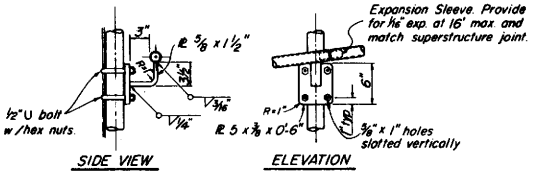


ELEVATION

PIPE HANDRAILING AT END



PLAN



SIDE VIEW

ELEVATION

PIPE HANDRAILING BRACKET

NOTES :

1. Railing assembly except chain link fabric to be galvanized after fabrication.
2. Peen all bolt threads.
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'.

STATE OF CALIFORNIA
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CHAIN LINK RAILING

NO SCALE

B11-7

STD. PLAN B11-7

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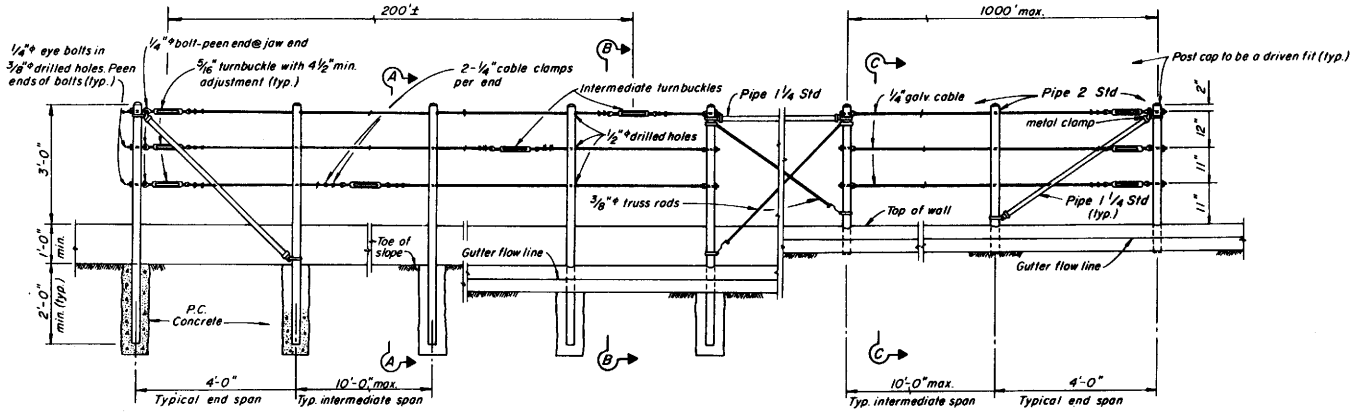
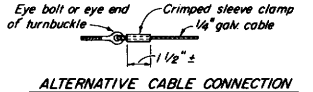


RETAINING WALL (Without Gutter) EXISTING

RETAINING WALL (With Gutter) EXISTING

RETAINING WALL (With Gutter) NEW CONSTRUCTION

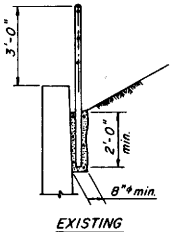
ELEVATION



ALTERNATIVE CABLE CONNECTION

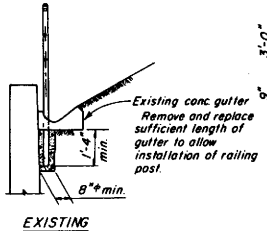
NOTES:

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.



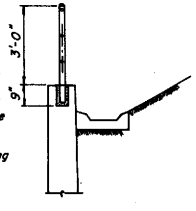
EXISTING

SECTION A-A



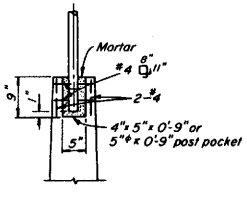
EXISTING

SECTION B-B

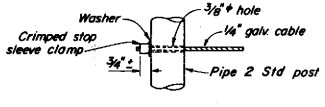


NEW CONSTRUCTION

SECTION C-C



POST POCKET



ALTERNATIVE DEAD END ANCHORAGE

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

CABLE RAILING

NO SCALE

B11-47

STD. PLAN B11-47

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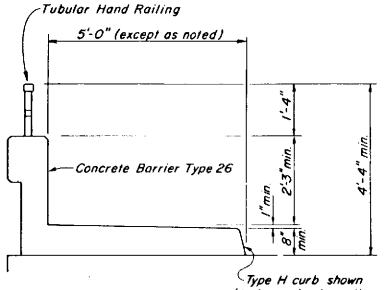
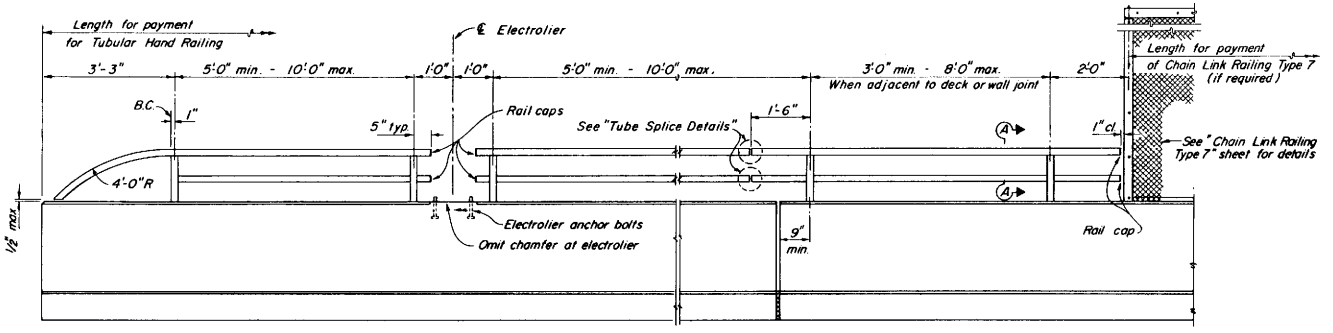
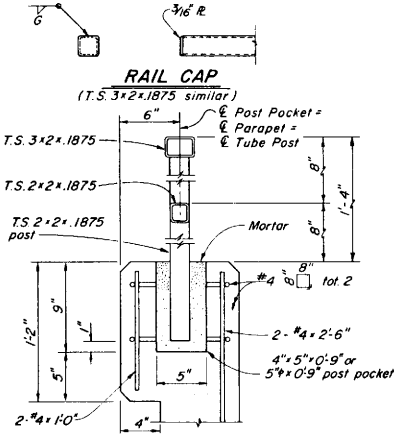


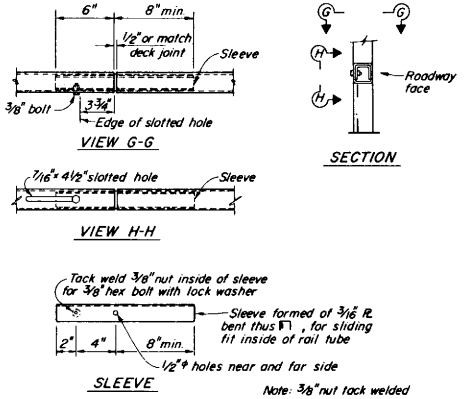
TYPICAL SECTION



ELEVATION

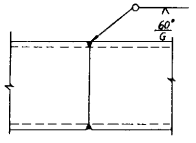


POST ANCHORAGE DETAILS

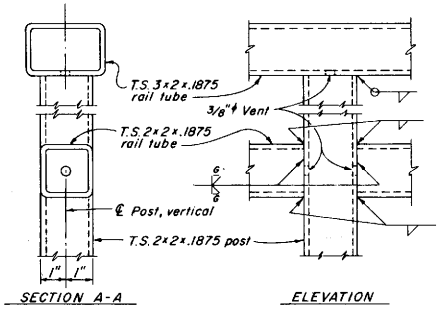


TUBE SPLICE DETAIL
(T.S. 3x2x.1875 similar)

Note: 3/8" nut tack welded to sleeve may be replaced by drilled and tapped hole in sleeve.



TUBE - WELDED SPLICE



RAIL CONNECTION DETAILS

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 Standard Plan B11-54.
7. See project plans for limits of Tubular Hand Railing.

STATE OF CALIFORNIA
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TUBULAR HAND RAILING

NO SCALE

B11-51

STD. PLAN B11-51

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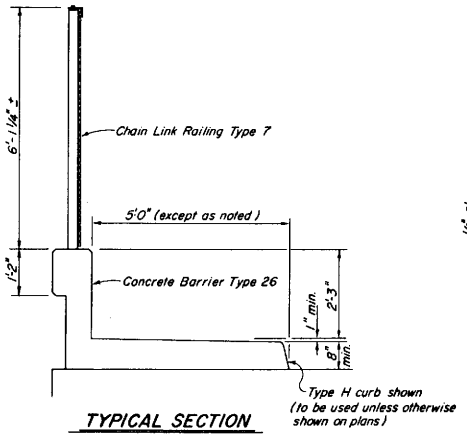
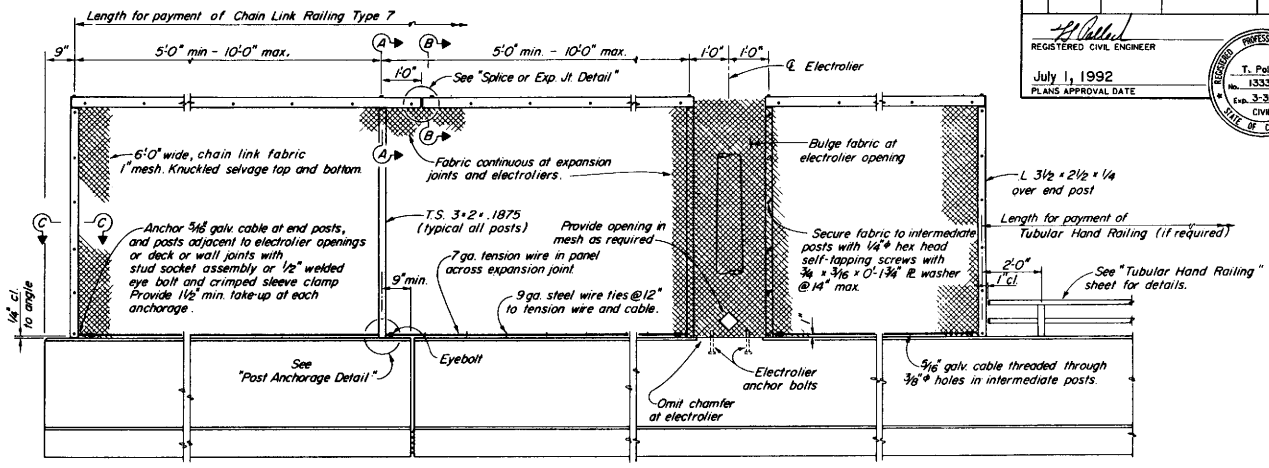
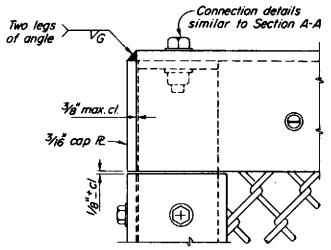


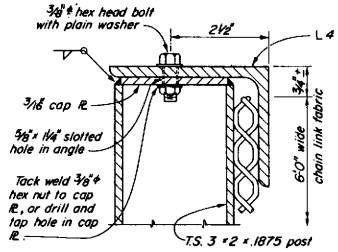
TYPICAL SECTION



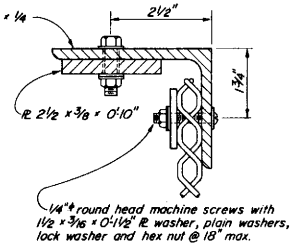
ELEVATION



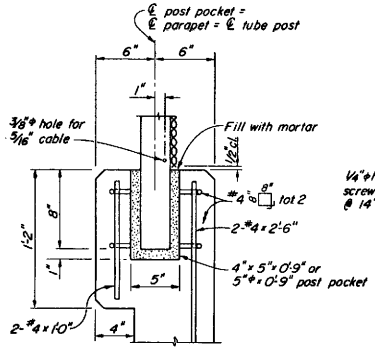
END POST ELEVATION



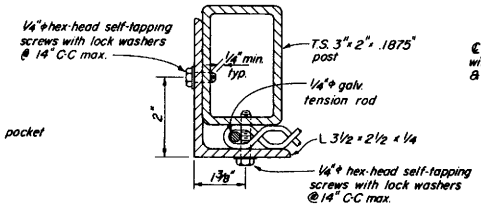
SECTION A-A



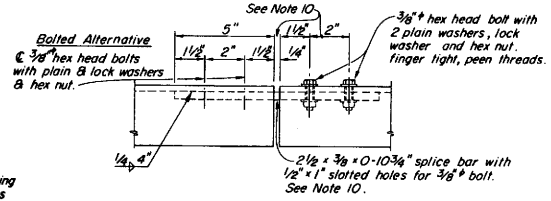
SECTION B-B



POST ANCHORAGE DETAIL



SECTION C-C



SPLICE OR EXPANSION JOINT DETAIL

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 Standard Plan B11-54.
8. See Project 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.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

CHAIN LINK RAILING TYPE 7

NO SCALE

B11-52

STD. PLAN B11-52

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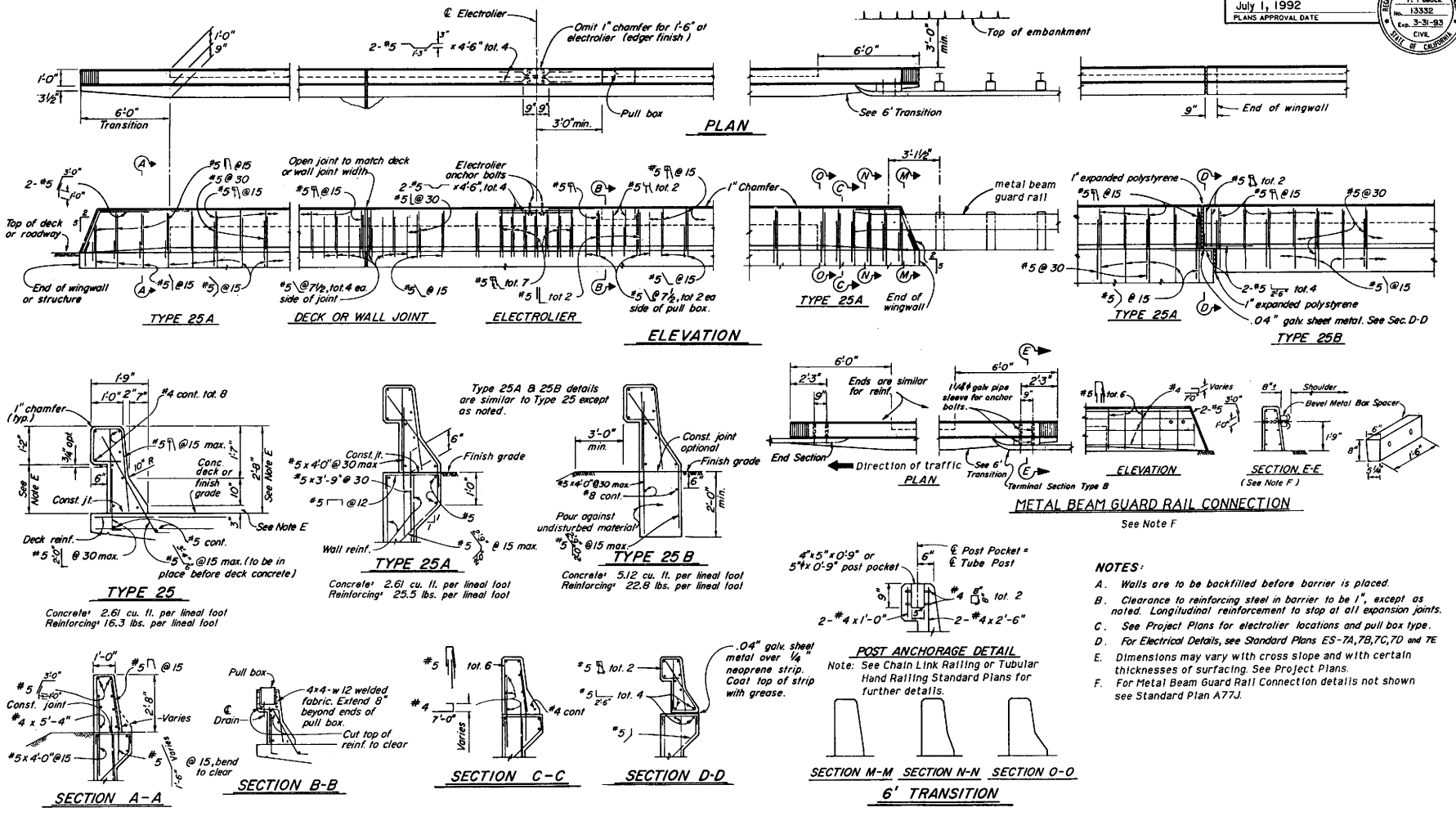

NOTES:

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 Plans ES-7A, 7B, 7C, 7D and 7E

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

F. For Metal Beam Guard Rail Connection details not shown see Standard Plan A77J.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

CONCRETE BARRIER TYPE 25

NO SCALE

B11-53

STD. PLAN B11-53

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July 1, 1992
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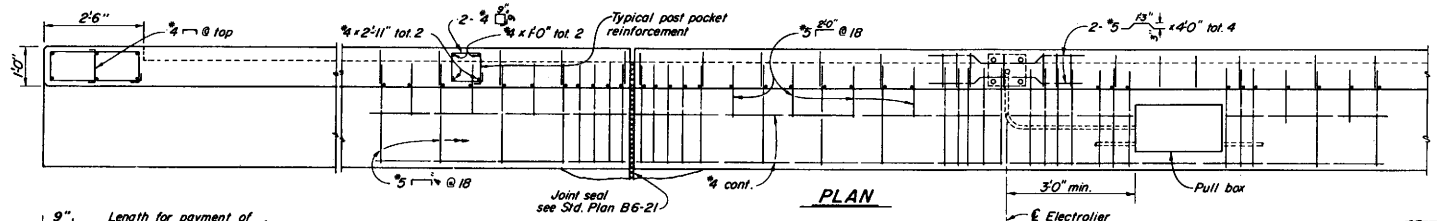
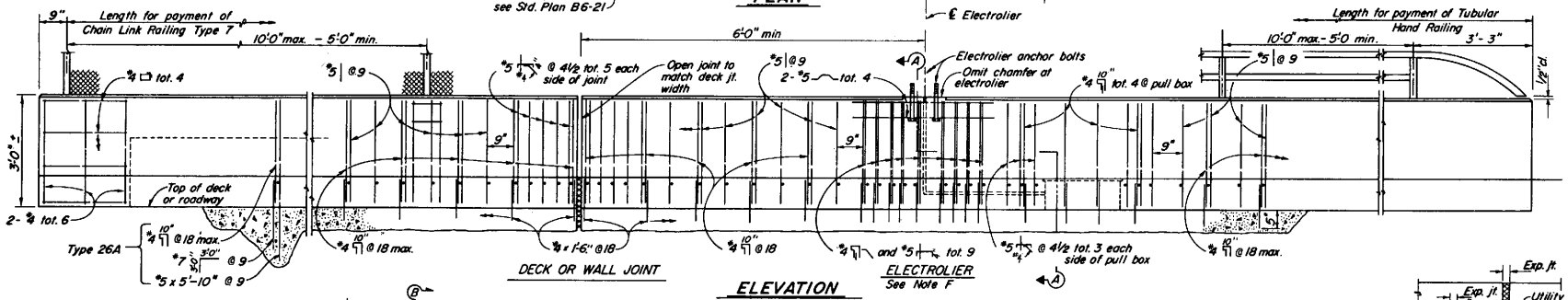
REGISTERED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA



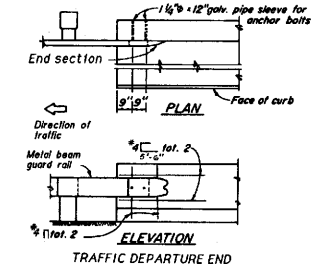
PLAN



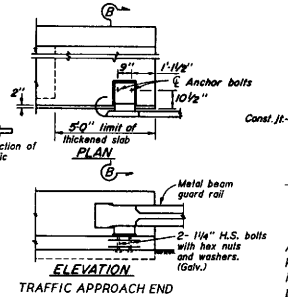
DECK OR WALL JOINT

ELEVATION

ELECTROLIER
See Note F

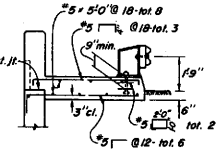


TRAFFIC DEPARTURE END

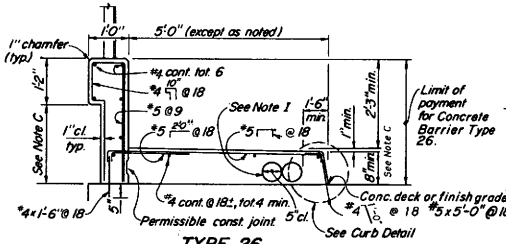


TRAFFIC APPROACH END

METAL BEAM GUARD RAIL CONNECTION
See Note J

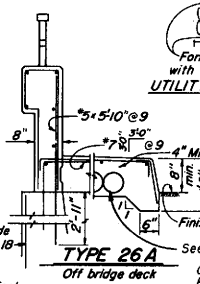


SECTION B-B
Adjust post height as shown. Reinforcement shown is in addition to typical barrier railing reinforcement.



TYPE 26
On bridge deck

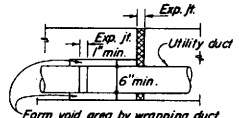
Concrete: 5.61 cu. ft. per lineal foot
Reinforcing: 21.4 lbs. per lineal foot
For 5'-0" sidewalk width and 1½% deck cross slope.



TYPE 26A
Off bridge deck

Type 26A barrier similar to Type 26 except as noted.

Concrete: 5.99 cu. ft. per lineal foot
Reinforcing: 42.7 lbs. per lineal foot
For 5'-0" sidewalk width and 1½% deck cross slope.

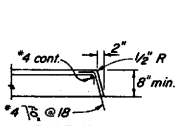


Form void area by wrapping duct with 15 lb building paper or equal.

UTILITY DUCT EXPANSION JOINT

NOTES:

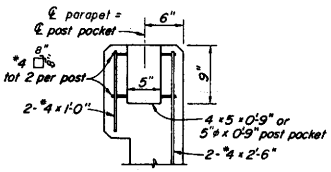
A. For chain link railing notes and details not shown, see Standard Plan B11-52.
B. For hand railing notes and details not shown, see Standard Plan B11-51.
C. Dimensions will vary with cross slope and with certain thicknesses of surfacing. See Project Plans.
D. Walls are to be backfilled before railing is placed.
E. Clearance to reinforcing steel in curb and railing to be 1" except as noted. Longitudinal reinforcement to stop at all expansion joints.
F. See Project Plans for electrolier locations & Pull Box type.
G. See Project Plans for limits of Chain Link Railing Type 7 and / or Tubular Hand Railing.
H. For Electrical Details, see Standard Plans ES-7A, 7B, 7C, 7D, and 7E.
I. A minimum of two - 5 inch round openings are required for future utilities in addition to those on other plan sheets. Openings are to be sealed at ends and extended 8" min. past end of sidewalk if not used. Duct forms are to be tied down.
J. For Metal Beam Guard Rail connection details not shown see Standard Plan A77K and A77I.



TYPE H

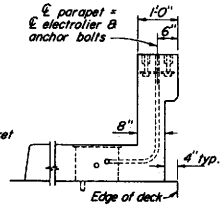
(To be used unless shown otherwise on plans)

CURB DETAIL



POST POCKET DETAIL

Applies to Chain Link Railing Type 7 and Tubular Hand Railing, see respective Standard Plans for additional details.



SECTION A-A

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

CONCRETE BARRIER TYPE 26

NO SCALE

B11-54

STD. PLAN B11-54

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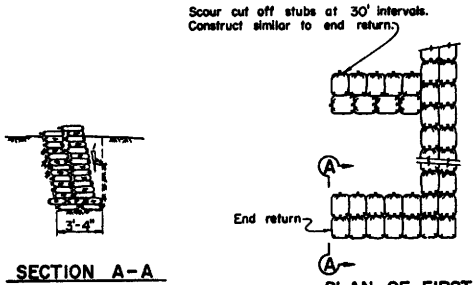
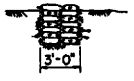
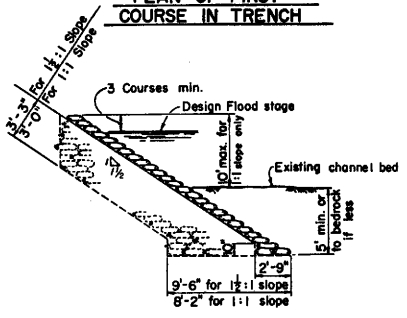
SECTION A-A



PLAN OF FIRST COURSE IN TRENCH

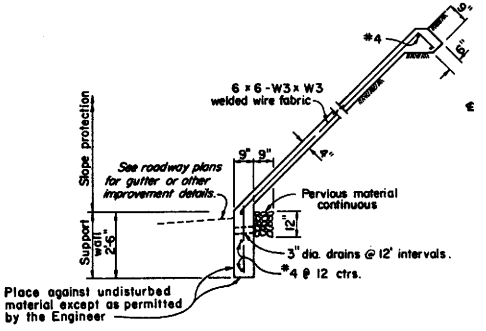


SECTION OF SCOUR CUT-OFF STUBS

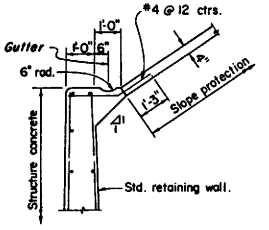


TYPICAL SECTION

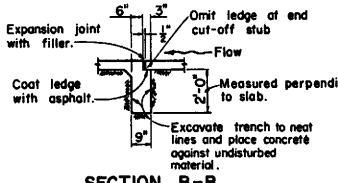
SACKED CONCRETE SLOPE PROTECTION ON SLOPES 1½:1 & 1:1



TYPICAL SECTION "C"

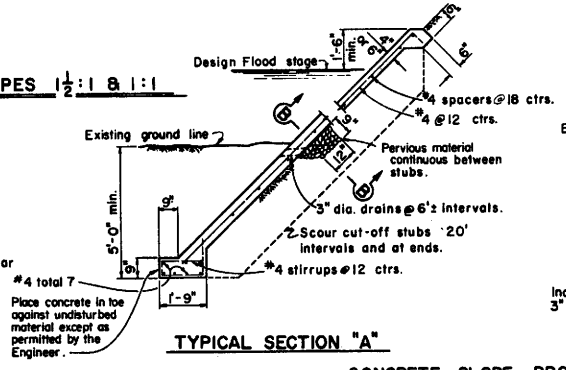


TYPICAL SECTION "D"

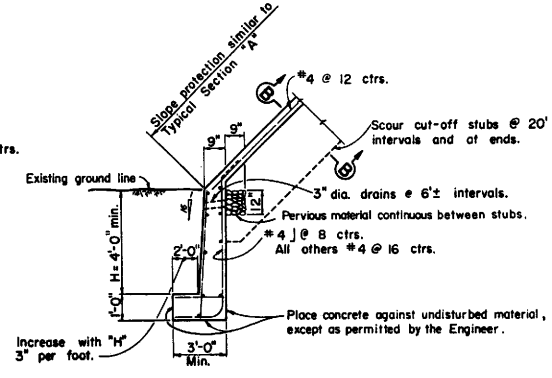


SECTION B-B

Scale: ½" = 1'-0"



TYPICAL SECTION "A"



TYPICAL SECTION "B"

CONCRETE SLOPE PROTECTION

Scale: ½" = 1'-0"

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SLOPE PROTECTION DETAIL NO. 1

NO SCALE

B13-1

STD. PLAN B13-1

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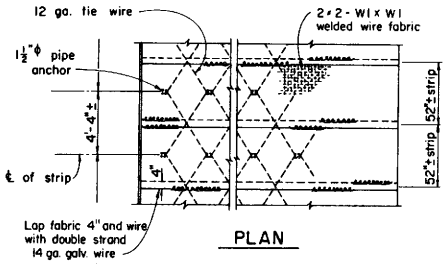
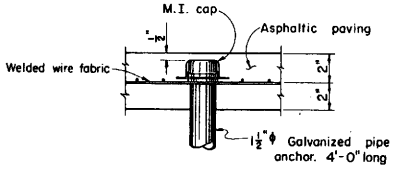
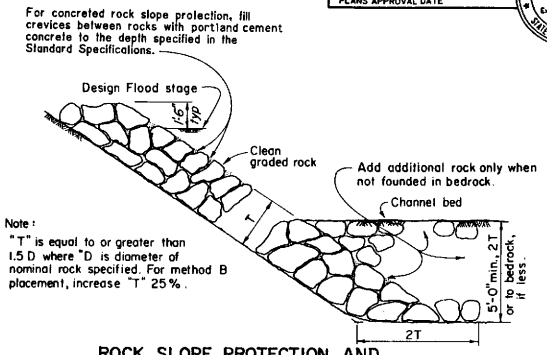


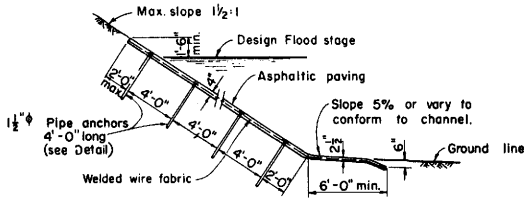
PLAN



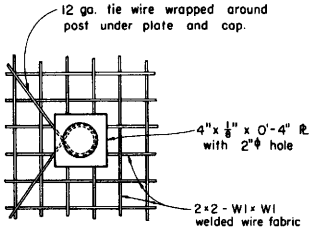
SECTIONAL ELEVATION of PIPE ANCHOR



ROCK SLOPE PROTECTION AND
CONCRETED-ROCK SLOPE PROTECTION

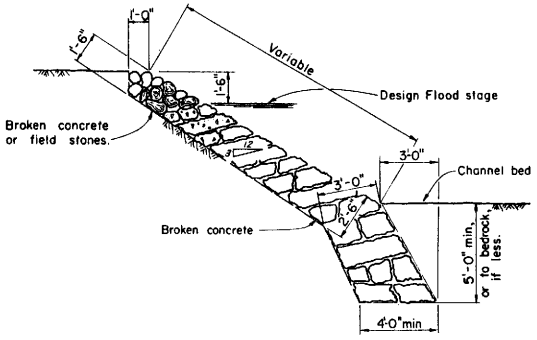


TYPICAL SECTION



PLAN OF PIPE ANCHOR

ASPHALTIC MIXTURE SLOPE PROTECTION



BROKEN CONCRETE SLOPE PROTECTION

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SLOPE PROTECTION DETAIL NO. 2

NO SCALE

B13-2

STD. PLAN B13-2

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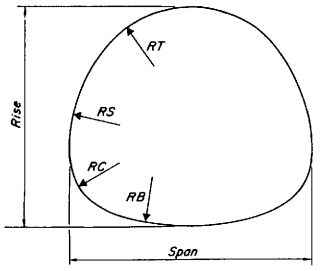
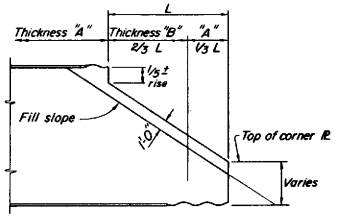
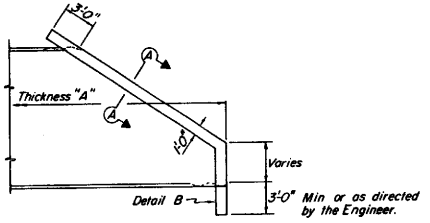




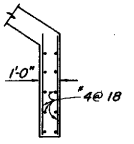
SIDE ELEVATION

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

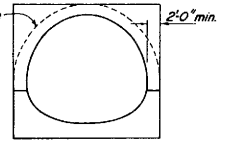


SIDE ELEVATION



DETAIL B

SECTION A-A



END ELEVATION

Note: Reinforce both faces of concrete collar with #4 @ 18 both ways.
Maximum skew is 35°

ALTERNATIVE 2

END BEVELS

MAXIMUM HEIGHT OF FILL (Feet)													LAYOUT DATA (inches)			
		Thickness (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 Ton/SQFT				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. See Note A

TABLE A							
Spans	Soil Pressure Ton / SQFT						
	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

NOTES:

A. For strutting requirements of structural steel plate vehicular undercrossing during construction, see Standard Plan D88A.

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

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

D. Minimum cover for construction loading, see Standard Plan D88.

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

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

STRUCTURAL STEEL PLATE VEHICULAR UNDERCROSSING

NO SCALE

B14-1

STD. PLAN B14-1

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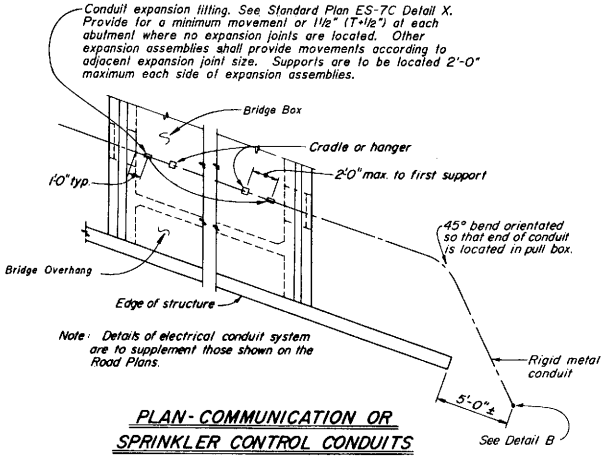
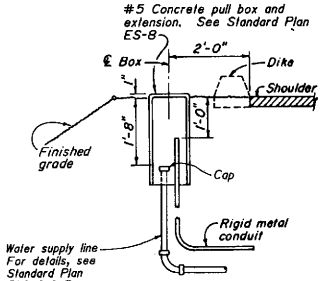
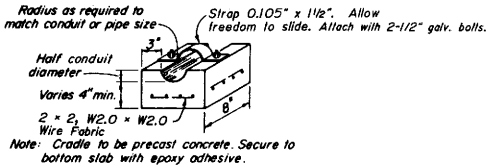


Note: Details of electrical conduit system are to supplement those shown on the Road Plans.

PLAN - COMMUNICATION OR SPRINKLER CONTROL CONDUITS

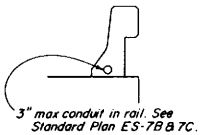


DETAIL B

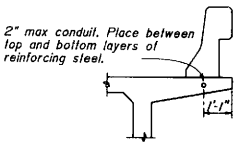


Note: Cradle to be precast concrete. Secure to bottom slab with epoxy adhesive.

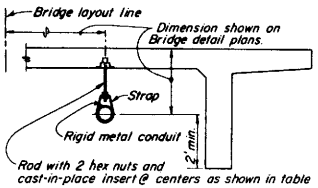
CONCRETE CRADLE

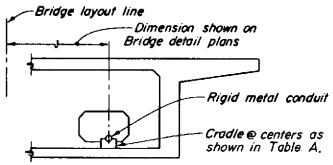


CONDUIT IN BRIDGE RAIL



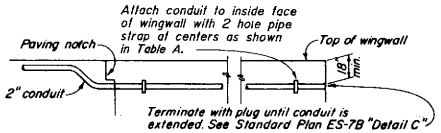
CONDUIT IN OVERHANG





BOX GIRDER

CRADLE SUPPORT DETAILS



CONDUIT IN OVERHANG - WINGWALL DETAIL

CONDUIT LOCATIONS

(For 2" conduit only except as noted)

For location see Bridge Detail plans.

TABLE A

Conduit	2½" or less	3"	3½"
Rod	3/8"	1/2"	5/8"
Strap	0.090 × 1"	0.090 × 1"	0.105 × 1½"
Support spacing	10'	10'	10'

OTHER THAN BOX GIRDER

HANGER SUPPORT DETAILS

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

COMMUNICATION AND SPRINKLER CONTROL CONDUITS (CONDUIT LESS THAN 4" DIAMETER)

NO SCALE

B14-3

STD. PLAN B14-3

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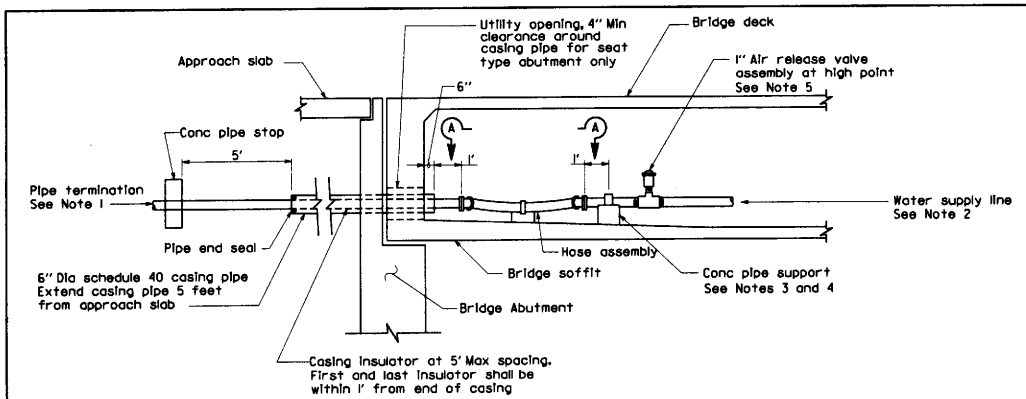
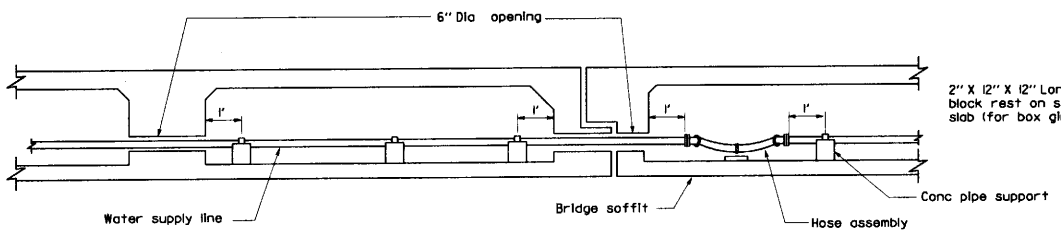
REGISTERED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA



BOX GIRDER INSTALLATION

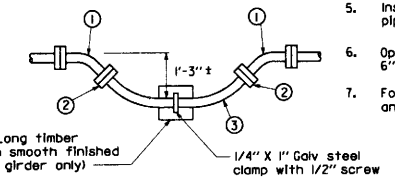


PIPE INSTALLATION AT HINGE

Same for hanger type installation

NUMBERED ITEM

1. 45 degree flanged elbow with insulated flange connection
2. Flanged hose fitting
3. Hose 6'-8" live length (size shall be same as pipe)

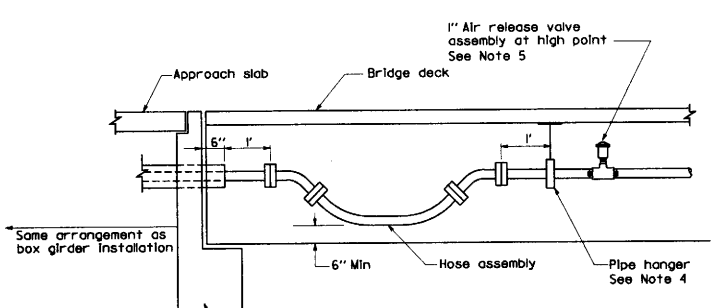


VIEW A-A

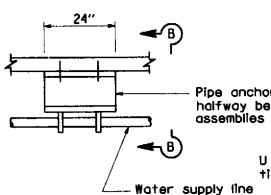
HOSE ASSEMBLY

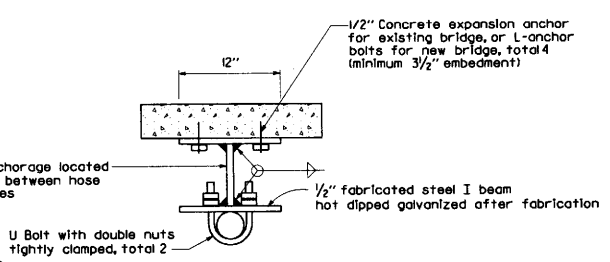
NOTES

1. Extend pipe 5'+ beyond the edge of shoulder or as shown on bridge plans. Terminate in a pull box as shown on Standard Plan B14-3, Detail B.
2. Water supply line shall be installed parallel to to bridge soffit or deck.
3. For concrete pipe support, pipe shall be tightly clamped at the pipe support located halfway between hose assemblies. At all other supports, pipe clamp shall be shimmed with steel washer plate to provide 1/4" clearance between pipe and clamp.
4. Maximum spacing between pipe hangers or supports shall be 10' unless otherwise detailed on the plans.
5. Install air release valve using threaded tee or pipe saddle.
6. Openings through diaphrams and bent caps shall be 6" diameter unless otherwise detailed on the plans.
7. For details of pipe hanger, concrete pipe support and concrete pipe stop see Standard Plan B14-5.



INSTALLATION FOR OTHER STRUCTURE TYPES





VIEW B-B

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

WATER SUPPLY LINE (BRIDGE) (PIPE LESS THAN 4" DIAMETER)

NO SCALE

B14-4

STD. PLAN B14-4

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

REGISTERED CIVIL ENGINEER

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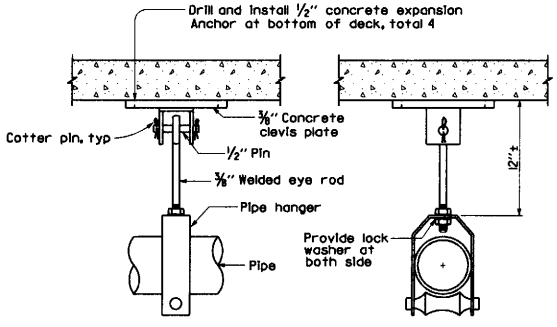
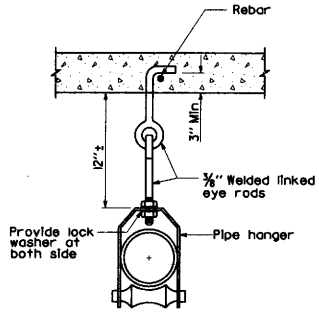


FRONT VIEW

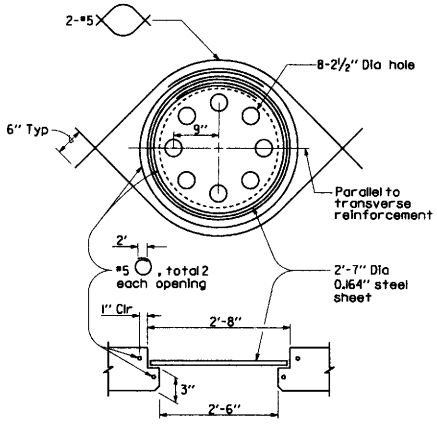
SIDE VIEW

FOR EXISTING BRIDGE



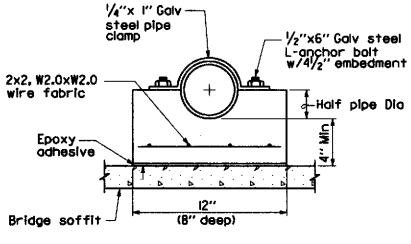
FOR NEW BRIDGE

PIPE HANGER

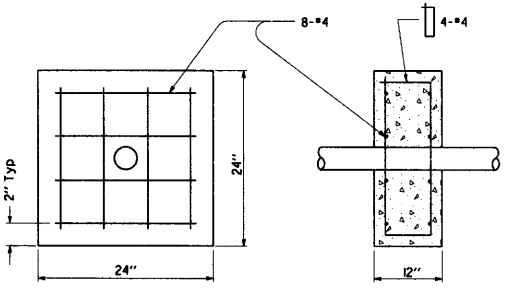


Locate where called for on bridge plans. Adjust reinforcement to clear opening. Plate must be installed before top deck is placed.

SOFFIT ACCESS OPENING



CONCRETE PIPE SUPPORT



CONCRETE PIPE STOP

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

WATER SUPPLY LINE (DETAILS) (PIPE LESS THAN 4" DIAMETER)

NO SCALE

B14-5

STD. PLAN B14-5

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July 1, 1992
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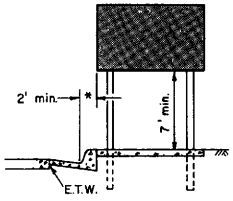
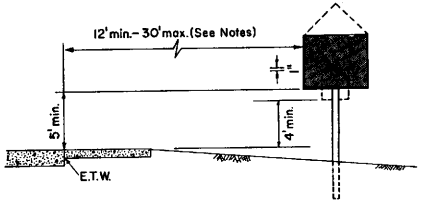
REGISTERED PROFESSIONAL ENGINEER P. Lowden Jr. No. 12284 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA



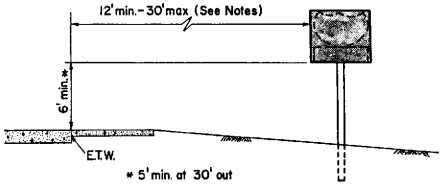
* 1' min. where lateral clearance limited.

URBAN LOCATIONS

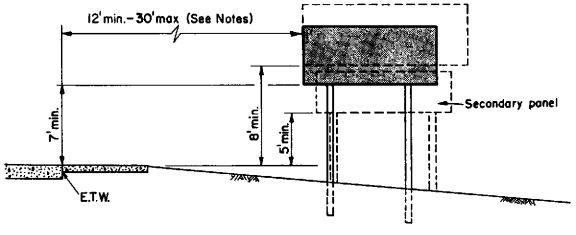


RURAL LOCATIONS

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

NO SCALE

RS1

STD. PLAN RS1

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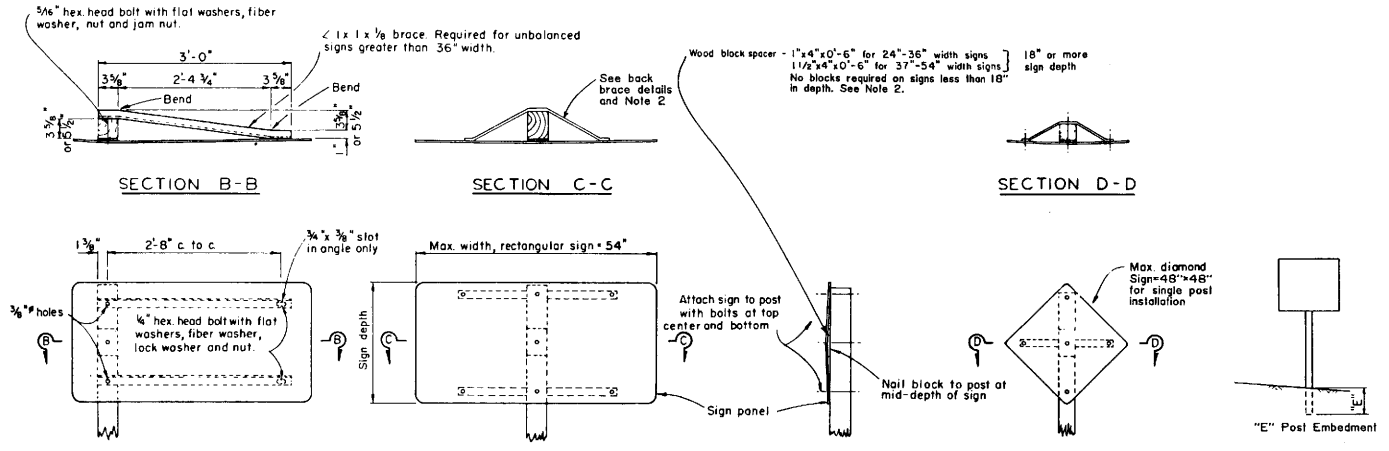
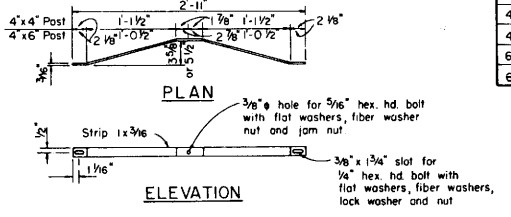


SINGLE POST INSTALLATION

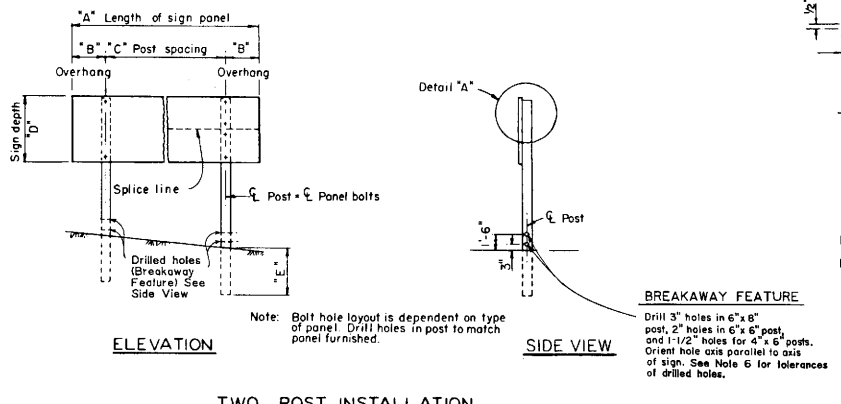
(See Note 5 regarding breakaway feature for single post installations)

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'

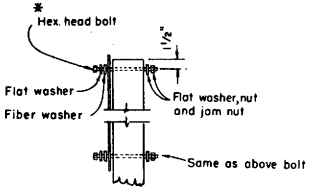


BACK BRACE DETAILS

(See Note 2)



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. See Section C-C.
2. Balanced single post installations of unframed single sheet aluminum panel signs shall have block spacers if 18" or more in depth and a combination of block spacers and back braces if 18" or more in depth and 34" or more in width. Sign 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.
5. Breakaway feature for single post installation shall be the same as the breakaway feature shown for the two post installation.
6. Tolerance for diameter of drilled holes in breakaway feature is ±1/8".

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

ROADSIDE SIGNS - WOOD POST
TYPICAL INSTALLATION DETAILS NO. 2

NO SCALE

RS2

STD. PLAN RS2

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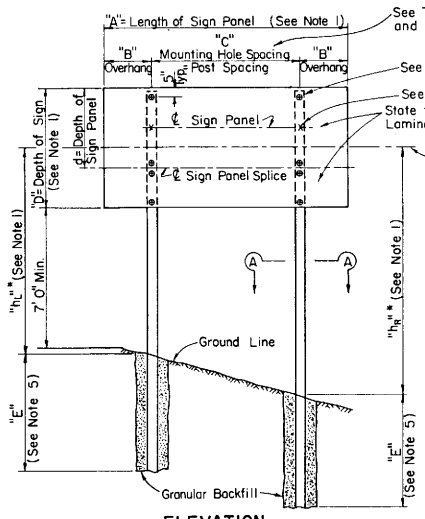
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

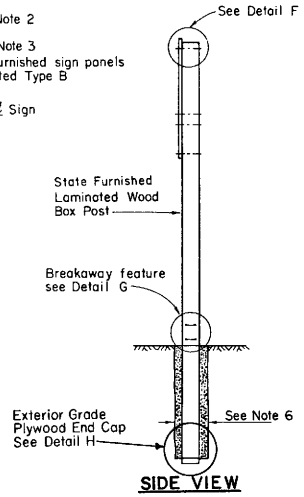
REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — P. Lowden Jr. — No. 12284 — Exp. 3-31-93 — CIVIL — STATE OF CALIFORNIA

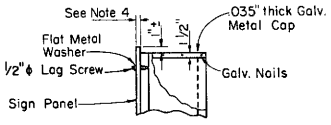


ELEVATION



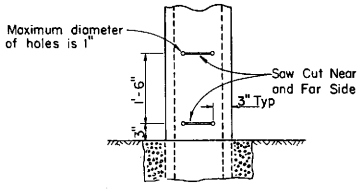
SIDE VIEW

* 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.

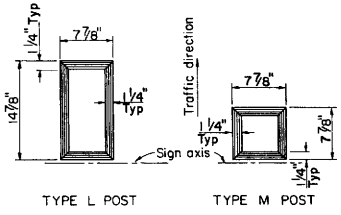


DETAIL F

GALV. METAL CAP (STATE FURNISHED)



DETAIL G



SECTION A-A

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"

TABLE 2

MINIMUM POST EMBEDMENT "E" FOR TYPE L POST

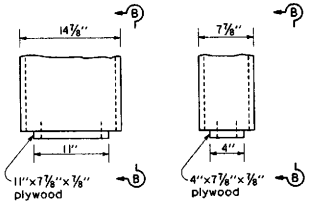
"h_L" or "h_R" (in feet)	TOTAL SIGN AREA (sq. ft.) 40 to 90	90+ to 140	140+ to 190	190+ to 240	240+ to 290
9 to 13	6'	6.5'	7.5'	8.5'	9'
13+ to 17	6'	7'	8'	9'	10'
17+ to 21	6'	7.5'	9'	9'	
21+ to 26	7'	8'	9'		

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 for other details.
2. "ϕ" indicates location of 1/2" lag screws and existing holes in panels. Lag screws are to be embedded at least 1" into post using 5/16" diameter pilot holes.
3. "x" indicates location of additional 1/2" lag screws required when the depth of sign panel (d) and the length of sign panel (A) are as follows:

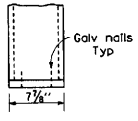
d	A
60"	17' - 0" to 24' - 0"
54"	19' - 0" to 24' - 0"
48"	21' - 0" to 24' - 0"
42"	24' - 0"

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.



TYPE L POST TYPE M POST

DETAIL H



SECTION B-B

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

ROADSIDE SIGNS
LAMINATED WOOD BOX POST
TYPICAL INSTALLATION DETAILS NO. 3

NO SCALE

RS3

STD. PLAN RS3

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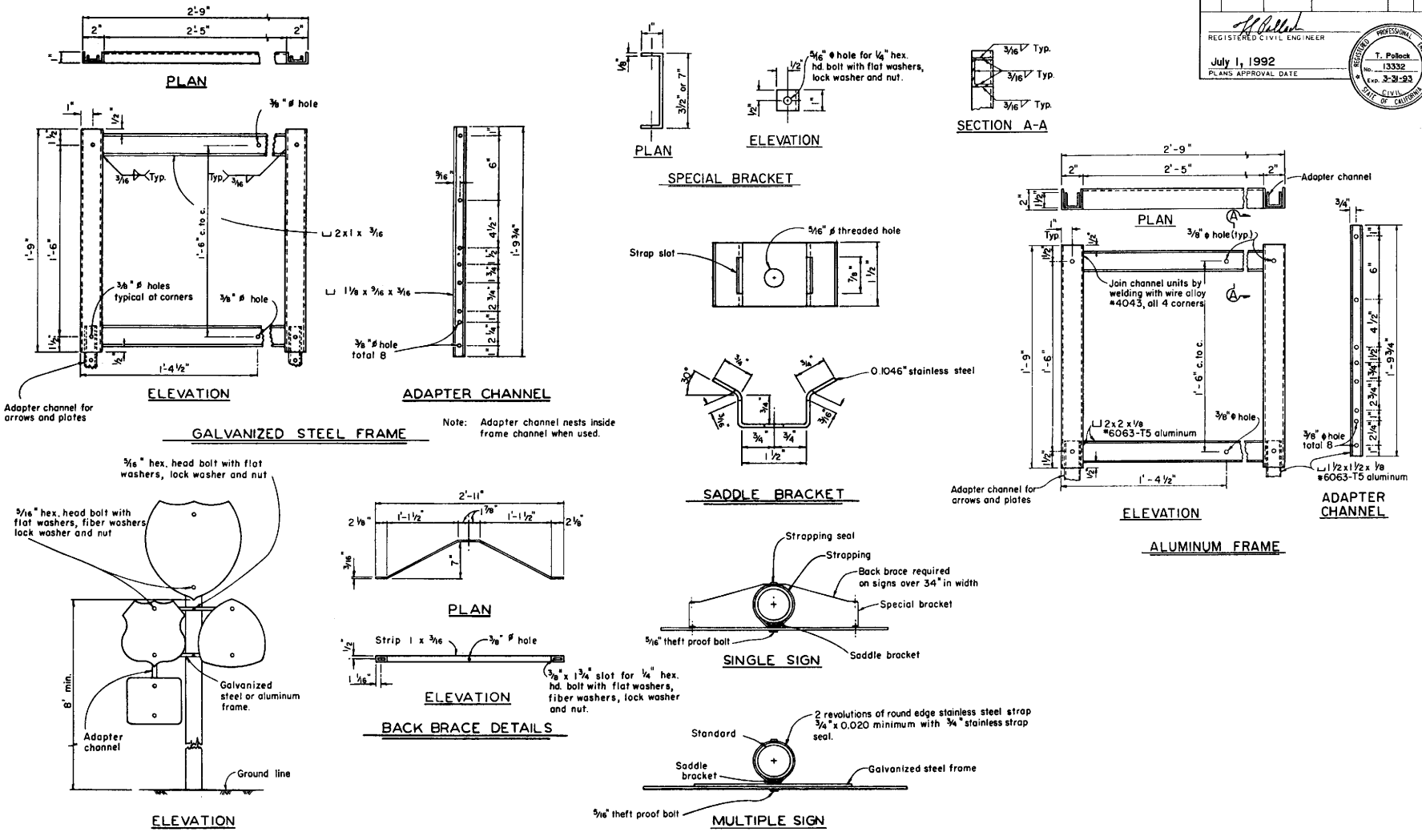

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

ROADSIDE SIGNS
TYPICAL INSTALLATION DETAILS NO. 4

NO SCALE

RS4

STD. PLAN RS4

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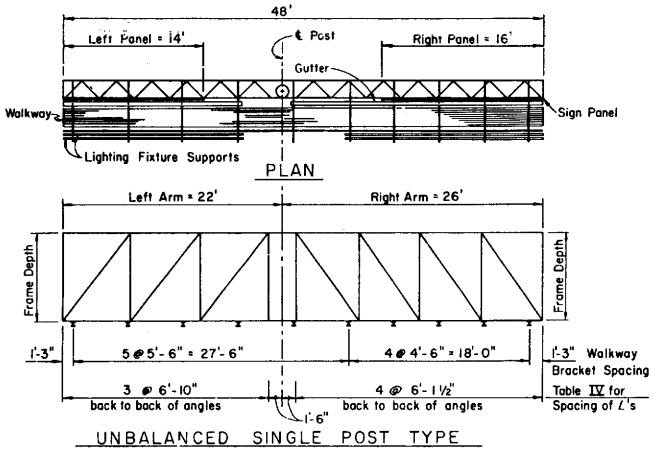


UNBALANCED SINGLE POST TYPE

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	Instructions and examples
S2	Post types II thru VIII
S3	Post types I-S thru VII-S
S4	Structural frame members
S5	Structural frame members
S6	Structural frame details
S7	Frame juncture details
S8A,B,C,D	Sign panel mounting details
S9	Walkway details no. 1
S10	Walkway details no. 2
S11	Walkway safety railing details
S13	Pile foundation
ES-29	Mercury Sign Lighting Equipment
ES-32A	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.

GENERAL NOTES

SPECIFICATIONS:

DESIGN: A.A.S.H.T.O. Specifications for the Design and Construction of Structural Supports for Highway Signs, dated 1985.

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.

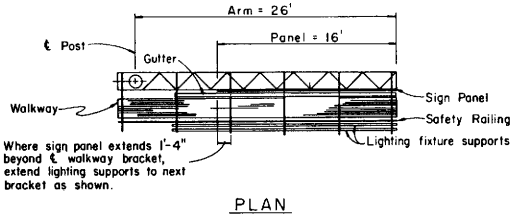
UNIT STRESSES:

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. (spread footing)

MINIMUM CLEARANCE: Vertical roadway clearance 18'-0"

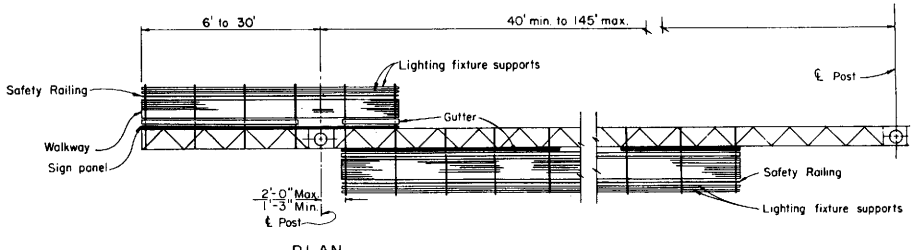
WELDING: All welding continuous unless otherwise noted on the plans. All welding to be done in accordance with the Standard Specifications.

Standard Plan Sheet No.
Detail No.



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

NO SCALE

S1

STD. PLAN S1

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PLANS APPROVAL DATE

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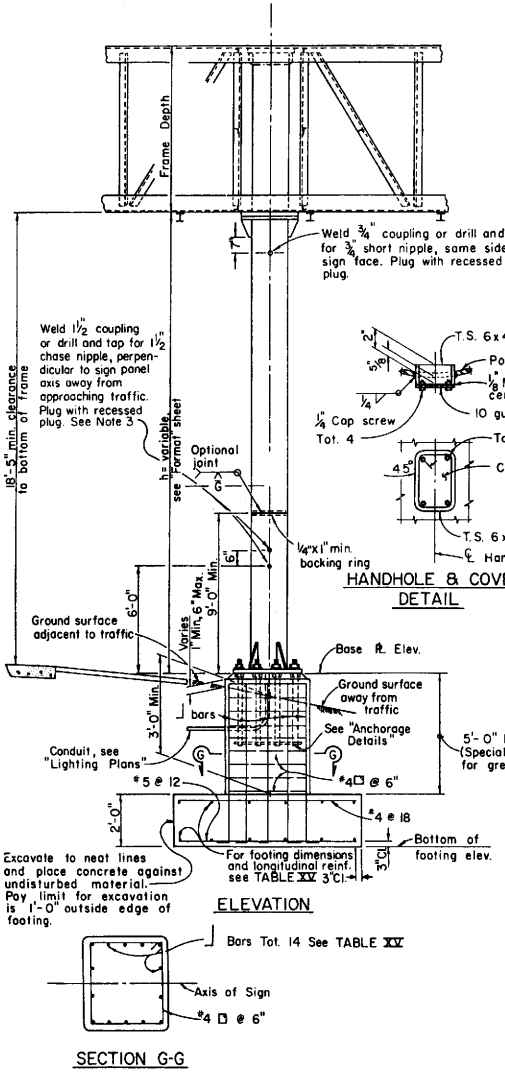
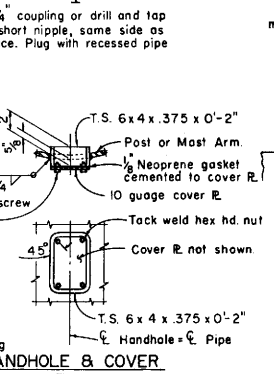
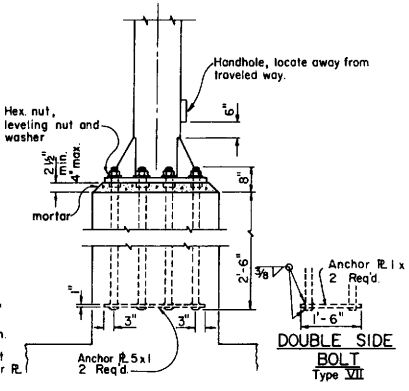
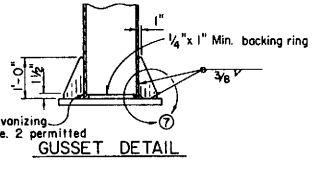


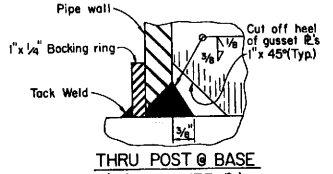


HANDHOLE & COVER DETAIL



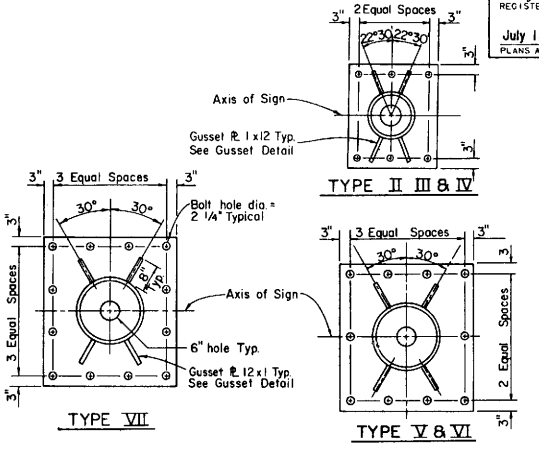
ANCHORAGE DETAILS





THRU POST @ BASE PL (NO COVER PL)

DETAIL 7



TYPICAL BASE PLATES

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"x 1'-7"x 7/8"	2'-4"x 2'-1"x 2"	6	2'-11"x2'-8"	7'-0"x 10'-0"	6-#4 bars	9-#5 bars	#5
III	14"O.D. @ 72.09	1'-8"x 1'-8"x 7/8"	2'-7"x 2'-3"x 2"	6	3'-2"x2'-10"	8'-0"x12'-0"	6-#5 bars	8-#7 bars	#6
IV	16"O.D. @ 82.77	1'-10"x 1'-10"x 7/8"	3'-1"x 2'-9"x 2"	6	3'-8"x3'-4"	8'-0"x14'-0"	6-#5 bars	9-#8 bars	#6
V	18"O.D. @ 93.45	2'-0"x 2'-0"x 7/8"	3'-3"x 3'-0"x 2"	10	3'-10"x3'-7"	9'-0"x15'-0"	6-#5 bars	9-#9 bars	#7
VI	20"O.D. @ 104.13	2'-2"x 2'-2"x 1"	3'-3"x 3'-0"x 2"	10	3'-10"x3'-7"	9'-0"x 16'-0"	6-#6 bars	8-#10 bars	#8
VII	24"OD. @ 125.49	2'-6"x 2'-6"x 1"	3'-7"x 3'-3"x 2"	12	4'-3"x3'-11"	10'-0"x17'-0"	7-#6 bars	10-#10 bars	#10

NOTES:
1. For "General Notes" see Standard Plan S1.
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 PL's 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 Standard Plan S13.
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 VII

NO SCALE

S2

STD. PLAN S2

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REGISTERED CIVIL ENGINEER

July 1, 1992
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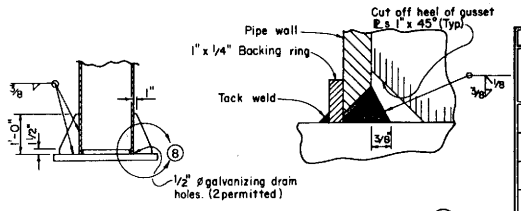


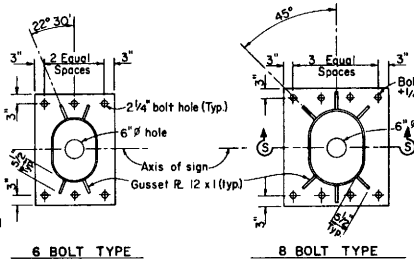
SECTION S-S

DETAIL 8

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	J Bars
I - S	10" std. @ 40.48	4"	2'-3" x 1'-9" x 2"	6-2" ø	2'-9" x 2'-3"	5'-0" x 10'-0"	5-#4 bars	5-#6 bars	#6
II - S	12" std. @ 49.56	5"	2'-6" x 1'-11" x 2"	6-2" ø	3'-0" x 2'-6"	6'-0" x 11'-0"	6-#4 bars	6-#7 bars	#6
III - S	14" O.D. @ 72.09	5"	2'-9" x 2'-0" x 2"	6-2" ø	3'-4" x 2'-7"	7'-0" x 13'-0"	7-#4 bars	7-#8 bars	#8
IV - S	16" O.D. @ 82.77	6"	2'-11" x 2'-7" x 2"	8-2" ø	3'-6" x 3'-2"	8'-0" x 14'-0"	8-#5 bars	8-#9 bars	#8
V - S	18" O.D. @ 93.45	7"	3'-1" x 2'-9" x 2"	8-2" ø	3'-8" x 3'-4"	8'-0" x 16'-0"	8-#5 bars	8-#9 bars	#9
VI - S	20" O.D. @ 104.13	8"	3'-5" x 2'-9" x 2"	8-2" ø	4'-0" x 3'-4"	9'-0" x 17'-0"	9-#5 bars	9-#10 bars	#10
VII - S	24" O.D. @ 125.49	8"	3'-9" x 3'-3" x 2"	8-2 1/4" ø	4'-5" x 3'-11"	10'-0" x 18'-0"	10-#6 bars	10-#11 bars	#11

Notes:

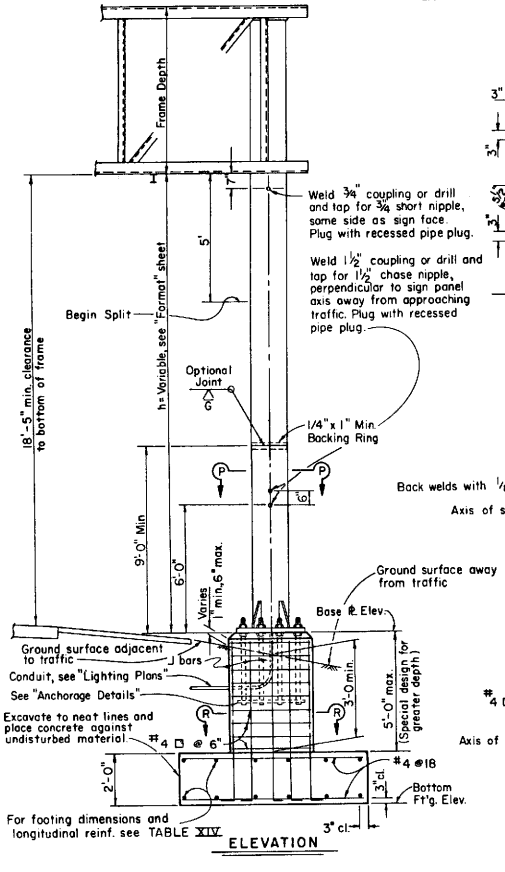
1. For "General Notes" see Standard Plan S1.
2. Longer sides of Base Plates, Pedestals & Footings; shall be normal to axis of sign.
3. Backfill shall be in place prior to erection of post.
4. Thread upper 8" of anchor bolts and galvanize upper 1'-0".
5. Spread footing shown, use Pile Foundation when shown on the Project Plans.
6. Anchor PLs may be retained with hex. nut or formed head as an alternative to details shown.



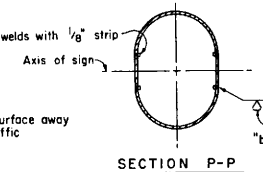
6 BOLT TYPE

8 BOLT TYPE

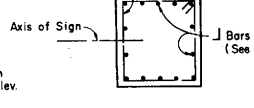
TYPICAL BASE PLATES



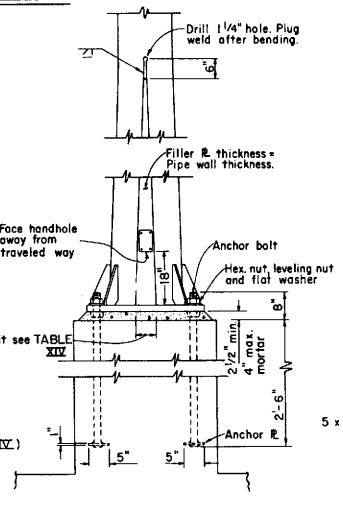
ELEVATION



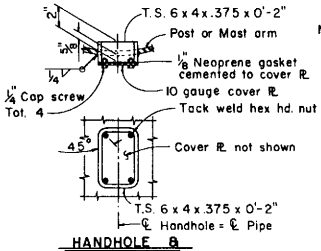
SECTION P-P



SECTION R-R



ANCHORAGE DETAILS

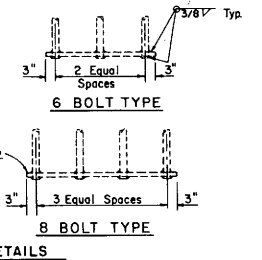


HANDHOLE & COVER DETAILS

Notes:

When foundation is located on a steep slope with exposed face of concrete adjacent to traffic, see detail on Standard Plan S13.

Slope protection required when indicated on Project Plans.



STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

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

NO SCALE

S3

STD. PLAN S3

170

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REGISTERED CIVIL ENGINEER

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PLANS APPROVAL DATE

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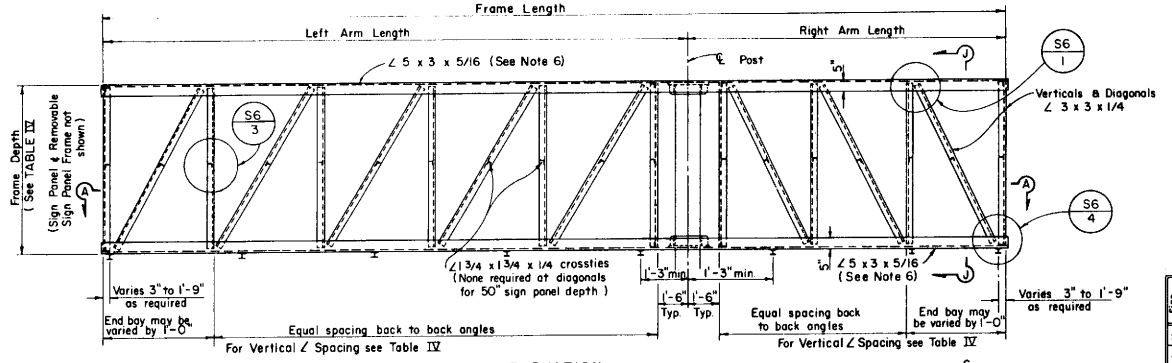
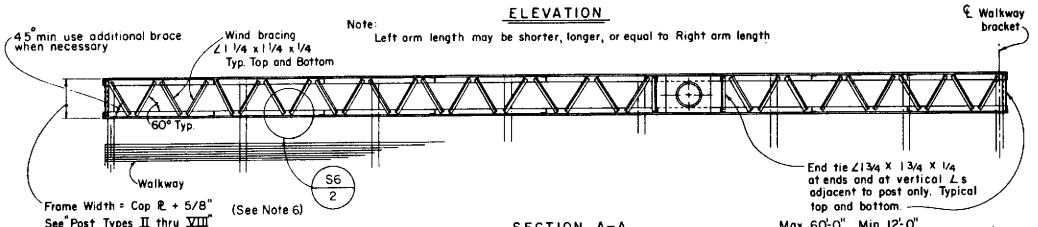


ELEVATION

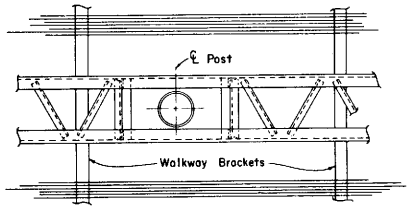
Note:
Left arm length may be shorter, longer, or equal to Right arm length



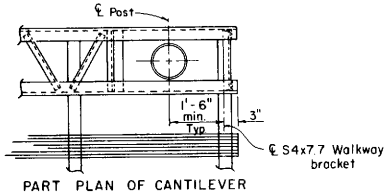
SECTION A-A

Sign Panel Depth	Frame Depth	Maximum Vertical ∠ Spacing	See Note 7
50"	4'-6"	4'-6"	4'
60"	5'-6"	5'-0"	4'
70"	6'-4"	5'-6"	4'
80"	7'-2"	6'-0"	5'
90"	8'-0"	7'-0"	5'
100"	8'-10"	7'-0"	6'
110"	↓	↓	6'
120"			6'

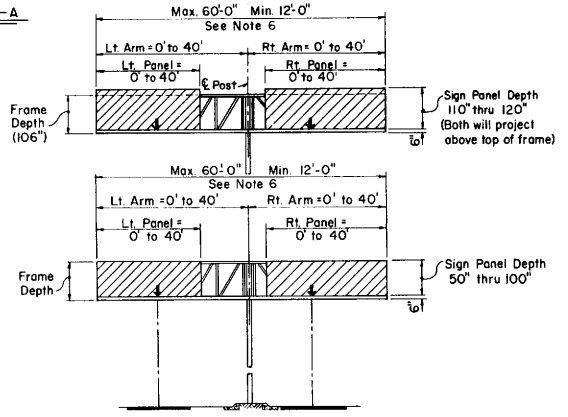
TABLE IV



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)
2. For walkway see (S9) & (S10)
3. For walkway length see (S1)
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.)

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS - TRUSS SINGLE POST TYPE STRUCTURAL FRAME MEMBERS

NO SCALE

S4

STD. PLAN S4

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

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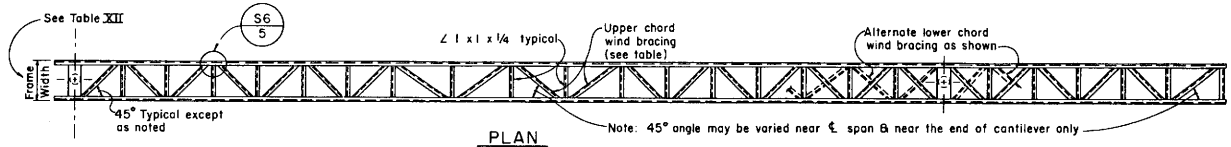
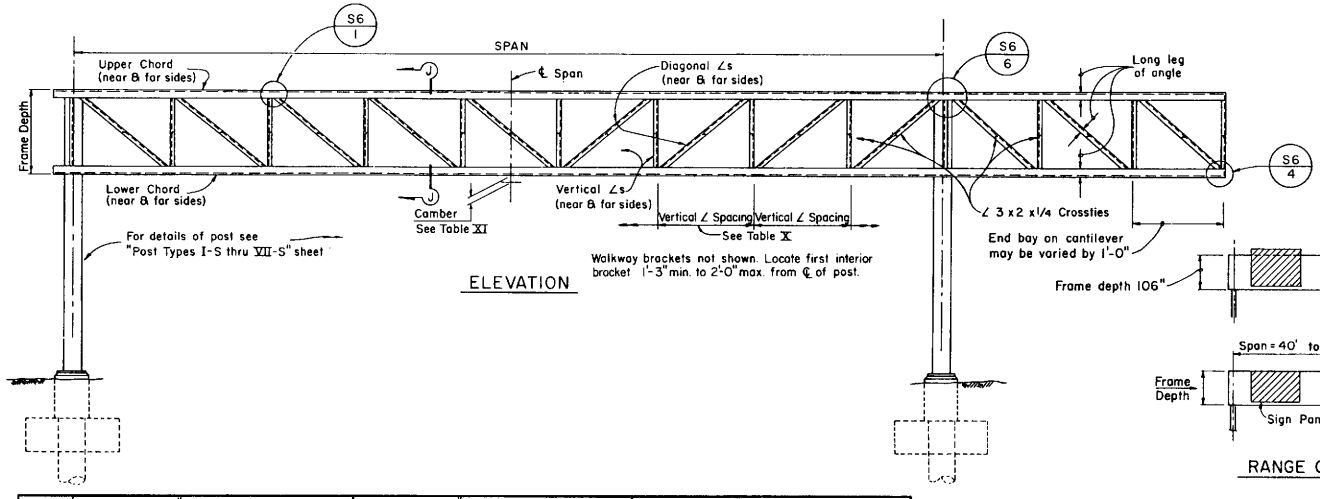


PLAN



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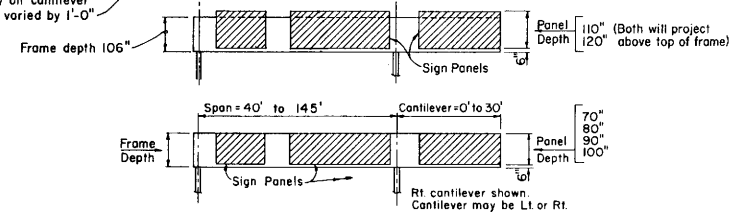

RANGE OF STRUCTURE SIZES

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

TABLE X

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"

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.

Span	100" Panel Depth					110" & 120" Panel Depth				
	Frame Width	Chord ∠s	Vertical ∠s	Diagonal ∠s	Wind Bracing	Frame Width	Chord ∠s	Vertical ∠s	Diagonal ∠s	Wind Bracing
40'-50'	2'-0"*	5x3½x5/16	3x3x5/16	3x3x5/16	1¼x1¼x1/4	2'-0"*	5x3½x5/16	3x3x5/16	3x3x5/16	1¾x1¾x1/4
51'-60'	2'-0"*	5x3½x5/16			1¼x1¼x1/4	2'-0"*	5x3½x5/16			1¾x1¾x1/4
61'-70'	2'-6"†	5x3½x5/16			1½x1½x1/4	2'-6"†	↓			2x2x1/4
71'-80'	3'-0"	6x4x3/8			1¾x1¾x1/4	3'-0"	6x4x3/8			2x2x1/4
81'-90'	3'-0"	6x4x3/8			1¾x1¾x1/4	3'-0"	6x4x3/8			2½x2½x1/4
91'-100'	3'-0"	6x4x3/8			1¾x1¾x1/4	3'-6"	↓			2½x2½x1/4
101'-110'	3'-6"	7x4x7/16			2x2x1/4	3'-6"	7x4x7/16			2½x2½x1/4
111'-120'	3'-6"	7x4x7/16			2x2x1/4	3'-6"	8x4x1/2	↓		3x3x1/4
121'-132'	3'-6"	8x4x1/2			2x2x1/4	3'-6"	8x4x5/8	3½x3½x5/16		3x3x1/4
133'-145'	3'-6"	8x4x5/8	↓	↓	2x2x1/4	3'-6"	9x4x5/8	↓	↓	3x3x1/4

TABLE XII

TABLE XI

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'.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS - TRUSS TWO POST TYPE STRUCTURAL FRAME MEMBERS

NO SCALE

S5

STD. PLAN S5

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

REGISTERED CIVIL ENGINEER

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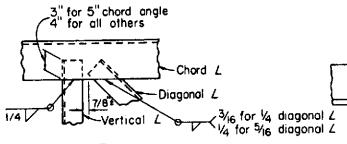

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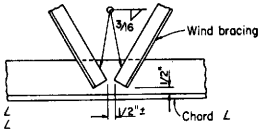

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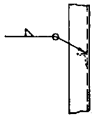

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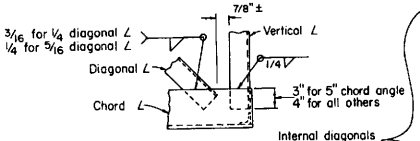

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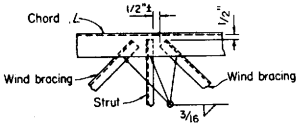
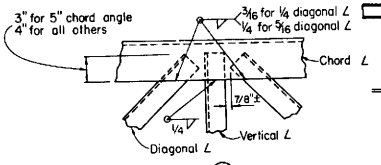
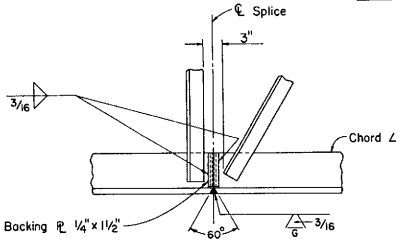


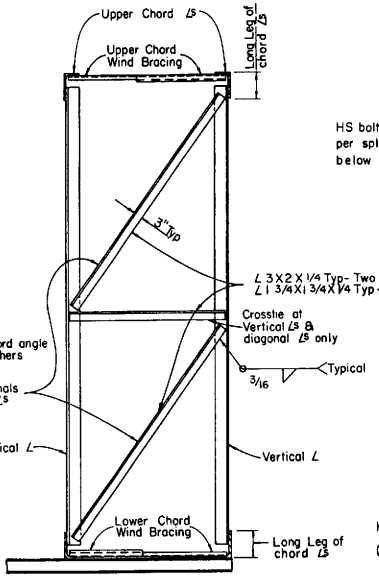
DETAIL 5



DETAIL 6

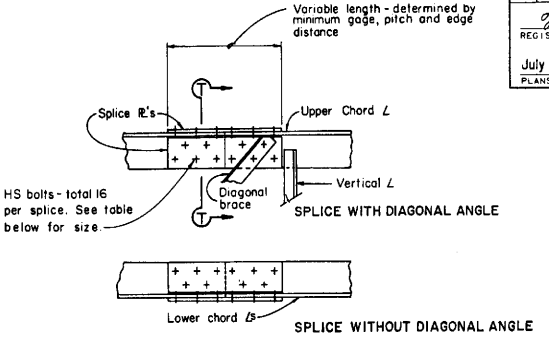


WELDED CHORD SPLICE

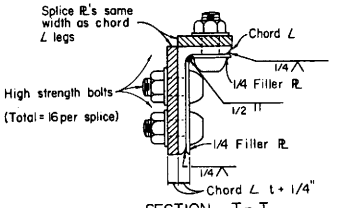


TYPICAL SECTION J-J

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



BOLTED CHORD SPLICE



SECTION T-T

SPLICE NOTES

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"
5X3X 7/16	3/4"

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS - TRUSS STRUCTURAL FRAME DETAILS

NO SCALE

S6

STD. PLAN S6

Return to Table of Contents

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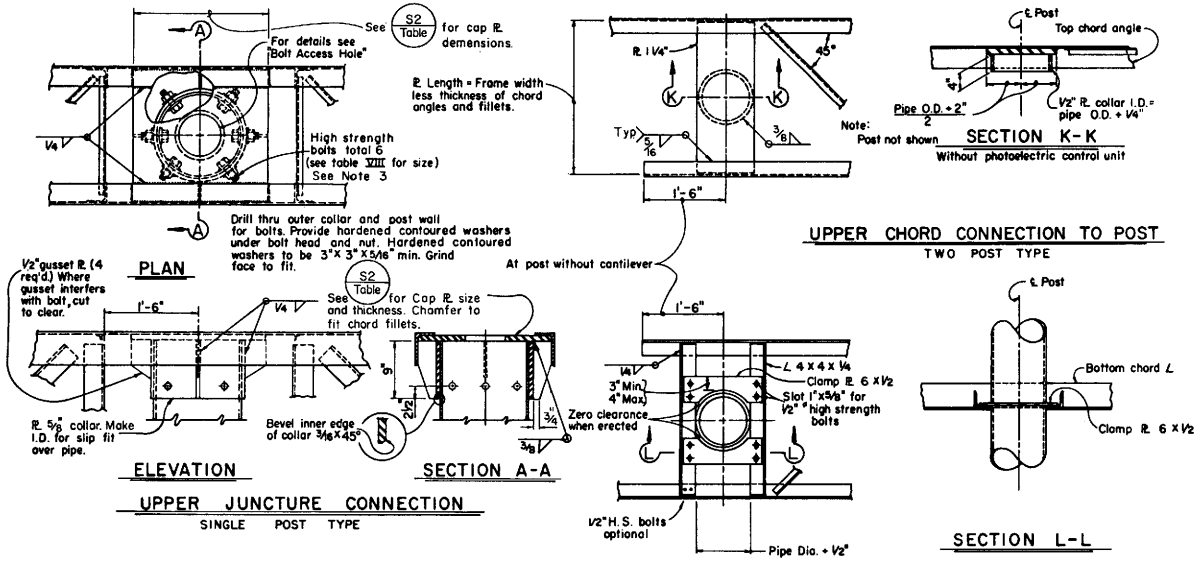


NOTE:

A. Photoelectric control unit and 3-prong, EEI-NEMA standard, twist lock plug receptacle.

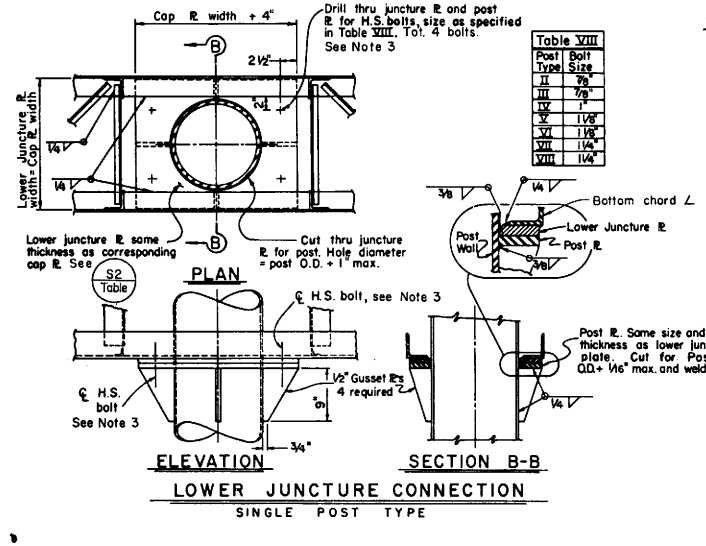
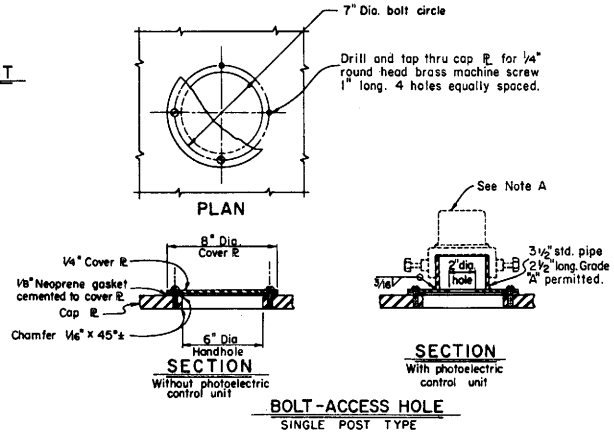


Table VIII	
Post Type	Bolt Size
II	7/8"
III	7/8"
IV	1"
V	1 1/8"
VI	1 1/8"
VII	1 1/4"
VIII	1 1/4"

Notes: (SINGLE POST TYPE)

1. In all cases, Truss shall be supported at lower juncture connection. Bearing surface shall be finished true.
2. Post to Truss connections shall be fitted in shop.
3. High strength bolts noted to be wrench tightened. Torque requirements are waived.



STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS — TRUSS FRAME JUNCTURE DETAILS

NO SCALE

S7

STD. PLAN S7

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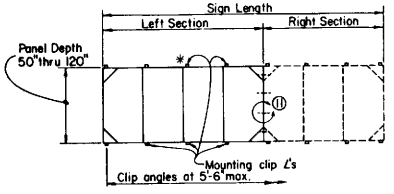
Note:
Panel mounting holes not shown.
Panel lengths available in 2'-0" increments.

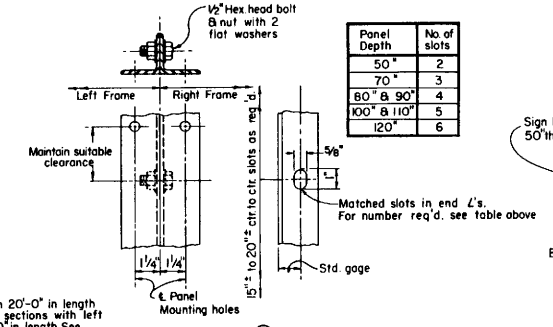


REMOVABLE FRAME
GREATER THAN 20'-0"

* 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 Standard Plan S8D for details.

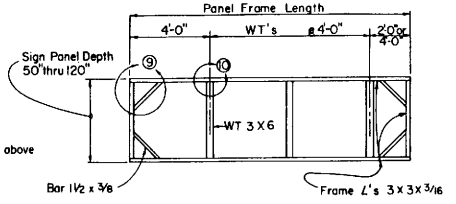
Sign Length	Left Section	Right Section
22'-0"	12'	10'
24'-0"	12'	12'
26'-0"	12'	14'
28'-0"	16'	12'
30'-0"	16'	14'
32'-0"	16'	16'
34'-0"	16'	18'
36'-0"	20'	16'
38'-0"	20'	18'
40'-0"	20'	20'

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.

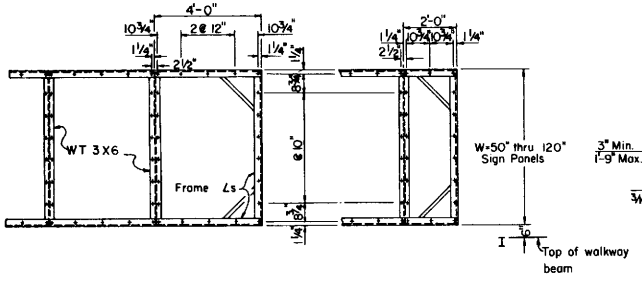


DETAIL ⑪

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



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

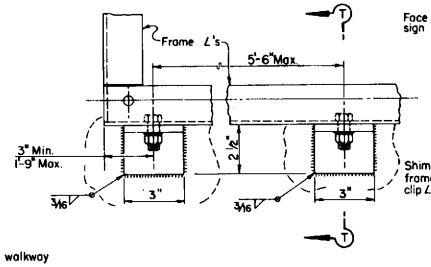


TYPICAL 4'-0" PANEL TYPICAL 2'-0" PANEL

Note: All holes ½" diameter maximum.

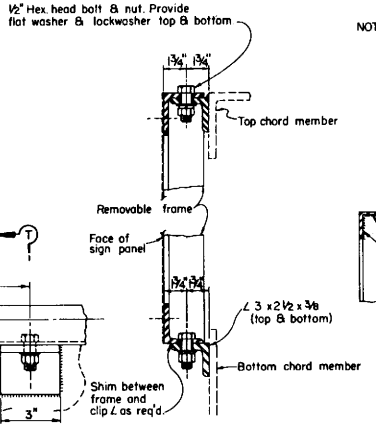
MOUNTING HOLE SPACING FOR SIGN PANEL & FRAME

Hole spacing is for single sheet sign panels.
For Overhead Formed Panels refer to "Overhead Formed Panel" Sheet.



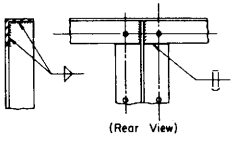
FRAME MOUNTING DETAILS

Details shown apply for sign panel frames ≤ 100" deep. Mounting details for deeper panels shown on Standard Plan S8D.

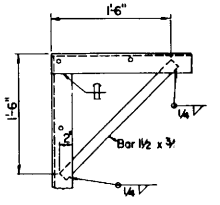


SECTION T-T

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 (¼"-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

NO SCALE

S8A

STD. PLAN S8A

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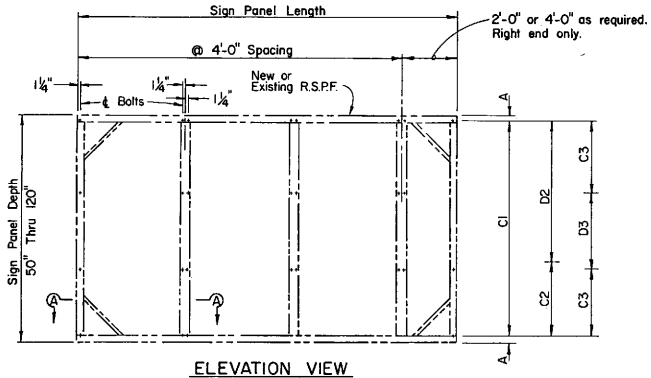
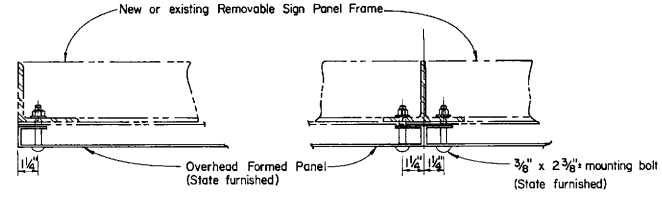


ELEVATION VIEW
NEW OR EXISTING REMOVABLE SIGN PANEL FRAME
MOUNTING HOLE SPACING

PANEL DEPTH	A	MOUNTING BOLT SPACING 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



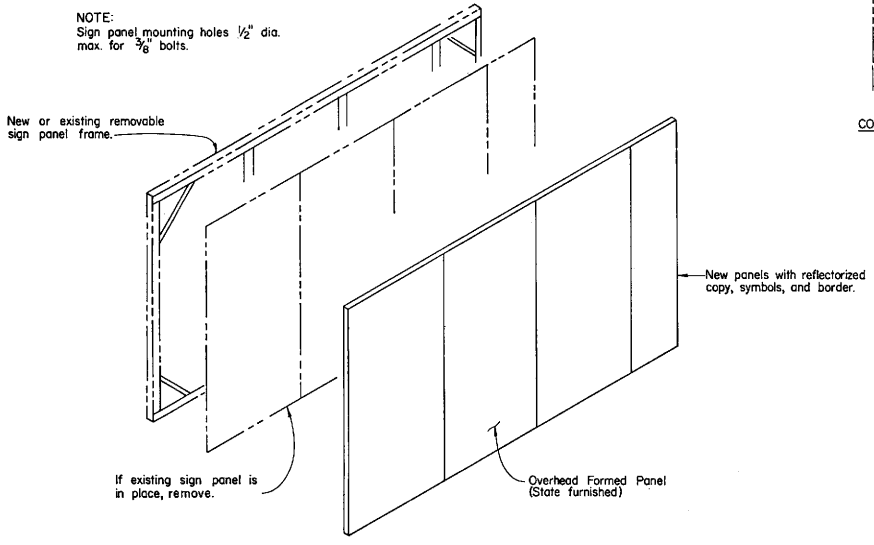
CORNER DETAIL

PANEL CONNECTION

SECTION A-A

NOTES:
When constructing a new frame:
(1) refer to standard plan sheet S8A 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 SIGNS
REMOVABLE SIGN PANEL FRAMES
OVERHEAD FORMED PANEL MOUNTING DETAILS

NO SCALE

STD. PLAN S8B

S8B

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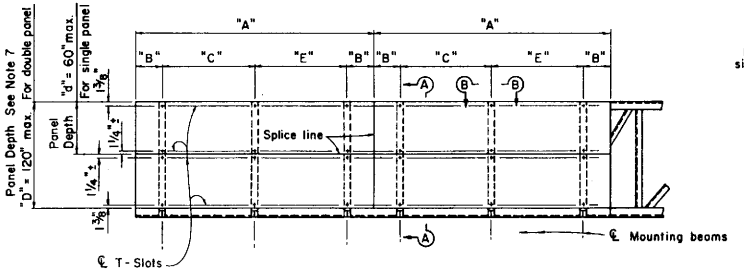
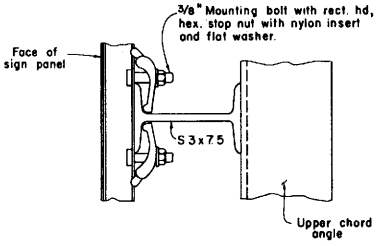
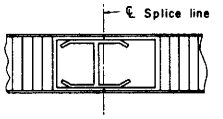


SIGN-ELEVATION



VIEW B-B

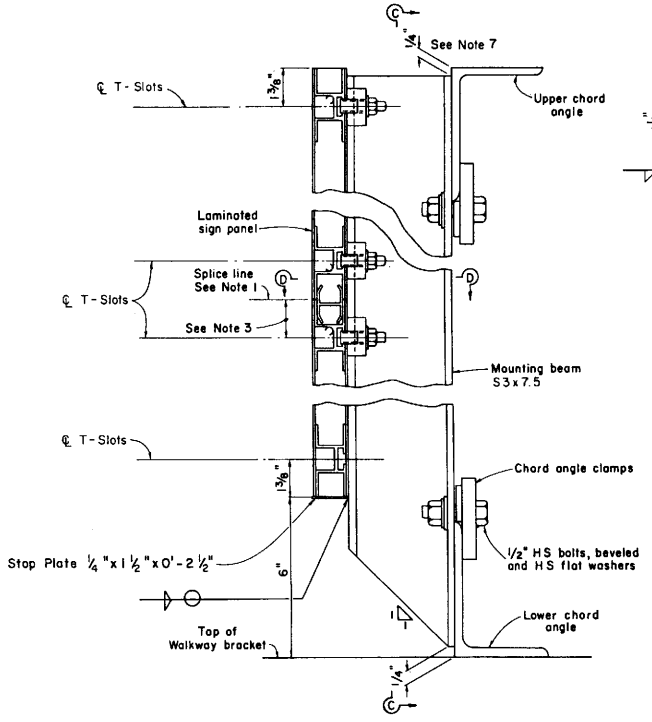


SECTION D-D

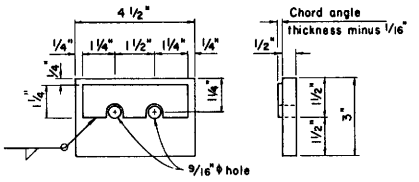
Sign Panel Length *	Number Mounting Beams	Sign Panel Overhang	Mounting Beam Spacing	
"A"		"B"	"C"	"E"
5'-0"	2	9"	3'-6"	
6'-0"	2	12"	4'-0"	
7'-0"	2	15"	4'-6"	
8'-0"	2	18"	5'-0"	
9'-0"	2	22"	5'-4"	
10'-0"	2	24"	6'-0"	
11'-0"	2	24"	7'-0"	
12'-0"	2	30"	7'-0"	
13'-0"	2	30"	8'-0"	
14'-0"	2	30"	9'-0"	
15'-0"	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.

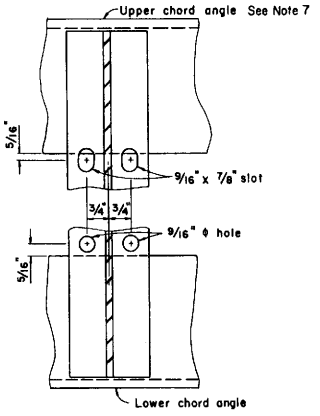
MOUNTING BEAM SPACING TABLE



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 inch-pounds.
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

NO SCALE

S8C

STD. PLAN S8C

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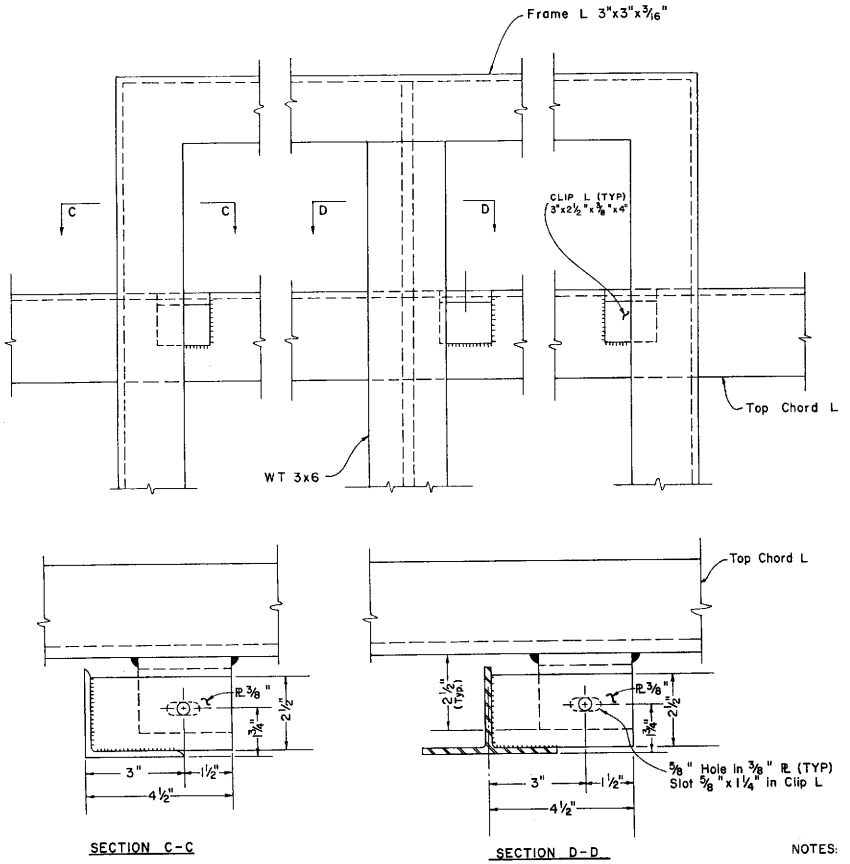
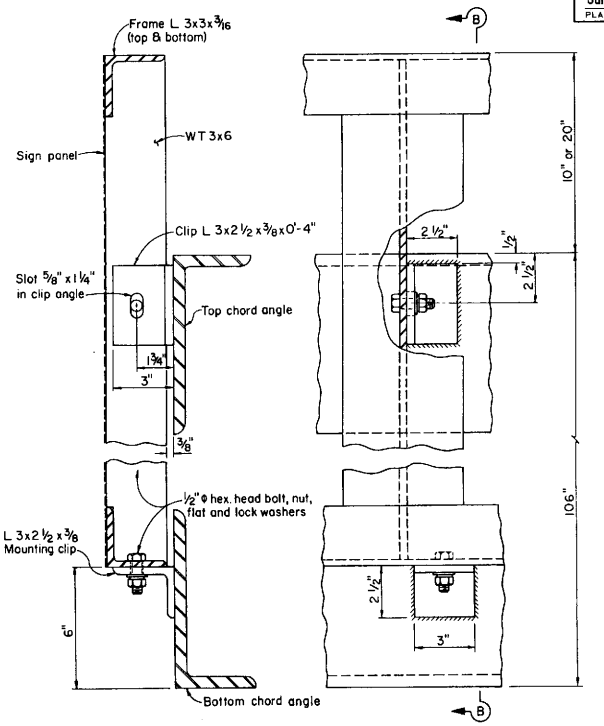


SECTION C-C

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 Standard Plan S8A.
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'' AND 120'' SIGN PANELS

NO SCALE

S8D

STD. PLAN S8D

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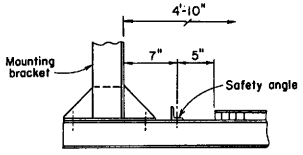
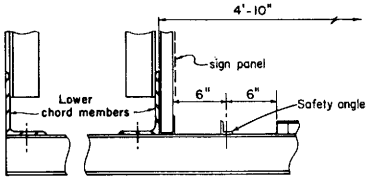
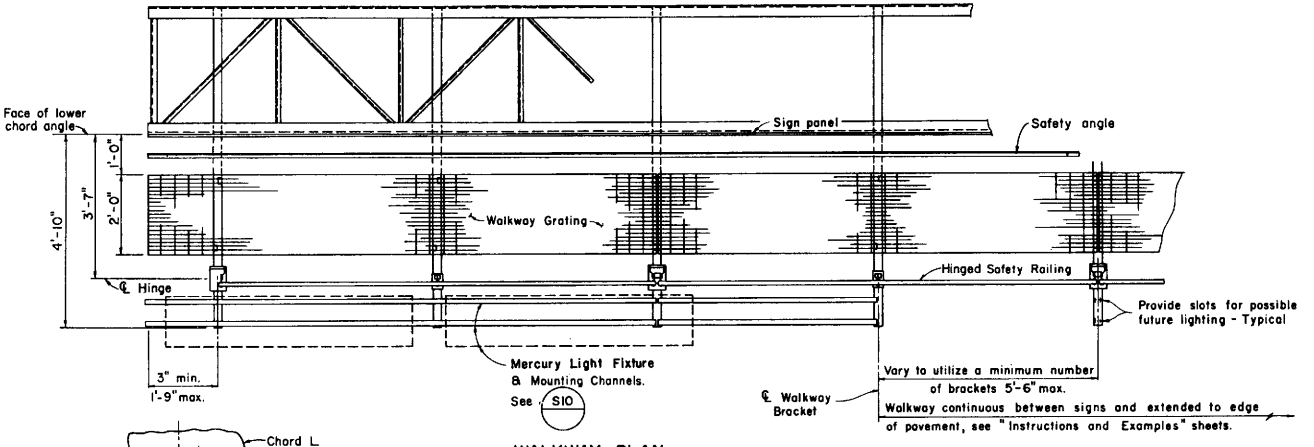


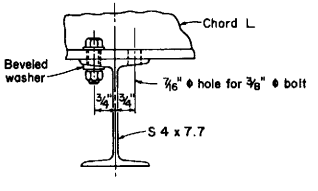
BRIDGE MOUNTED

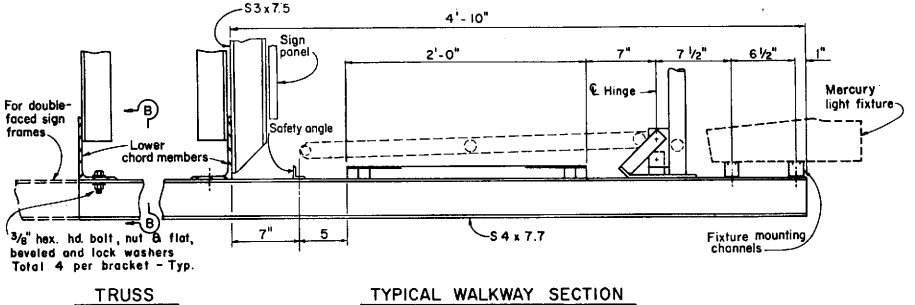


BOX BEAM CLOSED TRUSS



WALKWAY PLAN





TRUSS

TYPICAL WALKWAY SECTION

NOTE:
1. For spacing of lighting fixtures, see Standard Plan ES-29.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
WALKWAY DETAILS NO. 1

NO SCALE

S9

STD. PLAN S9

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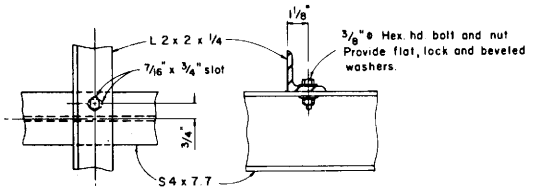
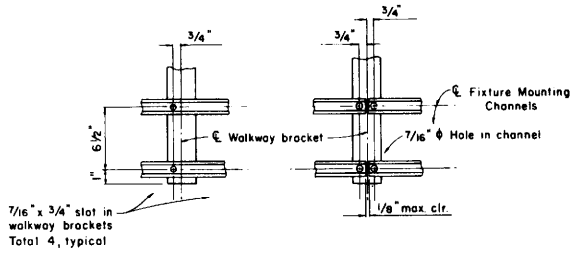
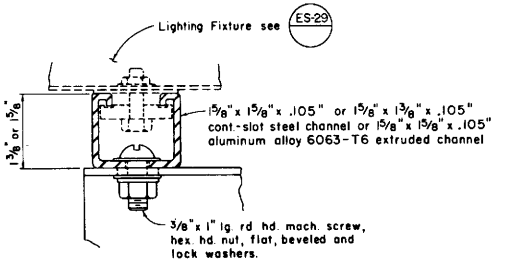


SAFETY ANGLE DETAILS
FOR BRIDGE MOUNTED SIGNS

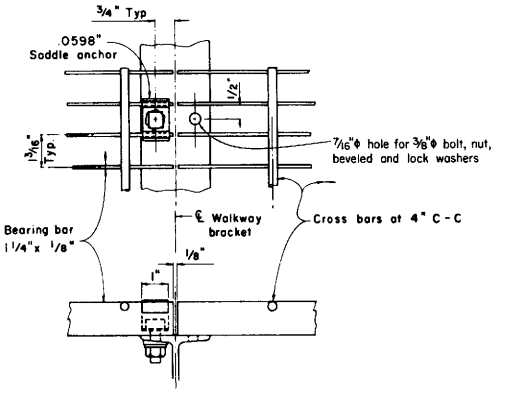


TYPICAL CONNECTION

CONNECTION AT SPLICE



LIGHT FIXTURE MOUNTING CHANNEL DETAILS



WALKWAY DETAILS

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.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
WALKWAY DETAILS NO. 2

NO SCALE

S10

STD. PLAN S10

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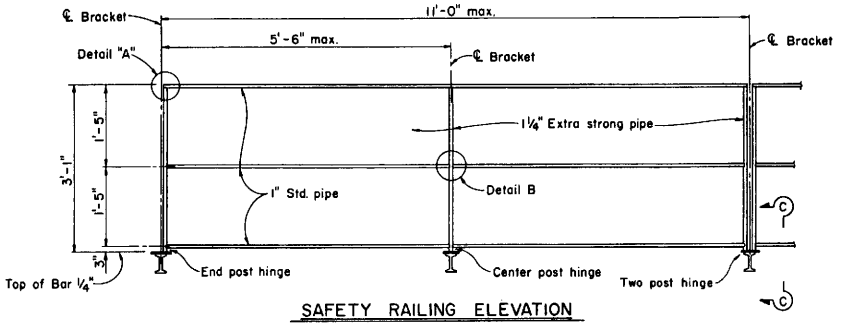
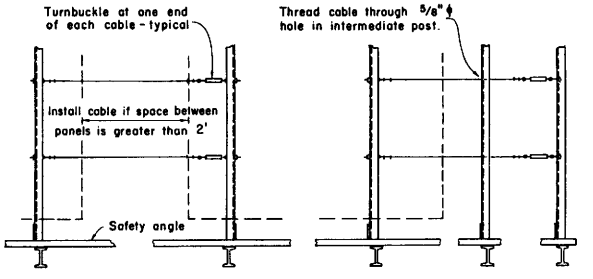
REGISTERED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA



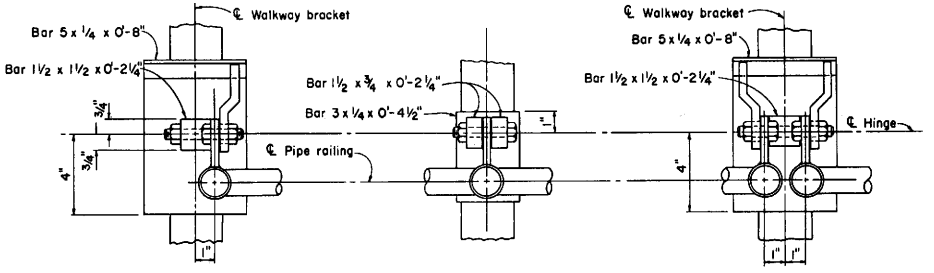
SAFETY RAILING ELEVATION



BETWEEN PANELS

BEYOND PANEL

SAFETY CABLE ELEVATION
FOR BRIDGE MOUNTED SIGNS

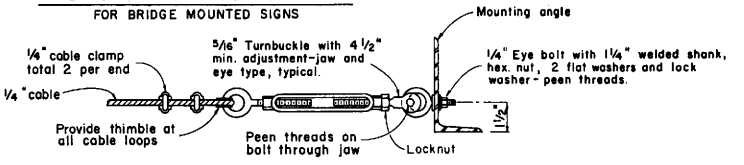


END POST

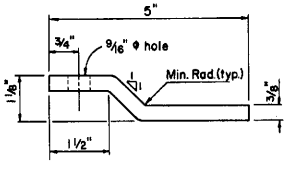
CENTER POST

TWO POST

HINGE - PLAN



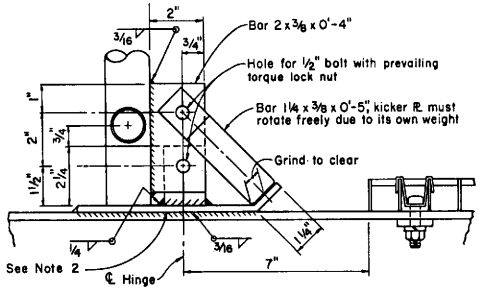
TURNBUCKLE DETAILS



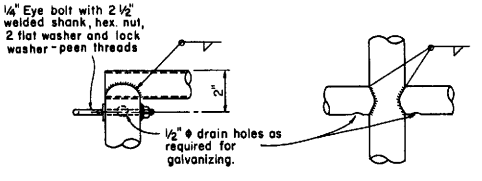
PLAN - KICKER BAR

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.



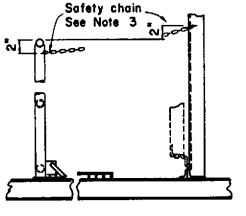
SECTION C-C



DETAIL A

DETAIL B

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



CHAIN ASSEMBLY

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
WALKWAY SAFETY RAILING DETAILS

NO SCALE

S11

STD. PLAN S11

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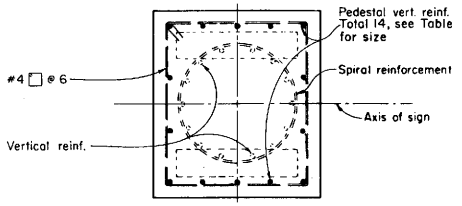
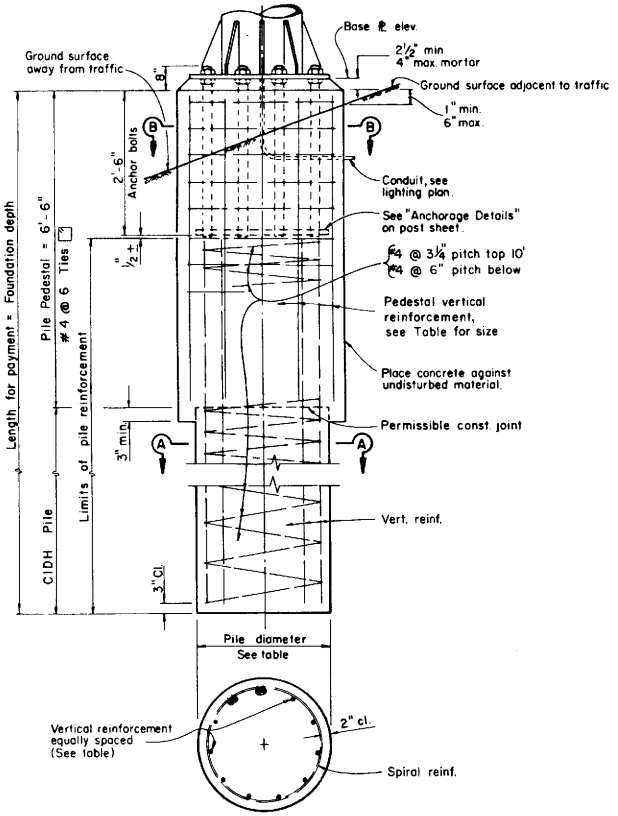


SECTION B-B



SECTION A-A

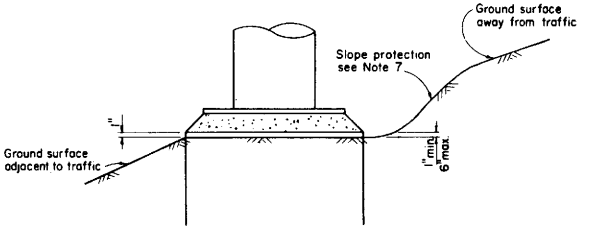
Post Type	Anchor Bolts	Pedestal Size	Reinforcing Steel Vertical	Pile Diameter	Foundation Depth**
II	6 - 2"	2'-11" x 2'-10"	14 - # 7	30"	14'
III	6 - 2"	3'-2" x 2'-10"	14 - # 8	30"	14'
IV	6 - 2"	3'-8" x 3'-4"	16 - # 8	36"	14'
V	10 - 2"	3'-10" x 3'-7"	16 - # 9	36"	17'
VI	10 - 2"	3'-10" x 3'-7"	16 - #10	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.
8. Foundation Design is based on a lateral soil pressure of 1800 pounds per square foot.



DETAIL C

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS - TRUSS PILE FOUNDATION

NO SCALE

S13

STD. PLAN S13

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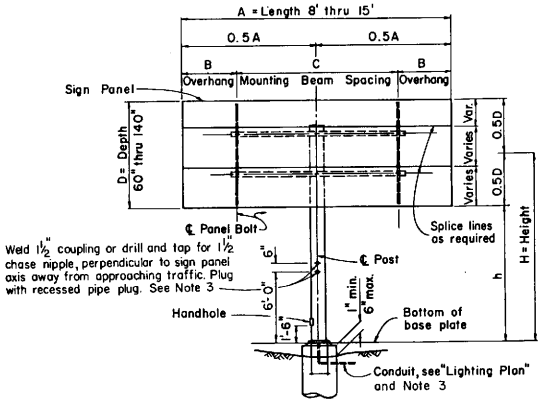
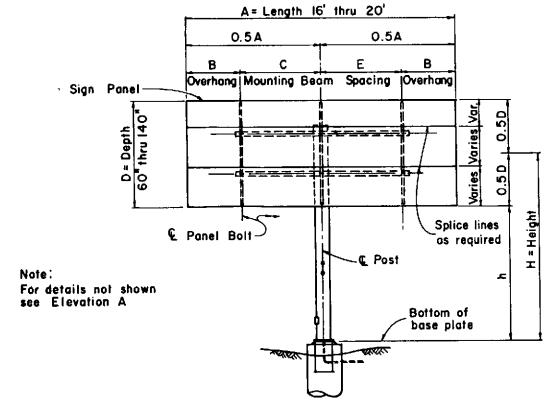
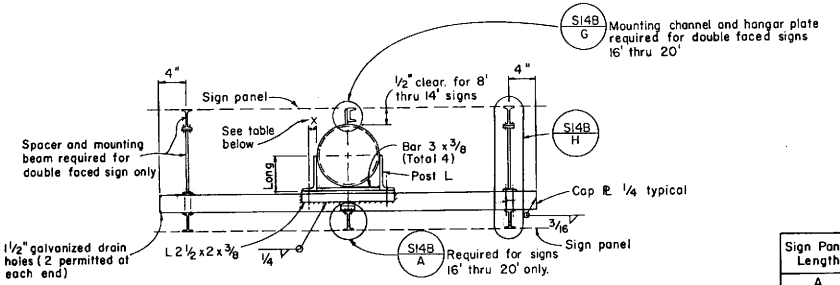


ELEVATION A

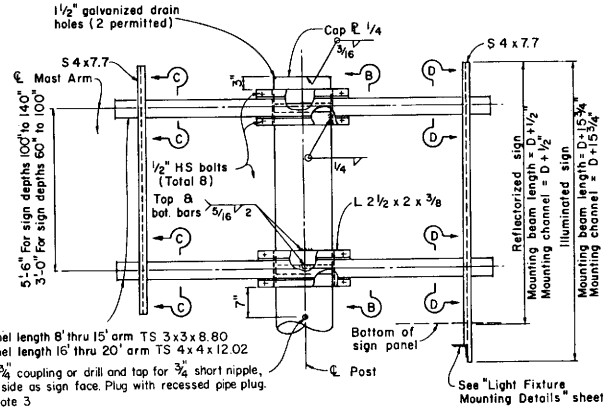


Note:
For details not shown see Elevation A

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

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
2. For post and foundation details see Standard Plans S20A and S20B.
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

NO SCALE

S14A

STD. PLAN S14A

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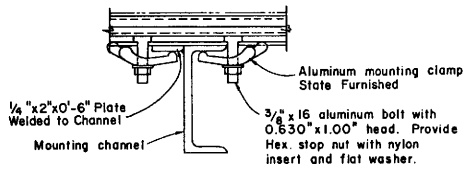
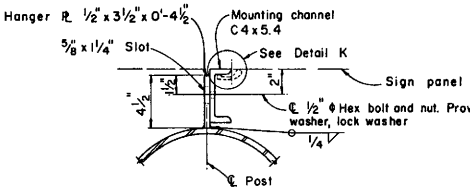
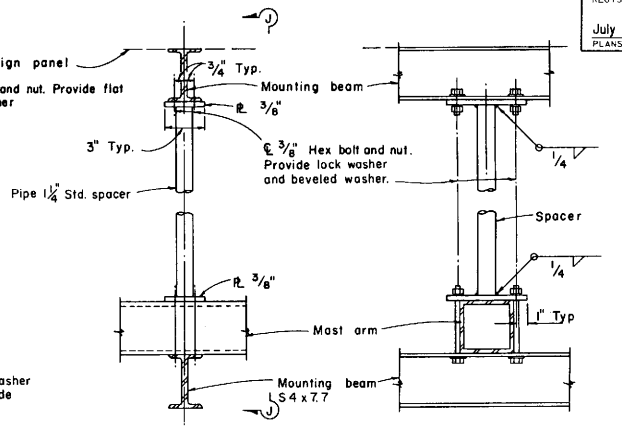


DETAIL K



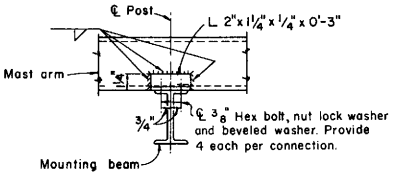
DETAIL G
3" = 1'-0"



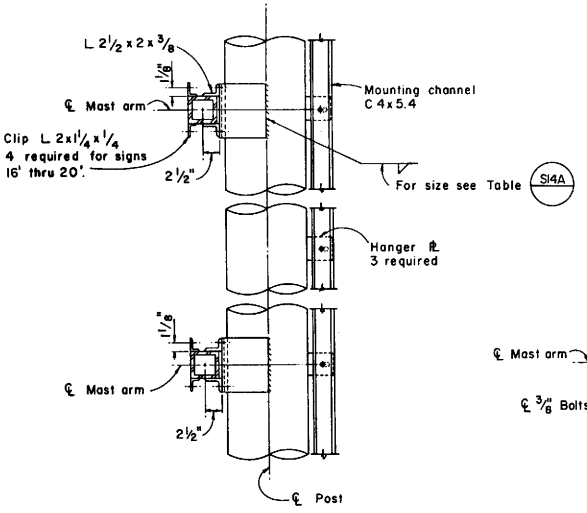
DETAIL H

VIEW J-J

Note: Spacer required for double faced sign only.

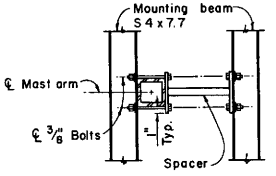


DETAIL A



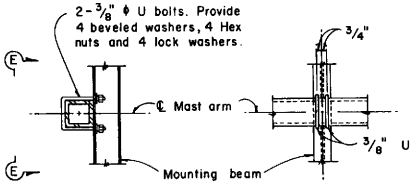
SECTION B-B

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.

Note: For sections and details not shown see S14A

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS - LIGHTWEIGHT BALANCED - SINGLE STEEL POST DETAILS

NO SCALE

S14B

STD. PLAN S14B

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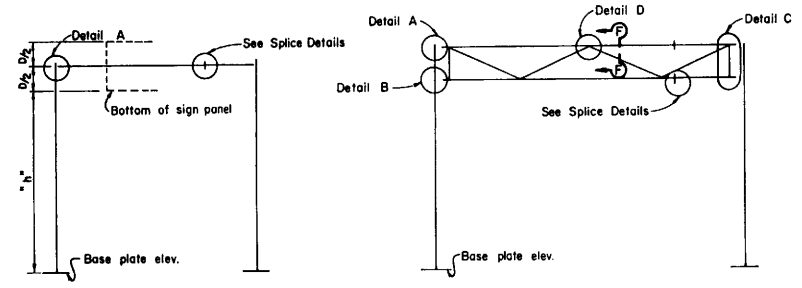
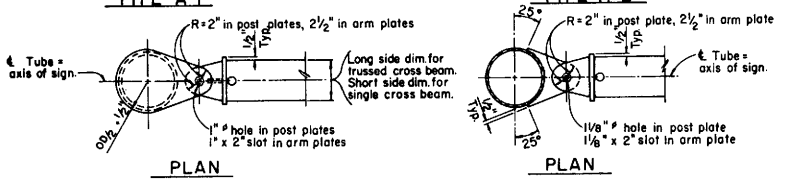


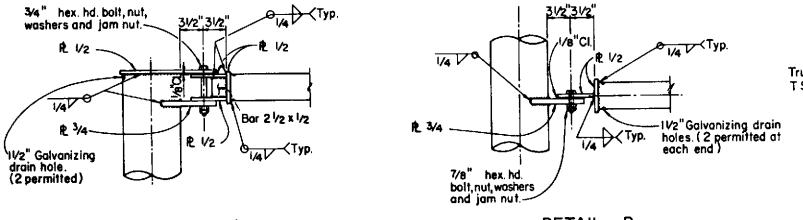
SINGLE CROSS BEAM SERIES
TYPE A-1

TRUSSED CROSS BEAM SERIES
TYPE A-2



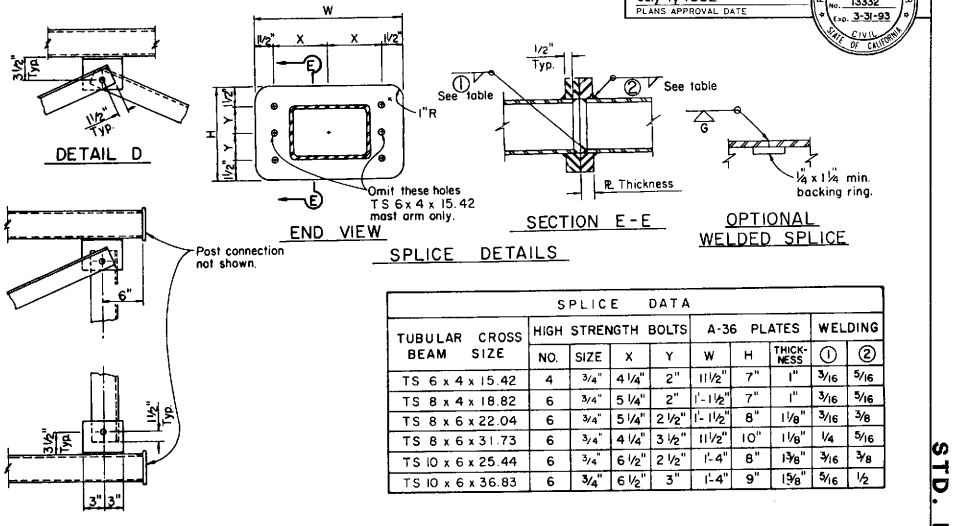
PLAN

PLAN

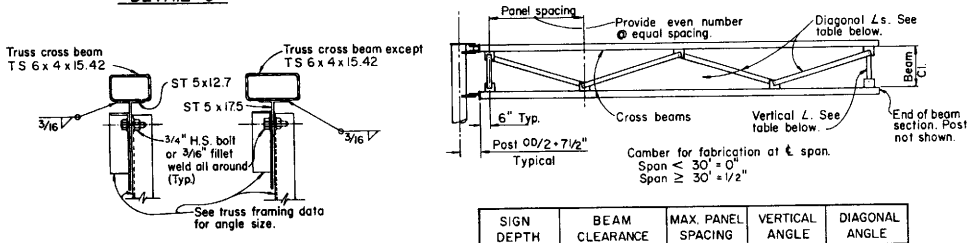


DETAIL A

DETAIL B



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	¾"	4¼"	2"	11½"	7"	1"	3/16	5/16
TS 8 x 4 x 18.82	6	¾"	5¼"	2"	1'-1½"	7"	1"	3/16	5/16
TS 8 x 6 x 22.04	6	¾"	5¼"	2½"	1'-1½"	8"	1⅛"	3/16	3/8
TS 8 x 6 x 31.73	6	¾"	4¼"	3½"	11½"	10"	1⅛"	¼	5/16
TS 10 x 6 x 25.44	6	¾"	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



SIGN DEPTH	BEAM CLEARANCE	MAX. PANEL SPACING	VERTICAL ANGLE	DIAGONAL ANGLE
40"- 70"	2'-0"	5'-6"	L3½x2½x¼*	L3½x2½x¼*
80"- 100"	4'-6"	6'-6"	L3½x2½x¼*	L3½x2½x¼*

* Short leg outstanding.

TRUSS FRAMING DATA

Note:
For post connection to base PL see S20A/A
For cross beam to sign panel connections see S18A

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

For General Notes see Standard Plan S20A

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS - LIGHTWEIGHT TYPE A CONNECTION DETAILS

NO SCALE

S15

STD. PLAN S15

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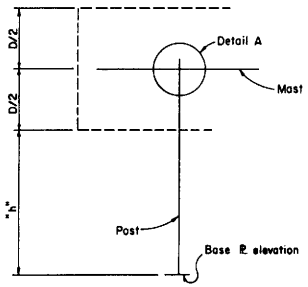
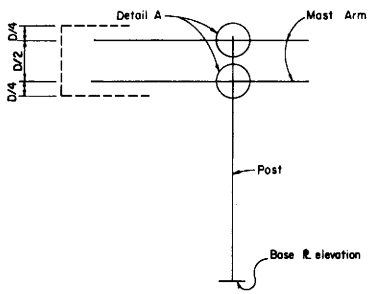
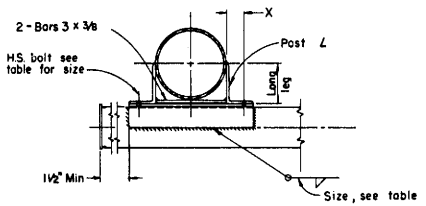


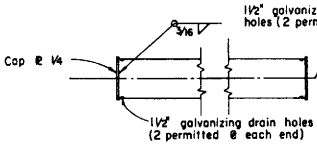
SINGLE ARM SERIES
TYPE B-1



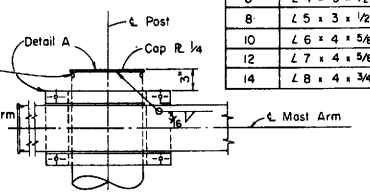
DOUBLE ARM SERIES
TYPE B-2



SECTION D-D



MAST ARM



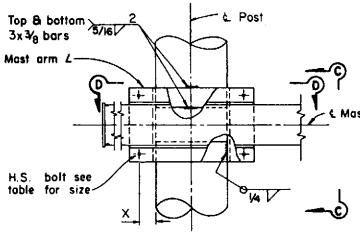
POST CAP

END DETAIL

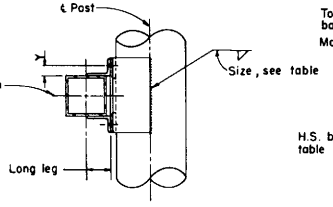
POST ANGLES			
POST SIZE	ANGLE	X	WELD
6	∠ 4 x 3 x ½	1 ¾"	¼
8	∠ 5 x 3 x ½	1 ¾"	¼
10	∠ 6 x 4 x ⅝	2 ½"	¼
12	∠ 7 x 4 x ⅝	2 ½"	5/16
14	∠ 8 x 4 x ¾	2 ½"	5/16

MAST ARM ANGLES				
ARM SIZE	ANGLE	H.S. BOLT	Y	WELD
TS 3 x 3 x 8.80	∠ 2 x 2 x ⅜	½	1 ⅛"	¼
TS 4 x 4 x 12.02	∠ 2½ x 2 x ⅜	½	1 ⅛"	¼
TS 5 x 5 x 15.42	∠ 3 x 2½ x ⅜	⅝	1 ⅜"	¼
TS 6 x 6 x 18.62	∠ 3½ x 2½ x ⅜	⅝	1 ⅜"	¼
TS 7 x 7 x 22.04	∠ 4 x 3 x ½	¾	1 ¾"	5/16
TS 8 x 8 x 25.44	∠ 5 x 3 x ½	⅞	1 ¾"	5/16
TS 10 x 10 x 32.23	∠ 6 x 4 x ⅝	⅞	2 ½"	5/16

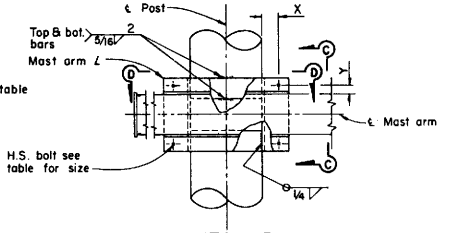
POST TO ARM FRAMING DATA



DETAIL A



VIEW C-C



DETAIL B

SEE OTHER PLAN SHEETS 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.

NOTE:
For post connection to base plate see S20A
For mast arm length and mast-arm-to-sign panel connections see S18A

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS - LIGHTWEIGHT TYPE B CONNECTION DETAILS

NO SCALE

S16

STD. PLAN S16

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REGISTERED CIVIL ENGINEER

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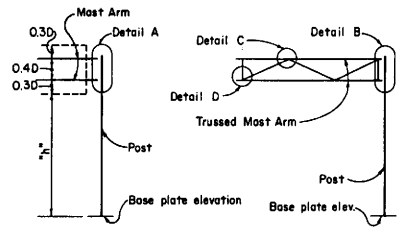
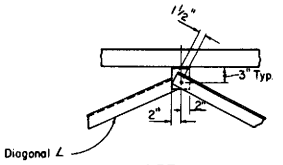
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA

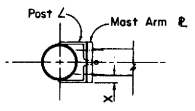


DOUBLE MAST ARM SERIES
TYPE C-1

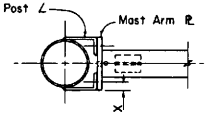
TRUSSED MAST ARM SERIES
TYPE C-2



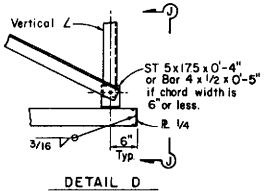
DETAIL C



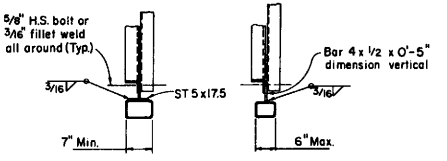
SECTION F-F



SECTION G-G

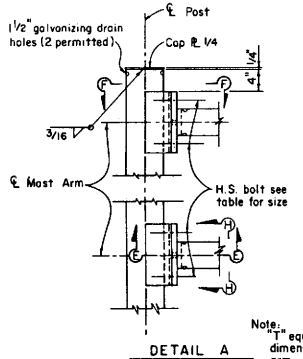


DETAIL D



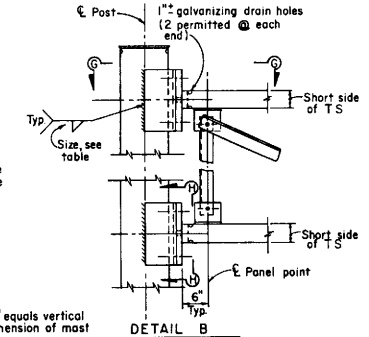
VIEW J-J

POST ANGLES			
POST SIZE	ANGLE	X	WELD
6	∠5 x 3 x 1/2	1 3/4"	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

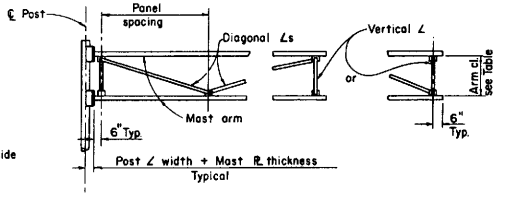


DETAIL A

Note: "T" equals vertical dimension of mast arm.



DETAIL B



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

*Short leg outstanding

TRUSS FRAMING DATA

MAST ARM PLATE			
TWO ARMS	TRUSSED ARMS	PLATE	H.S. BOLT
TS 3 x 3 x 8.80		3/4"	1/2"
TS 4 x 4 x 12.02		1"	5/8"
TS 5 x 5 x 15.42		1"	3/4"
TS 6 x 6 x 18.82		1"	3/4"
TS 7 x 7 x 22.04	TS 5 x 3 x 16.34	1 1/4"	3/4"
	TS 6 x 4 x 21.34	1 1/4"	7/8"
	TS 7 x 5 x 27.34	1 1/4"	7/8"
	TS 8 x 6 x 31.73	1 1/4"	7/8"
	TS 10 x 6 x 36.33	1 1/4"	1"

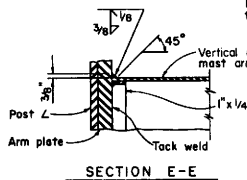
POST TO ARM FRAMING DATA

Note:
For post connection to base ℞ see S20A

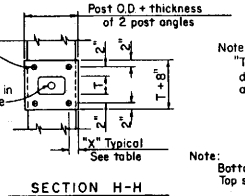
For mast arm length and mast-arm-to sign panel connections see S18A

See Other Plan Sheets For:
1. Sign type and location.
2. Panel type and location on structure.
3. Post size and dimension "T".
4. Mast Arm size.
5. Foundation type.
6. Illumination if required.

For General Notes see S20A



SECTION E-E



SECTION H-H

Note: "T" equals vertical dimension of mast arm.

Note: Bottom connection shown. Top similar.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS - LIGHTWEIGHT TYPE C CONNECTION DETAILS

NO SCALE

S17

STD. PLAN S17

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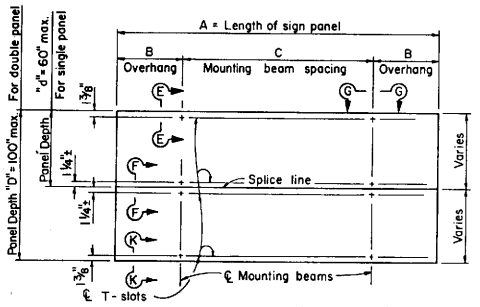
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

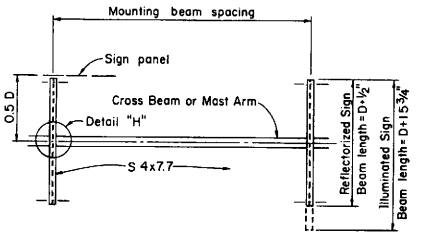
REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

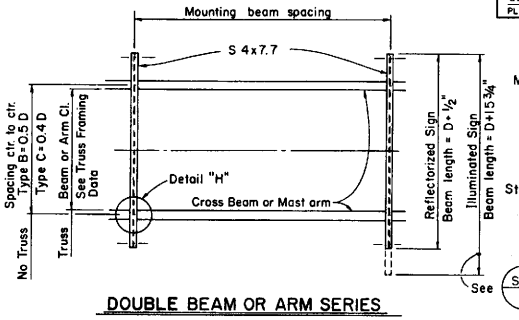
REGISTERED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA



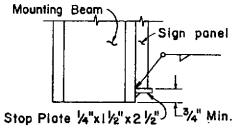
SIGN PANEL LENGTH 5'-0" TO 15'-0"



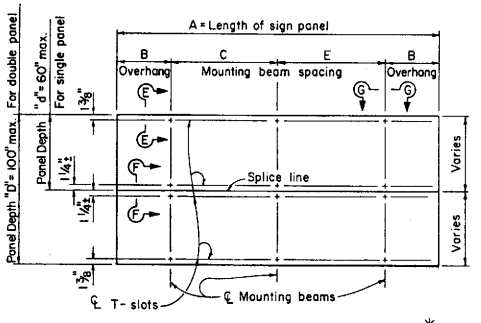
SINGLE BEAM OR ARM SERIES



DOUBLE BEAM OR ARM SERIES

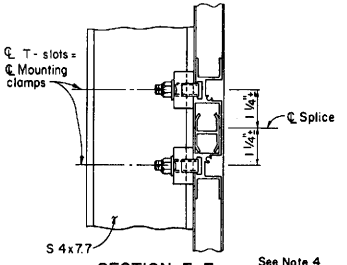


SECTION K - K

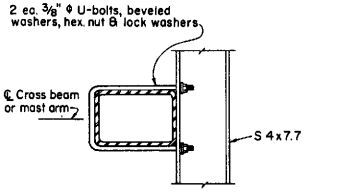


SIGN PANEL LENGTH 16'-0" TO 24'-0"*

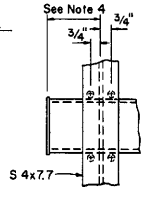
ELEVATION



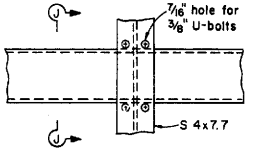
SECTION F-F



SECTION J-J



END ARM DETAIL
SINGLE POST SIGNS

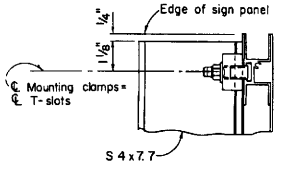


DETAIL H

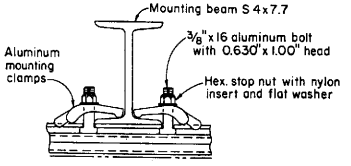
Sign Panel Length*	Number Mounting Beams	Sign Panel Overhang	Mounting Beam Spacing	
A		B	C	E
5'-0"	2	9"	3'-6"	
6'-0"	2	12"	4'-0"	
7'-0"	2	15"	4'-6"	
8'-0"	2	18"	5'-0"	
9'-0"	2	22"	5'-4"	
10'-0"	2	24"	6'-0"	
11'-0"	2	24"	7'-0"	
12'-0"	2	30"	7'-0"	
13'-0"	2	30"	8'-0"	
14'-0"	2	30"	9'-0"	
15'-0"	2	36"	9'-0"	
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, ½" ϕ holes to pass the ⅜"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 inch pounds.
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

NO SCALE

S18A

STD. PLAN S18A

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

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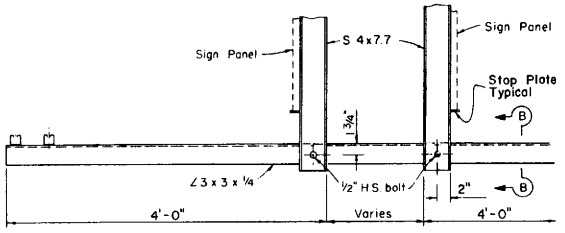
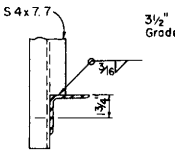
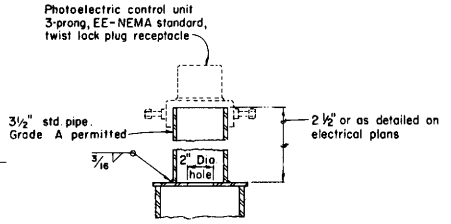


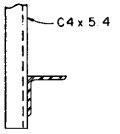
SIDE VIEW - DOUBLE FACED SIGN - END MOUNT



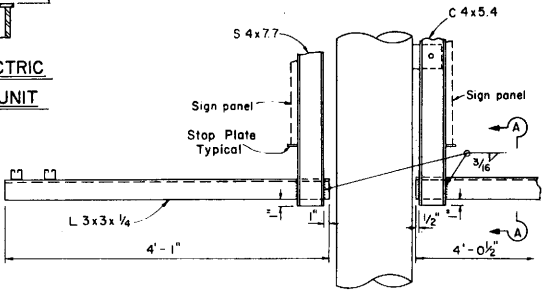
PART SEC. B-B



PHOTOELECTRIC CONTROL UNIT



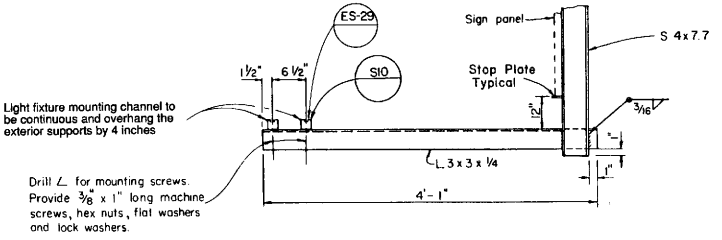
PART SEC. A-A



SIDE VIEW - DOUBLE FACED SIGN - CENTER MOUNT

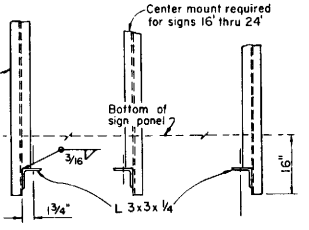
(Required only on balanced single post signs 16' thru 20')

Note:
For details not shown see "Side View - Single Faced Sign Types A, B & C" details



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

NO SCALE

S18B

STD. PLAN S18B

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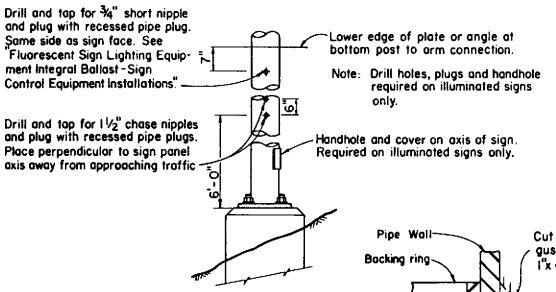
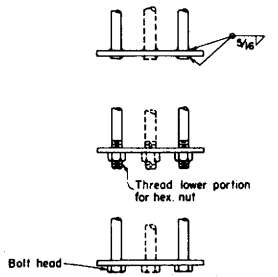
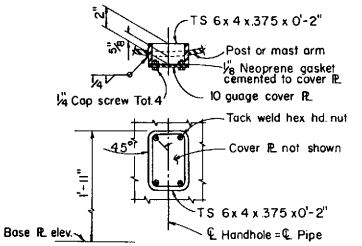


ELEVATION

DETAIL A



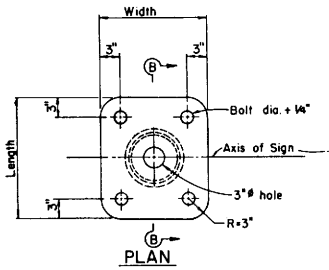
ALTERNATIVE BAR CONNECTIONS



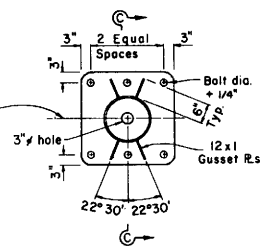
HANDHOLE & COVER DETAILS

POST SIZE	BASE PLATE	ANCHOR BOLTS (Min.)
6 @ 18.97	1 1/2" x 1'-2" x 1'-2"	4 - 1 1/4"
6 @ 28.57	1 1/2" x 1'-2" x 1'-2"	4 - 1 1/2"
8 @ 28.55	1 1/2" x 1'-6" x 1'-6"	4 - 1 3/4"
8 @ 43.39	2" x 1'-6" x 1'-6"	4 - 2"
10 @ 54.74	2" x 1'-8" x 1'-8"	4 - 2 1/4"
12 @ 65.42	2" x 1'-8" x 1'-8"	4 - 2 1/2"
14 @ 72.09	2" x 2'-4" x 2'-4"	6 - 2"
14 @ 89.30	2" x 2'-4" x 2'-4"	6 - 2 1/4"

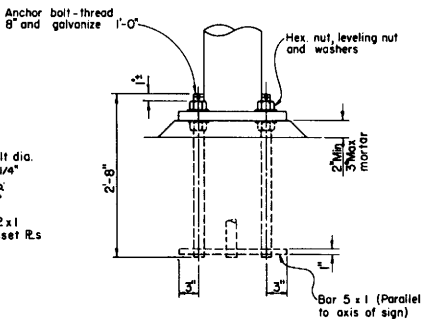
NOTES:
1. Footings shall be placed with long dimensions normal to axis of sign.
2. On single post signs the post shall be raked out of plumb with the use of the leveling nuts to make the bottom of the sign frame level.
3. 2" ϕ anchor bolts may be substituted for 1 3/4" ϕ bolts.
   2 1/2" ϕ anchor bolts may be substituted for 2 1/4" ϕ bolts.



PLAN



PLAN



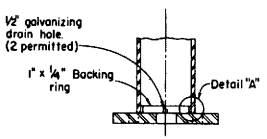
ANCHOR BOLT

GENERAL NOTES

DESIGN: A.A.S.H.T.O. Specifications for the Design and Construction of Structural Supports for Highway Signs, dated 1985.

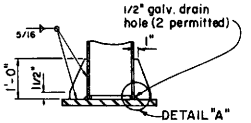
CONSTRUCTION: Standard Specifications and the special provision.

WELDING: All welding continuous unless otherwise noted on the plans. All welding to be done in accordance with the Standard Specifications.



SECTION B-B

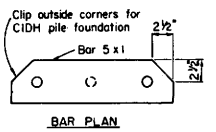
6" THRU 12" POSTS



SECTION C-C

14" POST

BASE PLATE DETAILS



BAR PLAN

ANCHORAGE DETAILS

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS - LIGHTWEIGHT POST DETAILS

NO SCALE

S20A

STD. PLAN S20A

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REGISTERED CIVIL ENGINEER

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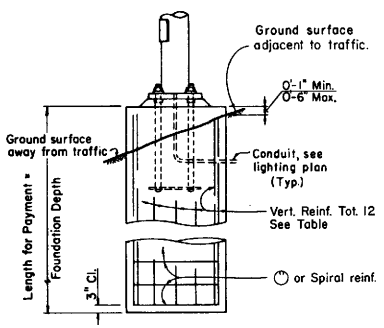
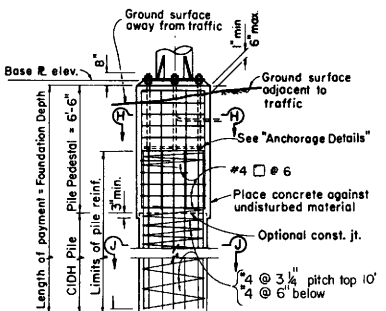
REGISTERED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA

POST SIZE	PILE FOUNDATION				SPREAD FOOTING				
	Pedestal	Pile Dia.	Found. Depth	Vert. Reinf.	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



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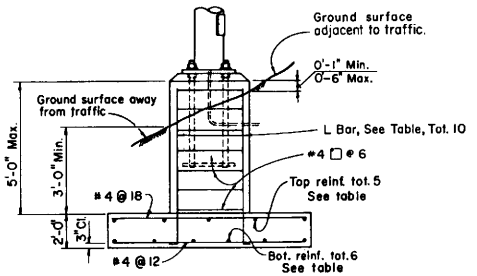

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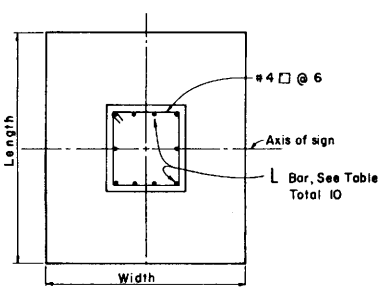
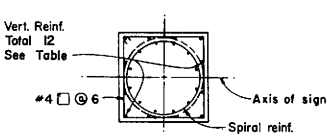


PLAN

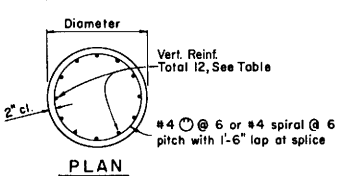
SPREAD FOOTING

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.

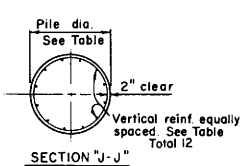


SECTION "H-H"



PLAN

6" & 8" POSTS



SECTION "J-J"

10" THRU 14" POSTS

PILE FOUNDATION

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS - LIGHTWEIGHT FOUNDATION

NO SCALE

S20B

STD. PLAN S20B

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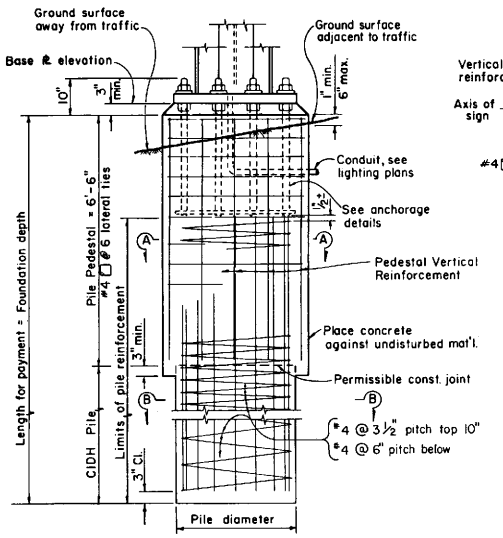

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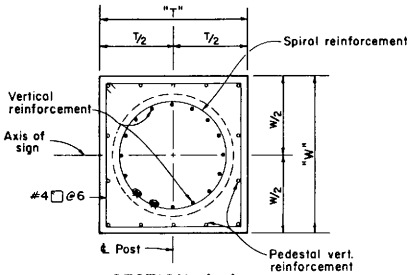
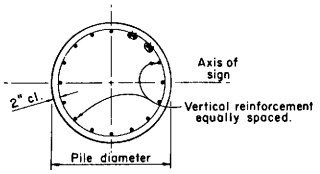
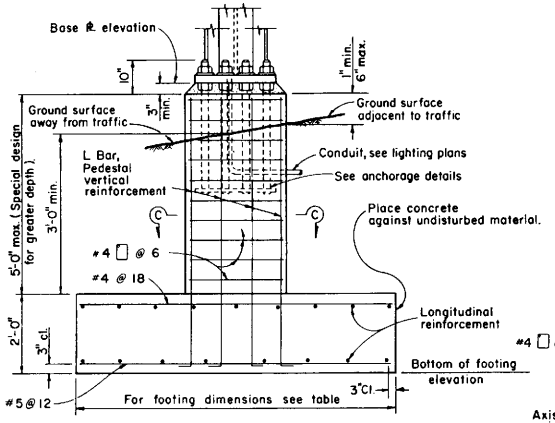


SECTION A-A



SECTION B-B

PILE FOUNDATION



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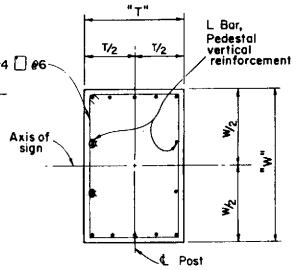

SPREAD FOOTING

SECTION C-C

SINGLE POST TYPE										
Post Type	Pedestal Size "T" x "W"	Pile Foundation				Spread Footing				
		Vertical Reinf.	Pile Dia.	Foundation 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.	Foundation 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"x16'-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"x3'-10"	24±#11	42"	23'	14-#11	8'-0"x23'-0"	8-#8		16-#11	
C-7	3'-10"x3'-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	#4@18	15-#14	#5@12
D-7	4'-2"x 4'-7"	34±#11	42"	30'	14-#11	8'-0"x26'-0"	10-#8		15-#14	

* Bundled bars

NOTES:

1. Base plates, pedestals and footings; longer sides shall be normal to axis of sign.
2. For anchor bolt layout see Standard Plans S40F and S40J.
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 CLOSED TRUSS FOUNDATION

NO SCALE

S39

STD. PLAN S39

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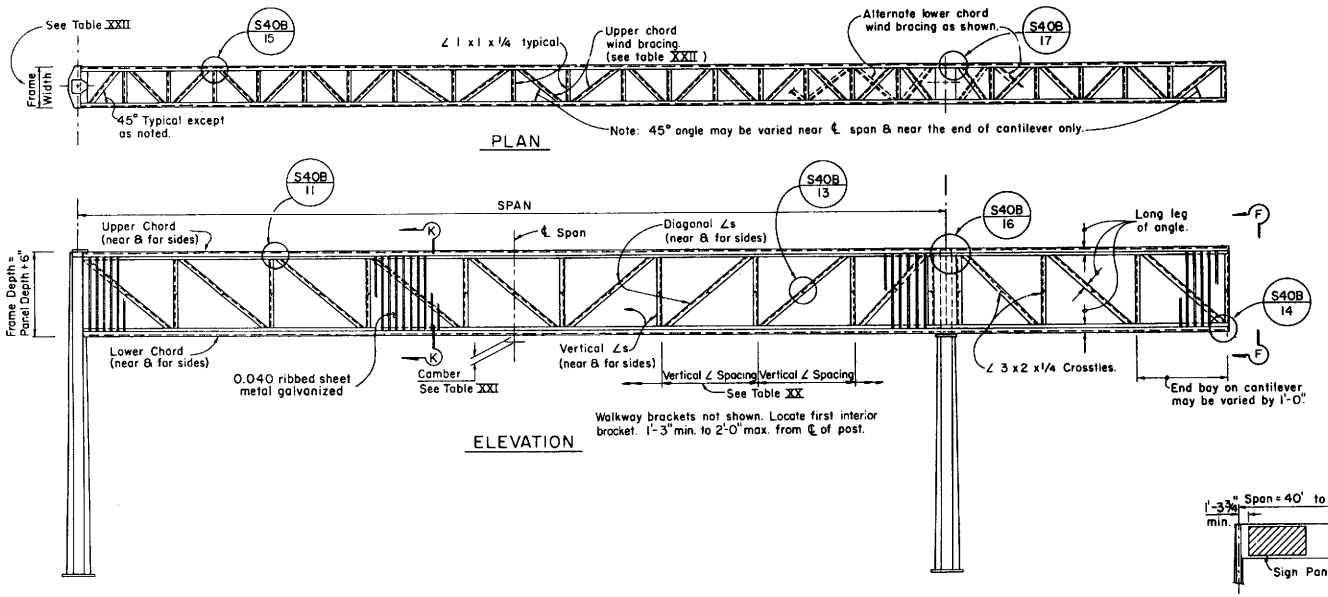

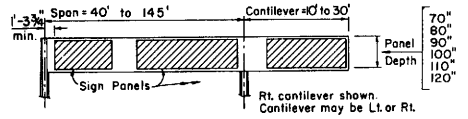

RANGE OF STRUCTURE SIZES

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
3. For Section K-K see S40B
4. For Foundation details see S39
5. For General Notes see S1

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS - BOX BEAM CLOSED TRUSS TWO POST TYPE FRAME MEMBERS

NO SCALE

S40A

STD. PLAN S40A

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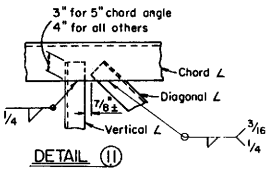

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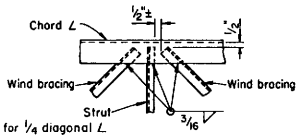

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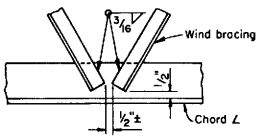

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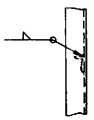

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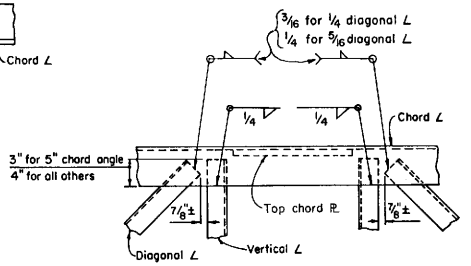

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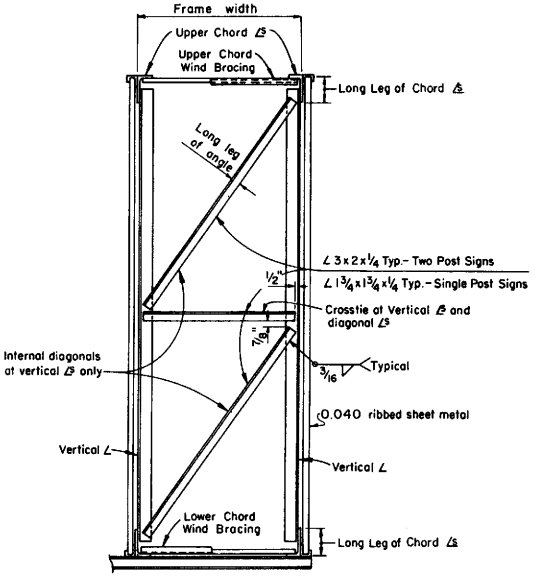
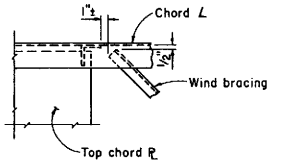


TYPICAL SECTION K-K



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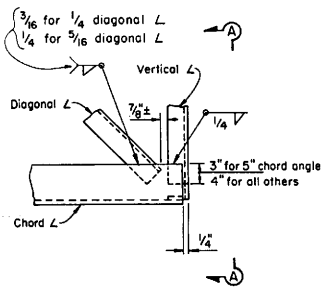

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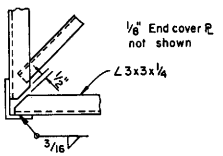
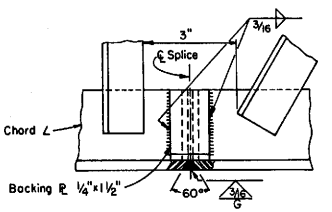


SECTION A-A



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

WELDED CHORD SPLICE

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS – BOX BEAM CLOSED TRUSS SINGLE AND TWO POST TYPE GENERAL FRAME DETAILS

NO SCALE

S40B

STD. PLAN S40B

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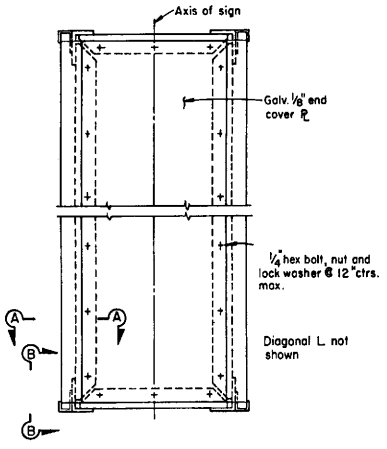
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

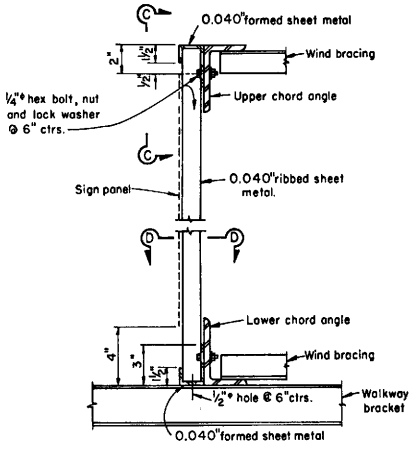
REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

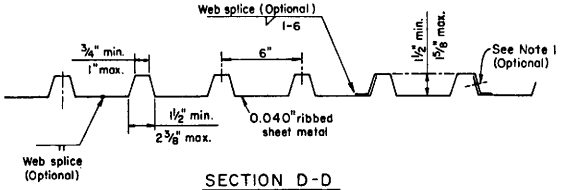
REGISTERED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA



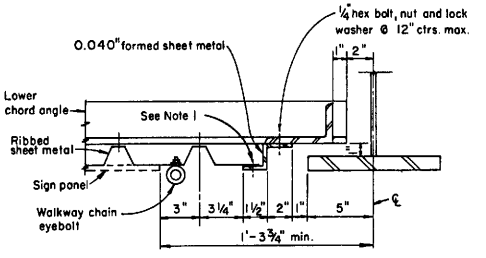
CANTILEVER END VIEW



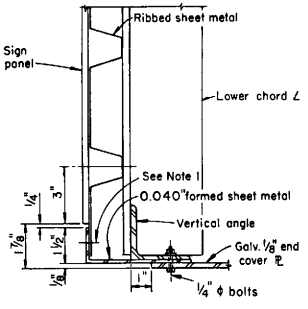
TYPICAL SECTION



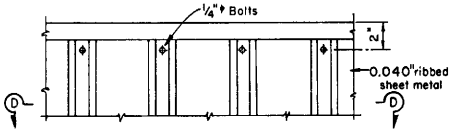
SECTION D-D



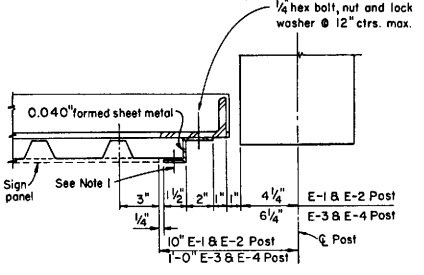
HORIZONTAL SECTION AT POST
TWO POST TYPE



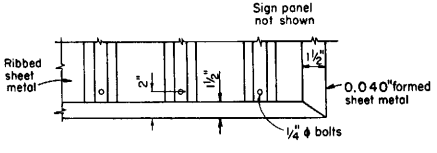
SECTION A-A



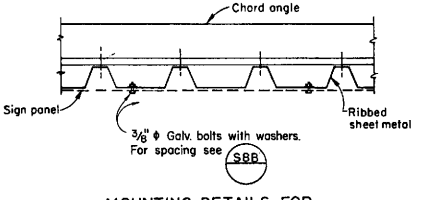
VIEW C-C



HORIZONTAL SECTION AT POST
CANTILEVER TYPE



VIEW B-B



MOUNTING DETAILS FOR
OVERHEAD FORMED PANELS

NOTES:

1. Approved blind rivets 3/16" dia. @ 6" ctrs.
2. For mounting details of laminated panel signs see S8C. Panel shall cover ribbed sheet metal by 3" or more.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS - BOX BEAM CLOSED TRUSS RIBBED SHEET METAL DETAILS

NO SCALE

S40C

STD. PLAN S40C

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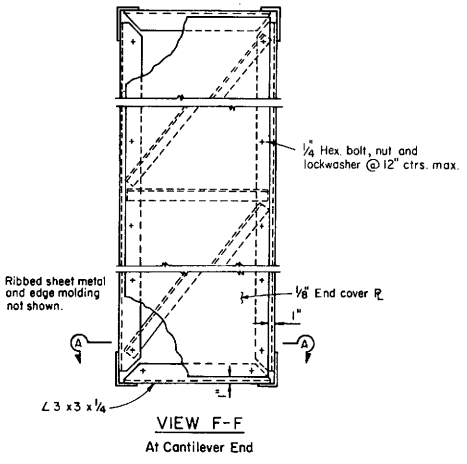
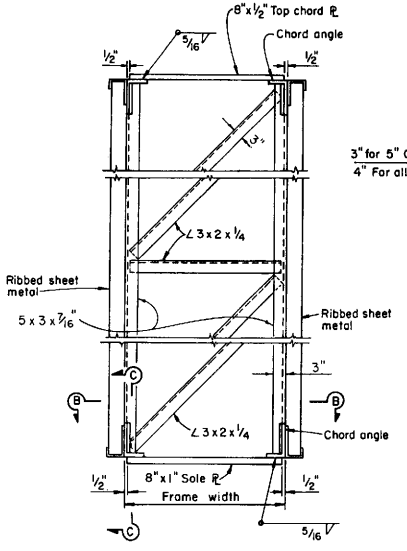
PLANS APPROVAL DATE

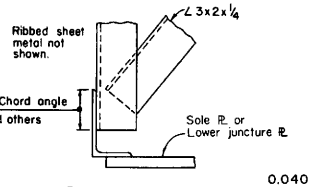
REGISTERED PROFESSIONAL ENGINEER
T. Pollock
No. 13332
Exp. 3-31-93
CIVIL
STATE OF CALIFORNIA



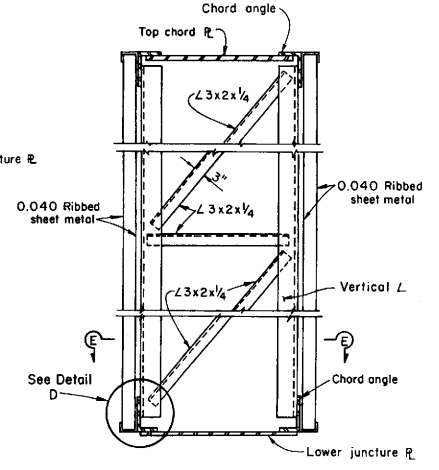
VIEW F-F
At Cantilever End



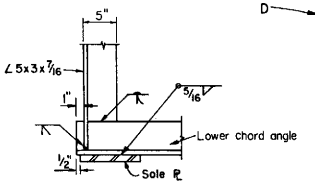
POST - END VIEW



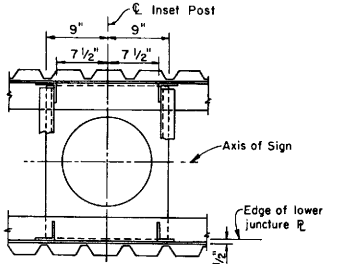
DETAIL D



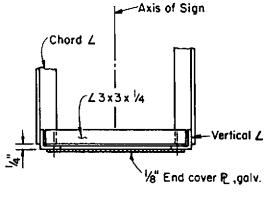
SECTION AT INSET POST



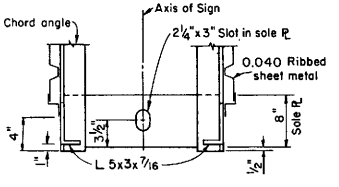
SECTION C-C



SECTION E-E



SECTION A-A



SECTION B-B

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS, BOX BEAM, CLOSED TRUSS
TWO POST TYPE FRAME DETAILS

NO SCALE

S40D

STD. PLAN S40D

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REGISTERED CIVIL ENGINEER

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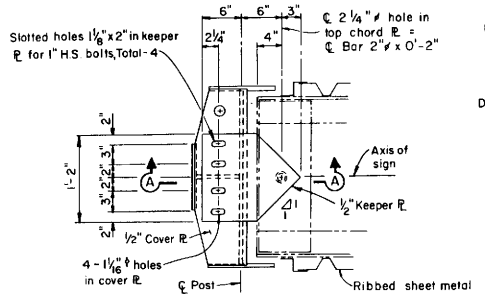
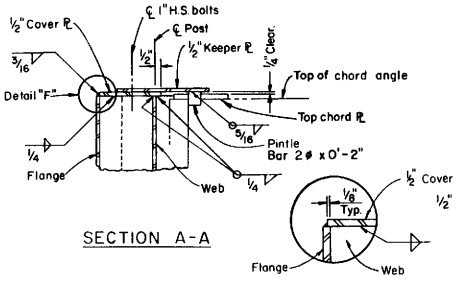


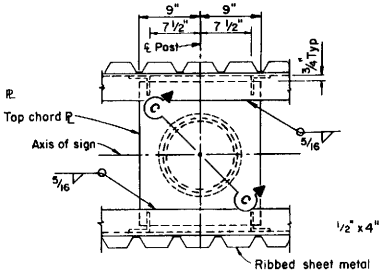
PLAN



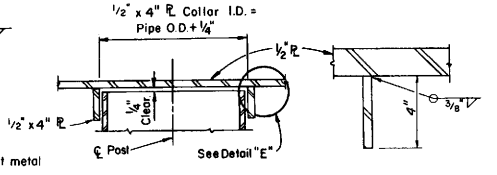
SECTION A-A

DETAIL F

UPPER JUNCTURE CONNECTION
END POST



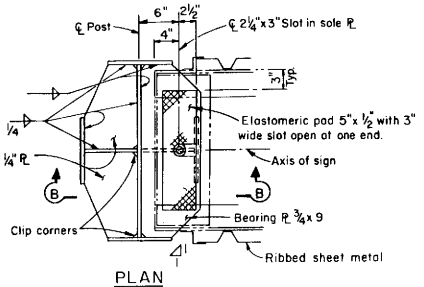
PLAN



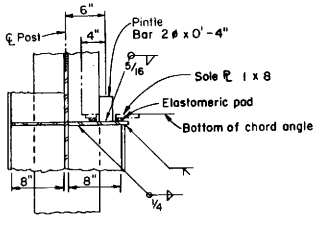
SECTION C-C

DETAIL E

UPPER JUNCTURE CONNECTION
INSET POST

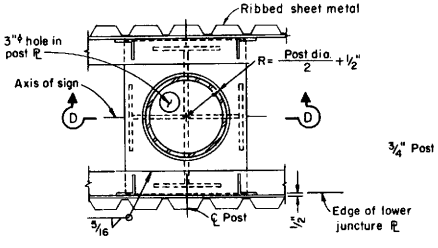


PLAN

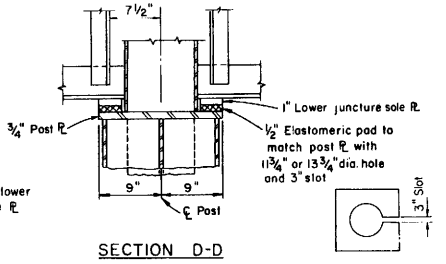


SECTION B-B

LOWER JUNCTURE CONNECTION
END POST

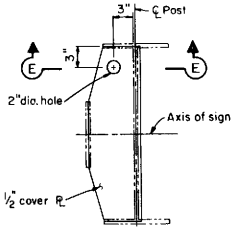


PLAN

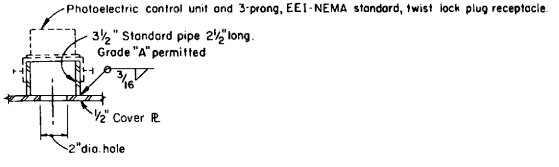


SECTION D-D

LOWER JUNCTURE CONNECTION
INSET POST



PHOTOELECTRIC CONTROL UNIT



SECTION E-E

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS - BOX BEAM
CLOSED TRUSS
TWO POST TYPE
FRAME JUNCTURE DETAILS

NO SCALE

S40E

STD. PLAN S40E

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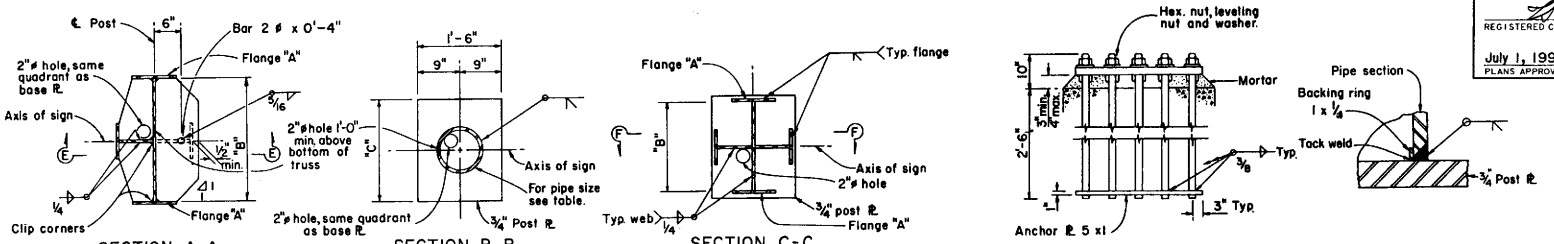
REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA



SECTION A-A

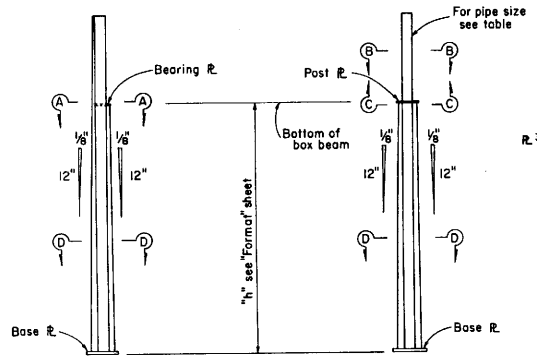
SECTION B-B

SECTION C-C

ANCHORAGE DETAILS

PIPE SECTION TO POST PL

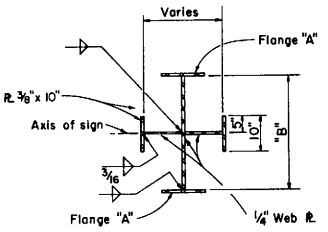
NOTE: For dimensions not shown see table



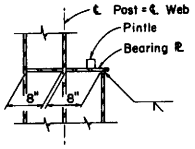
END POST
"A" & "B"

INSET POST
"C" & "D"

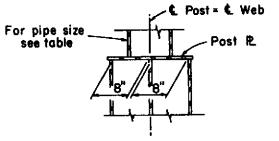
ELEVATION



SECTION D-D



SECTION E-E

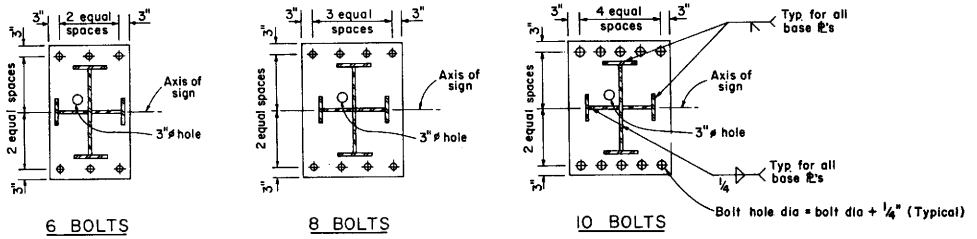


SECTION F-F

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 PL's may be retained with hex. nut or formed head.
3. 2 1/2" ø anchor bolts may be substituted for 2 1/4" ø bolts.
4. For Foundation details see S39



6 BOLTS

8 BOLTS

10 BOLTS

TYPICAL BASE PLATES

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS - BOX BEAM CLOSED TRUSS TWO POST TYPE POST DETAILS

NO SCALE

S40F

STD. PLAN S40F

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REGISTERED CIVIL ENGINEER

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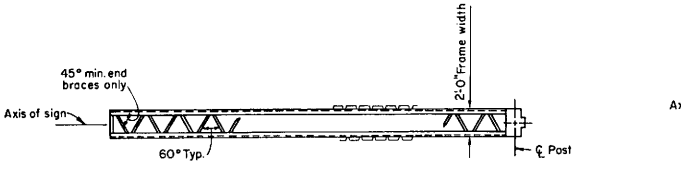
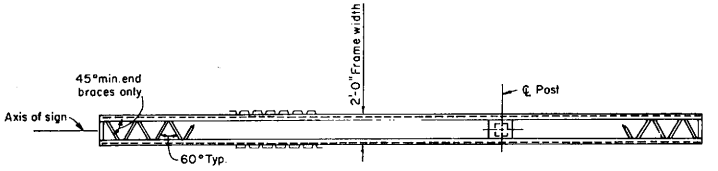
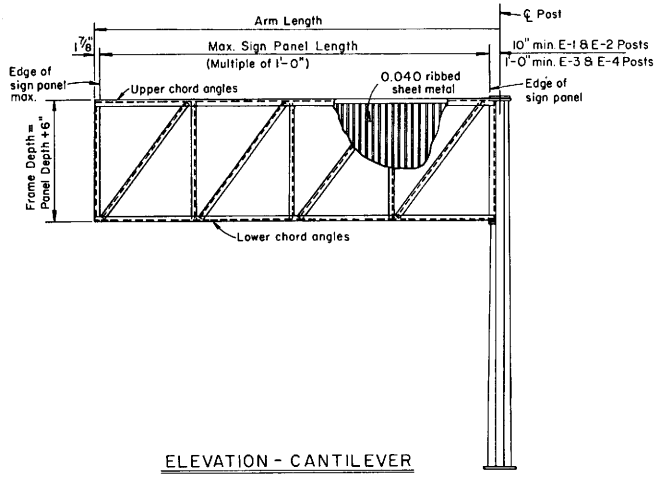


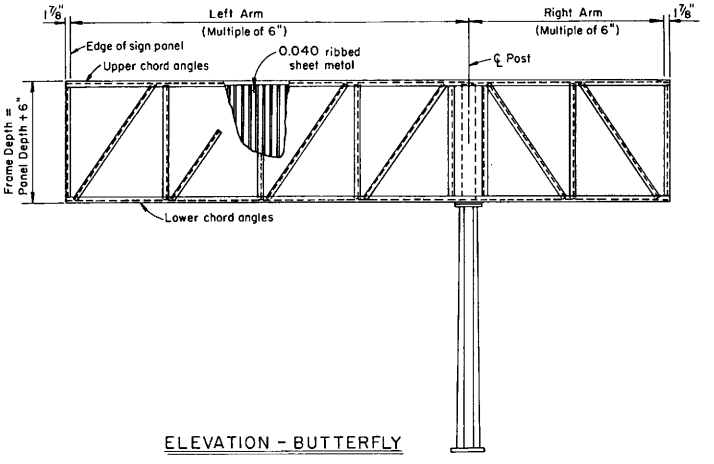
PLAN



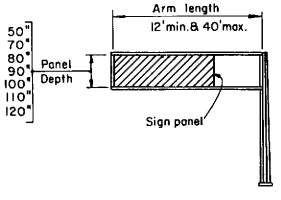
PLAN



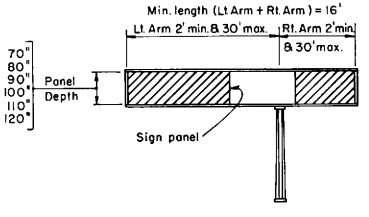
ELEVATION - CANTILEVER



ELEVATION - BUTTERFLY

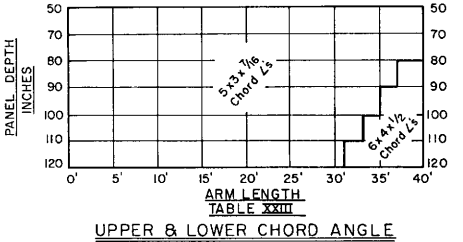


CANTILEVER



BUTTERFLY

RANGE OF STRUCTURE SIZES



ARM LENGTH
TABLE XXIII

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 and S40K
3. For foundation details see S39

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS - BOX BEAM CLOSED TRUSS SINGLE POST TYPE FRAME MEMBERS

NO SCALE

S40G

STD. PLAN S40G

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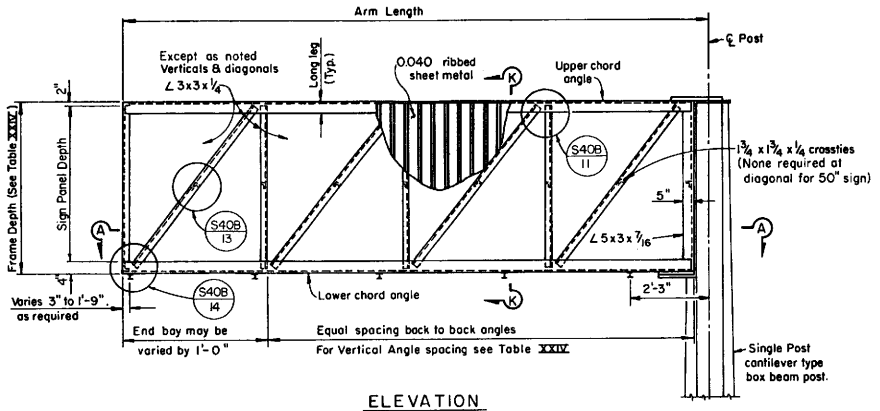
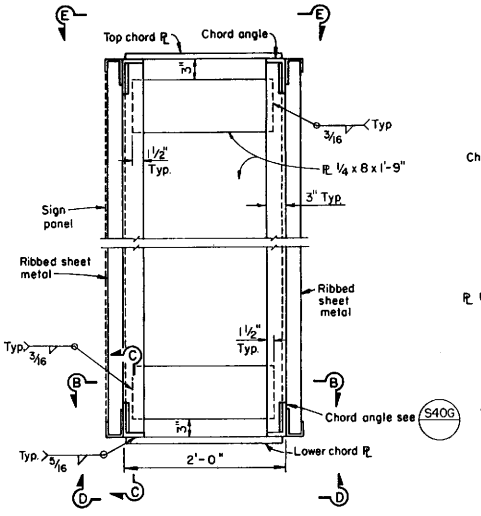
REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

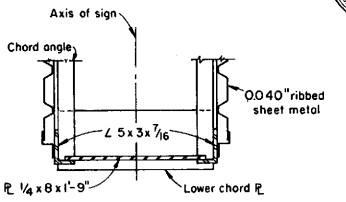
REGISTERED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA



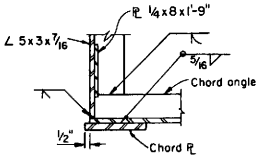
ELEVATION



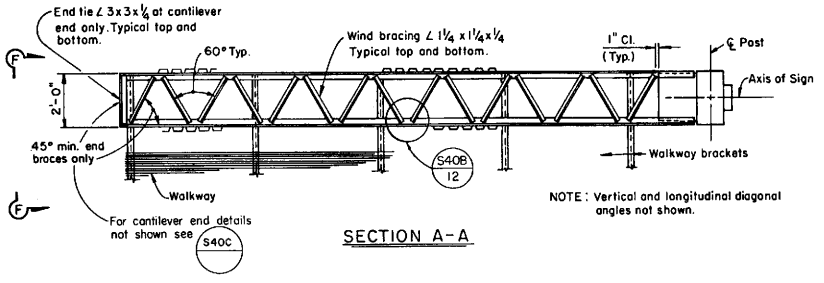
POST END VIEW



SECTION B-B



SECTION C-C



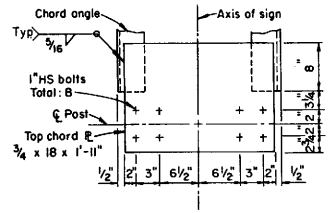
NOTE: Vertical and longitudinal diagonal angles not shown.

SECTION A-A

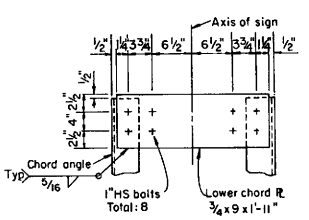
NOTE:
1. For Section K-K see S40B
2. For View F-F at cantilever end, see S40D

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

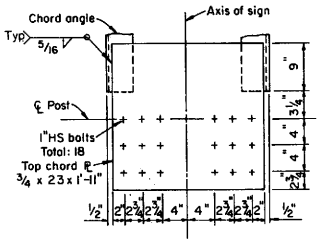


VIEW E-E

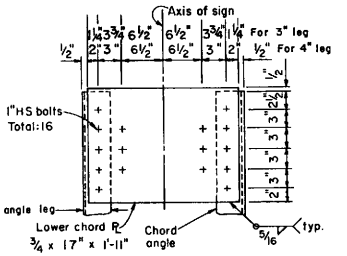


VIEW D-D

TYPE E-1 & E-2



VIEW E-E



VIEW D-D

TYPE E-3 & E-4

CHORD PLATE DETAILS

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS - BOX BEAM
CLOSED TRUSS
SINGLE POST CANTILEVER
FRAME DETAILS

NO SCALE

S40H

STD. PLAN S40H

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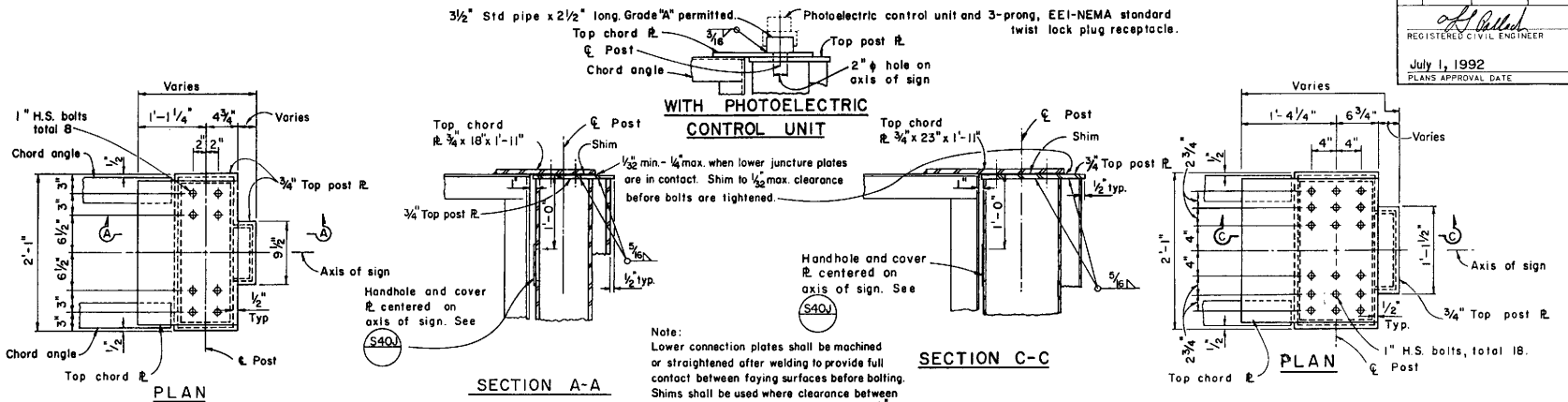
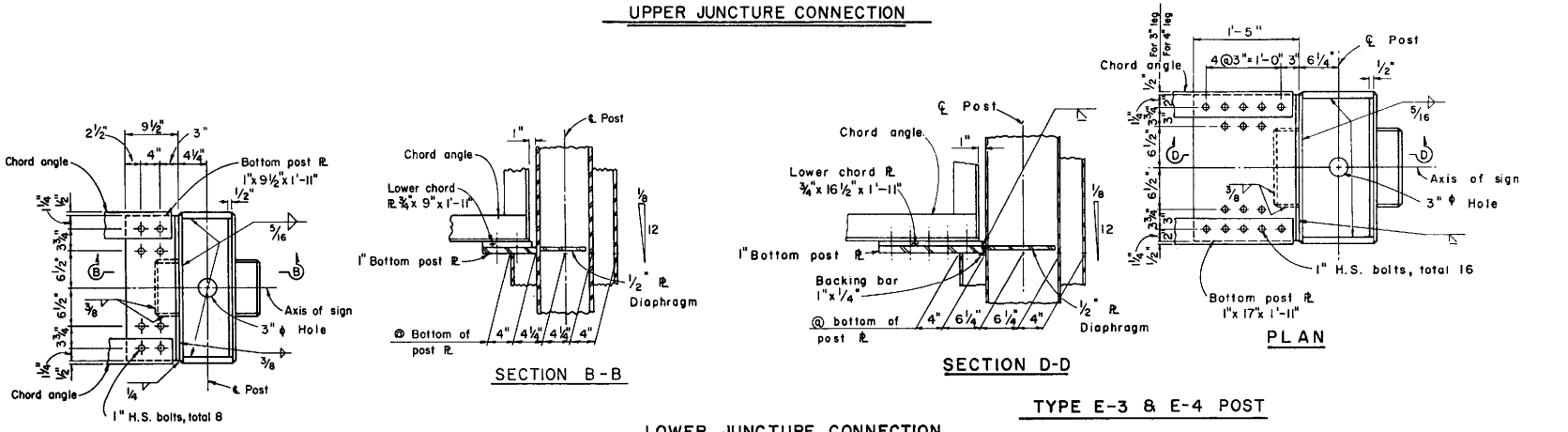


TYPE E-1 & E-2 POST

TYPE E-3 & E-4 POST

Note:
Lower connection plates shall be machined or straightened after welding to provide full contact between faying surfaces before bolting. Shims shall be used where clearance between top chord plate and top post plate exceeds 1/32". Predrill and galvanize shims to fit bolt group; min; shim size to include 2 bolts.

UPPER JUNCTURE CONNECTION



TYPE E-1 & E-2 POST

LOWER JUNCTURE CONNECTION

TYPE E-3 & E-4 POST

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS - BOX BEAM CLOSED TRUSS SINGLE POST CANTILEVER FRAME JUNCTURE DETAILS

NO SCALE

S401

STD. PLAN S401

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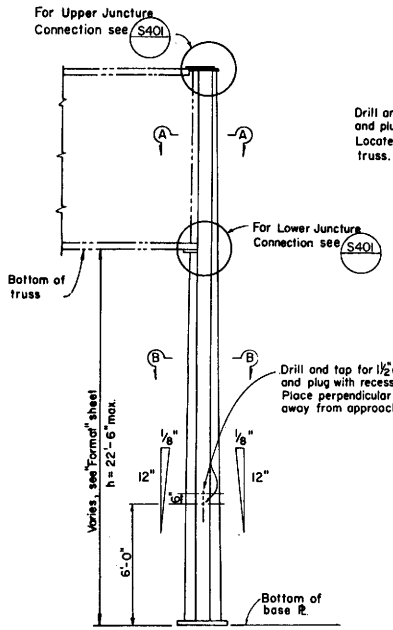

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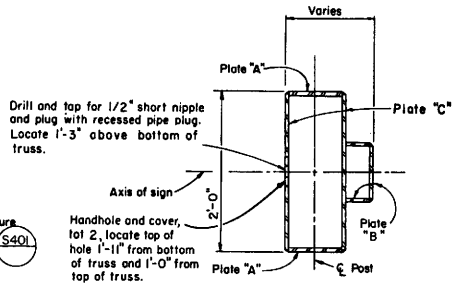
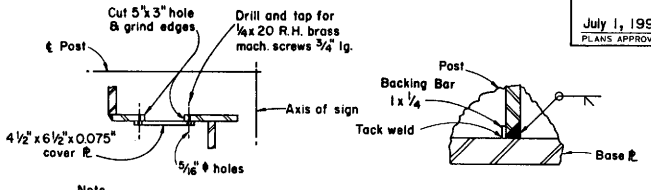


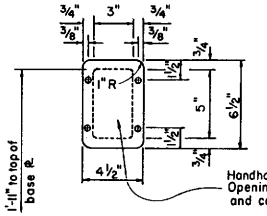
SECTION A-A



Note: Face handhole and cover PL away from traveled way except as shown. See "Section A-A".

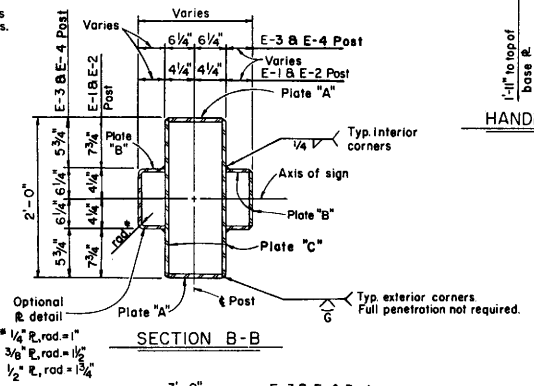
POST TO BASE PLATE

WELDING DETAILS



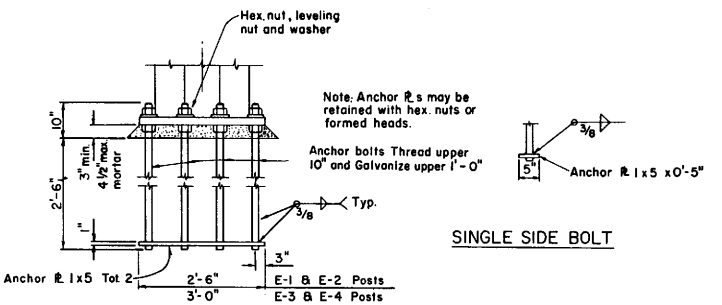
HANDHOLE AND COVER DETAIL

Note:
1. For Foundation details see S39



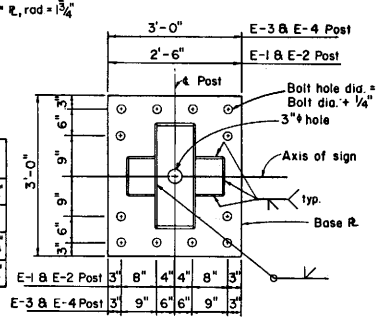
* 1/4" PL rad. = 1"
3/8" PL rad. = 1½"
1/2" PL rad. = 1¾"

SECTION B-B



SINGLE SIDE BOLT

ANCHORAGE DETAILS



BASE PLATE

Post Type	Base Plate	Plate "A"	Plate "B"	Plate "C"	*Anchor Bolts
E-1	2"x30"x3'-0"	½"	¼"	⅜"	12-1¾"
E-2	2½"x30"x3'-0"	1"	⅜"	½"	12-2"
E-3	2½"x36"x3'-0"	1"	⅜"	½"	12-2¼"
E-4	2½"x36"x3'-0"	1"	½"	⅝"	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
SINGLE POST CANTILEVER
POST DETAILS

NO SCALE

S40J

STD. PLAN S40J

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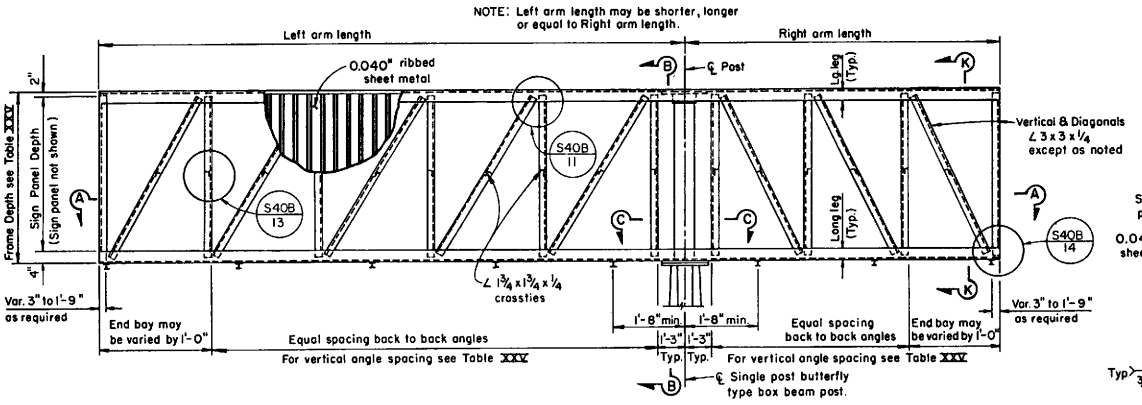
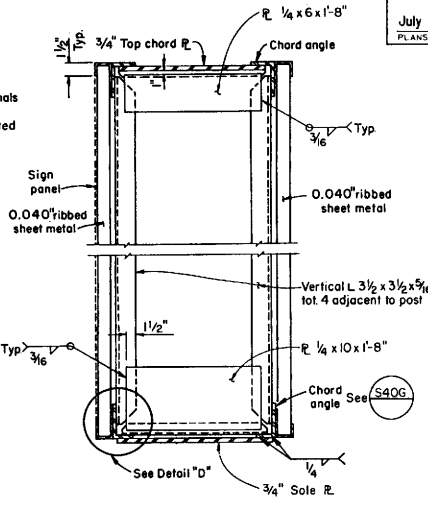


ELEVATION

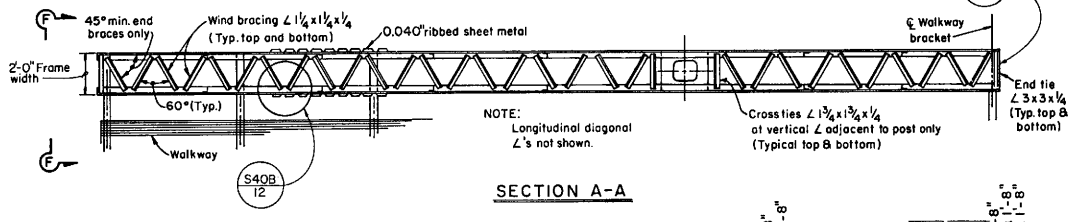


SECTION B-B

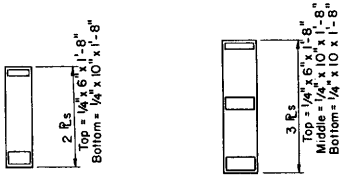
Sign Panel Depth	Frame Depth	Max Vert Angle Spacing	Arm Length
70"	6'-4"	5'-6"	4'
80"	7'-2"	6'-0"	5'
90"	8'-0"	7'-0"	5'
100"	8'-10"	7'-0"	6'
110"	9'-8"	7'-6"	6'
120"	10'-6"	7'-6"	6'

No diagonals required

TABLE XXV

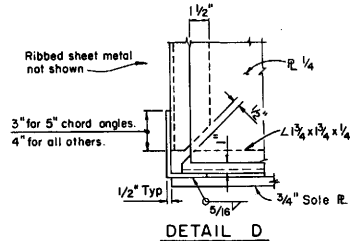


SECTION A-A

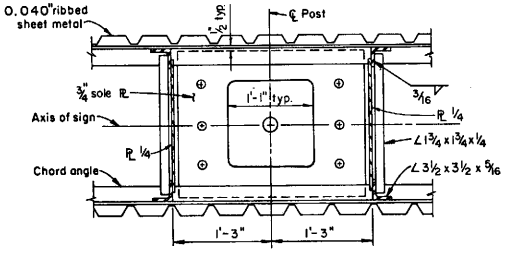


SIGN DEPTH 70"-90"

SIGN DEPTH 100"-120"



DETAIL D



SECTION C-C

NOTES:

1. For Detail 11 thru 14 and Section K-K, see S40B
2. For View F-F at cantilever end, see S40D

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS - BOX BEAM CLOSED TRUSS SINGLE POST BUTTERFLY FRAME DETAILS

NO SCALE

S40K

STD. PLAN S40K

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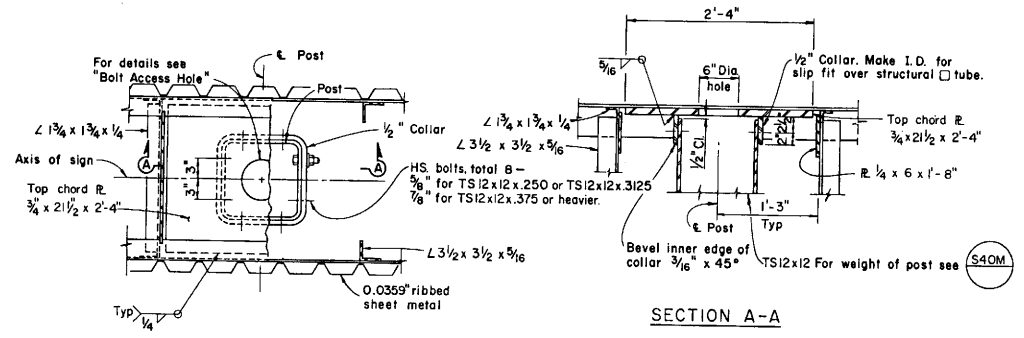
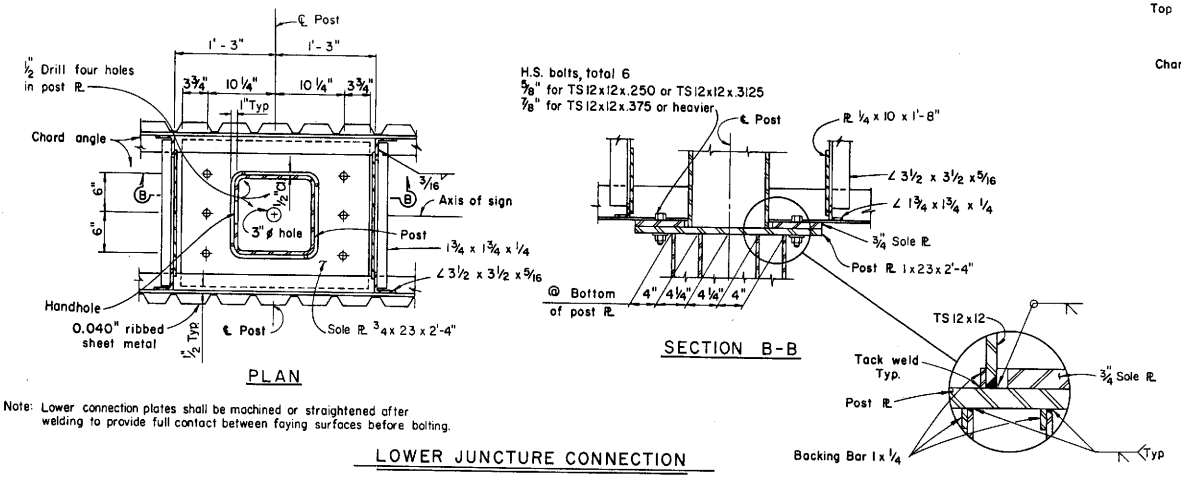
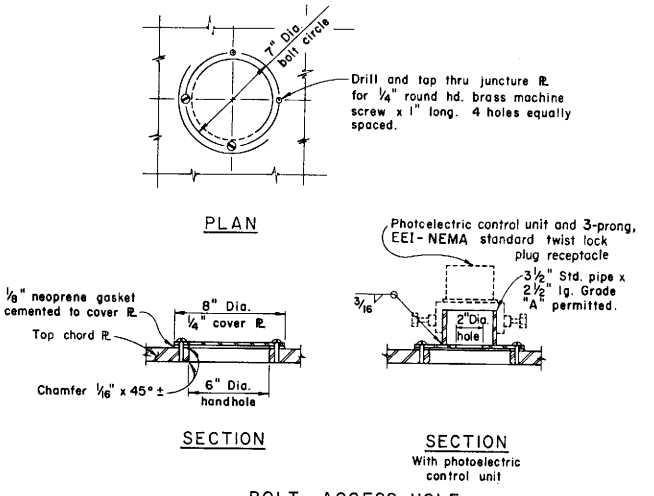


UPPER JUNCTURE CONNECTION



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 SINGLE POST BUTTERFLY FRAME JUNCTURE DETAILS

NO SCALE

S40L

STD. PLAN S40L

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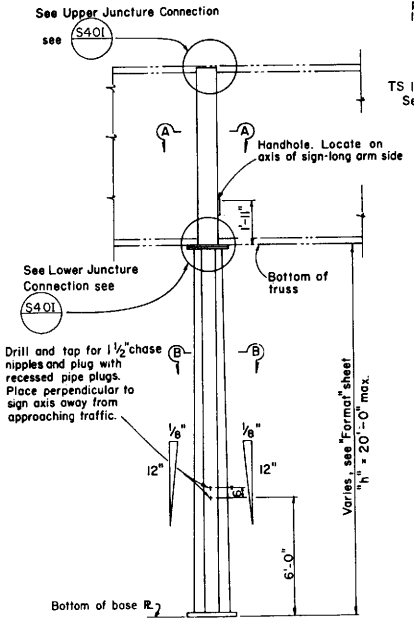

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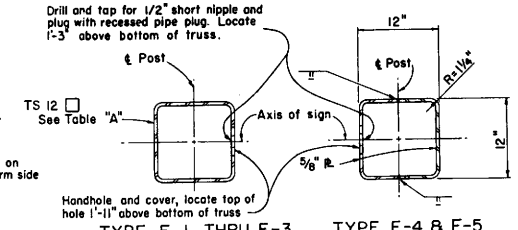
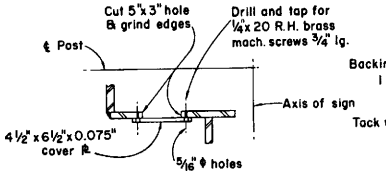
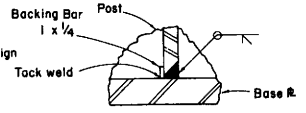


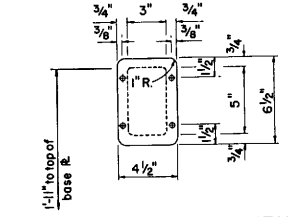
SECTION A-A



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

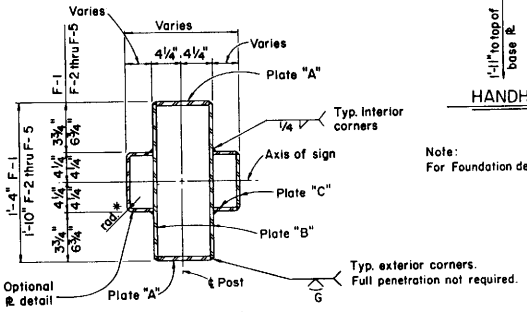


HANDHOLE AND COVER DETAIL

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"	12x12x0.3125
F-2	1/2"x 8"	1/4"	1/4"	2"x 30"x3'-0"	12 - 1 3/4"	12x12x0.375
F-3	1 1/2"x 8"	1/4"	1/4"	2"x 30"x3'-0"	12 - 2"	12x12x0.500
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"	

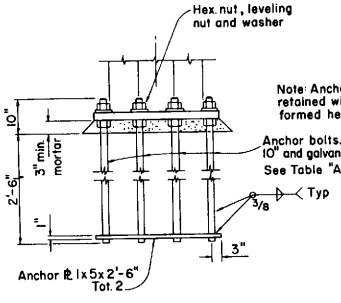
Note:
For Foundation details see S39

* 2" ϕ anchor bolts may be substituted for 1 3/4" ϕ bolts.

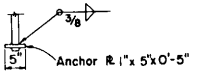


* 1/4" PL, rad. = 1"
3/8" PL, rad. = 1 1/2"

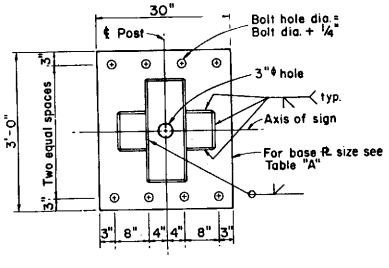
SECTION B-B



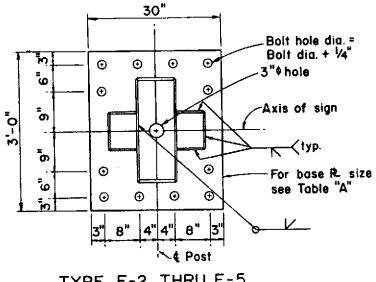
ANCHORAGE DETAILS



SINGLE SIDE BOLT



TYPE F-1



TYPE F-2 THRU F-5

BASE PLATE DETAILS

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS - BOX BEAM CLOSED TRUSS SINGLE POST BUTTERFLY POST DETAILS

NO SCALE

S40M

STD. PLAN S40M

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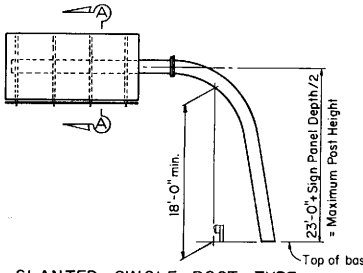
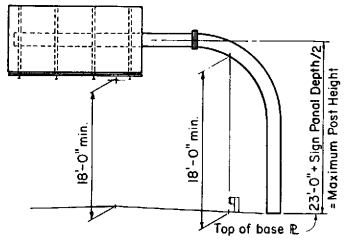
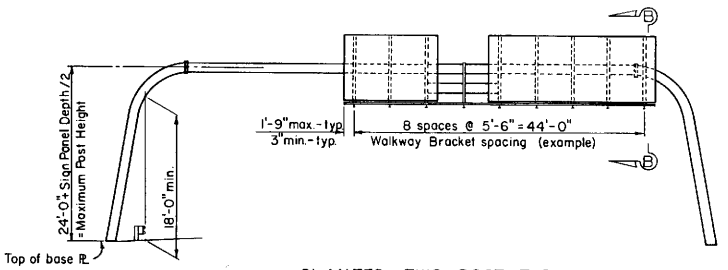


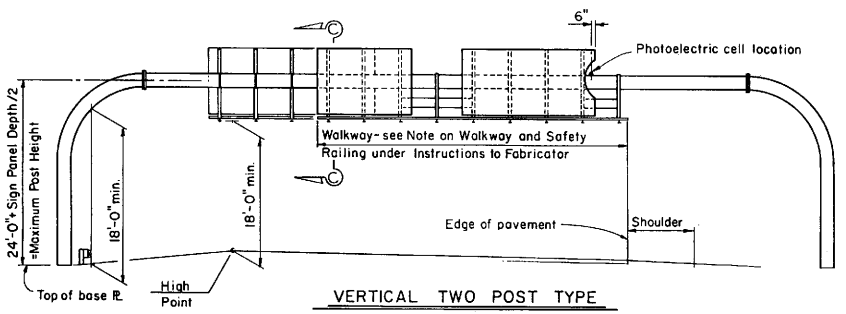
SLANTED SINGLE POST TYPE



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)
7. Safety Railing and Cable Details (S11)
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.

GENERAL NOTES

Specifications:

Design: A.A.S.H.T.O. Specifications for the Design and Construction of Structural Supports for Highway Signs, dated 1985.
Wind dynamics and resultant fatigue life were analyzed using Department of Transportation program WEFFLS as modified by Structure Design.

Construction: Standard Specifications and the Special Provisions.

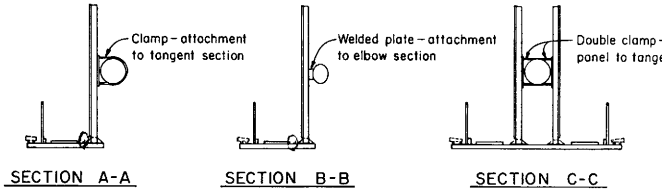
Wind Loading: 80 MPH velocity.

Soil Pressure: 1800 lbs per square foot lateral

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.



STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS - TUBULAR INSTRUCTIONS AND EXAMPLES

NO SCALE

S40N

STD. PLAN S40N

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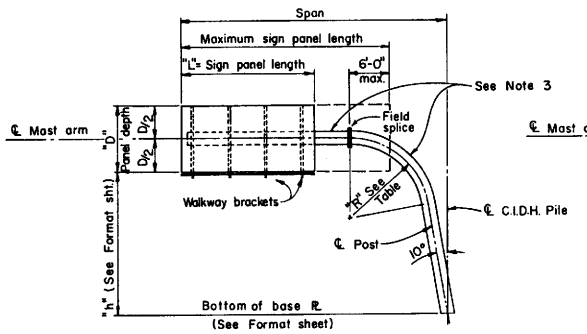
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER

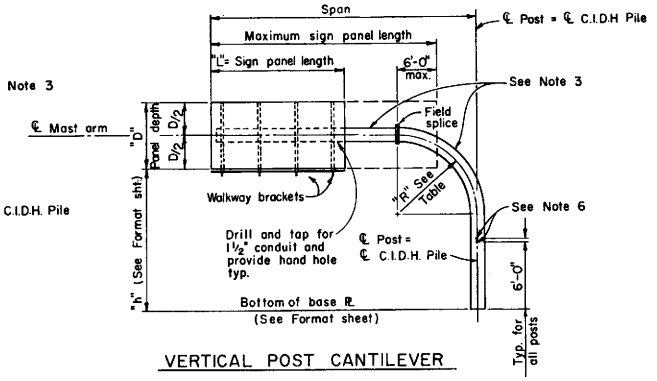
July 1, 1992

PLANS APPROVAL DATE

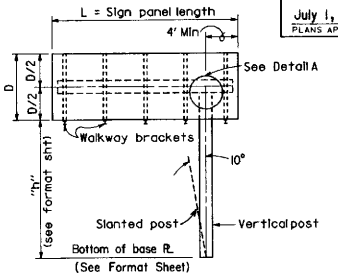
REGISTERED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA



SLANTED POST CANTILEVER



VERTICAL POST CANTILEVER



BUTTERFLY

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 know 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.

BUTTERFLY POST PIPE SELECTION PROCEDURE

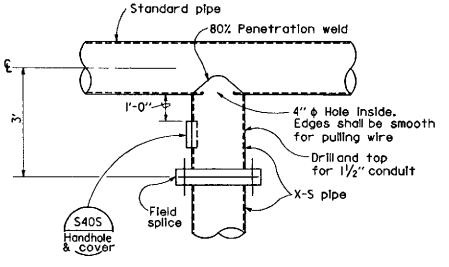
A. For butterfly post add 4' to sign panel length "L" and enter table to proper column with known panel depth "D" and appropriate height "h".

B. Read down column to desired span length.

C. Determine Pipe Post "Dia" and "R" for elbow by reading to the left horizontally.

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 a space between the panels, the space shall be as small as possible and 2' maximum.
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 1 1/2" chase nipples and plug with recessed pipe plugs. Place perpendicular to sign panel axis and away from approaching traffic.



DETAIL A

SLANTED POST CANTILEVER - MAXIMUM SPAN														
TYPE	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
D	8'-0"	12"	Span (Ft) →	21	21	21	21	21	21	21	21	20	19	18	18
G	8'-0"	14"		24	22	24	22	24	22	24	22	22	21	21	21
K	8'-0"	16"		28	25	28	25	28	25	28	25	28	25	25	24
N	8'-0"	18"		33	31	33	31	33	31	33	31	33	31	31	30
R	8'-0"	20"		38	34	38	34	38	34	38	34	38	34	35	34
T	10'-0"	24"		40	40	40	40	40	40	40	40	40	40	40	40

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS - TUBULAR SINGLE POST TYPE LAYOUT AND PIPE SELECTION

NO SCALE

S40P

STD. PLAN S40P

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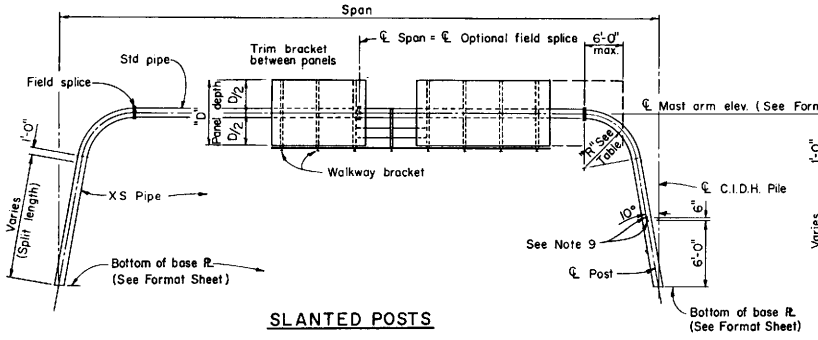
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

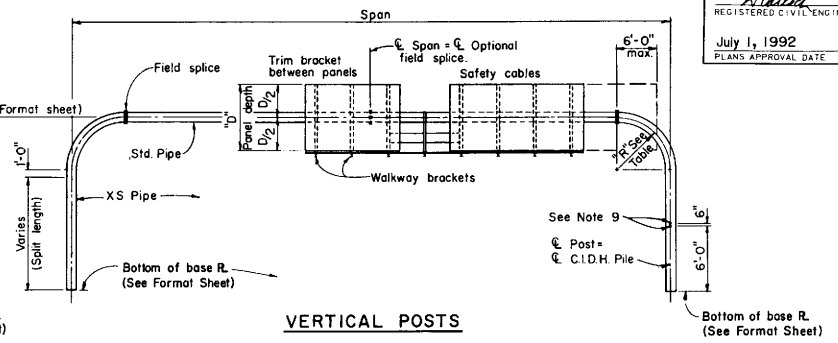
REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — T. Pollock — No. 13332 — Exp. 3-31-93 — CIVIL — STATE OF CALIFORNIA



SLANTED POSTS



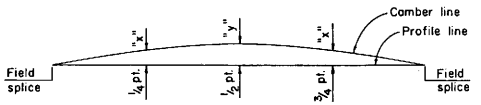
VERTICAL POSTS

* Mast arm diameter same as post.
◯ Indicates camber type, see Table.

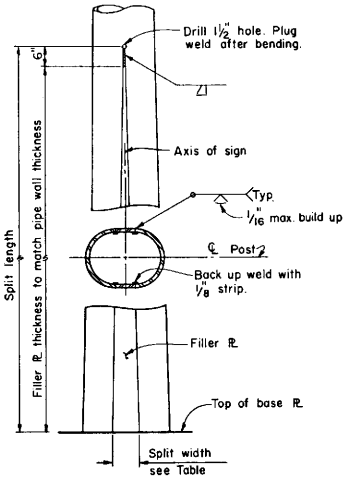
SLANTED POSTS (See Note 2)									
*PIPE POST			"D" →	70"	80"	90"	100"	110"	120"
"R"	Dia.	Split							
8'-0"	8"	5"	Span (Ft.)	Ⓐ 50-57	Ⓐ 50-57				
8'-0"	10"	4" 6"		Ⓐ 58-67	Ⓐ 58-67	Ⓐ 50-67	Ⓐ 50-67	Ⓐ 50-60	Ⓐ 50-57
8'-0"	12"	4" 8"		Ⓑ 68-77	Ⓑ 67-77	Ⓑ 68-77	Ⓑ 68-77	Ⓑ 61-72	Ⓐ 58-70
8'-0"	14"	4" 8"		Ⓑ 78-89	Ⓑ 78-89	Ⓒ 78-89	Ⓒ 78-87	Ⓑ 73-85	Ⓑ 71-83
8'-0"	16"	4" 8"		Ⓑ 90-100	Ⓑ 90-100	Ⓒ 90-100	Ⓒ 88-100	Ⓒ 86-93	Ⓒ 84-93
10'-0"	18"	5" 8"		Ⓑ 101-110	Ⓑ 101-110	Ⓒ 101-110	Ⓒ 101-110	Ⓒ 94-107	Ⓒ 94-105
10'-0"	20"	0" 5"		Ⓑ 111-120	Ⓒ 111-120	Ⓒ 111-120	Ⓓ 111-120	Ⓓ 108-115	Ⓒ 106-110
12'-0"	24"	0" 5"		Ⓒ 121-140	Ⓒ 121-140	Ⓓ 121-140	Ⓓ 121-140	Ⓓ 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 ½"	2"
Ⓑ	2 ¼"	3"
Ⓒ	2 ¾"	4"
Ⓓ	3 ½"	5"
Ⓔ	4 ½"	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 ½" ± 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 1½" 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

NO SCALE

S40Q

STD. PLAN S40Q

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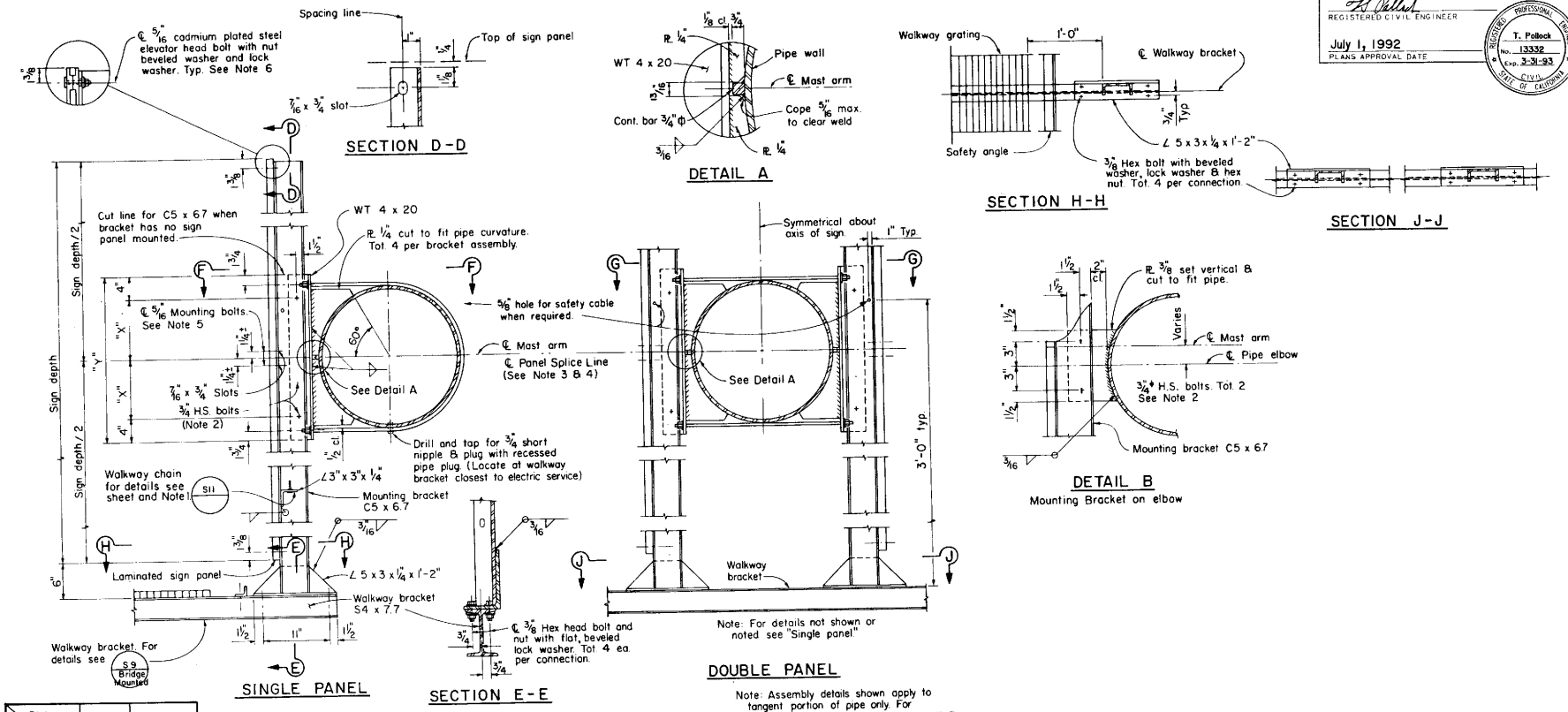
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA



MOUNTING BRACKET ASSEMBLY DETAILS

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"

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS - TUBULAR STRUCTURAL FRAME DETAILS NO.1

NO SCALE

S40R

STD. PLAN S40R

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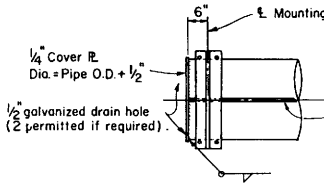
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER

July 1, 1992

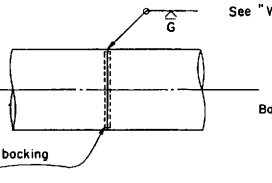
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA

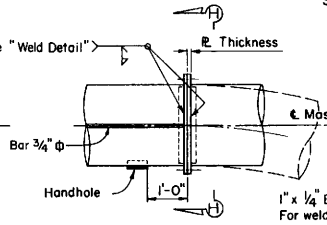


MAST ARM END DETAIL

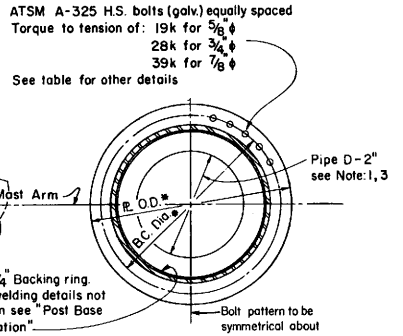
(For "Single Post Type" only)



SHOP SPLICE



FIELD SPLICE

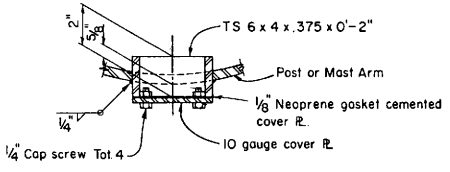


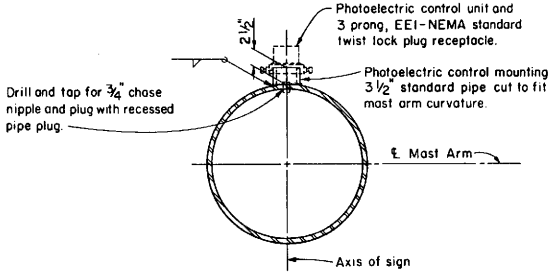
SECTION H-H

FIELD SPLICE				
Pipe Diameter	PL Thickness	H.S. Bolts	* B.C. Diameter	* PL 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

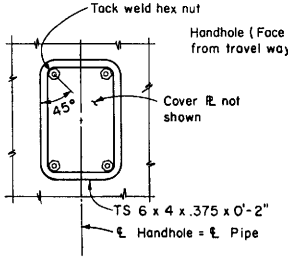
Note: Design based on capacity of Standard pipe.



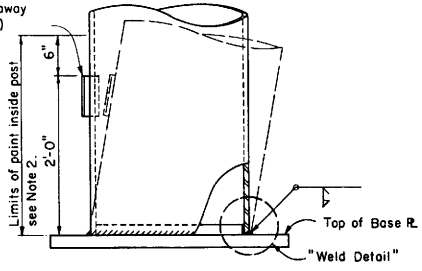


PHOTOELECTRIC CONTROL DETAILS

(See "Layout" sheet for location when required)

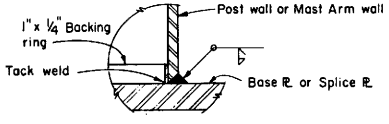


HANDHOLE & COVER DETAILS



POST BASE ELEVATION

(For Base PL 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 PL 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

NO SCALE

S40S

STD. PLAN S40S

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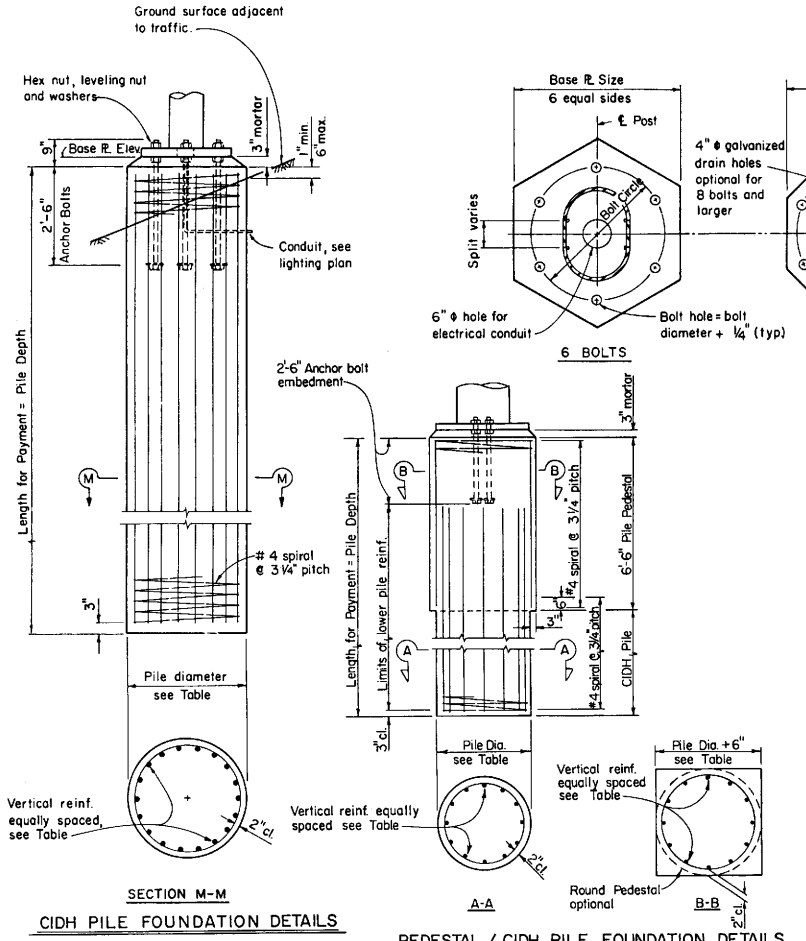
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

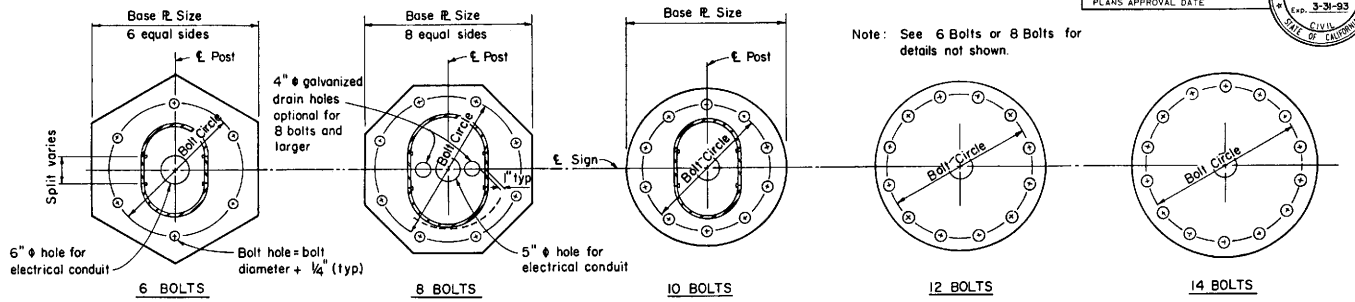
REGISTERED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA



CIDH PILE FOUNDATION DETAILS

PEDESTAL / CIDH PILE FOUNDATION DETAILS

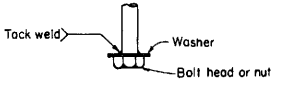
(CIDH Denotes cast-in-drilled-hole)



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 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

NO SCALE

S40T

STD. PLAN S40T

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

REGISTERED ELECTRICAL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

R. L. Donner No. 7405 Exp. 9-30-94 ELECTRICAL STATE OF CALIFORNIA

ELECTROLIERS

STANDARD TYPES
15 ROADWAY
15 STRUCTURE
21 STRUCTURE
22 STRUCTURE
30 ROADWAY
31 ROADWAY
32 ROADWAY

Existing electrolier to remain in place unless otherwise specified or indicated.

Foundation for future electrolier (see project notes).

NOTES

1. Luminaires shall be 310-watt HPS when installed on Type 21, 30, 31 and 32 standards, unless otherwise specified. Luminaires shall be 200-watt HPS when installed on all other type standards or poles, unless otherwise specified.
2. All Luminaires shall be the cutoff type, ANSI Type III medium cut off lighting distribution, unless otherwise specified
3. Variations noted adjacent to symbol on project plans.

Electrolier (see project notes or project plans)

Luminaire on wood pole

SOFFIT AND WALL MOUNTED LUMINAIRES

Pendant, 70 watt HPS unless otherwise specified.

Flush, 70 watt HPS unless otherwise specified.

Wall surface, 70 watt HPS unless otherwise specified.

Existing soffit or wall luminaire to remain unmodified.

Existing soffit or wall luminaire to be modified as specified.

NOTE

Arrow indicates "street side" of luminaire or glassware.

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
FB	fb	Flashing beacon
FBCA	fbca	Flashing beacon control assembly
HPS	hps	High pressure sodium
IISNS	iisns	Internally illuminated street name sign
IMC	imc	Intermediate steel conduit
LMA	lma	Luminaire mast arm
LPS	lps	Low pressure sodium
MC	mc	Mercury contactor
MER	mer	Mercury
MLC	mlc	Magnetometer detector lead in cable
M/M	m/m	Multiple to multiple transformer
MT	mt	Conduit with pull wire or rope
NC		Normally closed
NO		Normally open
PB	pb	Pull box
PEC	pec	Photo electric control (Type I, II, III, IV or V 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
SIC	sic	Signal interconnect cable
SMA	sma	Signal mast arm
S/M	s/m	Series to multiple transformer
SN		Solid neutral
SP	sp	Service point
SW	sw	Switch
TS	ts	Time 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.
- BP — Pedestrian barricade, type as indicated on plan.
- 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.
- DH — Detector handhole. Type A unless otherwise indicated.
- FA — Foundation is to be abandoned.
- IS — Install state furnished sign on signal mast arm.
- 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.
- RL — Relocate equipment.
- RR — Remove and reuse equipment.
- RS — Remove and salvage equipment.
- SB — Install slip base on standard.
- SBI — Install slip base insert.
- SC — Splice new to existing conductors.
- SD — Service disconnect.
- SF — Standard to remain for future use. Remove luminaire, pole conductors and ballast. Tape disconnects.
- TSP — Telephone service point.

EQUIPMENT IDENTIFICATION

ILLUMINATED SIGN IDENTIFICATION NUMBER:

Sign No. 1234 — Sign number - Place on post or structure

10MER SC1 1.0 — Transformer rating (KVA); Sign control type; Number and type of fixtures — DO NOT place on standard or structure

ELECTROLIER OR EQUIPMENT IDENTIFICATION NUMBER:

12345 - 15 — Mast arm length in feet, if shown. Do not place on standard or structure.; Equipment number - Place on standard or structure. Existing equipment numbers are shown in parenthesis

CONDUIT AND CONDUCTOR IDENTIFICATION:

1½"C, 2#10, 15#14, 2DLC — 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

A B C — Equipment description, installation or item numbers

1 2 3 — Conduit run numbers

SIGNAL AND LIGHTING STANDARD (TYPICAL DESIGNATION):

19A - 3 - 70 — Wind velocity=70 MPH; Case 3 arm loading; Standard type

Standard Plan sheet number

Detail number or letter

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL, LIGHTING AND ELECTRICAL SYSTEMS SYMBOLS AND ABBREVIATIONS

ES-1A

STD. PLAN ES-1A

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REGISTERED ELECTRICAL ENGINEER

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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 Conduit.
— 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	U	Wood Pole. "U" Indicates Utility Owned.
		Pole Guy- With Anchor.
		Pad Mount for Ground-Mounted Utility Transformer.
III		Service Equipment Enclosure Type.
		Service Equipment Enclosure Door Indicates Front of Enclosure.
T		Telephone Demarcation Cabinet

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.
		"Meter On" Sign

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		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 Red and Yellow Sections and 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 Signal Section With 12-Inch Lens and Visor. "R" Indicates Red Lens, "Y" Indicates Yellow Lens.
		Controller Assembly Door Indicates Front of Cabinet.
		Guard Post
		Wood 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) = Traffic Pull Box.

VEHICLE DETECTORS

5 J 9 U

Vehicle Detector Designation

U = Upper

L = Lower

Slot Number in Input File

Input File (I or J)

Phase

		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.
DH	dh	Detector Handhole Type A Unless Otherwise Specified.

STATE OF CALIFORNIA
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SIGNAL, LIGHTING AND ELECTRICAL SYSTEMS SYMBOLS AND ABBREVIATIONS

ES-1B

STD. PLAN ES-1B

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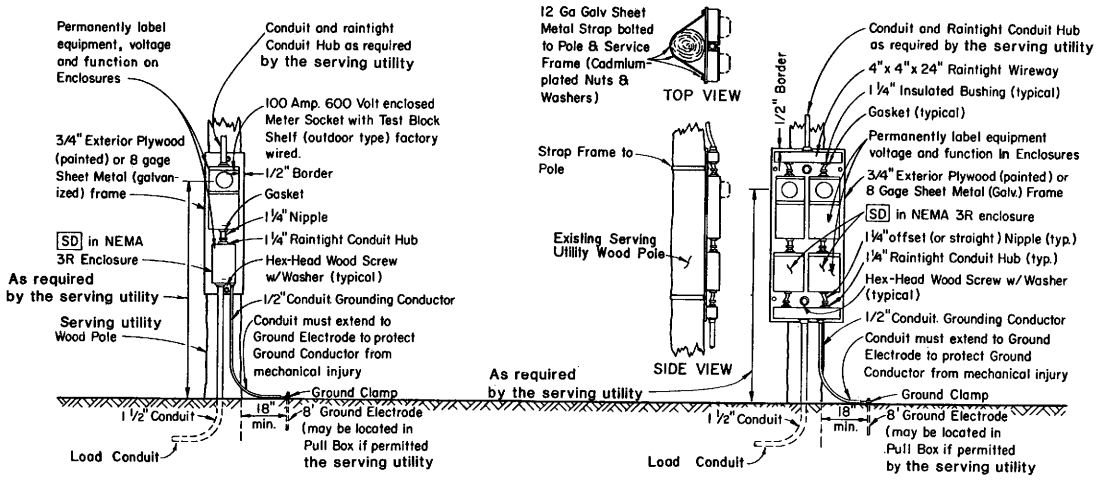
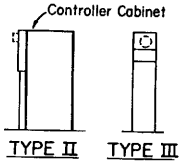
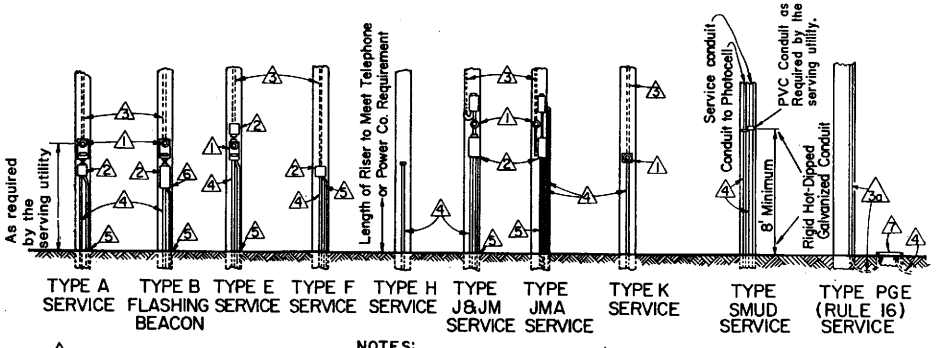
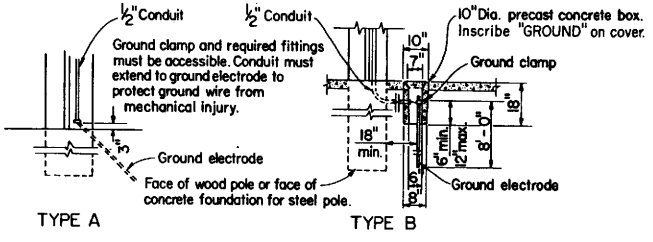




TYPES OF SERVICE (TYPICAL)

Type II Service Equipment Enclosure mounted on side of a Controller Cabinet.
Type III Complete Free-Standing Service Equipment Enclosure.





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.

SERVICE GROUNDING

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 the serving 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 and installed by Contractor. Exact location determined by the serving utility.

POLE MOUNTED SERVICE INSTALLATIONS

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL, LIGHTING AND ELECTRICAL SYSTEMS
SERVICE EQUIPMENT

NO SCALE

ES-2A

STD. PLAN ES-2A

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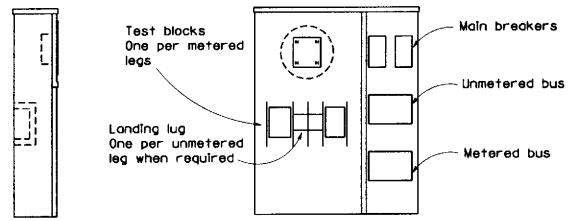
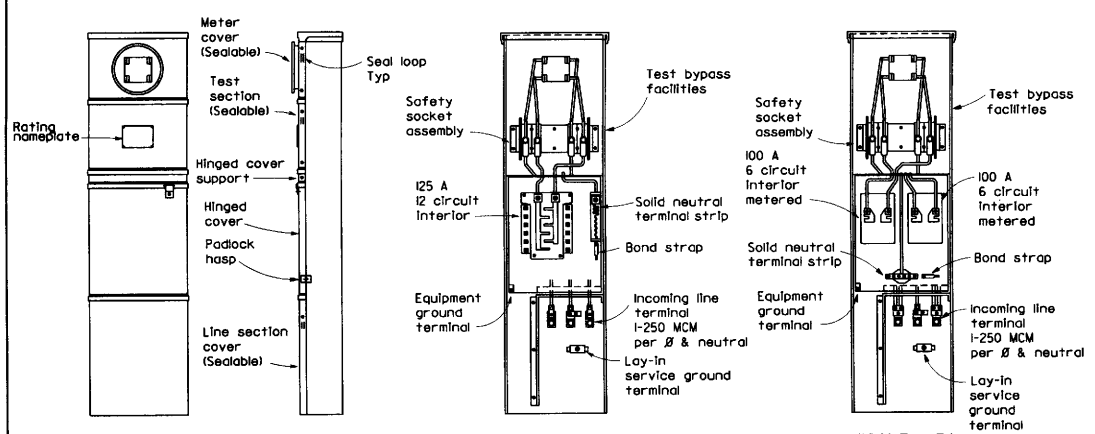


SIDE VIEW FRONT VIEW

TYPE II-A SERVICE EQUIPMENT ENCLOSURE



FRONT VIEW SIDE VIEW

FRONT VIEW
(Less Covers and Deadfront)
For
Metered Circuits Only

FRONT VIEW
(Less Covers and Deadfront)
For
Metered and Unmetered Circuits

TYPE II-B SERVICE EQUIPMENT ENCLOSURE

NOTES - TYPE II SEVICE 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 NEMA 3R Construction and shall be provided with Dead Front Panel and provisions for padlocking.
4. All control wiring shall be 600-volt No. 14 stranded machine tool wire. Where subject to flexing, 19 strand wire shall be used.
5. All main bus shall be rated for 125 amperes and shall be tin-plated copper.
6. An engraved phenolic nameplate on the dead front panel indicating the function of each circuit breaker or device, shall be installed with stainless steel rivets or stainless steel screws:
   a) Adjacent to the breaker or device. Character size shall be a minimum of 1/8".
   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".
7. A Plastic Laminated Wiring Diagram shall be provided and attached to the inside of the Front Door.
8. In unpaved areas, a raised PCC pad of 24"x4"x width of service enclosure foundation or controller cabinet foundation shall be placed in front of Type II Service Equipment Enclosures.
9. Internal bus, where shown, is typical only. Alternative designs of proposed service equipment enclosures shall be submitted to the Engineer for approval.
10. Circuit breakers may be mounted in the vertical or horizontal position.
11. Dimensions of Service Equipment Enclosures shall meet the requirements of the serving utility.

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SIGNAL, LIGHTING AND ELECTRICAL SYSTEMS
SERVICE EQUIPMENT

NO SCALE

ES-2B

STD. PLAN ES-2B

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NOTES-TYPE III SERVICE EQUIPMENT ENCLOSURES

1. Service Equipment Enclosure 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. Dimensions of Service Equipment Enclosures shall meet the requirements of the serving utility.
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. No live parts shall be mounted on either side of the dead front panel.
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. Fasteners on the exterior of the enclosure shall be vandal-resistant and shall not be removable from the exterior. All screws, nuts, bolts and washers shall be stainless steel.
8. All terminals for incoming service conductors shall be compatible with either copper or aluminum conductors sized to suit the conductors shown on the plan. Terminal lugs shall be copper or tin-plated aluminum. Solid neutral terminal strip shall be rated for 125 amperes unless otherwise specified and for use with copper or aluminum conductors. The terminal shall include but not be limited to:
   a) Incoming terminals (landing lugs)
   b) Neutral lugs
   c) Solid neutral terminal strip
   d) Terminal strips for conductors within the enclosure.
9. At least 6 standard single pole circuit breaker spaces (3/4" nominal) shall be provided. Circuit breaker interiors shall be copper. Interiors shall accept plug-in circuit breakers.
10. All control wiring shall be 600-volt No. 14 stranded machine tool wire. Where subject to flexing, 19 strand wire shall be used.
11. All main bus shall be rated for 125 amperes and shall be tin-plated copper.
12. A plastic laminated wiring diagram shall be provided with brass mounting eyelets and attached to the inside of the enclosure or the wiring diagram shall be mounted to the interior of the door with an UL or ETL approved method.
13. An engraved phenolic nameplate on the dead front panel indicating the function of each circuit within the enclosure, shall be installed with stainless steel rivets or stainless steel screws:
   a) Adjacent to the breaker or device. Character size shall be a minimum of 1/8".
   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 portland cement concrete 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" minimum beyond edge of enclosure.
17. Terminate conduits 2" maximum above top of foundation.
18. Internal bus, where shown, is typical only. Alternative design of proposed service equipment enclosure shall be submitted to the Engineer for approval.
19. Circuit breakers may be mounted in the vertical or horizontal position.
20. On Type III-AF and Type III-BF Service Equipment Enclosure, the meter viewing windows are located on the front side of the Service Equipment Enclosure.
21. The Type III-AR and Type III-BR Service Equipment Enclosures are similarly constructed as Type III-AF and Type III-BF respectively, except the meter viewing window is located on the back side of the Service Equipment Enclosures.

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SIGNAL, LIGHTING AND ELECTRICAL SYSTEMS
SERVICE EQUIPMENT NOTES

ES-2C

STD. PLAN ES-2C

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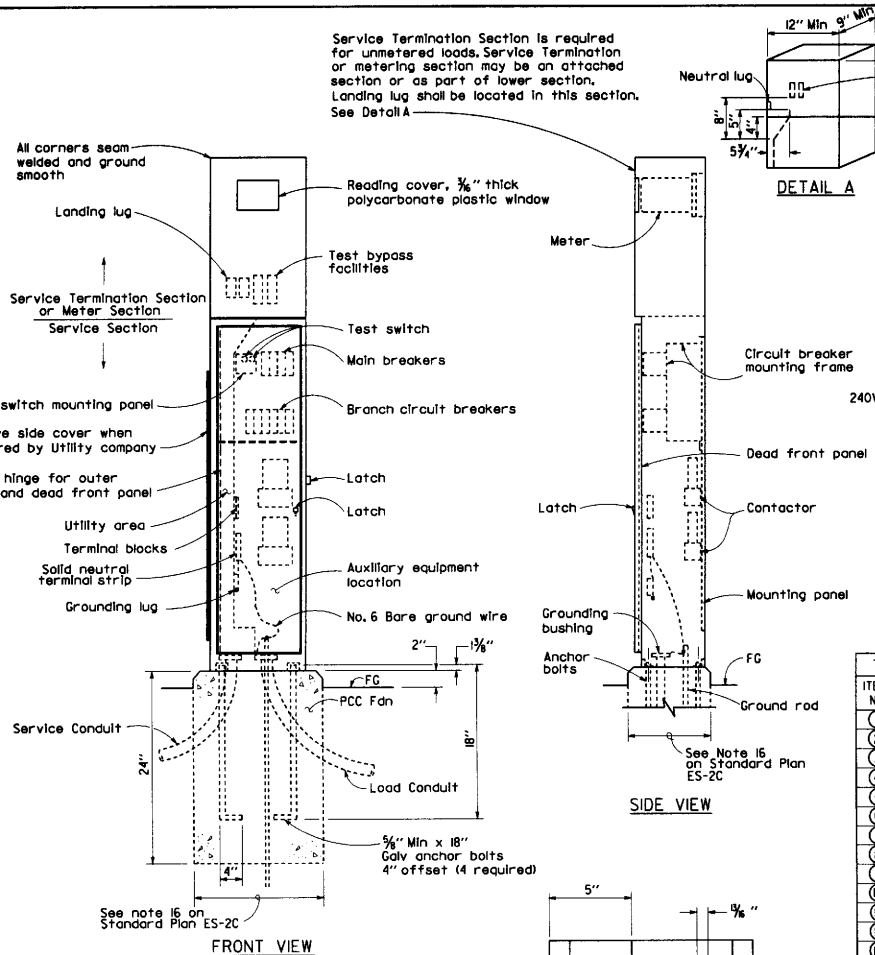
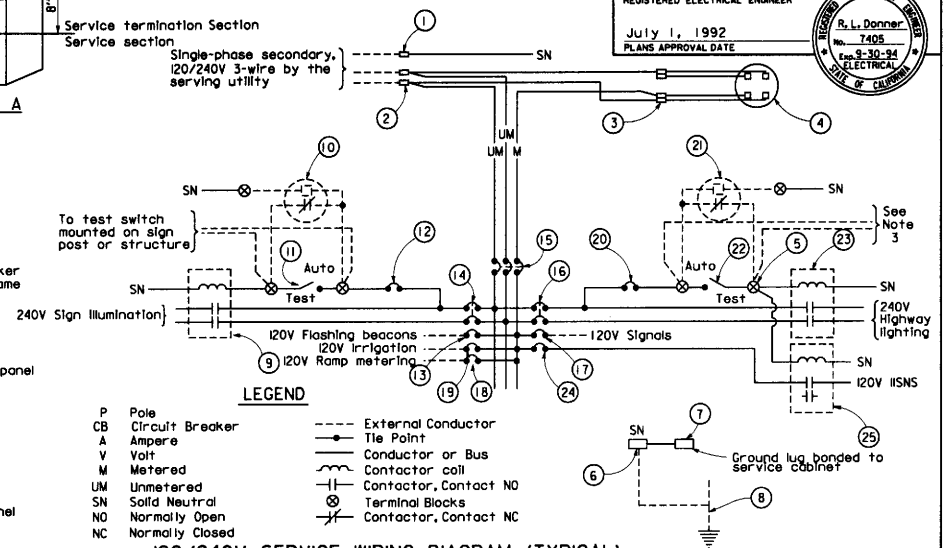


TYPE III-AF SERVICE EQUIPMENT ENCLOSURE (TYPICAL)

BASE FOR TYPE III-A SERVICE EQUIPMENT ENCLOSURE



LEGEND

P	Pole
CB	Circuit Breaker
A	Ampere
V	Volt
M	Metered
UM	Unmetered
SN	Solid Neutral
NO	Normally Open
NC	Normally Closed

External Conductor
Tie Point
Conductor or Bus
Contactor coil
Contactor, Contact NO
Terminal Blocks
Contactor, Contact NC

120/240V SERVICE WIRING DIAGRAM (TYPICAL)

TYPE III-A SERVICE (120/240V) EQUIPMENT LEGEND

ITEM NO.	COMPONENT	NAME PLATE DESCRIPTION
1	Neutral Lug	
2	Landing Lug	
3	Test Bypass Facilities	
4	Meter Socket and Support	
5	Terminal Blocks	
6	Solid Neutral Terminal Strip	
7	Ground Lug	
8	Ground Rod	
9	30A, 2PNO Mercury Contactor	
10	Photo Electric Unit	
11	15A, IP, Test Switch	Sign Illumination Test Switch
12	15A, 120V, IP, CB	Sign Illumination Control
13	15A, 120V, IP, CB	Flashing Beacon
14	30A, 240V, 2P, CB	Sign Illumination
15	100A, 240V, 3P, CB	Main Breaker
16	40A, 240V, 2P, CB	Highway Lighting
17	50A, 120V, IP, CB	Signals
18	30A, 120V, IP, CB	Ramp Metering
19	20A, 120V, IP, CB	Irrigation
20	15A, 120V, IP, CB	Highway Lighting Control
21	Photo Electric Unit	
22	15A, IP, Test Switch	Highway Lighting Test Switch
23	60A, 2PNO Mercury Contactor	
24	15A, 120V, IP, CB	IISNS
25	30A, 2PNO Mercury Contactor	

NOTES
(FOR SERVICE EQUIPMENT)

1. Voltage ratings of service equipment shall conform to the service voltages indicated on the plans.
2. Unless otherwise indicated on the plans, all service equipment items shall be provided for each service equipment enclosure as shown.
3. When sign and highway lighting circuits are combined into one circuit, conductors shall be provided to remote test switch mounted on sign post or structure. In addition, the word "Lighting" shall replace the words "Highway Lighting".
4. Item No. 1 and 6 shall be insulated from the cabinet.

STATE OF CALIFORNIA
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SIGNAL, LIGHTING AND ELECTRICAL SYSTEMS SERVICE EQUIPMENT AND TYPICAL WIRING DIAGRAM TYPE A

NO SCALE

ES-2D

STD. PLAN ES-2D

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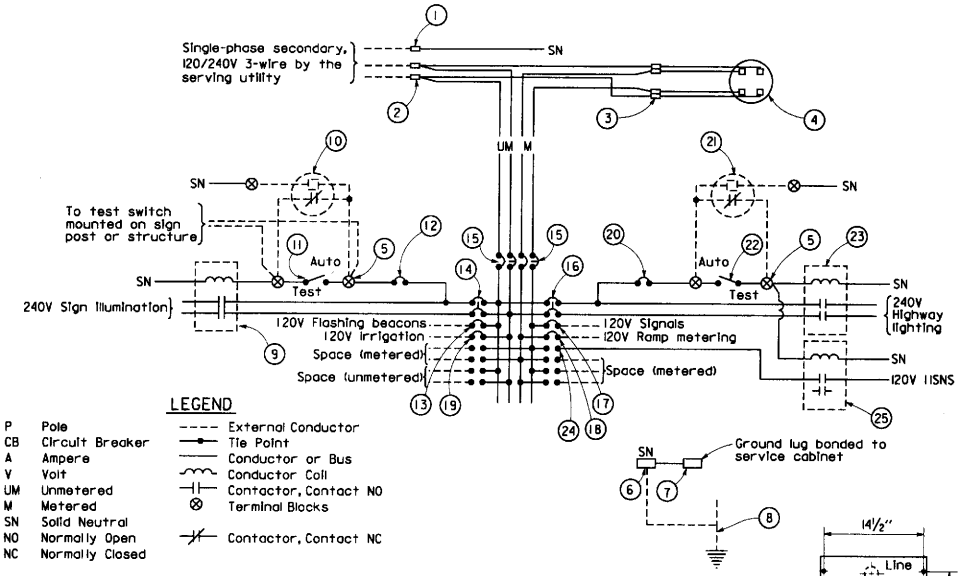
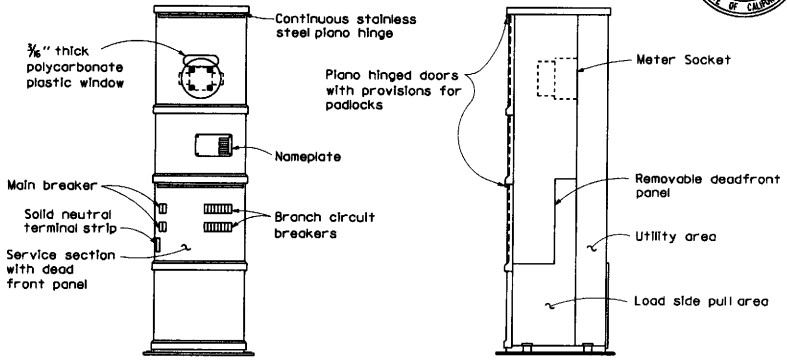
ELECTRICAL
STATE OF CALIFORNIA



LEGEND

P	Pole	----	External Conductor
CB	Circuit Breaker	—●—	Tie Point
A	Ampere	——	Conductor or Bus
V	Volt	~~~	Conductor Coil
UM	Unmetered	—⊣⊢—	Contactor, Contact NO
M	Metered	⊗	Terminal Blocks
SN	Solid Neutral		
NO	Normally Open	—⊣/⊢—	Contactor, Contact NC
NC	Normally Closed		

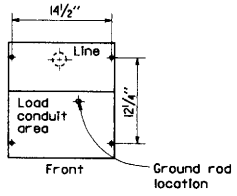
120/240V SERVICE WIRING DIAGRAM (TYPICAL)



FRONT VIEW

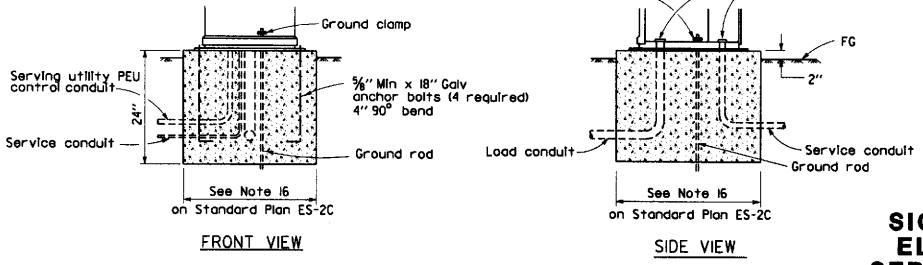
SIDE VIEW

TYPE III-BF SERVICE EQUIPMENT ENCLOSURE WITH PROVISIONS FOR ONE 100 A METER (TYPICAL)



BASE FOR TYPE III-B SERVICE EQUIPMENT ENCLOSURE

TYPE III-B SERVICE (120/240V) EQUIPMENT LEGEND		
ITEM NO.	COMPONENT	NAME PLATE DESCRIPTION
1	Neutral Lug	
2	Landing Lug	
3	Test Bypass Facilities	
4	Meter Socket and Support	
5	Terminal Blocks	
6	Solid Neutral Terminal Strip	
7	Ground Lug	
8	Ground Rod	
9	30A, 2PNO Contactor	
10	Photo Electric Unit	
11	15A, IP, Test Switch	Sign Illumination Test Switch
12	15A, 120V, IP, CB	Sign Illumination Control
13	15A, 120V, IP, CB	Flashing Beacon
14	30A, 240V, 2P, CB	Sign Lighting
15	100A, 240V, 3P, CB	Main Breaker
16	40A, 240V, 2P, CB	Highway Lighting
17	50A, 120V, IP, CB	Signals
18	30A, 120V, IP, CB	Ramp Metering
19	20A, 120V, IP, CB	Irrigation
20	15A, 120V, IP, CB	Highway Lighting Control
21	Photo Electric Unit	
22	15A, IP, Test Switch	Highway Lighting Test Switch
23	60A, 2PNO Contactor	
24	15A, 120V, IP, CB	IISNS
25	30A, 2PNO Contactor	



FRONT VIEW

SIDE VIEW

TYPE III-B SERVICE EQUIPMENT ENCLOSURE FOUNDATION DETAILS

NOTES
(FOR SERVICE EQUIPMENT)

1. Voltage ratings of service equipment shall conform to the service voltages indicated on the plans.
2. Unless otherwise indicated on the plans, all service equipment items shall be provided for each service equipment enclosure as shown.

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SIGNAL, LIGHTING AND ELECTRICAL SYSTEMS SERVICE EQUIPMENT AND TYPICAL WIRING DIAGRAM TYPE B

NO SCALE

ES-2E

STD. PLAN ES-2E

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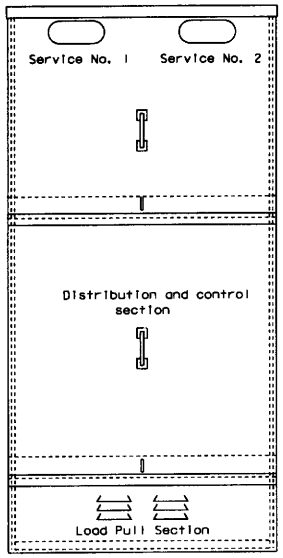
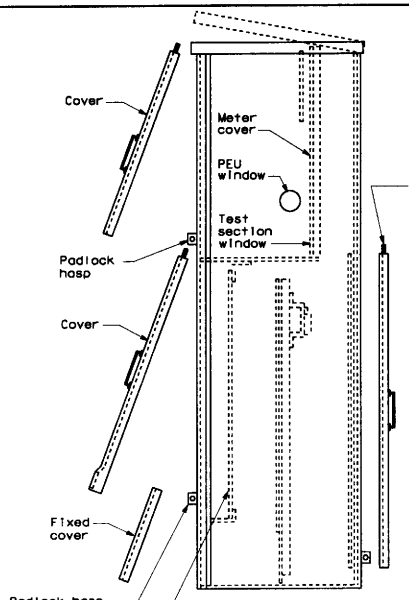
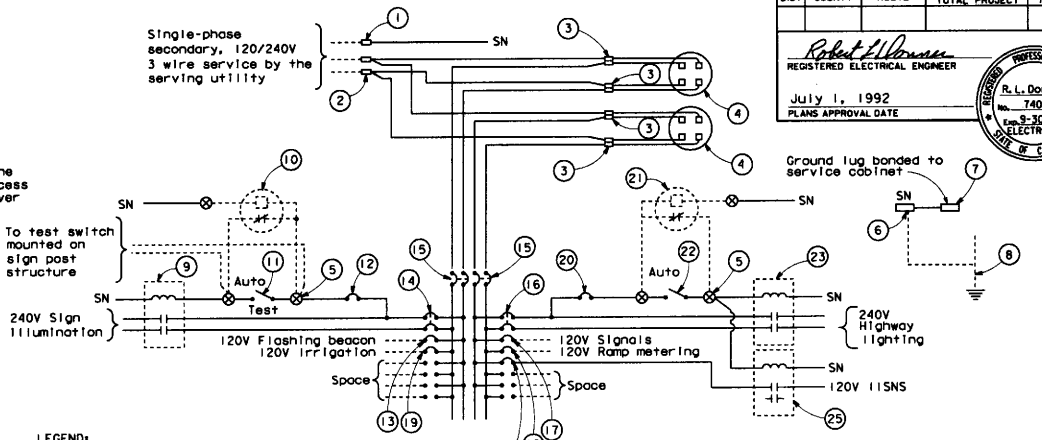


FRONT VIEW



SIDE VIEW

TYPE III-CF SERVICE EQUIPMENT ENCLOSURE WITH PROVISIONS FOR TWO 100A METERS (TYPICAL)



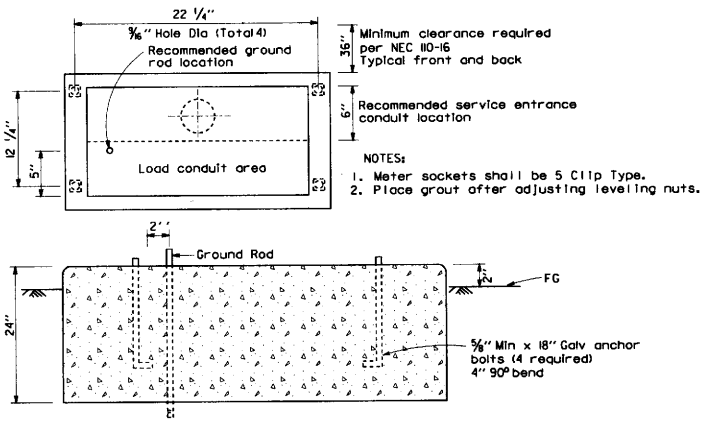
LEGEND:

P	Pole
CB	Circuit Breaker
A	Ampere
V	Volt
UM	Unmetered
M	Metered
SN	Solid Neutral
NO	Normally Open
NC	Normally Closed

---- External Conductor
—•— Tie Point
—— Conductor or Bus
Contactor Coil
Contactor, Contact NO
Terminal Block
Contactor, Contact NC

NOTES: (FOR SERVICE EQUIPMENT)
1. Voltage ratings of service equipment shall conform to the service voltages indicated on the plans.
2. Unless otherwise indicated on the plans, all service equipment items shall be provided for each service equipment enclosure as shown.

120/240V SERVICE WIRING DIAGRAM (TYPICAL)



NOTES:
1. Meter sockets shall be 5 Clip Type.
2. Place grout after adjusting leveling nuts.

FOUNDATION DETAIL
(See Note 16 on Standard Plan ES-2C)

TYPE III-C SERVICE (120/240V) EQUIPMENT LEGEND

ITEM No.	COMPONENT	NAME PLATE DESCRIPTION	ITEM No.	COMPONENT	NAME PLATE DESCRIPTION
1	Neutral Lug		14	30A, 240V, 1P, CB	Sign Illuminator
2	Landing Lug		15	100A, 240V, 2P, CB	Main Breaker
3	Test Bypass Facilitise		16	40A, 240V, 1P, CB	Highway Lighting
4	Meter Socket and Support		17	50A, 120V, 2P, CB	Signals
5	Terminal Blocks		18	30A, 120V, 1P, CB	Ramp Metering
6	Solid Neutral Terminal Strip		19	20A, 120V, 1P, CB	Irrigation
7	Ground Lug		20	15A, 120V, 1P, CB	Highway Lighting Control
8	Ground Rod		21	Photo Electric Unit	
9	30A, 2PNO, Contactor		22	15A, 1P, Test Switch	Highway Lighting Control
10	Photo Electric Unit		23	60A, 2PNO Contactor	
11	15A, 1P, Test Switch	Sign Illumination Test Switch	24	15A, 120V, 1P, CB	IISNS
12	15A, 120V, 1P, CB	Sign Illumination Control	25	30A, 2PNO Contractor	IISNS
13	15A, 120V, 1P, CB	Flashing Beacon			

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL, LIGHTING AND ELECTRICAL SYSTEMS SERVICE EQUIPMENT AND TYPICAL WIRING DIAGRAM TYPE C

NO SCALE

ES-2F

STD. PLAN ES-2F

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REGISTERED ELECTRICAL ENGINEER

July 1, 1992
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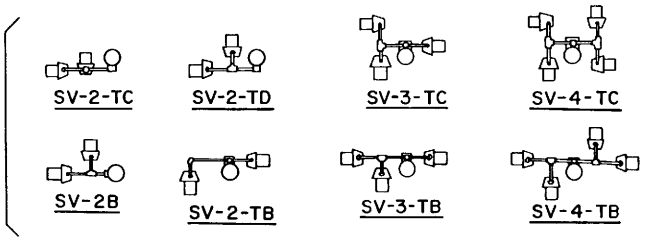
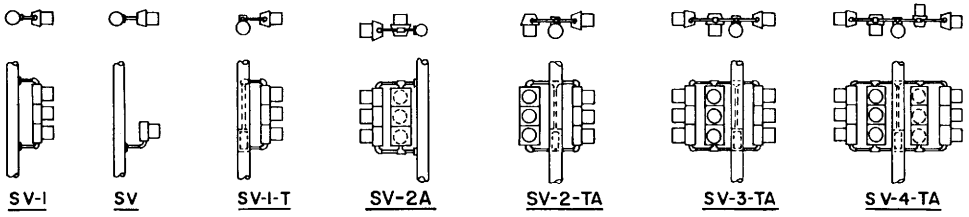
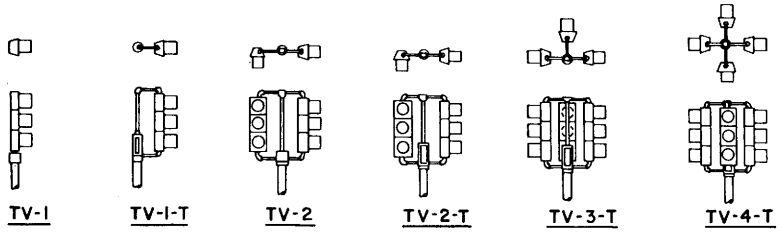
REGISTERED PROFESSIONAL ENGINEER
R.L. Donner
No. 7405
Exp. 9-30-94
ELECTRICAL
STATE OF CALIFORNIA

Plan View of Other Side Mountings





SIDE MOUNTINGS



TOP MOUNTINGS

VEHICULAR SIGNALS AND 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)

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.

STATE OF CALIFORNIA
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SIGNAL, LIGHTING AND ELECTRICAL SYSTEMS
SIGNAL HEADS AND MOUNTINGS

NO SCALE

ES-3A

STD. PLAN ES-3A

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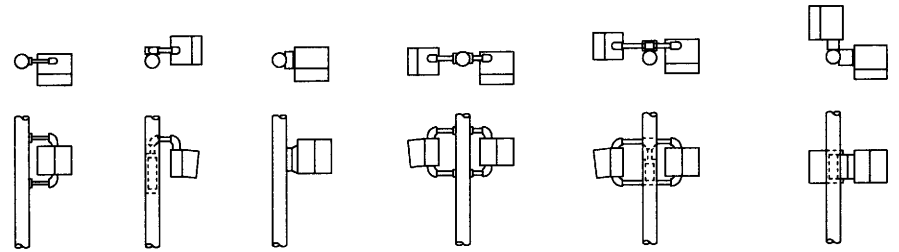
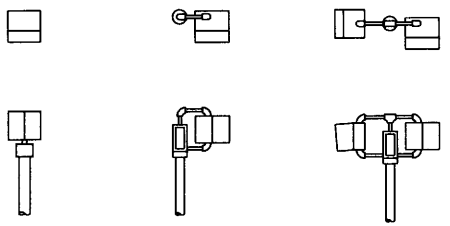
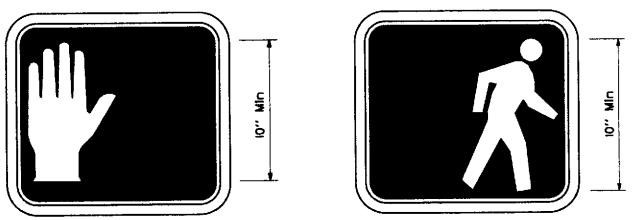


SIDE MOUNTINGS



TOP MOUNTINGS

PEDESTRIAN SIGNALS AND MOUNTINGS



PEDESTRIAN SIGNAL FACE

SYMBOL TYPE

NOTES:

1. Mounting 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
T	Terminal compartment
1,2	Number of signal faces

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL, LIGHTING AND ELECTRICAL SYSTEMS
SIGNAL HEADS AND MOUNTINGS

NO SCALE

ES-3B

STD. PLAN ES-3B

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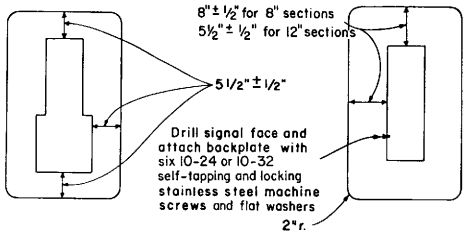
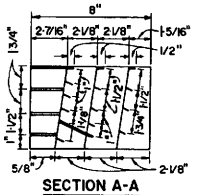
VISORS

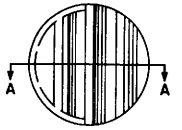


BACKPLATE

0.05 -inch minimum thickness.
3001-14 aluminum or plastic



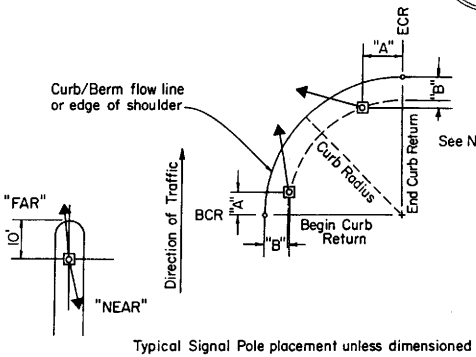
SECTION A-A



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.

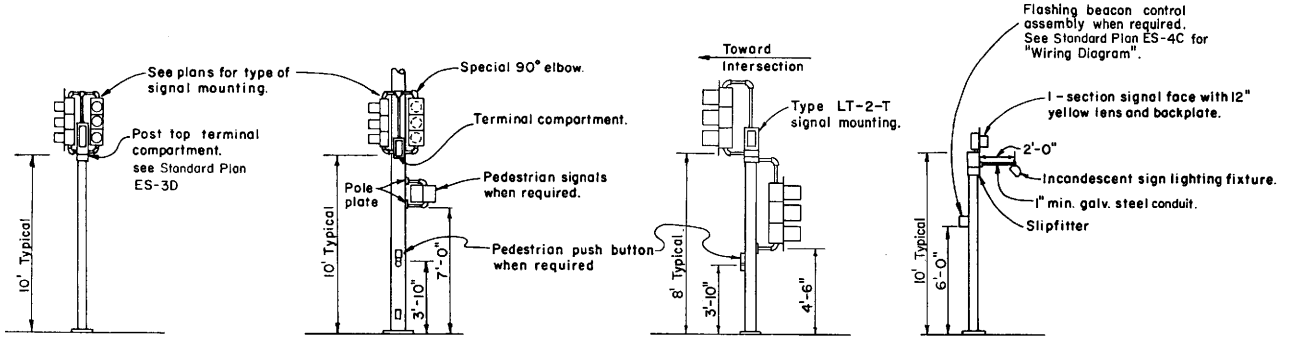


Typical Signal Pole placement unless dimensioned on plans.

SIGNAL STANDARD PLACEMENT DIMENSIONS & EQUIPMENT LOCATIONS

NOTE

1. For "A" and "B" dimensions, see Pole Schedule, or as directed by the Engineer.



TOP MOUNTED SIGNALS (TV)

Type 1-A, 1-B, 1-C or 1-D 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 1-A, 1-B, 1-C or 1-D standard as indicated on the plans

ADVANCE FLASHING BEACON INSTALLATION

Type 1-A, 1-B, 1-C or 1-D standard as indicated on the plans

TYPICAL SIGNAL INSTALLATIONS

ABBREVIATIONS

LT = Left Turn signals

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL, LIGHTING AND ELECTRICAL SYSTEMS
SIGNAL HEADS AND MOUNTINGS

NO SCALE

ES-3C

STD. PLAN ES-3C

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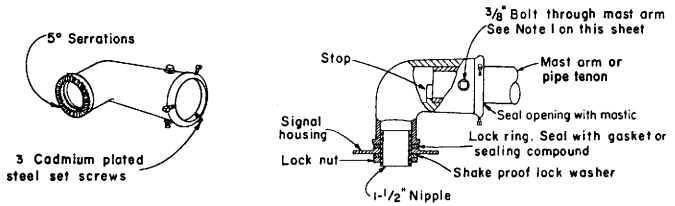
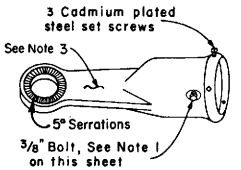
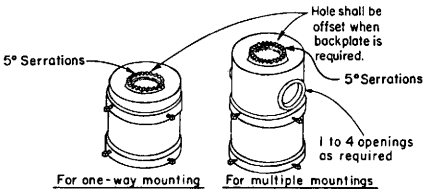


MAST ARM MOUNTING - TYPE "MAT"
For 2" pipe - See Note 1 on this sheet

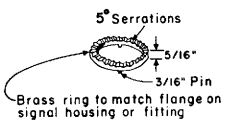


MAST ARM MOUNTING TYPE "MAS"
For 2" pipe - See Note 1 on this sheet

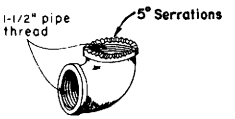


TOP MOUNTING
For 4" pipe - See Note 2 on this sheet

SIGNAL SLIP-FITTERS



LOCK RING
Use where locking ring is not integral with signal housing or fitting.

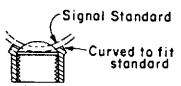


SPECIAL 90° ELBOW
One for each face, except those with special slip-fitter mounting

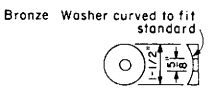
MISCELLANEOUS MOUNTING HARDWARE

NOTES

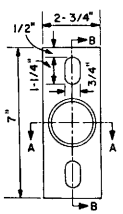
1. After mast arm signal has been plumbed and secured, drill 7/16" hole through mast arm in line with slip-fitter hole. Place a 3/8" galvanized bolt with washer under bolt head through hole and secure with washer, nut, and locknut. Seal openings between MAS, MAT or MAS-5 mountings and mast arm.
2. (a) 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 square inch minimum. Minimum width of 0.50 inch.



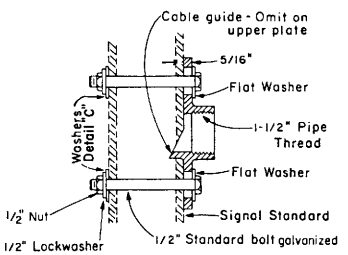
SECTION A-A



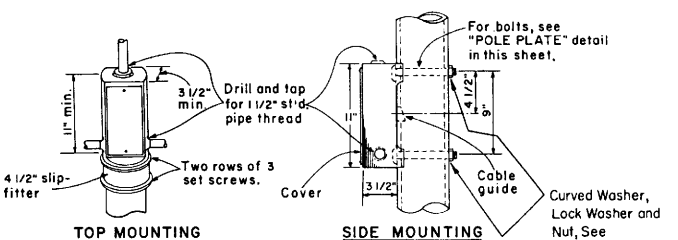
WASHER DETAIL "C"



POLE PLATE
For Side Mountings



SECTION B-B



TOP MOUNTING
SIDE MOUNTING

TERMINAL COMPARTMENTS

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL, LIGHTING AND ELECTRICAL SYSTEMS
SIGNAL HEADS AND MOUNTINGS

NO SCALE

ES-3D

STD. PLAN ES-3D

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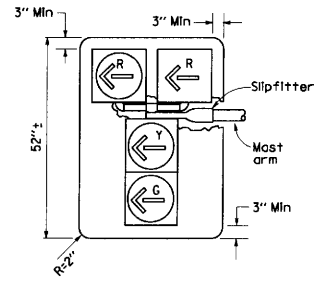
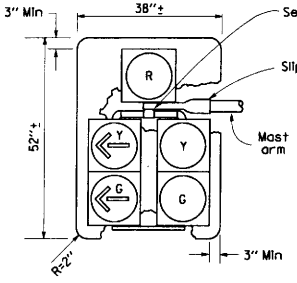
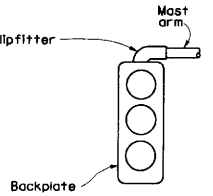


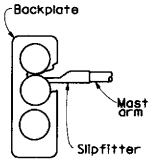
MAS-4A
Side attachment



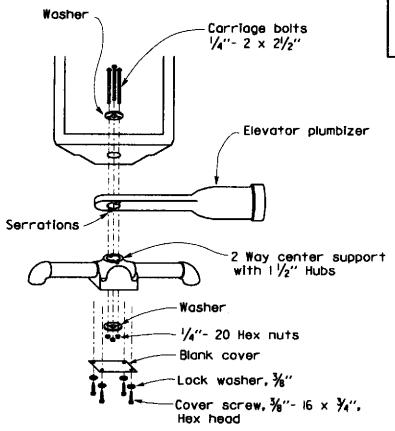
MAS-5A
Side attachment



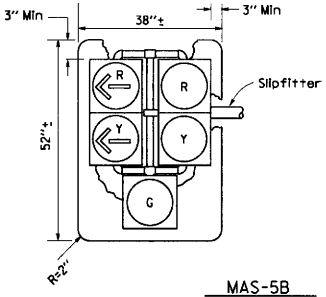
MAT
Top attachment



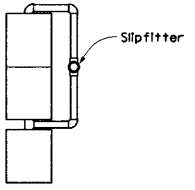
MAS
Side attachment



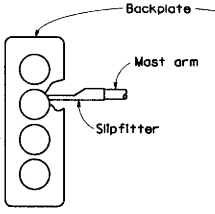
DETAIL A



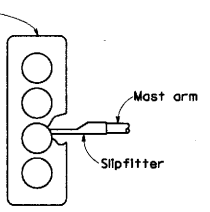
MAS-5B
Side attachment



SIDE VIEW



MAS-4B
Side attachment



MAS-4C
Side attachment

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.

ABBREVIATIONS

MAT	Mast Arm mounted vehicular signals Top attachment.
MAS	Mast Arm mounted vehicular signals Side attachment.
MAS-4A MAS-4B MAS-4C	Mast Arm mounted vehicular signals Side attachment - 4 signal sections.
MAS-5	Mast Arm mounted vehicular signals Side attachment - 5 signal sections.

MAST ARM MOUNTINGS

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL, LIGHTING AND ELECTRICAL SYSTEMS
SIGNAL HEADS AND MOUNTINGS

NO SCALE

ES-3E

STD. PLAN ES-3E

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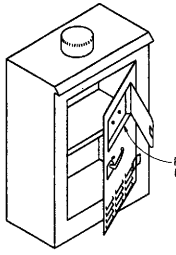
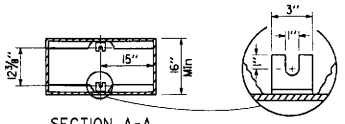
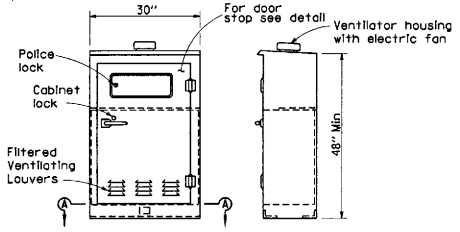




SECTION A-A

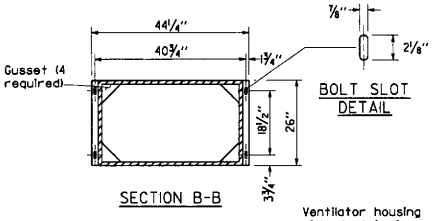
ANCHOR BOLT SLOT DETAIL



FRONT

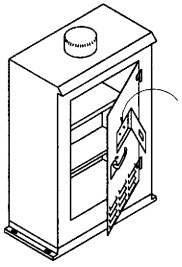
RIGHT SIDE

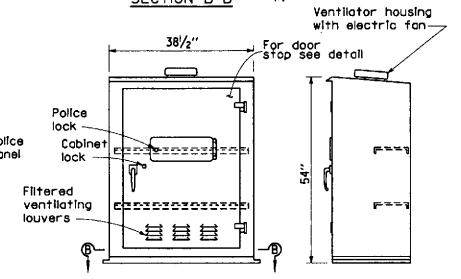
TYPE M CABINET



BOLT SLOT DETAIL

SECTION B-B

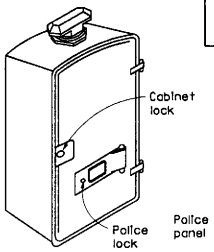


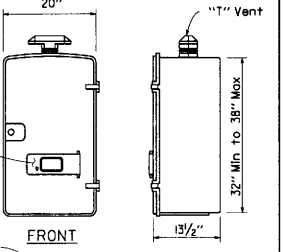


FRONT

RIGHT SIDE

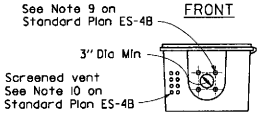
TYPE P CABINET





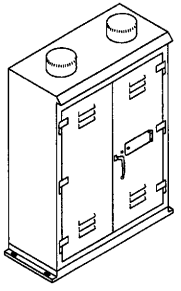
FRONT

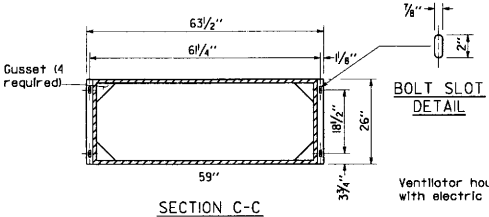
RIGHT SIDE



BOTTOM

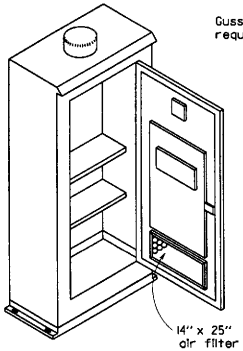
TYPE G CABINET

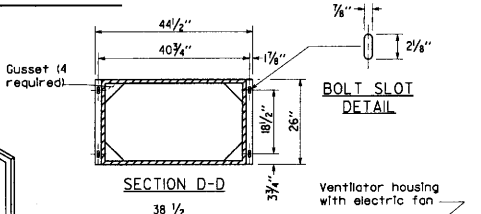




BOLT SLOT DETAIL

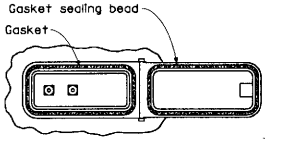
SECTION C-C



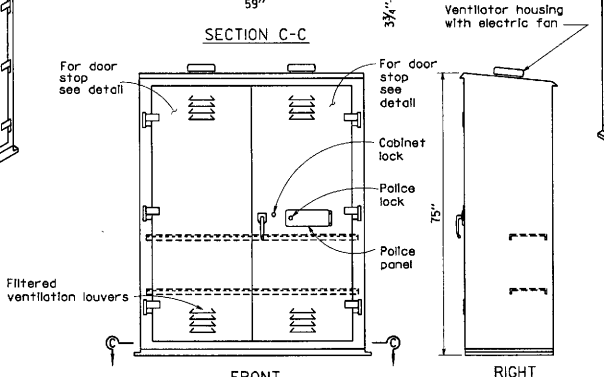


BOLT SLOT DETAIL

SECTION D-D



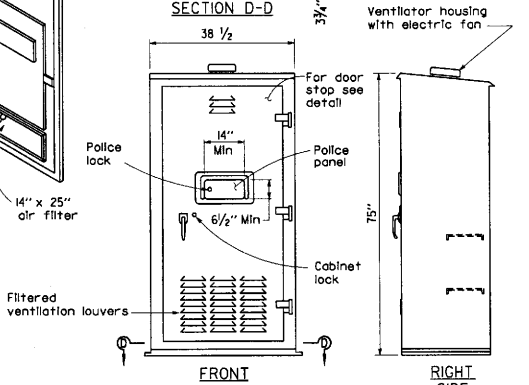
POLICE PANEL



FRONT

RIGHT SIDE

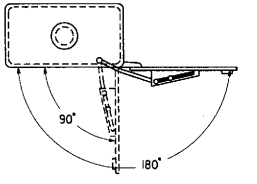
TYPE S CABINET



FRONT

RIGHT SIDE

TYPE R CABINET



PLAN VIEW

DOOR STOP DETAIL (2 POSITION)

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL, LIGHTING AND ELECTRICAL SYSTEMS CONTROLLER CABINET DETAILS

NO SCALE

ES-4A

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

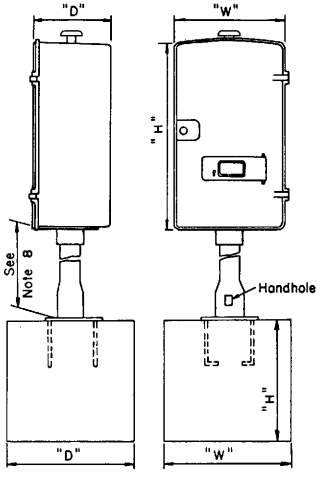
Robert L. Donner
REGISTERED ELECTRICAL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

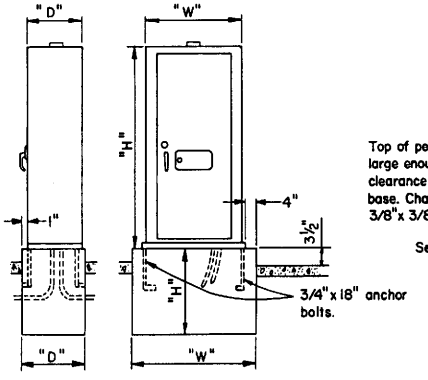
REGISTERED PROFESSIONAL ENGINEER R.L. Donner No. 7405 Exp. 9-30-94 ELECTRICAL STATE OF CALIFORNIA

NOTES - CONTROLLER CABINETS

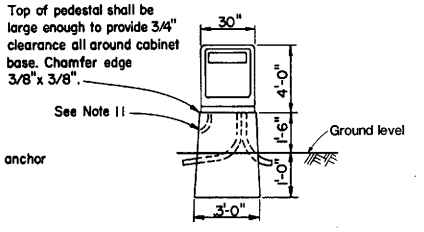
1. All cabinet dimensions are nominal.
2. Foundations shall be located to provide 2'-0" minimum clearance between face of curb and any portion of cabinet.
3. Type G, M, P, R and S cabinets shall be installed with the back toward the nearest lane of traffic.
4. The controller cabinet grounding bus shall be bonded to 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 separate telephone and power conductors in cabinets and pedestals.
21. For 332, 334 and 336 cabinet details, see traffic signal controller equipment specifications.



P.C.C. FOUNDATION FOR TYPE G CABINET

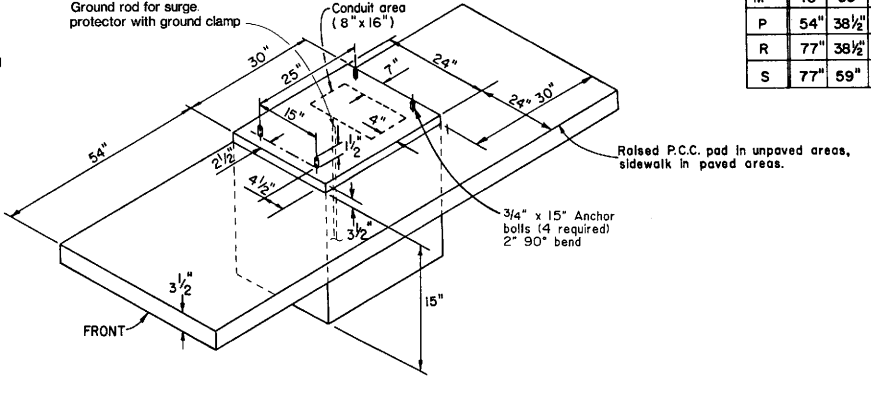


P.C.C. FOUNDATION FOR TYPE P, R and S CABINETS



P.C.C. PEDESTAL FOUNDATION FOR TYPE M OR 336 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

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL, LIGHTING AND ELECTRICAL SYSTEMS
CONTROLLER CABINET DETAILS

NO SCALE

ES-4B

STD. PLAN ES-4B

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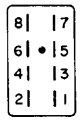
Robert L Donner
REGISTERED ELECTRICAL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
R.L. Donner
No. 7405
Exp. 9-30-94
ELECTRICAL
STATE OF CALIFORNIA

The Flash Transfer Relay shall intermate with a CINCH - JONES Socket S-408 - SB or equal connected as follows:

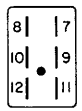
Pin No.	CIRCUIT	Pin No.	CIRCUIT
1	Coil	5	Common, Circuit #1
2	Coil	6	Common, Circuit #2
3	N.C. Circuit #1	7	N.O. Circuit #1
4	N.C. Circuit #2	8	N.O. Circuit #2



CONNECTOR SOCKET
FLASH TRANSFER RELAY

The FLASHER shall intermate with a CINCH-JONES Socket S-406-SB or equal connected as follows:

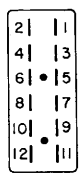
Pin No.	CIRCUIT	Pin No.	CIRCUIT
7	Load, Ckt. #1	10	AC⁻
8	Load, Ckt. #2	11	AC⁺
9	Chassis Ground	12	Not Used



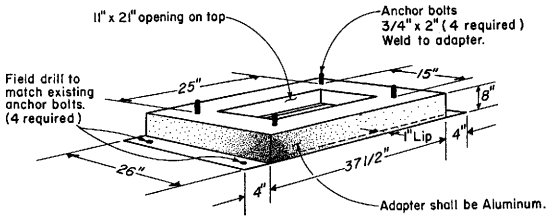
CONNECTOR SOCKET
SOLID STATE FLASHER UNIT

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

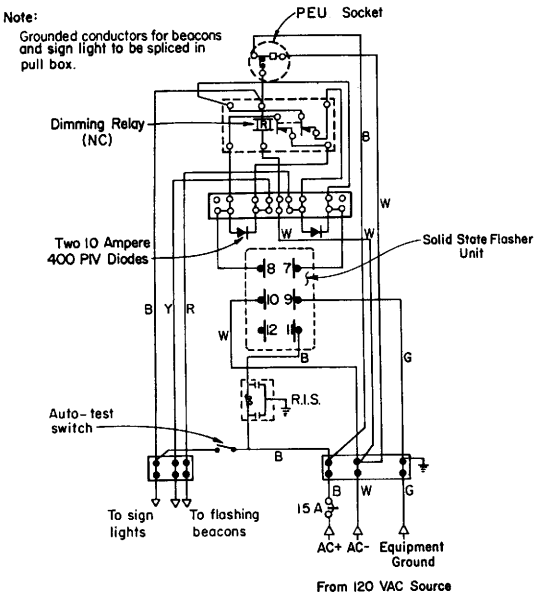


CONNECTOR SOCKET
SOLID STATE SWITCHING DEVICE

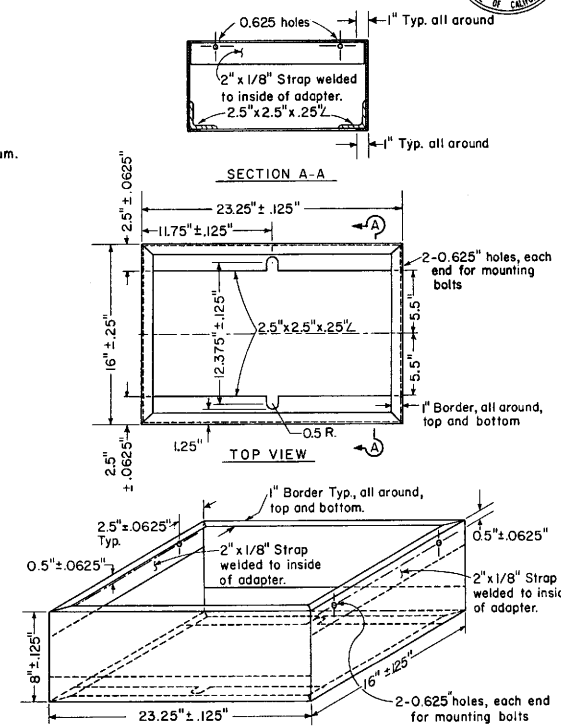


TYPE PR CABINET ADAPTER

1. Material: 0.188" Thickness Aluminum Plate.
2. Mount adapter on Type P or Type R Cabinet Foundation.



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
3. Aluminum (0.188" Thickness)

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL, LIGHTING AND ELECTRICAL SYSTEMS
CONTROLLER CABINET DETAILS

NO SCALE

ES-4C

STD. PLA. ES-4C

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REGISTERED ELECTRICAL ENGINEER

July 1, 1992
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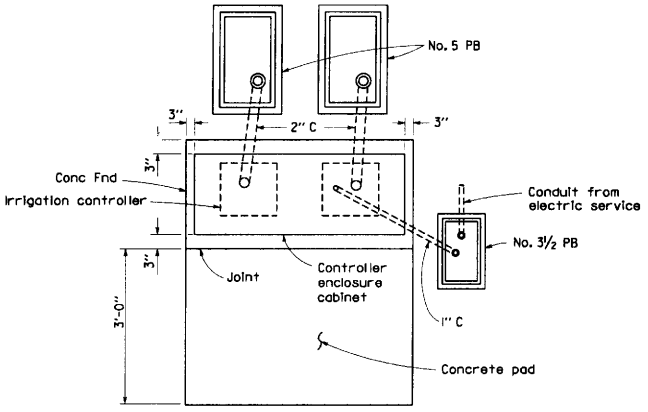
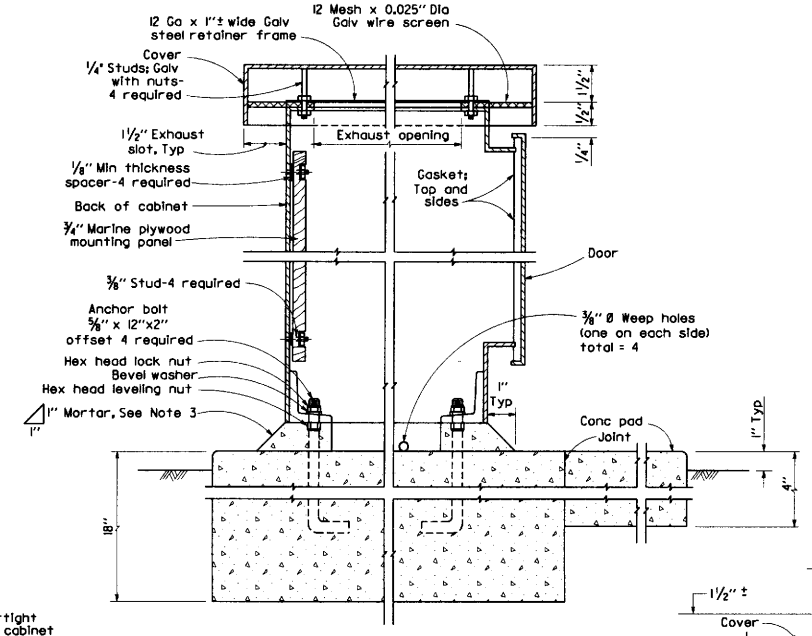


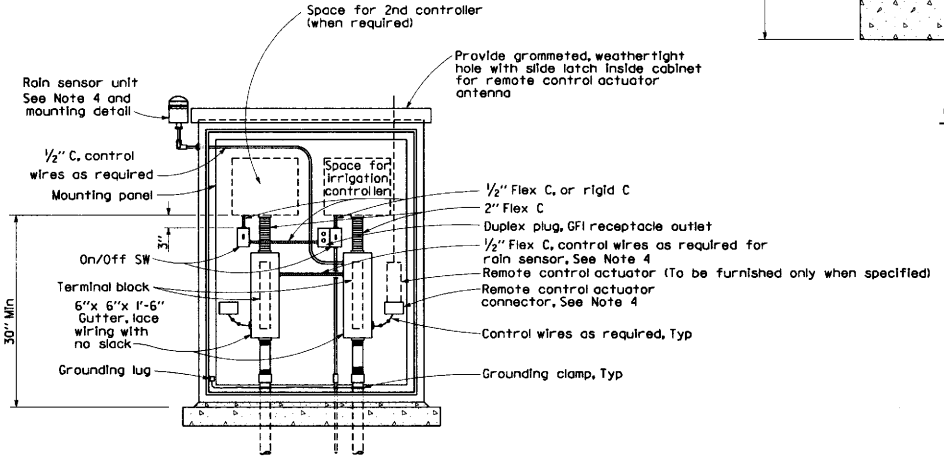
PLAN



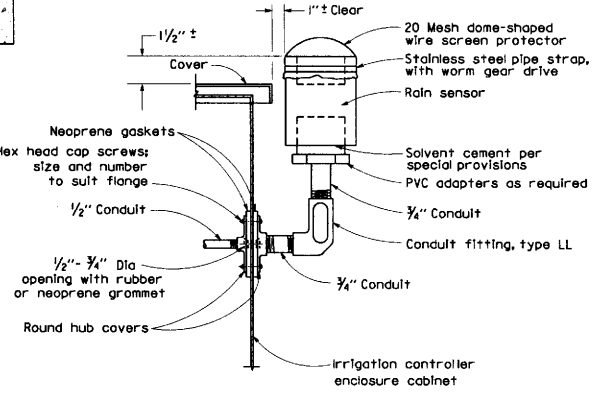
CABINET SECTION

NOTES

1. All dimensions are nominal.
2. Irrigation Controller Enclosure Cabinet dimensions: 60" H x 12" D x 20" W for single controller enclosure, 36" W for double enclosure.
3. Mortar shall be 1-part cement, 2-parts plaster sand.
4. Rain sensor unit and/or remote control actuator connectors. To be provided only when specified.
5. See project plans for location and number of irrigation controllers for each cabinet.
6. Switch and GFI outlet boxes shall be cast metal with threaded hubs and cast metal covers with gaskets. Snap switches shall be 20-ampere, 120/277-volt specifications grade switch.



ELEVATION



RAIN SENSOR UNIT MOUNTING DETAIL

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

IRRIGATION CONTROLLER ENCLOSURE CABINET

NO SCALE

STD. PLAN ES-4D

ES-4D

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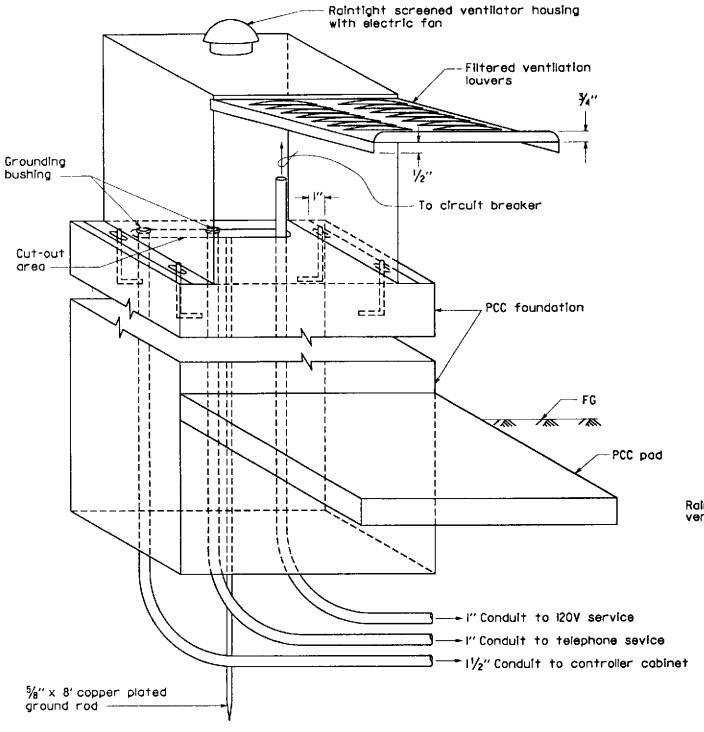
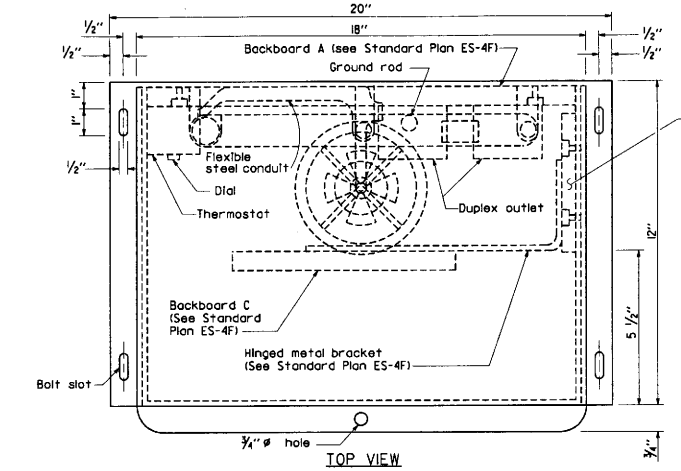
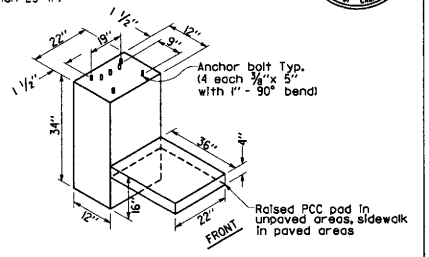
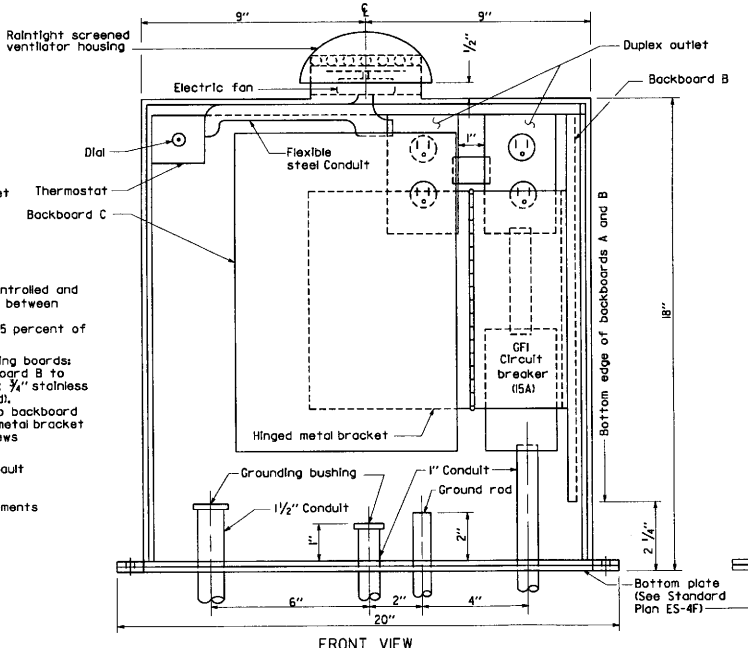




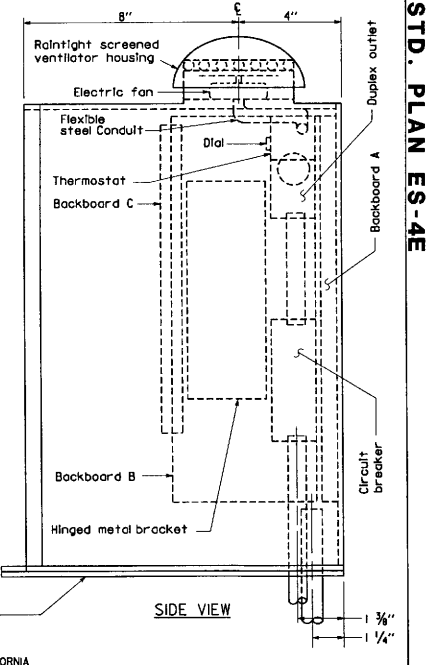
TOP VIEW



FOUNDATION DETAILS



FRONT VIEW



SIDE VIEW

1. Demarcation cabinet shall be furnished with mounting boards, thermostat, fan, outlet box and outlet plate.
2. 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.
3. In unpaved areas, a raised PCC pad shall be placed in front of the demarcation cabinet. Pad shall be 36" x 22" and 4" thick.
4. All conduits and anchor bolts shall be grounded and bonded to the ground rod per Section 86-2.10, "Bonding and Grounding" of the Standard Specifications.
5. DEMARCATION CABINET:
   a) Dimensions: 18" x 18" x 12" (HxWxD).
   b) Material: Anodized aluminum (0.125" thick).
   c) Fabrication: Shall conform to the requirements in Section 86-3.07A, "Cabinet Construction" of the Standard Specifications.
   d) Door to flip up with locking device to hold door open in the extreme open position.
   e) Ventilation louvers to be located in door.
   f) Door shall be lockable with padlock.
   g) Fan shall be mounted in ventilator housing.
   h) Fan capacity to be at least 25 CFM.
   i) Fan shall be thermostatically controlled and manually adjustable to turn on between 32° C and 65° C.
   j) Fan circuit shall be fused at 175 percent of the fan motor capacity.
6. Hardware for fastening of mounting boards:
   a) Fasten backboard A and backboard B to demarcation cabinet with 3/8" x 3/4" stainless steel carriage bolts (8 required).
   b) Fasten hinged metal bracket to backboard B and backboard D to hinged metal bracket with number 10 x 3/4" wood screws (9 required).
7. Duplex outlets shall have ground fault circuit protection.
8. Ground rod shall meet the requirements of NEC Article 250-84.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL, LIGHTING AND ELECTRICAL SYSTEMS
TELEPHONE DEMARCATION CABINET DETAILS

NO SCALE

ES-4E

STD. PLAN ES-4E

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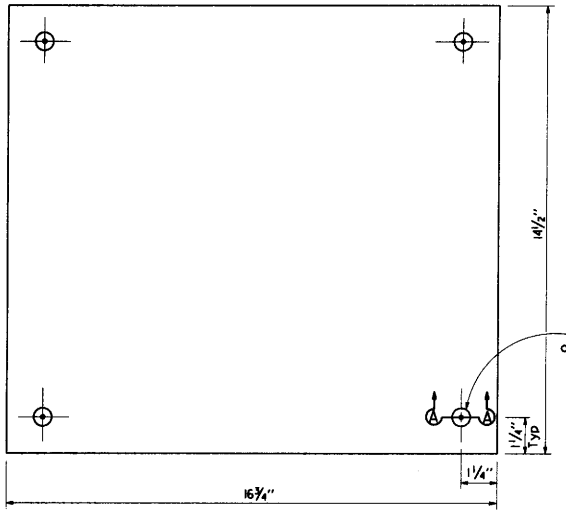
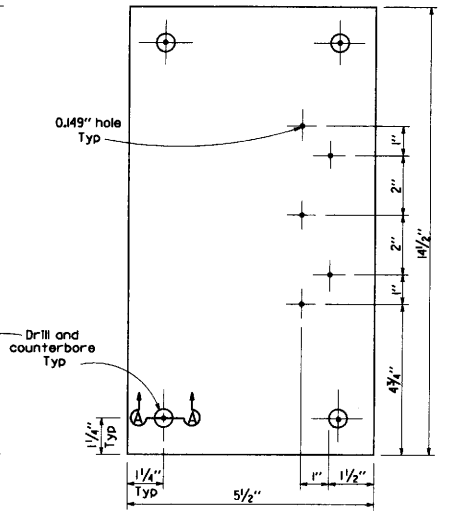
Robert L. Donner
REGISTERED ELECTRICAL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

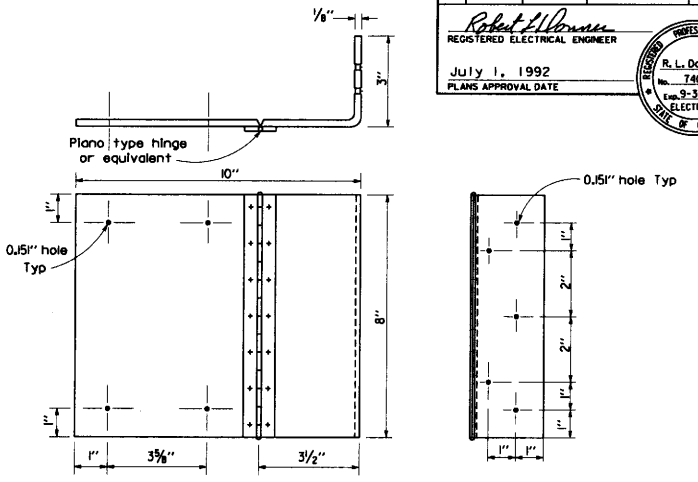
REGISTERED PROFESSIONAL ENGINEER
R. L. Donner
No. 7405
Exp. 9-30-94
ELECTRICAL
STATE OF CALIFORNIA



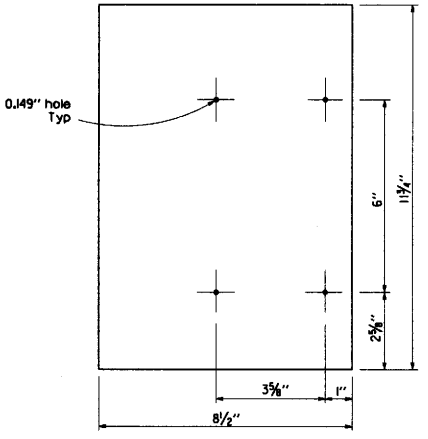
BACKBOARD A
(MATERIAL : ¾" MARINE PLYWOOD)



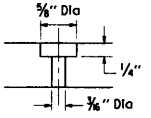
BACKBOARD B
(MATERIAL : ¾" MARINE PLYWOOD)



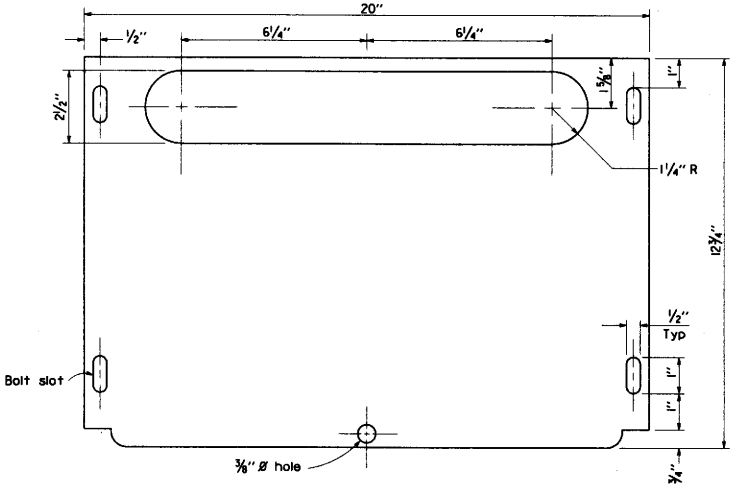
HINGED METAL BRACKET



BACKBOARD C
(MATERIAL : ¾" MARINE PLYWOOD)



SECTION A-A



BOTTOM PLATE
(MATERIAL : ½" GALVANIZED STEEL)

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL, LIGHTING AND ELECTRICAL SYSTEMS TELEPHONE DEMARCATION CABINET DETAILS

NO SCALE

ES-4F

STD. PLAN ES-4F

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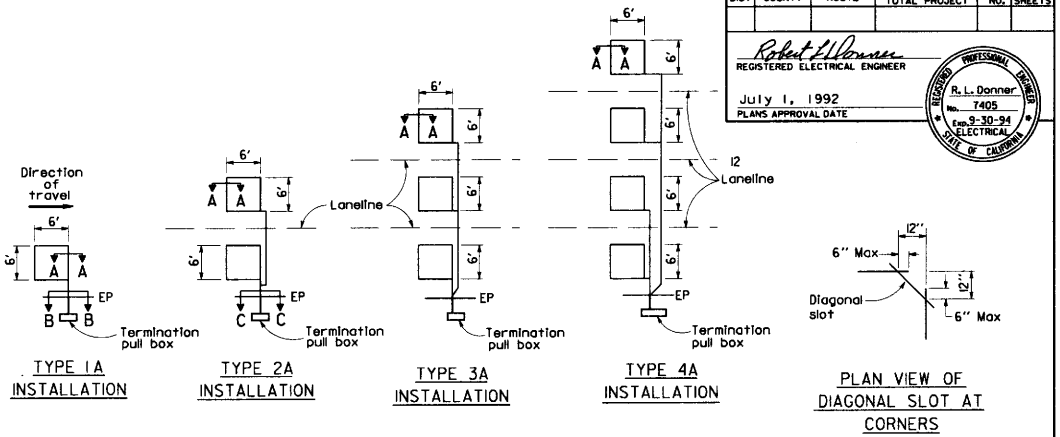
REGISTERED ELECTRICAL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

R. L. Donner No. 7405 Exp. 9-30-94 ELECTRICAL — REGISTERED PROFESSIONAL ENGINEER — STATE OF CALIFORNIA

LOOP INSTALLATION PROCEDURE

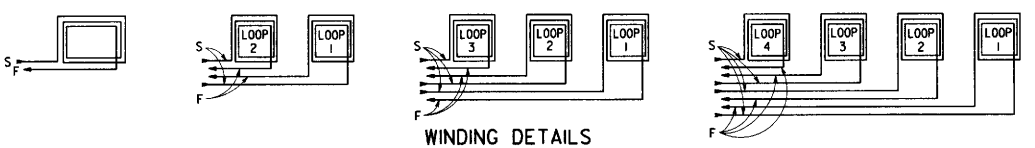
1. Saw slots in pavement for loop conductors as shown in details.
2. Slots shall be washed, blown out and thoroughly dried before installing loop conductors.
3. Install termination pull box and curb or shoulder termination detail (see Standard Plan ES-5E)
4. Install loop conductor in slot using a 3/16" 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 2 twisted pairs shall be installed in one sawed slot.
8. Identify and tag loop circuit pairs in the termination pull box. Indentify 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 rosin-core solder.
12. End of lead-in cable and Type II loop wire shall be 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.
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.
19. Bottom of saw slot shall be smooth with no sharp edges.



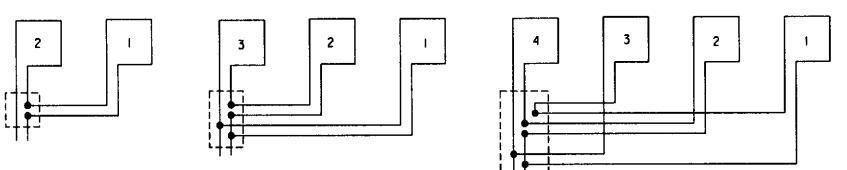
SAWCUT DETAILS

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 loop configuration in each lane.
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 loop configuration in each lane. (Use Type B, C, D or Q loop detector configurations only when specified or shown on plans)

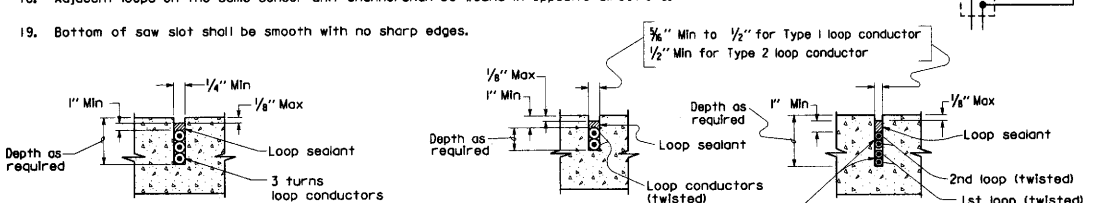


WINDING DETAILS



STANDARD LOOP CONNECTIONS

(Dashed lines represent the pull box)
Number 1 loop is closest to the crosswalk.



SECTION A-A

SECTION B-B

SECTION C-C

SLOT DETAILS-TYPE 1 AND TYPE 2 LOOP CONDUCTOR

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL, LIGHTING AND ELECTRICAL SYSTEMS DETECTORS

NO SCALE

ES-5A

STD. PLAN ES-5A

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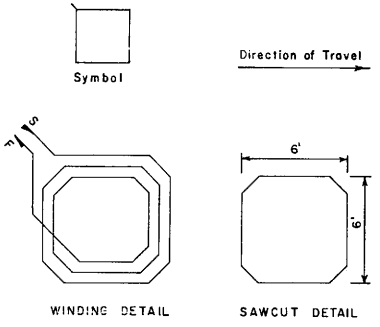
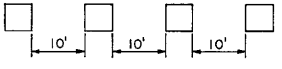
REGISTERED ELECTRICAL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

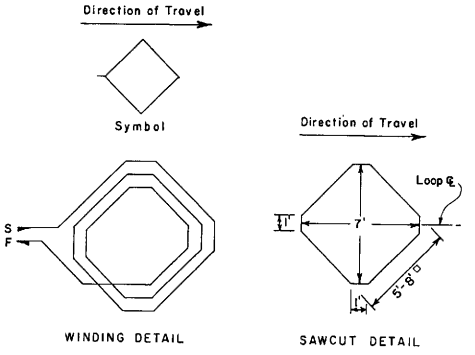
REGISTERED PROFESSIONAL ENGINEER R.L. Donner No. 7405 Exp. 9-30-94 ELECTRICAL STATE OF CALIFORNIA



TYPE A LOOP DETECTOR CONFIGURATION

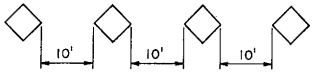


TYPICAL TYPE A INSTALLATION

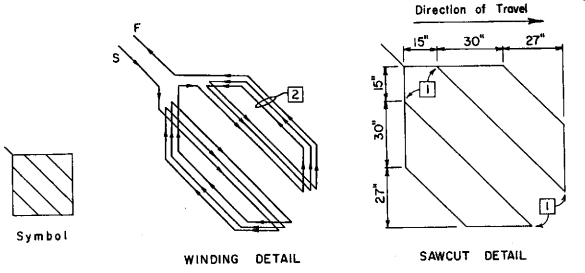


TYPE B LOOP DETECTOR CONFIGURATION
(Use only when specified or shown on the plans)

Note: Install loop with loop centerline parallel to curb or laneline



TYPICAL TYPE B INSTALLATION

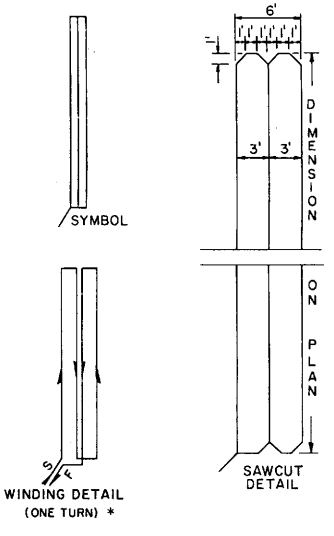


TYPE D LOOP DETECTOR CONFIGURATION
(Use only when specified or shown on the plans)

1 Round corners of acute angle sawcuts to prevent damage to conductors.

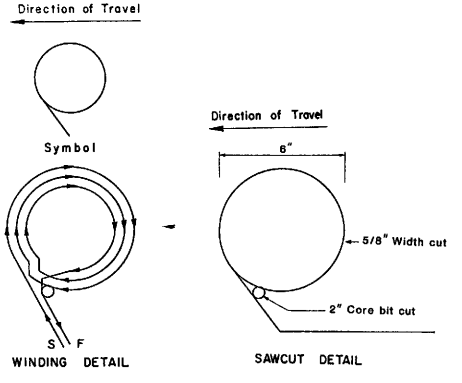
2 Install 3 turns when only one Type D loop is on a sensor unit channel.

Install 5 turns when one Type D loop is connected in series with 3 additional 6'X6' loops on a sensor unit channel.

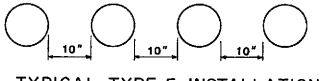


TYPE C LOOP DETECTOR CONFIGURATION
(Use only when specified or shown on the plans)

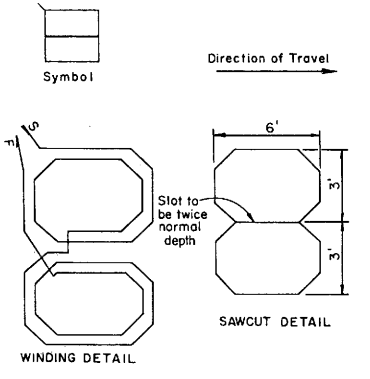
* Install two turns unless otherwise specified.



TYPE E LOOP DETECTOR CONFIGURATION



TYPICAL TYPE E INSTALLATION



TYPE Q LOOP DETECTOR CONFIGURATION
(Use only when specified or shown on the plans)

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL, LIGHTING AND ELECTRICAL SYSTEMS DETECTORS

NO SCALE

ES-5B

STD. PLAN ES-5B

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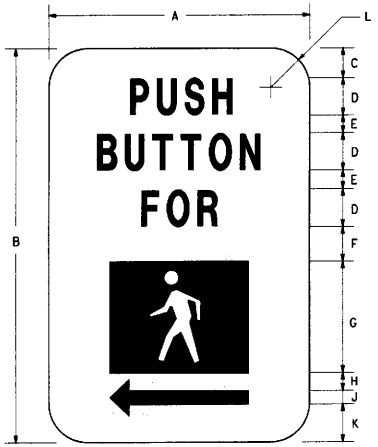
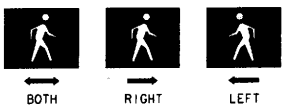
REGISTERED ELECTRICAL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER R. L. Donner No. 7405 Exp. 9-30-94 ELECTRICAL STATE OF CALIFORNIA



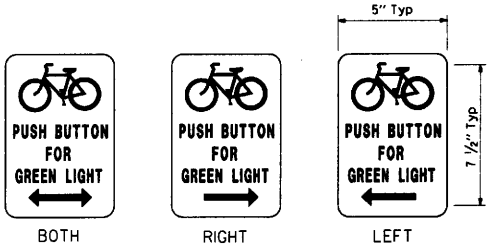
ALTERNATE SYMBOL AND ARROW DIRECTIONS:
LEFT, RIGHT OR BOTH



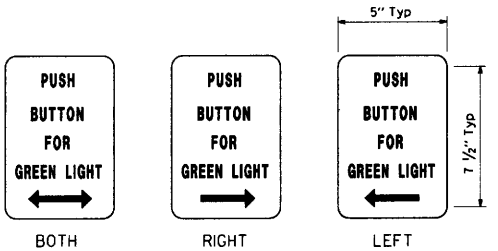
SIGN DIMENSIONS (INCHES)											
	A	B	C	D	E	F	G	H	J	K	L
Min	5	7 1/2	9/16	3/4C	3/8	7/16	2 1/8	3/8	1/4	3/4	3/4

NOTE

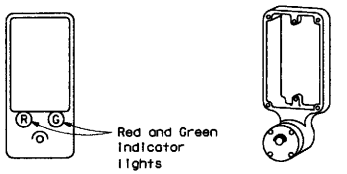
Color of legend and arrow are black
Color of background and symbol are white



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.



TYPE A
(Use only when specified)

TYPE B

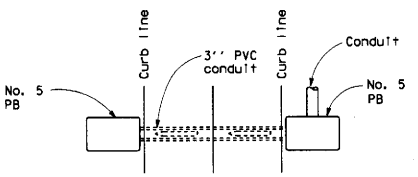
TYPE C
(Use only when specified)

PEDESTRIAN PUSH BUTTONS

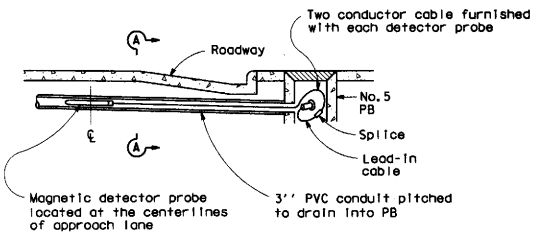
NOTE

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 push button on crosswalk side of standard.

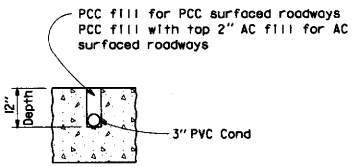
PEDESTRIAN PUSH BUTTON SIGNS



PLAN



ELEVATION



SECTION A-A

NON-DIRECTIONAL MAGNETIC VEHICLE DETECTOR
INSTALLATION DETAILS

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL, LIGHTING AND ELECTRICAL SYSTEMS
DETECTORS

NO SCALE

ES-5C

STD. PLAN ES-5C

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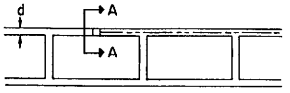
DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

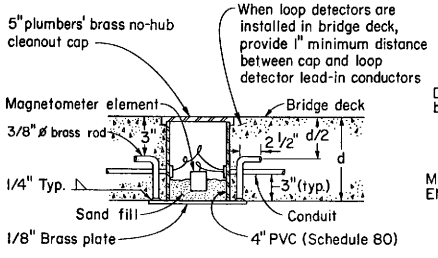
Robert L. Donner
REGISTERED ELECTRICAL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

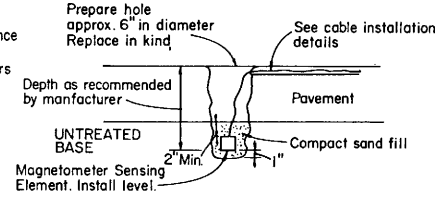
REGISTERED PROFESSIONAL ENGINEER
R.L. Donner
No. 7405
Exp. 9-30-94
ELECTRICAL
STATE OF CALIFORNIA



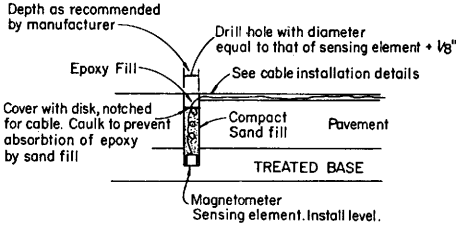
INSTALLATION DETAIL



SECTION A-A

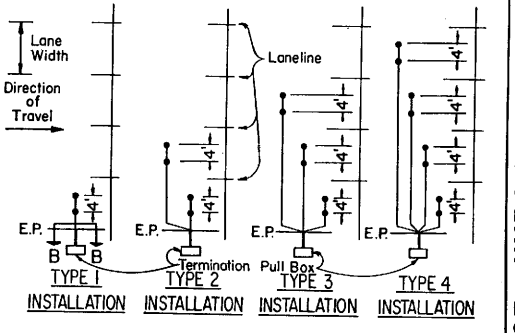


LIGHT DUTY ROADWAY
(WITH UNTREATED BASE)

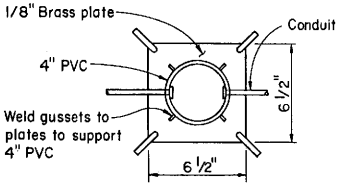


HEAVY DUTY ROADWAY
(WITH TREATED BASE)

MAGNETOMETER SENSING ELEMENT INSTALLATION DETAILS



LAYOUTS AND DIMENSIONS

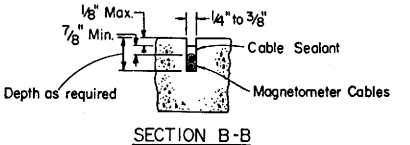


DETECTOR INSTALLATION IN BRIDGE DECK

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 Standard Plan ES-5E for curb termination details.

*Or other resistance per manufacturers' specifications



SECTION B-B

SLOT DETAILS

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL, LIGHTING AND ELECTRICAL SYSTEMS
DETECTORS
NO SCALE

ES-5D

STD. PLAN ES-5D

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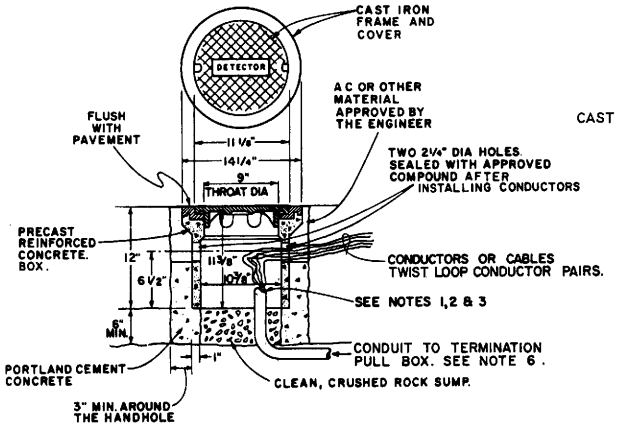
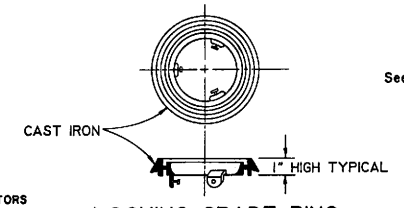
Robert L. Donner
REGISTERED ELECTRICAL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — R.L. Donner No. 7405 Exp. 9-30-94 ELECTRICAL — STATE OF CALIFORNIA

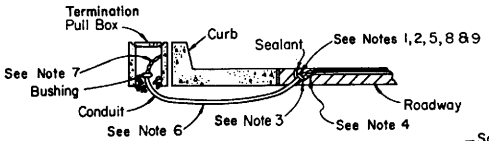


TYPE A DETECTOR HANDHOLE DETAILS

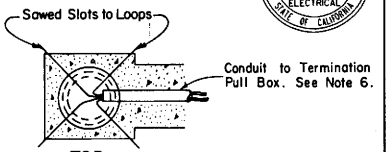


LOCKING GRADE RING

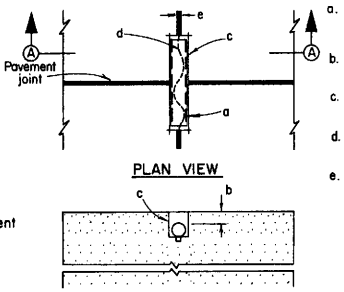
NOTE: Use for Type A Detector Handhole on pavement resurfacing only.



CURB TERMINATION DETAILS TYPE A



TOP

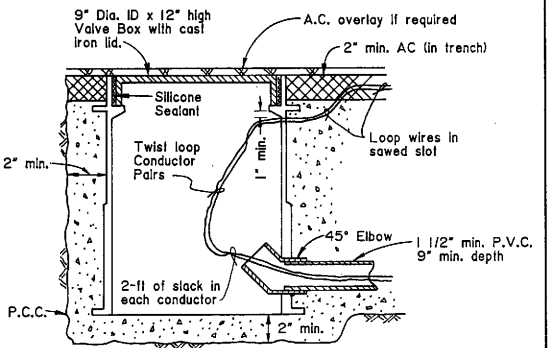


PLAN VIEW

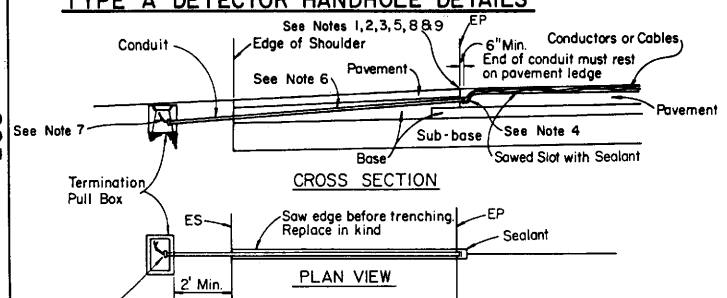
SECTION A-A

a. 3/4" conduit, 6" long minimum, plug both ends with caulking compound to keep out epoxy.
b. 1/2" minimum between top of conduit and pavement surface.
c. Saw-cut shall not exceed 1" in width and 1/8" longer than conduit to be installed.
d. Conductors with 1/2" minimum slack inside conduit.
e. ILD (Inductive Loop Detector) saw cut.

TYPICAL LOOP LEAD-IN DETAILS AT PAVEMENT JOINT



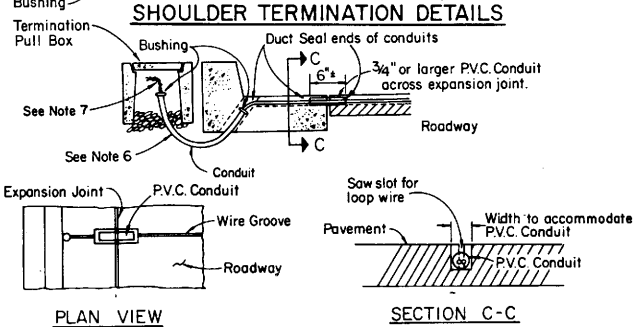
TYPE B DETECTOR HANDHOLE DETAILS



CROSS SECTION

PLAN VIEW

SHOULDER TERMINATION DETAILS



PLAN VIEW

SECTION C-C

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 sealant.
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.
8. Location of detector handhole when shown on plans.
9. When the shoulder and traveled way are paved with the same material and there is no joint between them, the conduit shall extend only 2 feet into the shoulder.

INSTALLATION REQUIREMENTS TYPE B DETECTORS

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 precast valve box with cast iron lid shall be fabricated of calcium carbonate and polyester resins with fiberglass reinforcing and designed for heavy traffic loads.
3. Cast iron lid shall be marked "Detector" and shall be secured in place by applying waterproof silicone sealant. Valve box shall be centered on lane line, unless otherwise shown on the plans.
4. Entire length of trench, from valve box 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

SIGNAL, LIGHTING AND ELECTRICAL SYSTEMS DETECTORS

NO SCALE

ES-5E

STD. PLAN ES-5E

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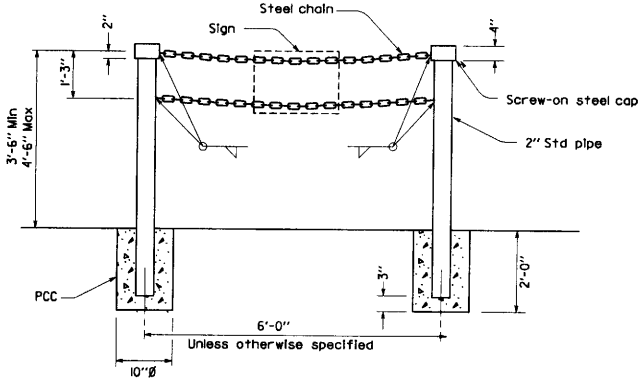
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

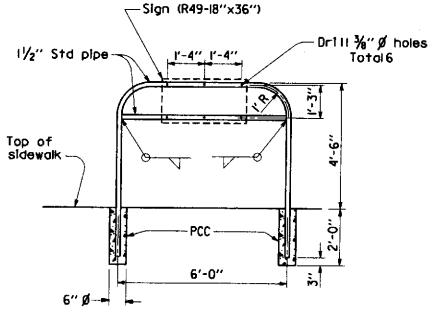
REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

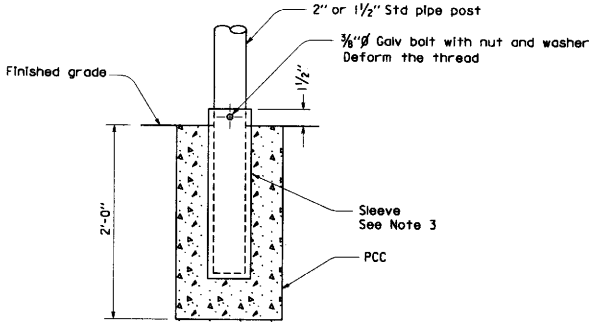
REGISTERED PROFESSIONAL ENGINEER
T. Pollock
No. 13332
Exp. 3-31-93
CIVIL
STATE OF CALIFORNIA



TYPE II



TYPE I



SLEEVE POST DETAIL

Shall not be used unless otherwise specified or shown on plans

NOTES

1. Pipe post to be set 1'-6" back from face of curb unless otherwise specified.
2. When sidewalk is existing, foundation may consist of a threaded pipe flange secured by four ⅜" expansion anchors. Bolt circle diameter shall be 4" minimum for Type I barricade and 5" minimum for Type II barricade.
3. Steel sleeve to be constructed with a diameter 1/10" larger than post. Wall thickness of sleeve to be same as post or larger.
4. Contractor may submit alternative details for approval by the Engineer.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL, LIGHTING AND ELECTRICAL SYSTEMS
PEDESTRIAN BARRICADES

NO SCALE

ES-5F

STD PLAN ES-5F

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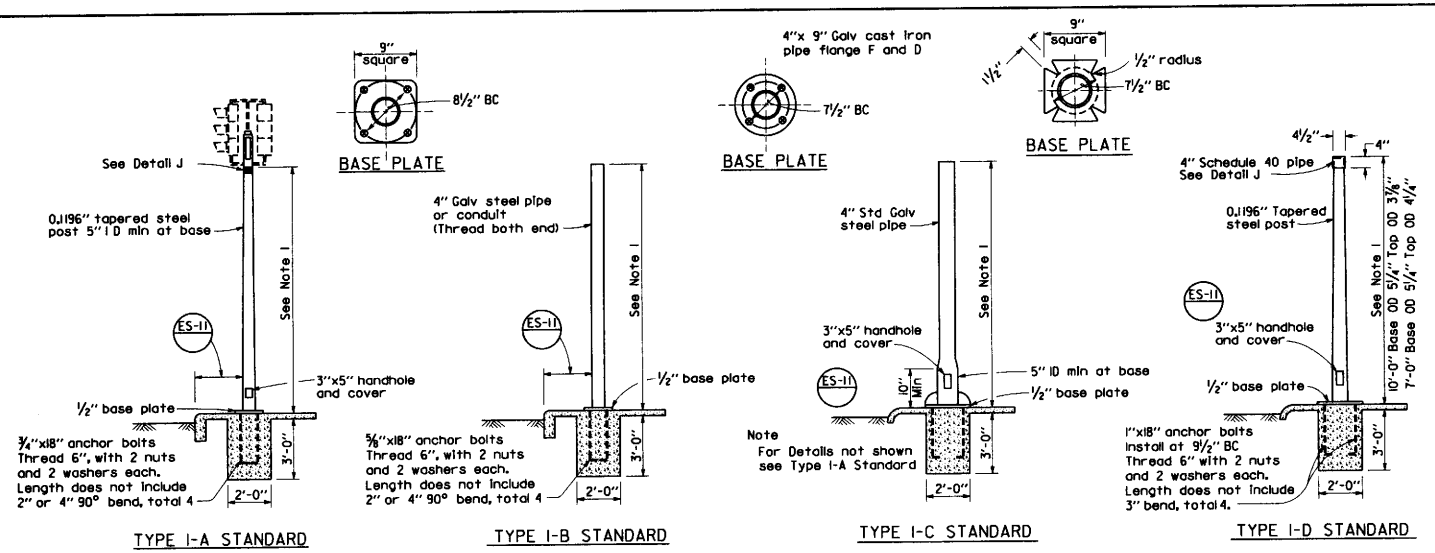
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

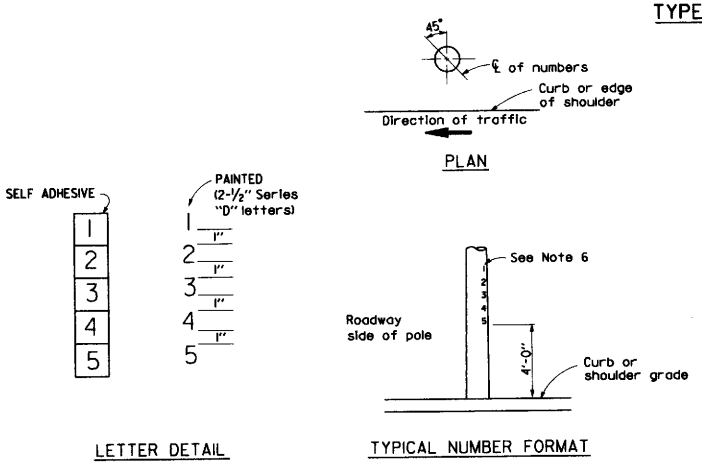
REGISTERED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA



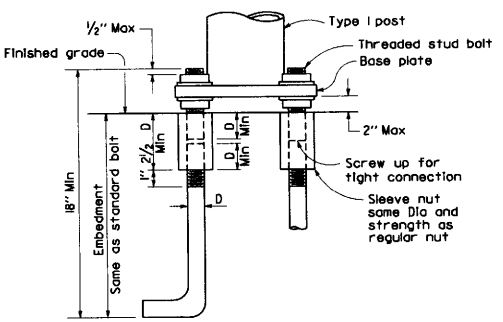
TYPE 1 SIGNAL STANDARDS

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 4½" OD.
3. Conduits shall extend 2" maximum above finished surface of foundation and for Types 1-A, 1-C and 1-D shall be sloped toward handhole.
4. Anchor bolts shall be bonded to conduit or grounding conductor.
5. Conduit between standard and adjacent pull box shall be 2" size minimum.
6. Paint numbers on roadway side facing traffic when electrolier or post is left of direction of traffic.

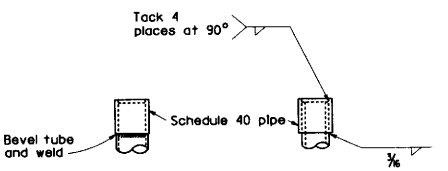


LOCATION OF EQUIPMENT NUMBERS ON STANDARDS AND POSTS



ANCHOR BOLTS WITH SLEEVE NUTS

Sleeve nuts to be used only when shown or specified on Project Plans



DETAIL J

Tube may be inserted into Schedule 40 pipe or butted as required

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL AND LIGHTING STANDARDS
TYPE 1 STANDARDS AND EQUIPMENT NUMBERING

NO SCALE

ES-6A

STD. PLAN ES-6A

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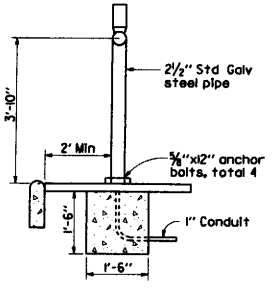
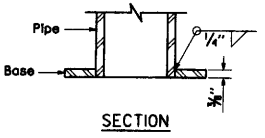
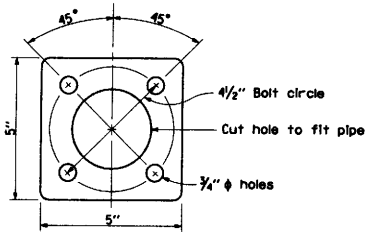
T. Pollock
No. 13332
Exp. 3-31-93
CIVIL
STATE OF CALIFORNIA



ELEVATION



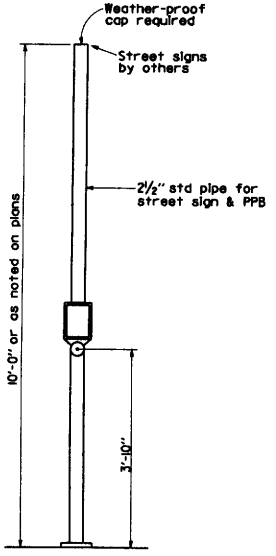
SECTION



BASE PLATE

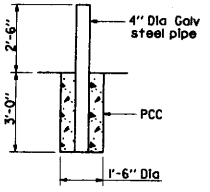
NOTE
Conduit shall protrude 2" Max above finished surface foundation.
Anchor bolt shall be bonded to conduit or grounding conductor.

PEDESTRIAN PUSH BUTTON POST



Foundation and anchor bolt details same as PPB post

COMBINED STREET SIGN
PEDESTRIAN PUSH BUTTON POST



GUARD POST

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL STANDARDS
PUSH BUTTON POSTS

NO SCALE

ES-6AA

STD. PLAN ES-6AA

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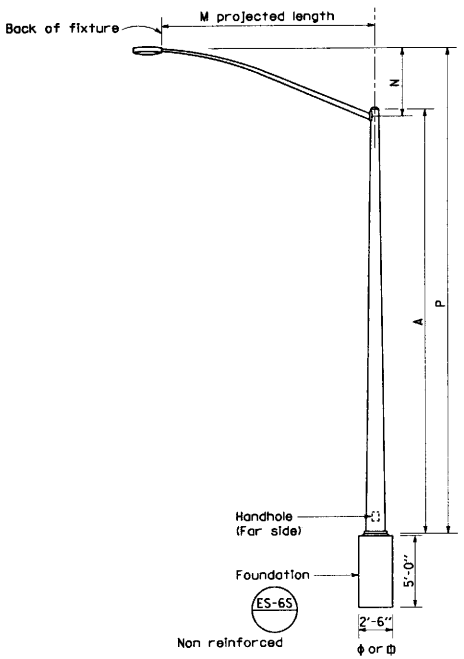
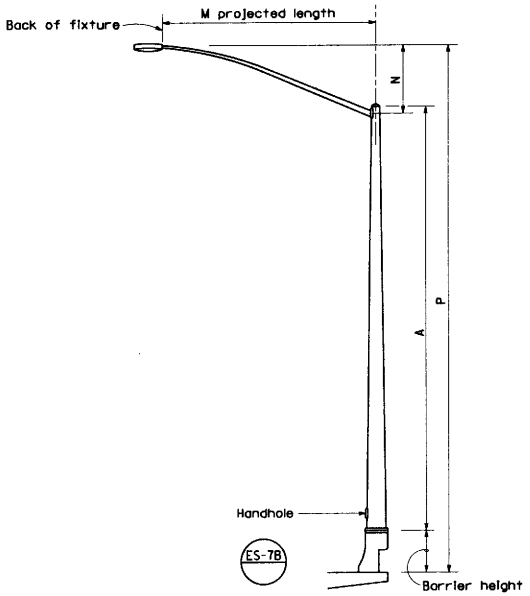


ELEVATION

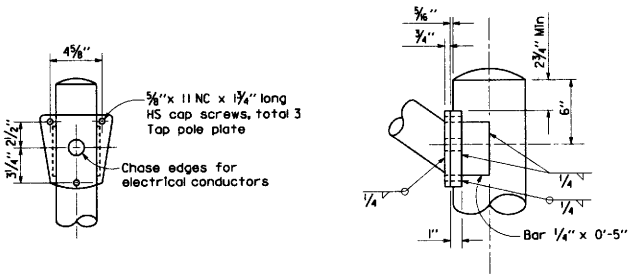
TYPE 15

TYPE 22



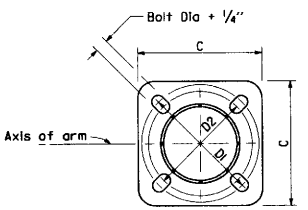
ELEVATION

TYPE 21 BRIDGE MOUNTED



DETAIL R

LUMINAIRE ARM CONNECTION



BASE PLATE

ES-6S — Alternative Base Plate Details

POLE TYPE	POLE DATA				BASE PLATE DATA						LUMINAIRE ARM	
	A Height	MIN OD Base	MIN OD Top	Thickness	C	D1	D2	Thickness	Anchor Bolts Size	Anchor Bolts Bolt Circle		
15	30'-0"	8"	3 7/8"	0.1196"	12"	11 1/2"	11"	1"	1"x36"x4"	11"	6'-15'	12'
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'	12'
22	35'-0"	8 5/8"	3 7/8"	0.1196"	12"	11 1/2"	11 1/2"	1"	1"x36"x4"	11 1/2"	6'-15'	12'

LUMINAIRE ARM DATA						
M Projected Length	N Rise	Min OD 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"	0.1196"	32'-0"±	37'-0"±	39'-8"±
10'-0"	3'-3"±	3 7/8"	0.1196"	32'-9"±	37'-9"±	40'-5"±
12'-0"	4'-3"±	3 7/8"	0.1196"	33'-9"±	38'-9"±	41'-5"±
15'-0"	4'-9"±	4 1/4"	0.1196"	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, see Standard Plan ES-6E.
5. For additional notes see Standard Plan ES-6S.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

LIGHTING STANDARDS TYPES 15, 21 AND 22

NO SCALE

ES-6B

STD. PLAN ES-6B

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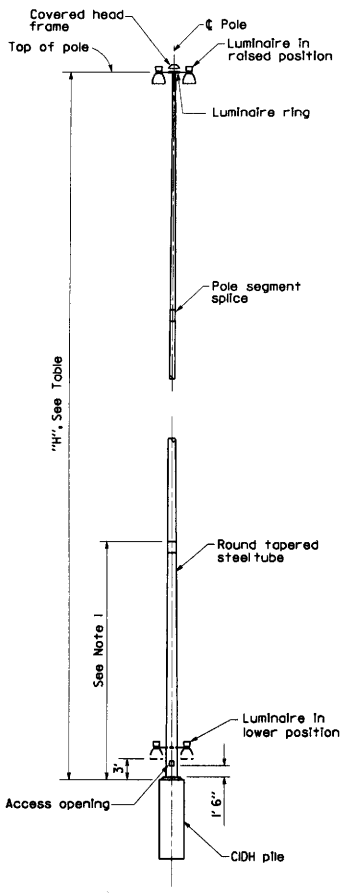
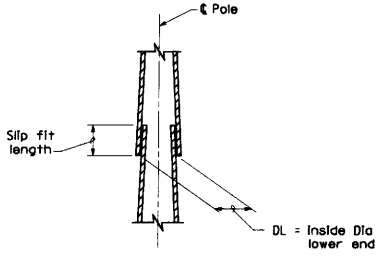
TABLE						
Pole Height "H" (feet)	"D" = CIDH Pile Dia (inches)	"L" Linear feet	Pile Reinf	B.C.= Bolt Circle (inches)	Anchor Bolts total	"d" = Bolt Dia (inches)
80'	42"	10'	12-#7	25"	4	2"
100'	42"	11'	16-#7	25"	6	2"
120'	48"	12'	25-#7	32"	6	2"
160'	54"	15'	31-#7	36"	6	2½"

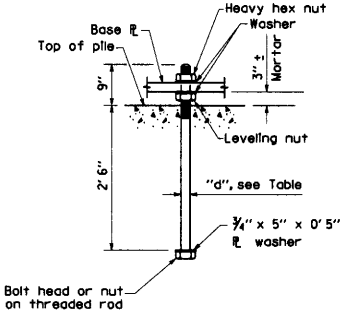


POLE DETAILS

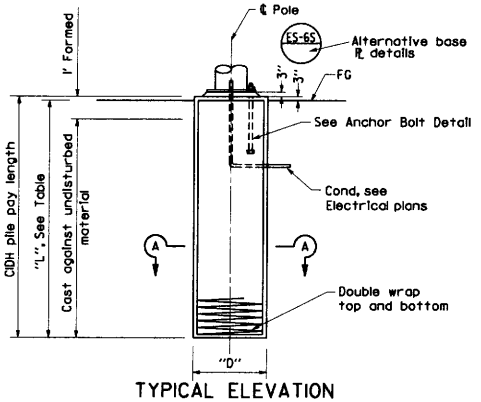


POLE SEGMENT SPLICE DETAIL

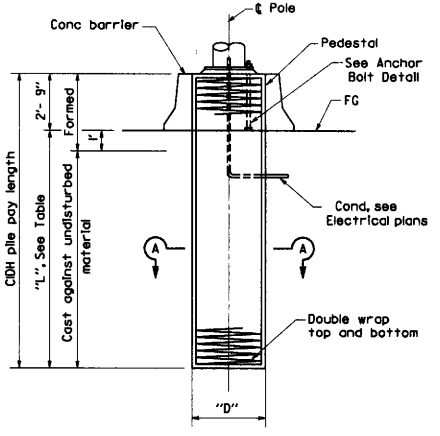
See Note 5



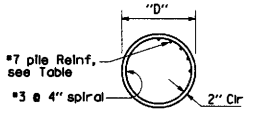
ANCHOR BOLT DETAIL



TYPICAL ELEVATION

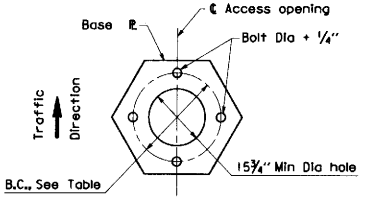


MEDIAN LOCATION

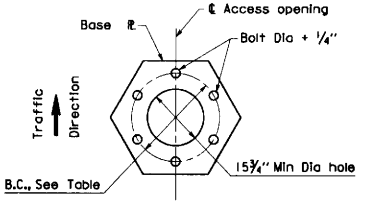


SECTION A-A

CIDH PILE DETAILS



4 BOLTS



6 BOLTS

BASE PLATE DETAILS

See Note 6

NOTES

1. Pole details shall suit the lowering device and this foundation plan. Pole details shall be submitted to the Engineer for approval.
2. Pole finish: Galvanize.
3. For number of luminaires to be mounted on the pole, see Electrical Plans.
4. Foundation design is based on a maximum of 10 luminaires. Design wind velocity 80 MPH.
5. Slip fit length shall not be less than 1.5 DL minus two inches.
6. Base plate shape optional.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

LIGHTING STANDARDS 80' TO 160' HIGH MAST LIGHT POLE FOUNDATION DETAILS

NO SCALE

ES-6C

STD. PLAN ES-6C

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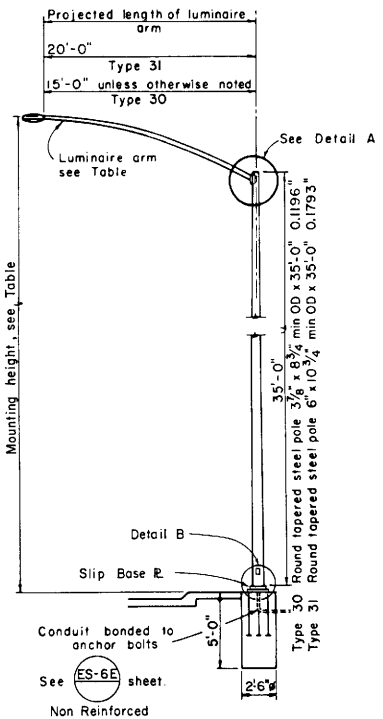
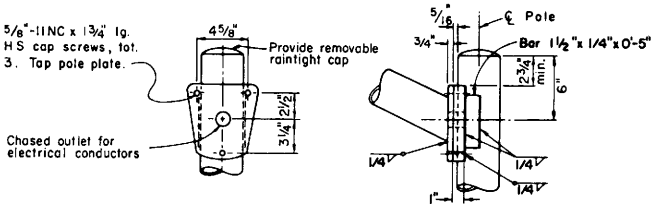
LUMINAIRE ARM DATA				
	Projected Length	Thickness	Minimum OD @ Pole	Mounting Height
*	6'-0"	0.1196"	3¼"	36'-9"±
	8'-0"		3½"	37'-3"±
	10'-0"		3¾"	38'-0"±
	12'-0"		3¾"	39'-0"±
	15'-0"		4¼"	39'-6"±
**	20'-0"	0.1793"	5"	37'-0"±

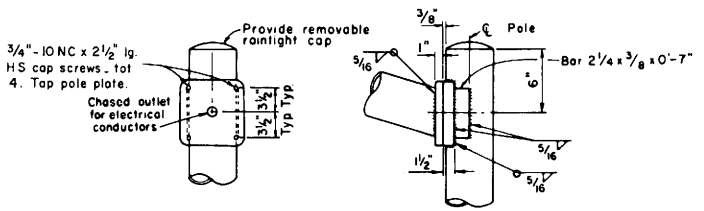
* Type 30 - arm lengths 6'-15' max.
** Type 31 - arm lengths 20'



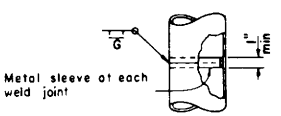
ELEVATION



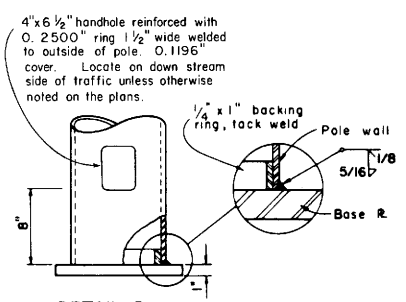
DETAIL A - TYPE 30



DETAIL A - TYPE 31



POLE SPLICE



DETAIL B

NOTES

1. Sheet steel shall have a minimum yield of 40,000 psi.
2. For slip base details see Standard Plan ES-6E.
3. For Type 30 fixed base use Type 22 on Standard Plan ES-6B.
4. For Type 31 fixed base use Type 32 foundation on Standard Plan ES-6DA.
5. Hand hole shall be located on downstream side of traffic unless noted otherwise on plans.
6. For additional general notes refer to Standard Plan ES-6S.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

LIGHTING STANDARDS TYPES 30 AND 31 SLIP BASE

NO SCALE

ES-6D

STD. PLAN ES-6D

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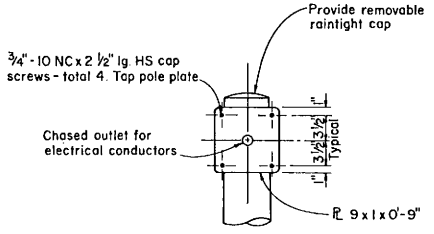
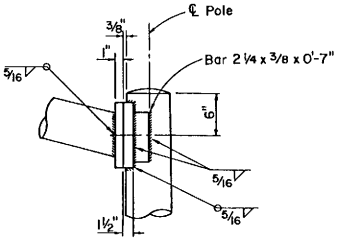
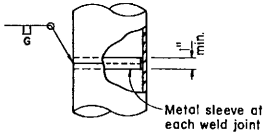
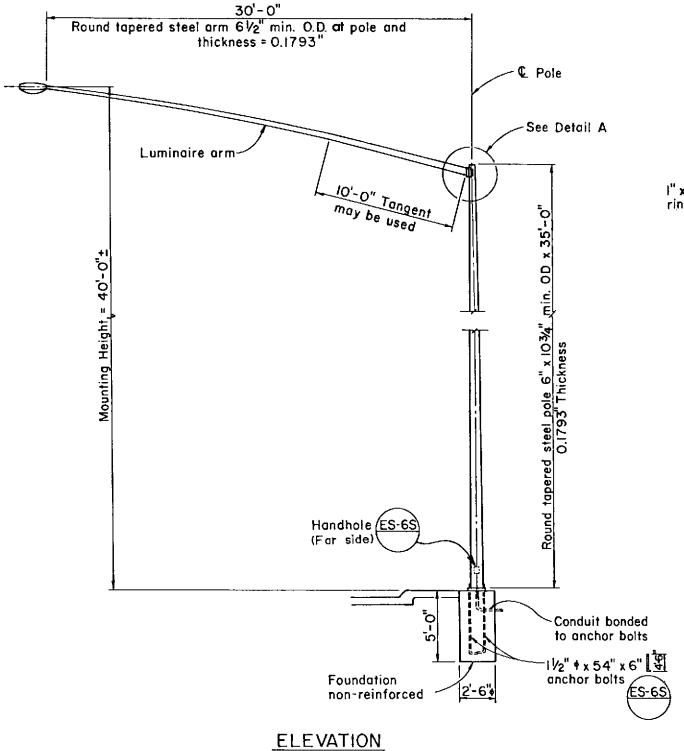


DETAIL A

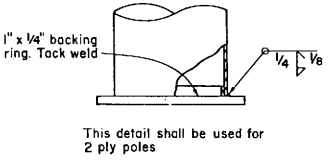




POLE SPLICE



ELEVATION



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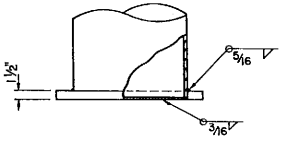

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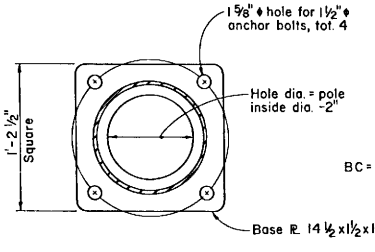
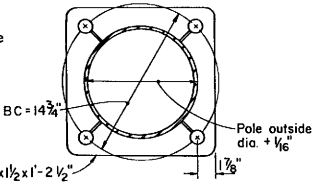


PLAN



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.
3. Handhole shall be located on downstream side of traffic unless otherwise noted on the plans.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

LIGHTING STANDARDS
TYPE 32
NO SCALE

ES-6DA

STD. PLAN ES-6DA

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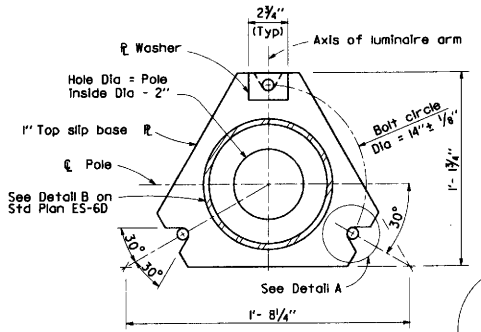
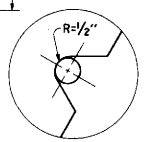


TYPICAL BASE PLATE



DETAIL A

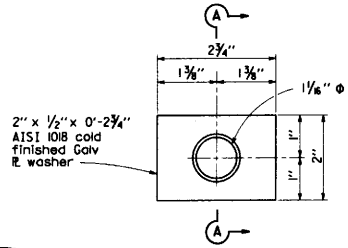
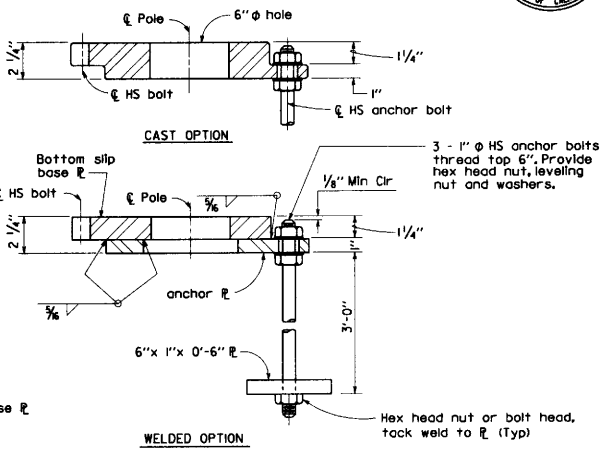
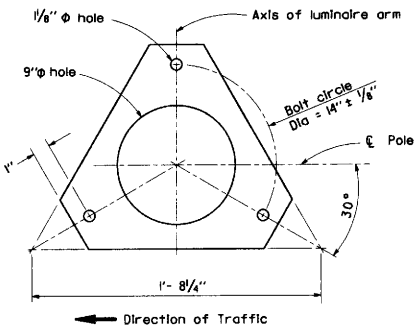


PLATE WASHER

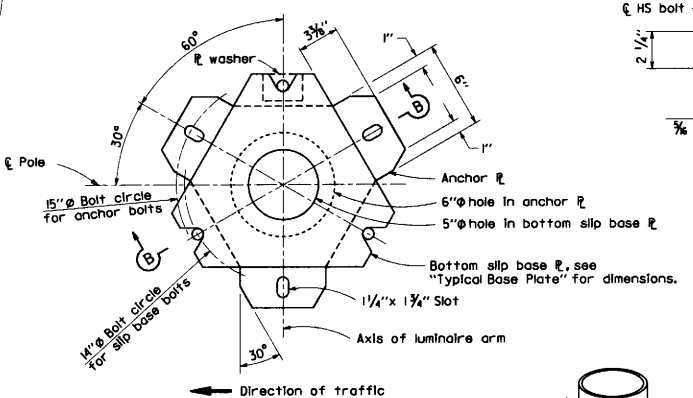
SECTION A-A



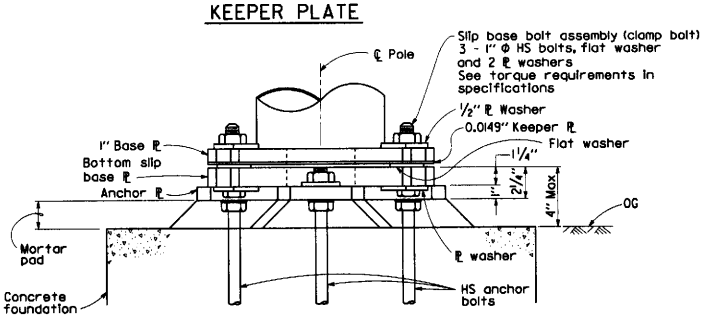
SECTION B-B



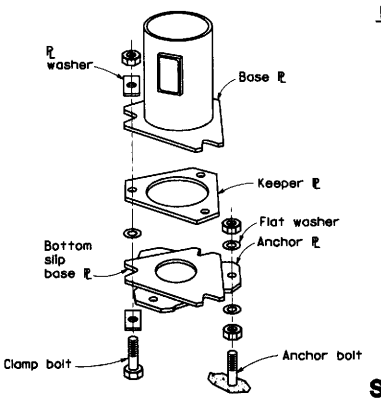
KEEPER PLATE



BOTTOM PLATES



ELEVATION - SLIP BASE



SLIP BASE INSERT DETAIL

NOTES

1. 1" HS anchor bolts, wrench tighten, torque requirement waived. For clamp bolts, see specifications.
2. Conduit shall not protrude more than 2" above top of foundation.
3. Locate handhole on downstream side of traffic.
4. For Type 30 fixed base use Type 22 foundation. For Type 31 fixed base use Type 32 foundation.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

LIGHTING STANDARDS TYPES 30 AND 31 SLIP BASE PLATE DETAILS

NO SCALE

ES-6E

STD. PLAN ES-6E

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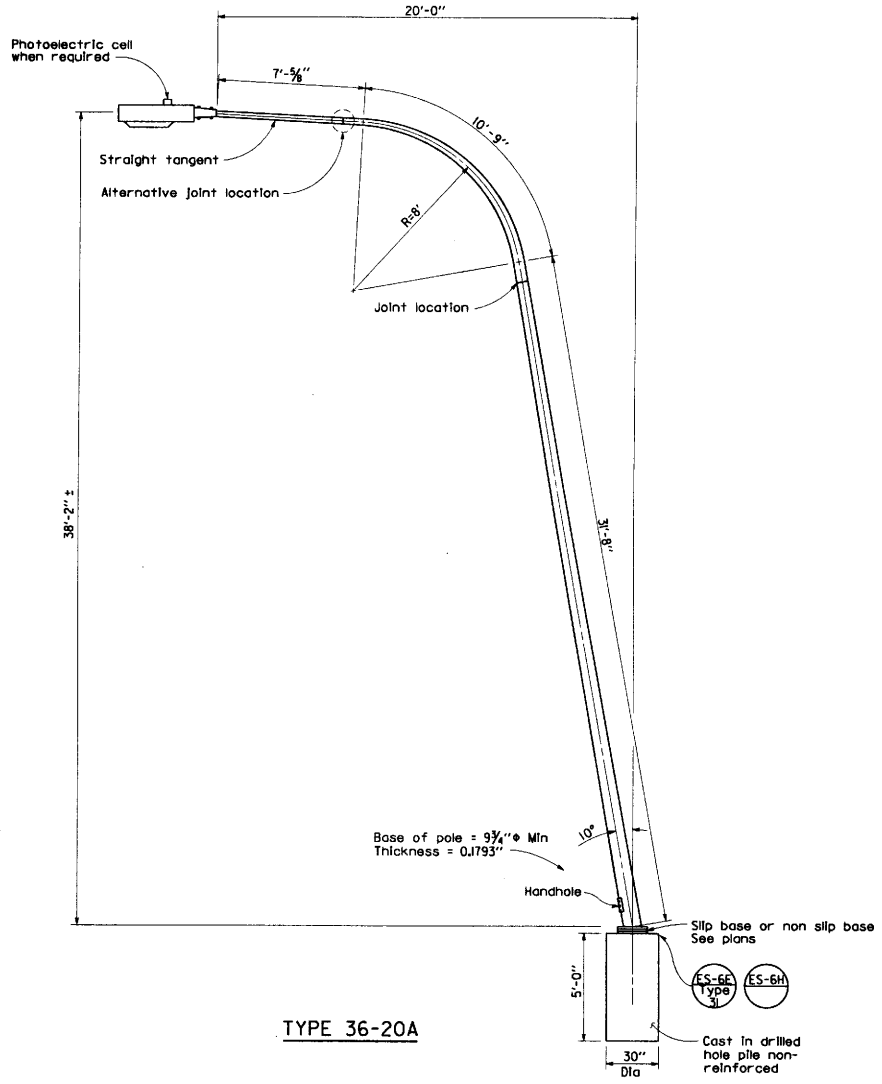
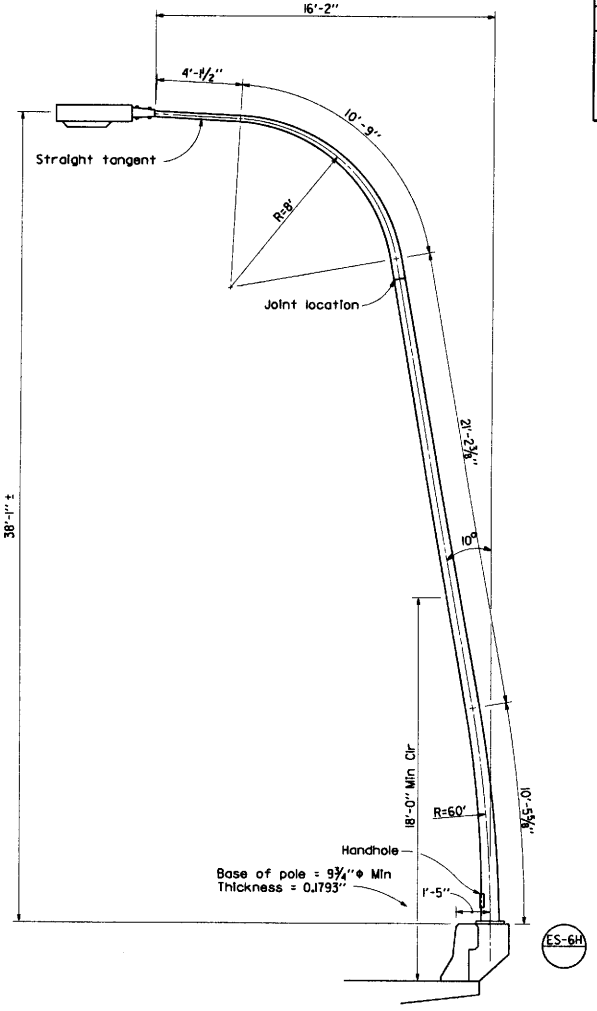


TYPE 36-20A



TYPE 35

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

REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
T. Pollock
No. 13332
Exp. 3-31-93
CIVIL
STATE OF CALIFORNIA

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

LIGHTING STANDARDS
10 DEGREE TYPE

NO SCALE

ES-6F

STD. PLAN ES-6F

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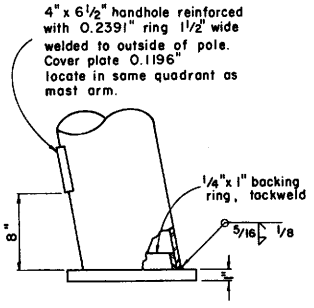
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

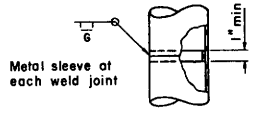
REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

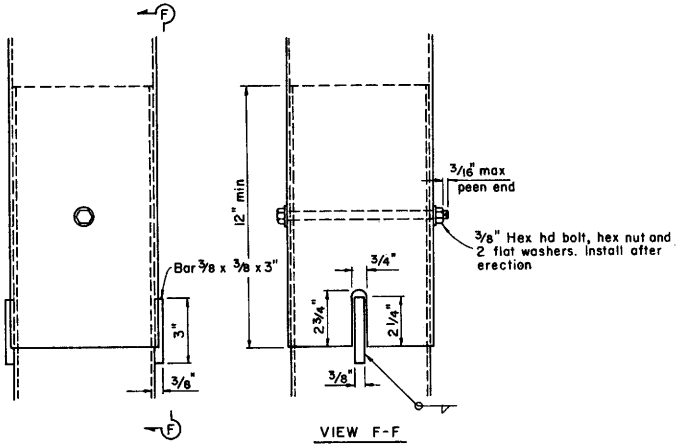
REGISTERED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA



ELEVATION

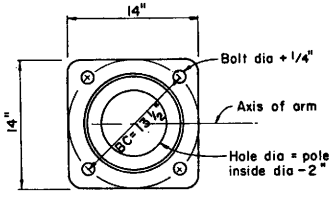


POLE SPLICE



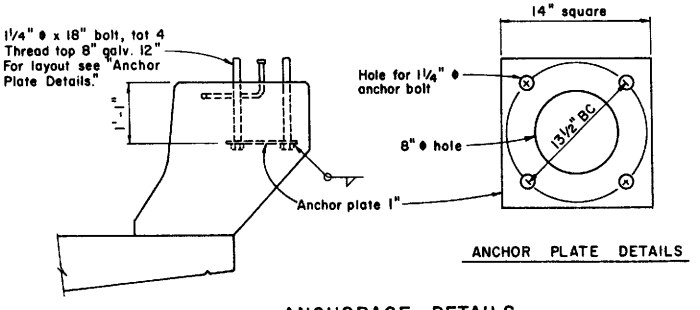
VIEW F-F

SLIP JOINT DETAILS



PLAN TYPE 35

BASE PLATE 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. Alternative 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

LIGHTING STANDARDS 10 DEGREE TYPE DETAILS

NO SCALE

ES-6H

STD. PLAN ES-6H

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

REGISTERED CIVIL ENGINEER

July 1, 1992
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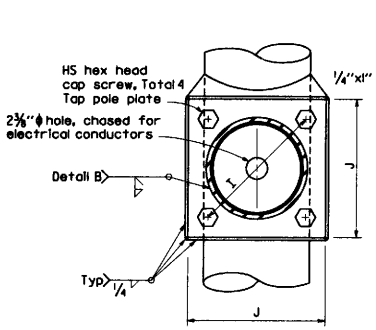
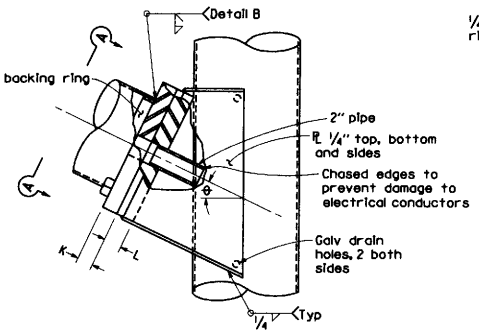
REGISTERED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA

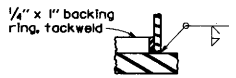


SECTION A-A

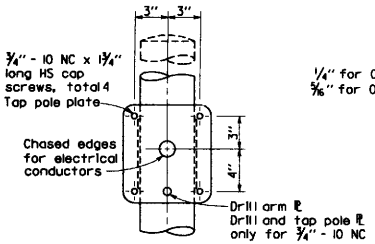


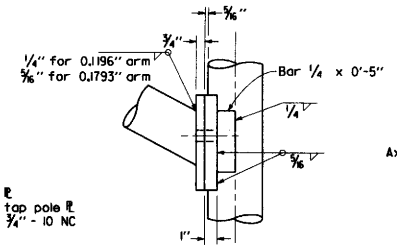
ELEVATION

SIGNAL ARM CONNECTION DETAILS
FOR 20', 25' AND 30' ARMS

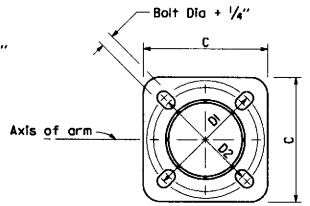


DETAIL B



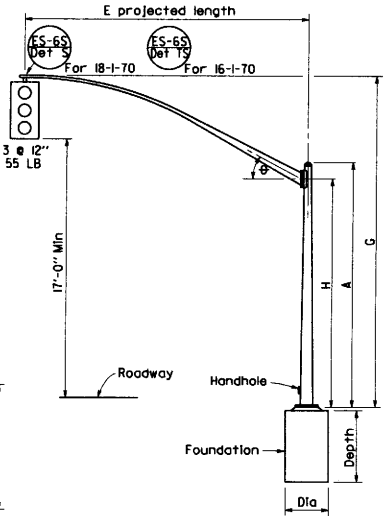


SIGNAL ARM CONNECTION DETAILS
FOR 15' AND 18' ARMS

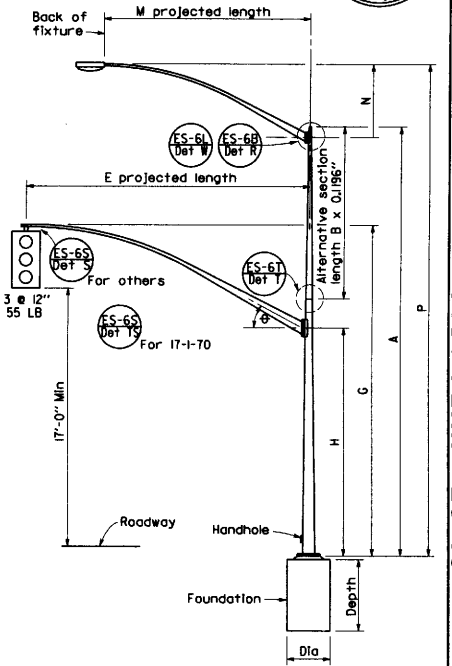


BASE PLATE

ES-6S ES-6T



ELEVATION
TYPE 16-1-70
TYPE 18-1-70



ELEVATION
TYPE 17A-1-70, 17B-1-70,
17D-1-70, 17E-1-70,
19-1-70, 19A-1-70

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
16-1-70	1	70	18'-6"	8"	5½"	0.1793"	None			12"	11½"	11"	1"	1"x36"x4"	11"	None	15'-20'	2'-6"	5'-0"	No
17E-1-70			30'-0"		3⅞"		10'-0"	5¼"	3⅞"	12"	11½"	11"		1¼"x42"x4"		6'-15' 12'	15'	3'-6"		
17D-1-70																6'-15' 12'	18'			
17B-1-70																6'-15' 15'	20'			
17A-1-70			35'-0"	9⅜"	4½"		15'-0"	6⅝"	4½"				1¼"		15"	6'-15' 15'	15' 18'or20'			
18-1-70			17'-0"		7"		None			16"	15"					None	25'or30'	2'-6"	6'-0"	Yes
19-1-70			30'-0"		5¼"		10'-0"		5¼"					1½"x42"x6"		6'-15' 12'				
19A-1-70			35'-0"	10¾"	5⅝"		15'-0"	8"	5⅝"							6'-15' 15'				

☐ Indicates arm length to be used unless otherwise noted on plans.

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"±	3¼"	0.1196"	31'-6"±	36'-6"±
8'-0"	2'-6"±	3½"		32'-0"±	37'-0"±
10'-0"	3'-3"±	3⅞"		32'-9"±	37'-9"±
12'-0"	4'-3"±			33'-9"±	38'-9"±
15'-0"	4'-9"±	4¼"		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	θ
15'-0"	22'-3"±	17'-6"	4⅝"	0.1196"	11"	1"-8NCx2½"	10½"	1"	1¼"	23°
18'-0"	23'-3"±		5¼"							
20'-0"			6½"							
25'-0"	22'-7"±	16'-0"	7⅝"							
30'-0"	23'-0"±	16'-0"	8"							

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL AND LIGHTING STANDARDS
CASE 1 ARM LOADING
WIND VELOCITY = 70 MPH
ARM LENGTHS 15' TO 30'

NO SCALE

STD. PLAN ES-6J

ES-6J

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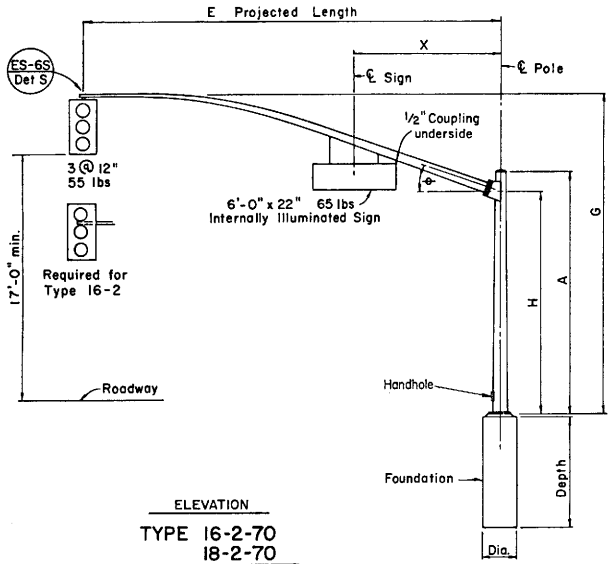
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER

July 1, 1992

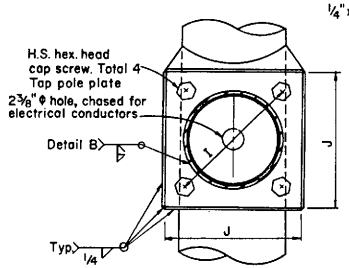
PLANS APPROVAL DATE

T. Pollock No. 13332 Exp. 3-31-93 CIVIL — REGISTERED PROFESSIONAL ENGINEER — STATE OF CALIFORNIA

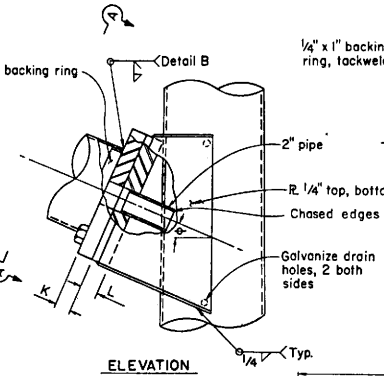


ELEVATION

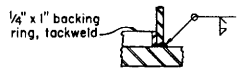
TYPE 16-2-70
18-2-70



SECTION A-A



ELEVATION

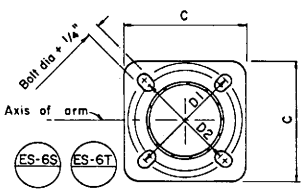


DETAIL B

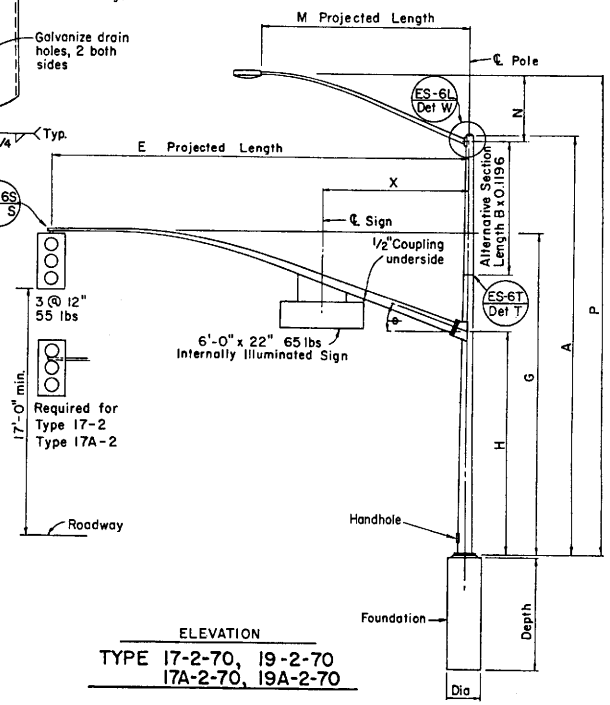
SIGNAL ARM CONNECTION DETAILS

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"±

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 R. Thickness	L Pole R. Thickness	ϕ	X Max.
20'-0"	21'-9"±	16'-0"	6 1/2"	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 42" 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 42" 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]				

☐ Indicates arm length to be used unless otherwise noted on plans.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL AND LIGHTING STANDARDS
CASE 2 ARM LOADING
WIND VELOCITY = 70 MPH
ARM LENGTHS 20' TO 30'

NO SCALE

STD. PLAN ES-6K

ES-6K

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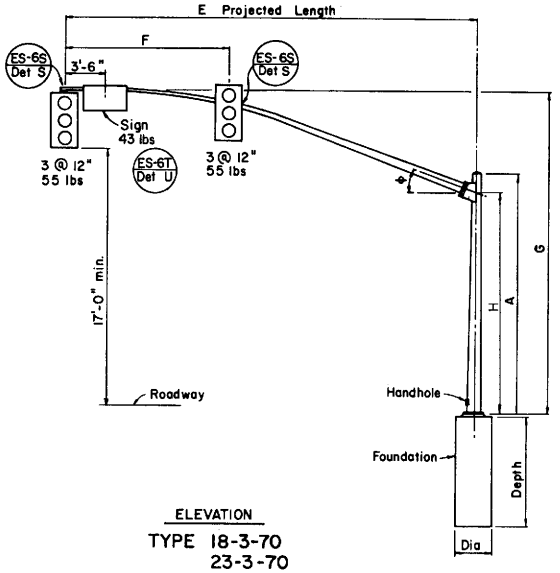
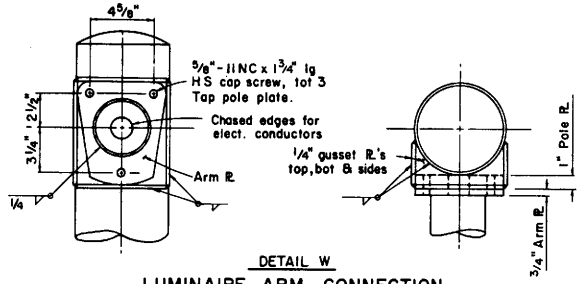


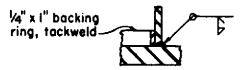
ELEVATION

TYPE 18-3-70
23-3-70
27-3-70



DETAIL W

LUMINAIRE ARM CONNECTION



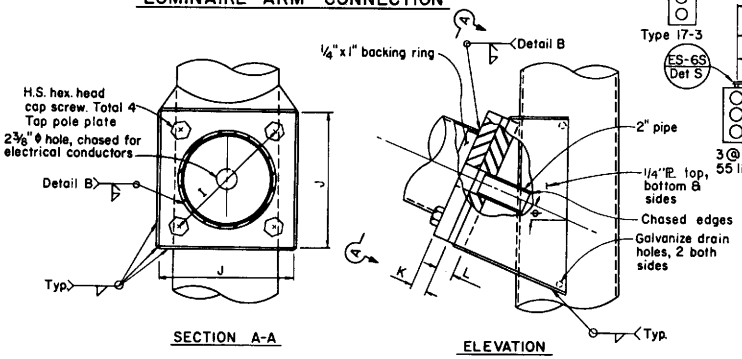
DETAIL B

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

REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

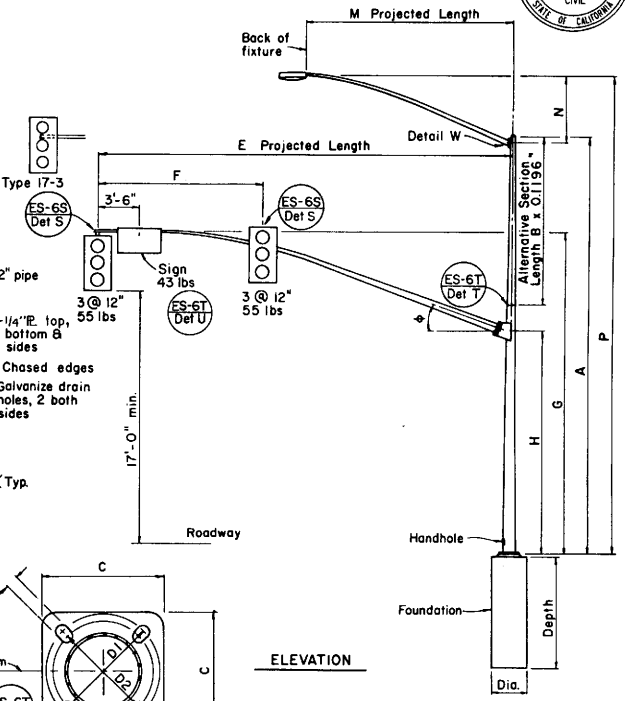
REGISTERED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA



SECTION A-A

ELEVATION

SIGNAL ARM CONNECTION DETAILS

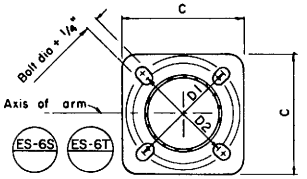


ELEVATION

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 OD At Pole	Thickness	I Bolt Circle	HS Cap Screws	J Plate Size	K Arm PL Thickness	L Pole PL Thickness	ϕ
15'-0"	8'-0"	22'-3" ±	17'-6"	5 15/16"	0.1793"	11"	1"-8NC x 2½"	10½"	1"	1¼	23°
20'-0"	8'-0"	21'-9" ±	16'-0"	6½"							
25'-0"	12'-0"	22'-7" ±	16'-0"	7 5/16"							
30'-0"				8"							
35'-0"	14'-0"	23'-0" ±		8 11/16"		13"		13"	1¼"	1½"	21°
40'-0"	15'-0"			9 3/8"	0.2391"	13"	1¼"-7NC x 3"	13"	1½"	1⅜"	15°
45'-0"		23'-6" ±		10 7/16"							

LUMINAIRE ARM DATA					
M Projected Length	N Rise	Min OD At Pole	Thickness	P Mounting Height 30'-0" Pole	P Mounting Height 35'-0" Pole
6' - 0"	2'-0" ±	3¼"	0.1196"	31'-6" ±	36'-6" ±
8' - 0"	2'-6" ±	3½"		32'-0" ±	37'-0" ±
10' - 0"	3'-3" ±	3⅞"		32'-9" ±	37'-9" ±
12' - 0"	4'-3" ±			33'-9"	38'-9" ±
15' - 0"	4'-9" ±	4¼"		34'-3"	39'-3" ±



BASE PLATE

POLE DATA										BASE PLATE DATA													
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	CIDH PILE FOUNDATION Diameter	CIDH PILE FOUNDATION Depth	CIDH PILE FOUNDATION Reinforced
17-3-70	3	70	30'-0"	9 3/8"	5¼"	0.1793"	10'-0"	6 5/8"	5¼"	16"	15"		1¼"	1½" x 42" x 4'	15"	6'-15' [12']	15' or [20']	2'-6"	7'-0"	Yes
18-3-70			17'-0"	10¾"	8 7/16"		None									None				
19-3-70			30'-0"	11 3/8"	7¼"		10'-0"	8⅝"	7¼"	17"	16½"	15"			16½"	6'-15 [12']	25' or [30']		8'-0"	
19A-3-70			35'-0"		6 5/8"		15'-0"		6 5/8"							6'-15' [15']				
23-3-70			17'-0"		9"		None			18"	17½"	16"	1½"	1¾" x 42" x 6'	17½"	None	35'			
24-3-70			30'-0"	12"	8"		10'-0"	9⅜"	8"							6'-15' [12']				
24A-3-70			35'-0"		7 5/16"		15'-0"		7 5/16"							6'-15' [15']				
26-3-70			30'-0"		8"		10'-0"		8"							6'-15' [12']				
26A-3-70			35'-0"		7 5/16"	0.2391"	15'-0"		7 5/16"			17"				6'-15' [15']	40' or [45']	3'-0"		
27-3-70			17'-0"		9¾"		None									None				

☐ Indicates arm length to be used unless otherwise noted on plans.

Minimum yield of sheet steel is 48,000 psi.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL AND LIGHTING STANDARDS
CASE 3 ARM LOADING
WIND VELOCITY = 70 MPH
ARM LENGTHS 15' TO 45'

NO SCALE

STD. PLAN ES-6L

ES-6L

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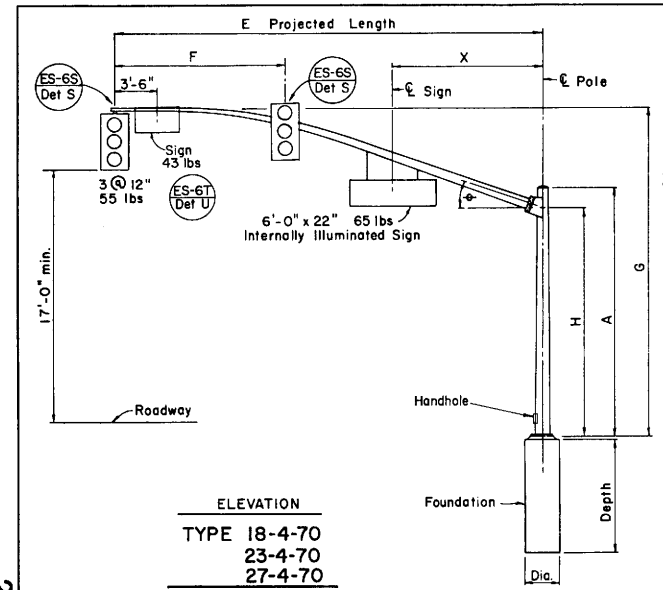
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER

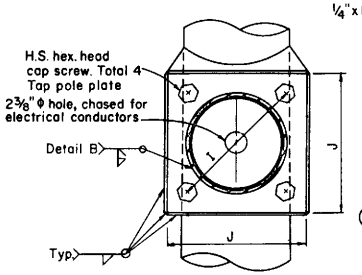
July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA

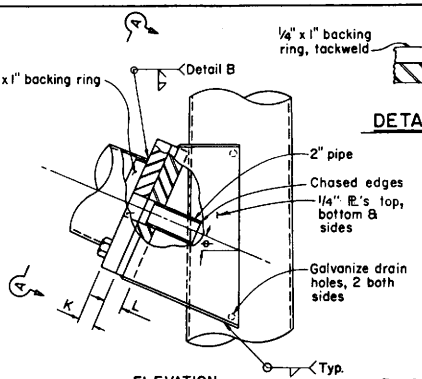


ELEVATION

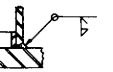
TYPE 18-4-70
23-4-70
27-4-70



SECTION A-A

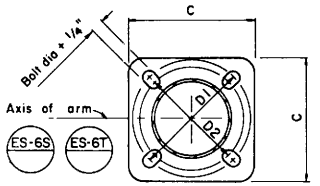


ELEVATION

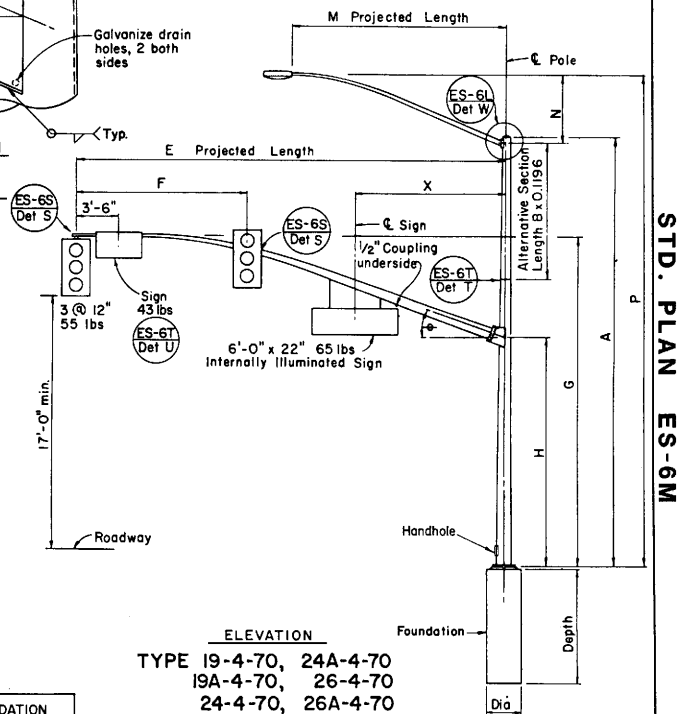


DETAIL B

SIGNAL ARM CONNECTION DETAILS



BASE PLATE



ELEVATION

TYPE 19-4-70, 24A-4-70
19A-4-70, 26-4-70
24-4-70, 26A-4-70

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	X Max
25'-0"	10'-0"	22'-7"±	16'-0"	7 5/16"	0.1793"	11"	1"-8NCx2½"	10½"	1"	1¼"	23°	10'-6"
30'-0"	12'-0"			8"					1¼"			
35'-0"	14'-0"	23'-0"±		8 11/16"		13"		13"	1¼"	1½"	21°	
40'-0"	15'-0"			9 3/8"	0.2391"	13"	1¼"-7NCx3"	13"	1½"	1¾"	15°	13'-0"
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"±	3¼"	0.1196"	31'-6"±	36'-6"±
8'-0"	2'-6"±	3½"		32'-0"±	37'-0"±
10'-0"	3'-3"±	3⅜"		32'-9"±	37'-9"±
12'-0"	4'-3"±			33'-9"±	38'-9"±
15'-0"	4'-9"±	4¼"		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
18-4-70	4	70	17'-0"	10¾"	8 7/16"	0.1793"	None			17"	16½"	15"	1¼"	1¾"x42"x6"	15"	None	25' or [30']	2'-6"	8'-0"	Yes
19-4-70			30'-0"		6 5/8"	0.2391"	10'-0"	8"	6⅝						16½"	6'-15' [12']				
19A-4-70			35'-0"		5 15/16"		15'-0"		5 15/16"							6'-12' [15']				
23-4-70			17'-0"	11⅜"	9"	0.2391"	None				18"	17½"	16"	1½"	17½"	None	35'			
24-4-70			30'-0"	12½"	8 1/4"	0.1793"	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"	12½"	8 3/8"	0.2391"	10'-0"	9 3/8"	8"			17"				6'-15' [12']	40' or [45']	3'-0"		
26A-4-70			35'-0"	12½"	7 9/16"		15'-0"	9 11/16"	7 9/16"							6'-15' [15']				
27-4-70			17'-0"	12"	9¾"		None									None				

☐ Indicates arm length to be used unless otherwise noted on plans.

Minimum yield of sheet steel is 48,000 psi.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL AND LIGHTING STANDARDS
CASE 4 ARM LOADING
WIND VELOCITY = 70 MPH
ARM LENGTHS 25' TO 45'

NO SCALE

ES-6M

STD. PLAN ES-6M

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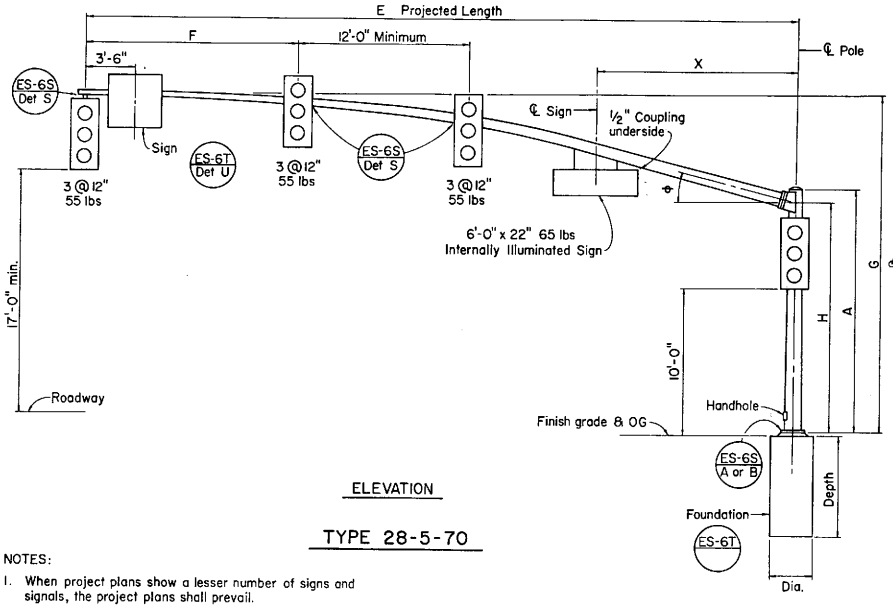
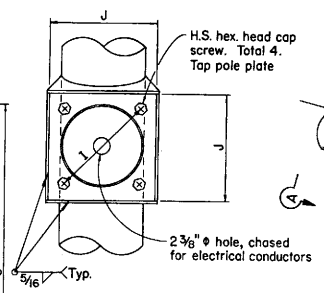
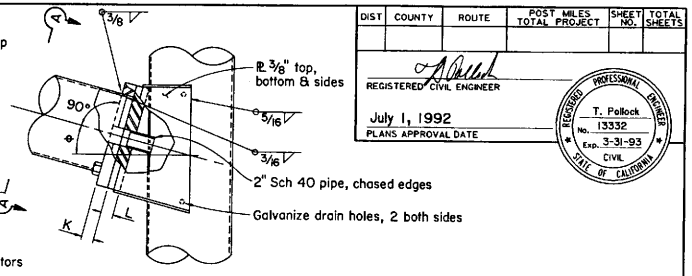


ELEVATION

TYPE 28-5-70



SECTION A-A



ELEVATION

SIGNAL ARM CONNECTION DETAILS

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

REGISTERED CIVIL ENGINEER

July 1, 1992

PLANS APPROVAL DATE

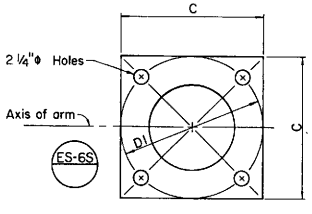
REGISTERED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA

NOTES:

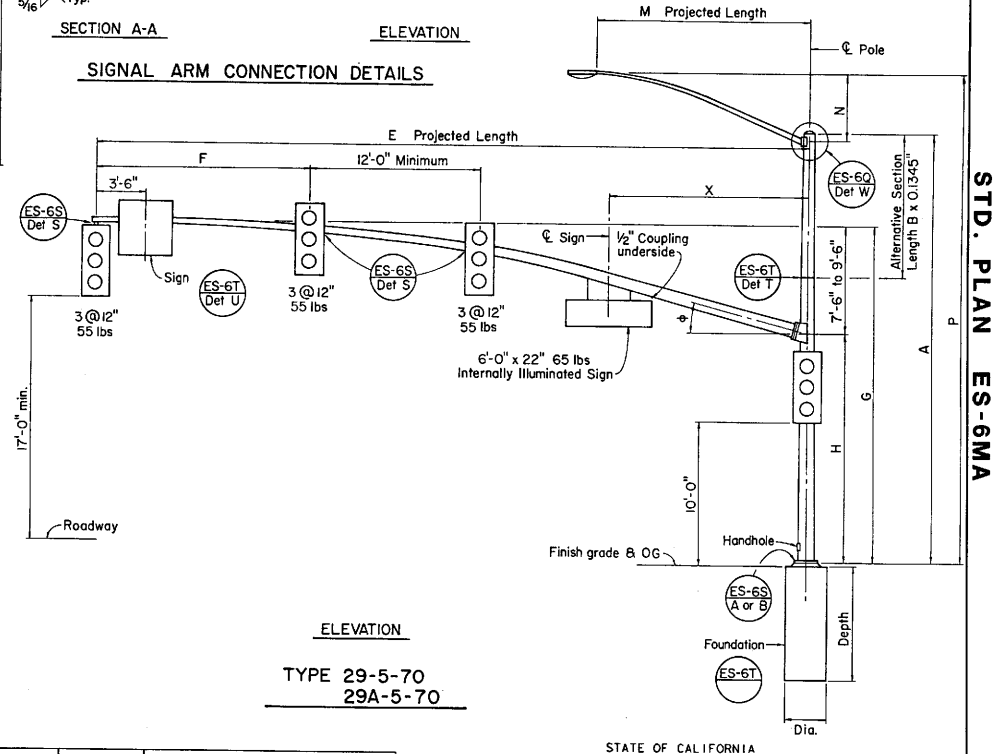
1. When project plans show a lesser number of signs and signals, the project plans shall prevail.
2. For details not shown see Standard Plans and Electrical Details.
3. Minimum yield of sheet steel is 48,000 psi.

LUMINAIRE ARM DATA					
M Projected Length	N Rise	Min OD 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" ±	3 7/8"		33'-9"	38'-9"
*15'-0"	4'-9" ±	4 1/4"		34'-3"	39'-3"

* Indicates use 15'-0" projected length unless shown otherwise.



BASE PLATE



ELEVATION

TYPE 29-5-70
29A-5-70

SIGNAL ARM DATA												
E Projected Length	F Min Spacing	G Min Mount Height	H	Min OD At Pole	Thickness	I Bolt Circle	HS Cap Screws	J Plate Size	K Arm PL Thickness	L Pole PL Thickness	-θ-	X Max
50'-0"	15'-0"	23'-6"	16'-0"	11 7/16"	0.1793"	15 3/4"	1 1/2"-6NC-3 1/4"	15"	1 3/4"	1 3/4"	15°	14'-0"
55'-0"				12"								

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
28-5-70	5	70	17'-0"	14"	11 11/16"	0.2391"	None			20"	20"		1 3/4"	2" x 40" x 6"	20"	None	50' or 55'	3'-0"	8'-0"	Yes
29-5-70			30'-0"		9 7/8"		10'-0"	11 1/4"	9 7/8"							6' - 15'				
29A-5-70			35'-0"		9 3/16"		15'-0"		9 3/16"								55'			

☐ Indicates arm length to be used unless otherwise noted plans.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL AND LIGHTING STANDARDS
CASE 5 ARM LOADING
WIND VELOCITY = 70 MPH
ARM LENGTHS 50' TO 55'

NO SCALE

STD. PLAN ES-6MA

ES-6MA

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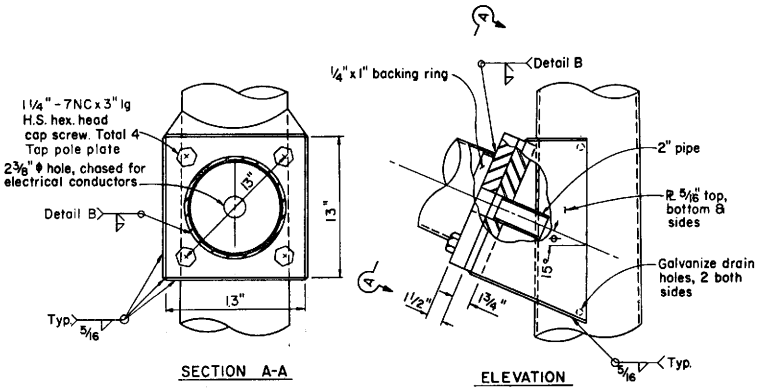
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

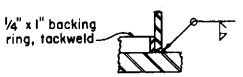
REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

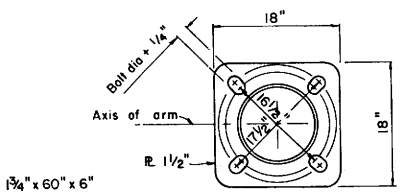
REGISTERED PROFESSIONAL ENGINEER
T. Pollock
No. 13332
Exp. 3-31-93
CIVIL
STATE OF CALIFORNIA



SIGNAL ARM CONNECTION DETAILS

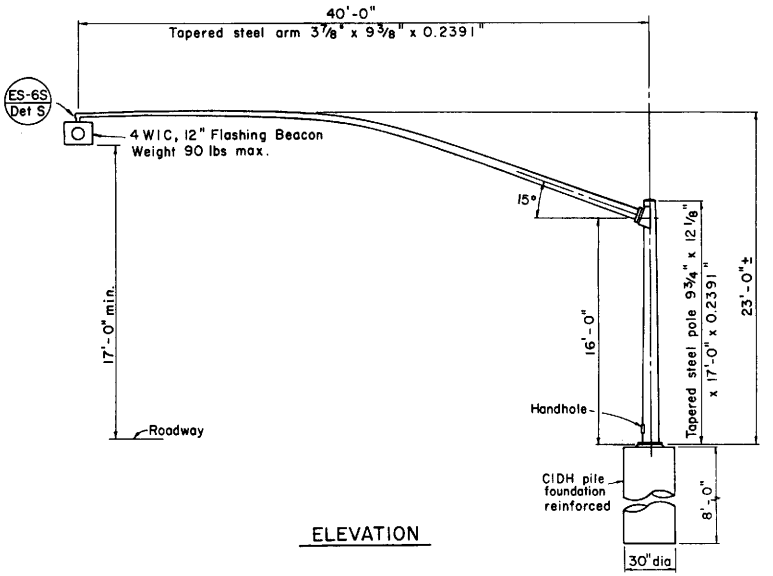


DETAIL B



BASE PLATE

ES-6S ES-6T



ELEVATION

NOTE
For details not shown see
Standards Plans ES-6S and ES-6T.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL AND LIGHTING STANDARDS
TYPE 40-0-80

NO SCALE

ES-6N

STD. PLAN ES-6N

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

REGISTERED CIVIL ENGINEER

July 1, 1992
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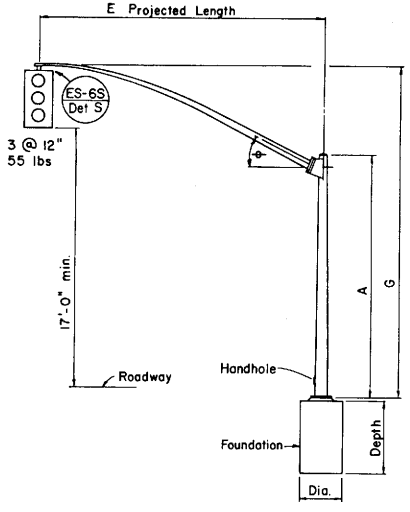
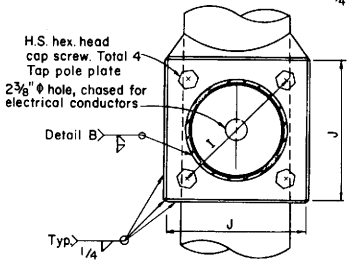
REGISTERED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA

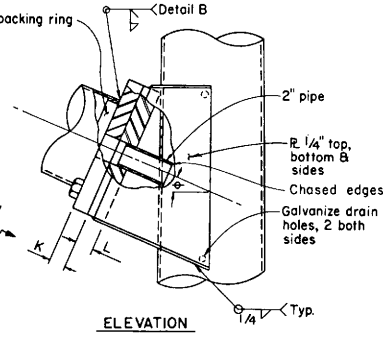


ELEVATION

TYPE 18-1-80

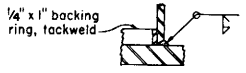


SECTION A-A

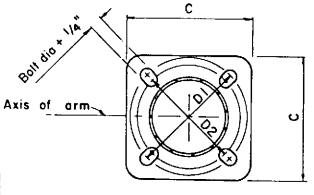


ELEVATION

SIGNAL ARM CONNECTION DETAILS

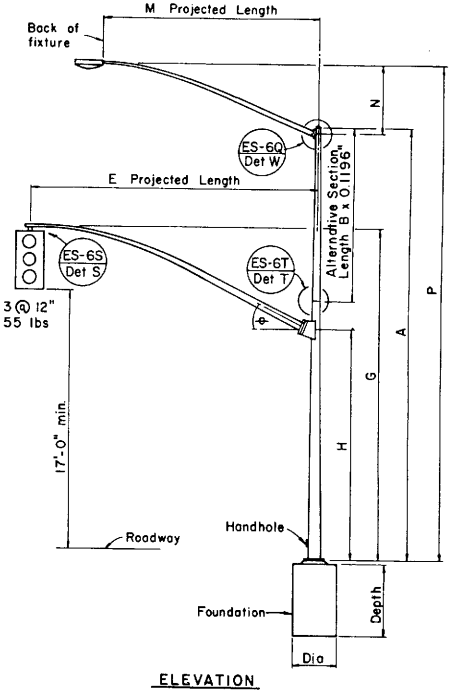


DETAIL B



BASE PLATE

ES-6S ES-6T



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							BASE PLATE DATA							Luminaire Arm	Signal Arm	CIDH PILE FOUNDATION		
			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				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"x42"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"x42"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

SIGNAL AND LIGHTING STANDARDS
CASE 1 ARM LOADING
WIND VELOCITY = 80 MPH
ARM LENGTHS 25' TO 30'

NO SCALE

STD. PLAN ES-60

ES-60

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

REGISTERED CIVIL ENGINEER

July 1, 1992
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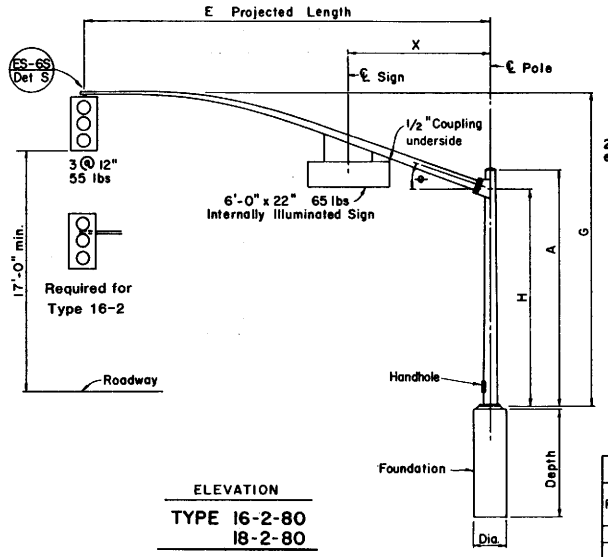
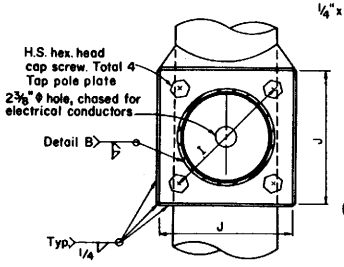
REGISTERED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA

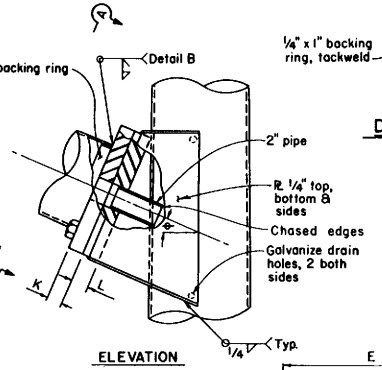


ELEVATION

TYPE 16-2-80
18-2-80

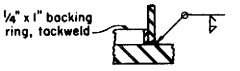


SECTION A-A



ELEVATION

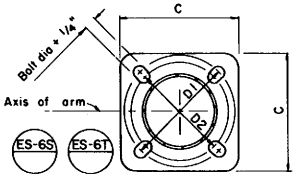
SIGNAL ARM CONNECTION DETAILS



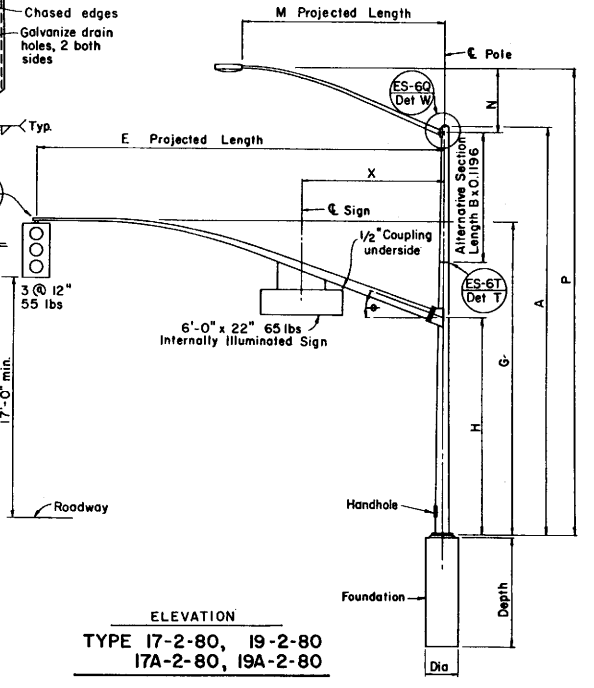
DETAIL B

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"±

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 1/2"	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



ELEVATION

TYPE 17-2-80, 19-2-80
17A-2-80, 19A-2-80

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			16"	15"		1 1/4"	1 1/4" x 42" x 4"	15"	None	20'	3'-6"	5'-0"	No
17-2-80			30'-0"	10 3/4"	6 5/8"		10'-0"	8"	6 1/2"					1 1/2" x 42" x 6"		6'-15' [12]		2'-6"	7'-0"	Yes
17A-2-80			35'-0"		5 15/16"		15'-0"		5 15/16"							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 42" x 6"		6'-15' [15]				

☐ Indicates arm length to be used unless otherwise noted on plans.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL AND LIGHTING STANDARDS
CASE 2 ARM LOADING
WIND VELOCITY = 80 MPH
ARM LENGTHS 20' TO 30'

NO SCALE

ES-6P

STD. PLAN ES-6P

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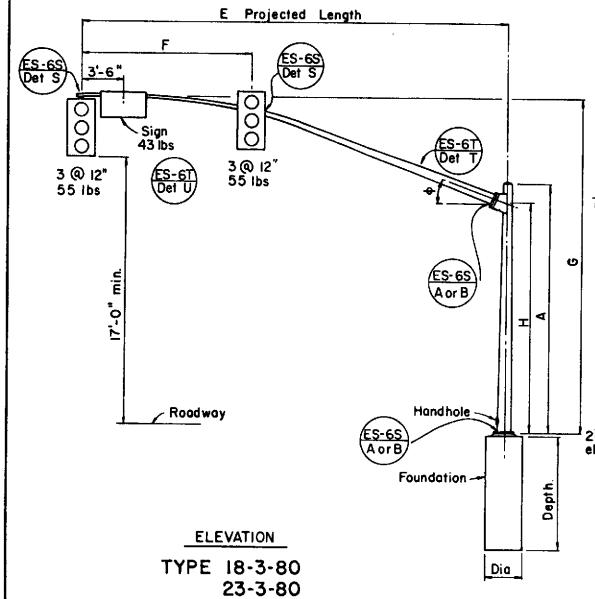
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER

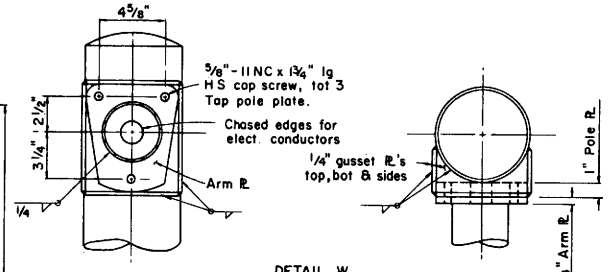
July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA



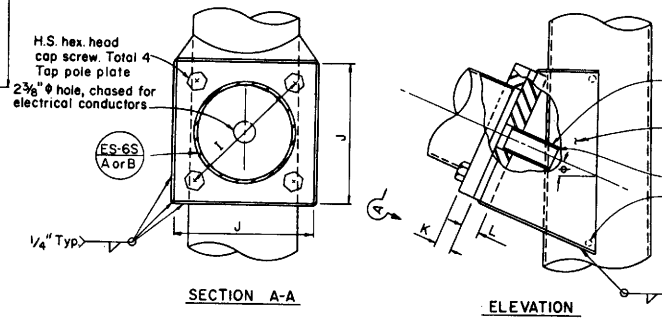
ELEVATION

TYPE 18-3-80
23-3-80
27-3-80



DETAIL W

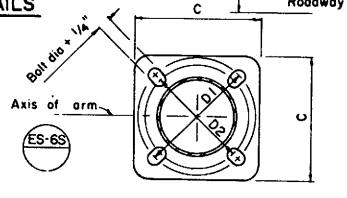
LUMINAIRE ARM CONNECTION



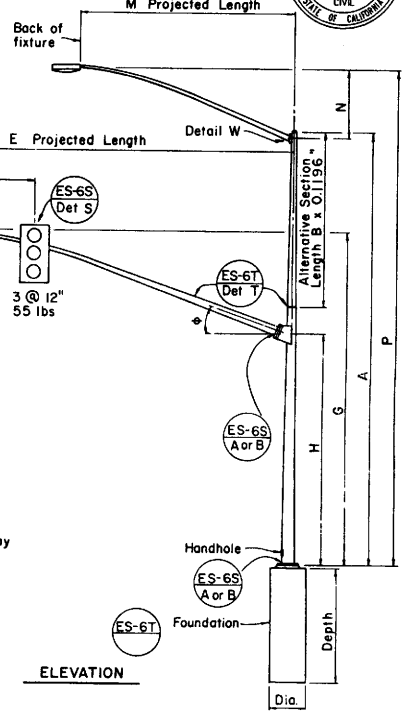
SECTION A-A

ELEVATION

SIGNAL ARM CONNECTION DETAILS



BASE PLATE



ELEVATION

TYPE 17-3-80, 24A-3-80
19-3-80, 26-3-80
19A-3-80, 26A-3-80
24-3-80

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 PL Thickness	L Pole PL Thickness	ϕ
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"	12"		12"	1 1/4"		
30'-0"				8"							
35'-0"	14'-0"	23'-0" ±		8 11/16"		13"	1 1/4"-7NC-3"	13"	1 1/4"	1 1/2"	21°
40'-0"	15'-0"			9 3/8"	0.2391"	13"		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" ±

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 42" x 6"	15"	6'-15' [12']	20'	2'-6"	8'-0"	Yes
18-3-80			17'-0"		8 7/16"		None									None				
19-3-80			30'-0"		6 5/8"	0.2391"	10'-0"	8"	6 5/8"	17"	16 1/2"	15"		1 3/4" x 42" x 6"	16 1/2"	6'-15' [12']	25' or [30']			
19A-3-80			35'-0"		5 15/16"		15'-0"		5 15/16"							6'-15' [15']				
23-3-80			17'-0"	11 3/8"	9"		None			18"	17 1/2"	16"	1 1/2"		17 1/2"	None	35'	3'-0"		
24-3-80			30'-0"		7 1/4"		10'-0"	8 5/8"	7 1/4"							6'-15' [12']				
24A-3-80			35'-0"		6 5/8"		15'-0"		6 5/8"							6'-15' [15']				
26-3-80			30'-0"	12 1/8"	8"	0.3125"	10'-0"	9 3/8"	8"			17"		2" x 42" x 6"		6'-15' [12']	40' or [45']			
26A-3-80			35'-0"		7 5/16"		15'-0"		7 5/16"							6'-15' [15']				
27-3-80			17'-0"		9 3/4"		None									None				

☐ Indicates arm length to be used unless otherwise noted on plans.

Minimum yield of sheet steel is 48,000 psi.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL AND LIGHTING STANDARDS
CASE 3 ARM LOADING
WIND VELOCITY = 80 MPH
ARM LENGTHS 20' TO 45'

NO SCALE

ES-6Q

STD. PLAN ES-6Q

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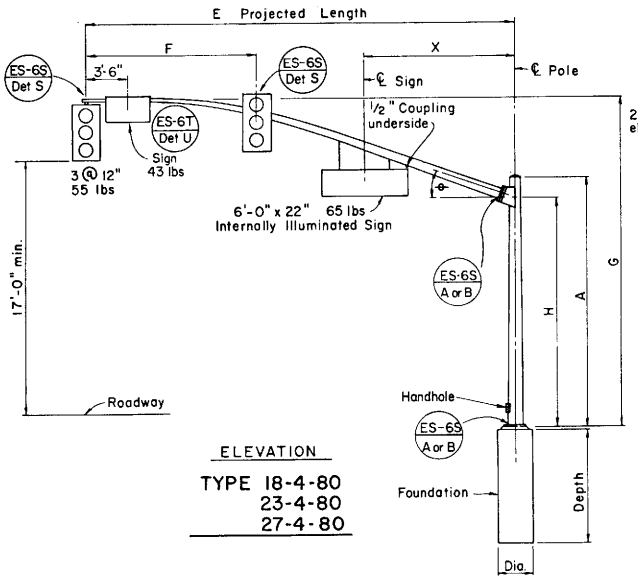
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER

July 1, 1992

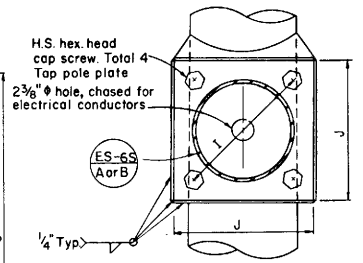
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA

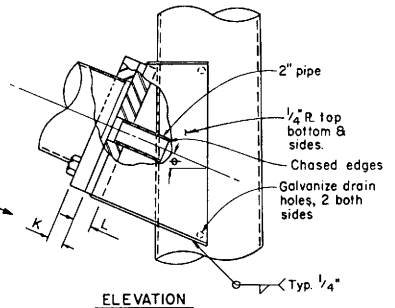


ELEVATION

TYPE 18-4-80
23-4-80
27-4-80

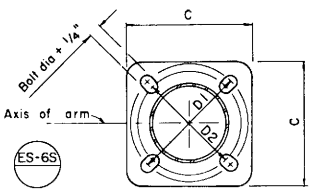


SECTION A-A

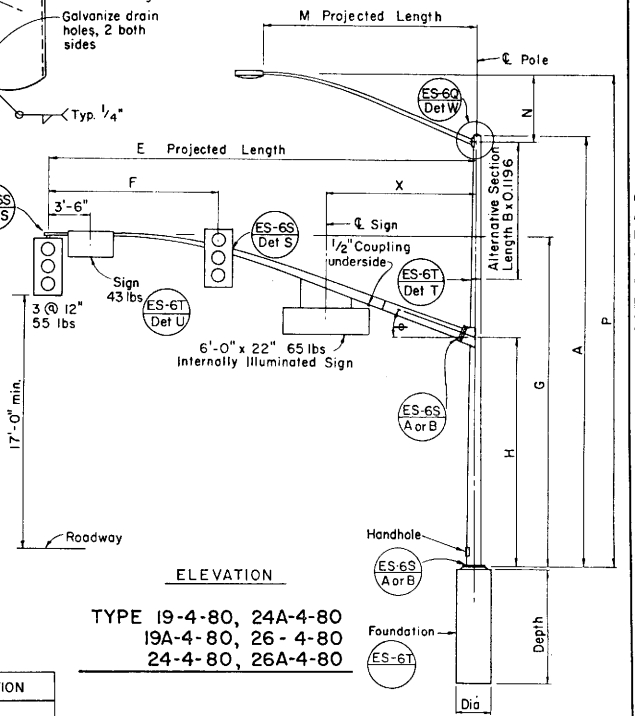


ELEVATION

SIGNAL ARM CONNECTION DETAILS



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	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"	13"		13"	1 1/2"	1 3/4"	15°	13'-0"
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" ±

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
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" x 42" 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]		3'-0"		
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" x 42" x 6"		6 - 15' [12]	40' or [45]	3'-0"	9'-0"	
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				

☐ Indicates arm length to be used unless otherwise noted on plans.

Minimum yield of sheet steel is 48,000 psi.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL AND LIGHTING STANDARDS
CASE 4 ARM LOADING
WIND VELOCITY = 80 MPH
ARM LENGTHS 25' TO 45'

NO SCALE

ES-6R

STD. PLAN ES-6R

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

REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

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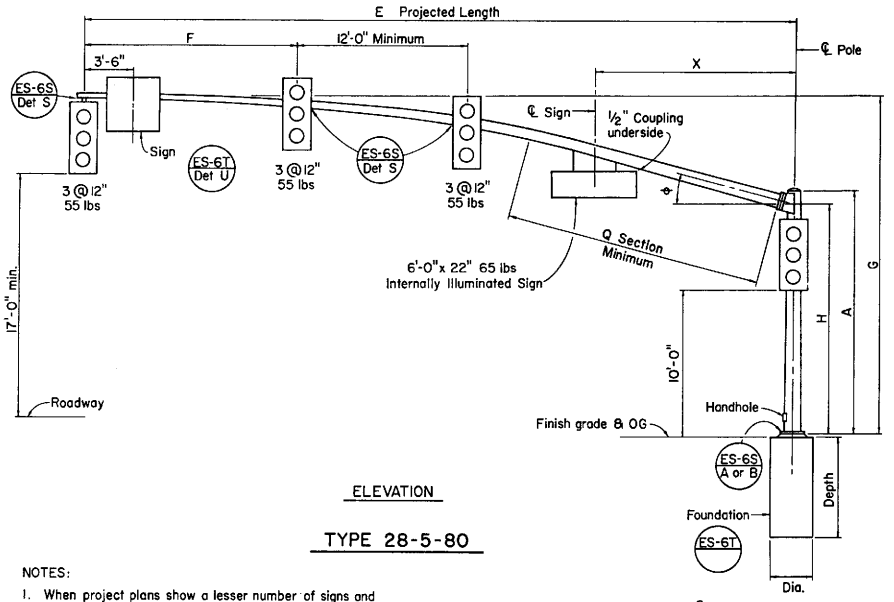
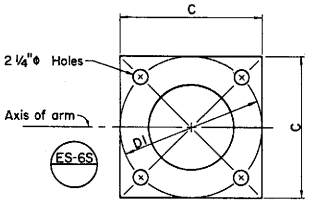
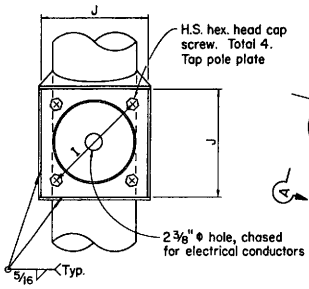


ELEVATION

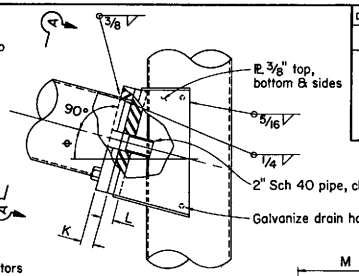
TYPE 28-5-80



BASE PLATE

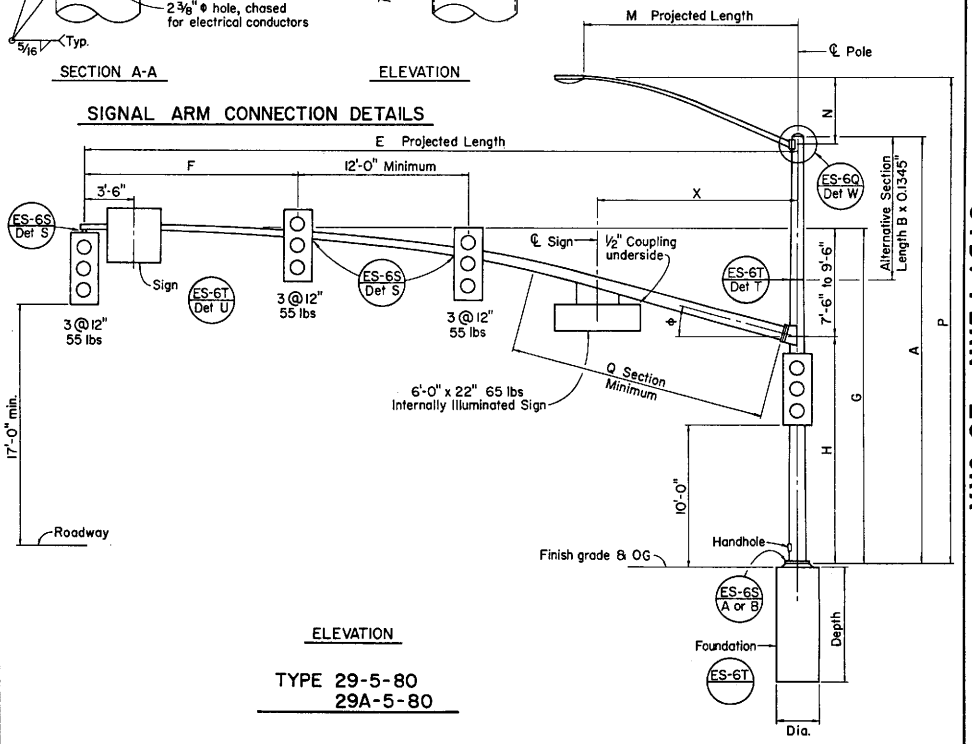


SECTION A-A



ELEVATION

SIGNAL ARM CONNECTION DETAILS



ELEVATION

TYPE 29-5-80
29A-5-80

NOTES:

1. When project plans show a lesser number of signs and signals, the project plans shall prevail.
2. For details not shown see Standard Plans and Electrical Details.
3. Minimum yield of sheet steel is 48,000 psi.

LUMINAIRE ARM DATA

M Projected Length	N Rise	Min OD 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" ±	3 7/8"		33'-9"	38'-9"
*15'-0"	4'-9" ±	4 1/4"		34'-3"	39'-3"

* Indicates use 15'-0" projected length unless shown otherwise.

SIGNAL ARM DATA

E Projected Length	F Min Spacing	G Min Mount Height	H	Min OD At Pole	Thickness	I Bolt Circle	HS Cap Screws	J Plate Size	K Arm PL Thickness	L Pole PL Thickness	ϕ	Q Section Length	Q Section Thickness	X Max
50'-0"	15'-0"	23'-6"	16'-0"	11 7/16"	0.1793"	15 3/4"	1 1/2"-6NC-3 1/4"	15"	1 3/4"	1 3/4"	15°	18'-0"	0.2391"	14'-0"
55'-0"				12"								23'-0"		

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
28-5-80	5	80	17'-0"	14"	11 11/16"	0.3125"	None			21"	21"		1 3/4"	2" x 40" x 6"	21"	None	50' or 55'	3'-0"	9'-0"	Yes
29-5-80			30'-0"		9 7/8"		10'-0"	11 1/4"	9 7/8"							6'- [15']				
29A-5-80			35'-0"		9 3/16"		15'-0"		9 3/16"	22"	22"				22"		55'			

☐ Indicates arm length to be used unless otherwise noted plans.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL AND LIGHTING STANDARDS
CASE 5 ARM LOADING
WIND VELOCITY = 80 MPH
ARM LENGTHS 50' TO 55'

NO SCALE

ES-6RA

STD. PLAN ES-6RA

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

REGISTERED CIVIL ENGINEER

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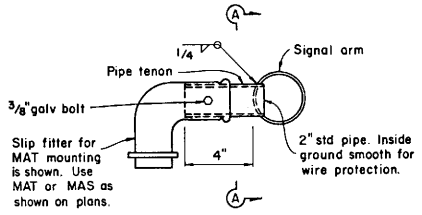
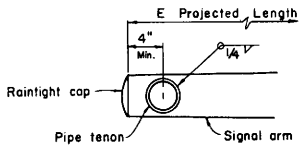
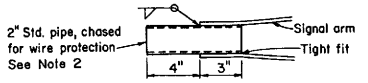


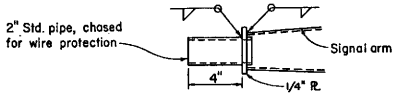
DETAIL S - SIDE TENON



SECTION A-A



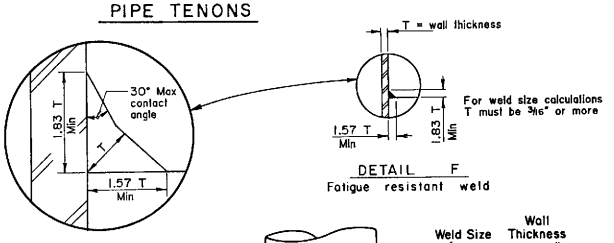
DETAIL TS-TIP TENON



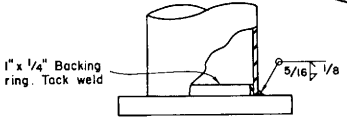
DETAIL TL-TIP TENON

This detail supersedes Detail S when so designated

PIPE TENONS

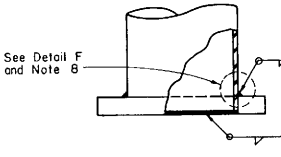


DETAIL F
Fatigue resistant weld



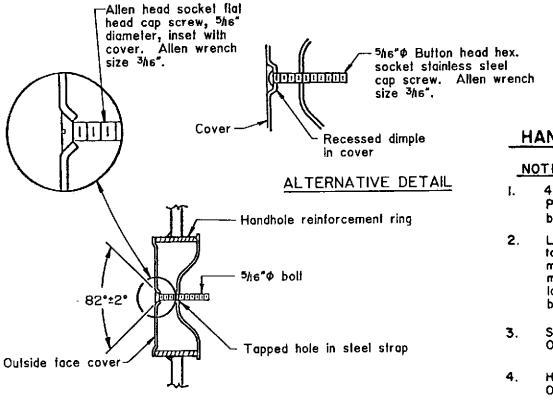
This detail shall be used for 2 ply poles

ELEVATION B



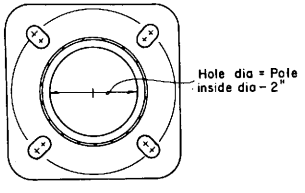
Weld Size	Wall Thickness
1/4"	0.1196"
5/16"	0.1793"
3/8"	0.2391"
7/16"	0.3125"
1/8"	0.1196"
3/16"	0.1797"
1/4"	0.2391"
5/16"	0.3125"

ELEVATION A

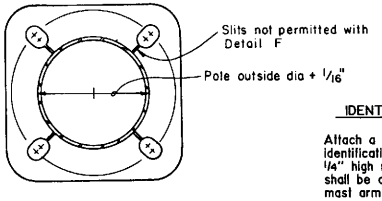


ALTERNATIVE DETAIL

TAMPER RESISTANT HANDHOLE COVER



PLAN
DETAIL B



PLAN
DETAIL A

ALTERNATIVE BASE PLATE DETAILS

IDENTIFICATION NUMBER

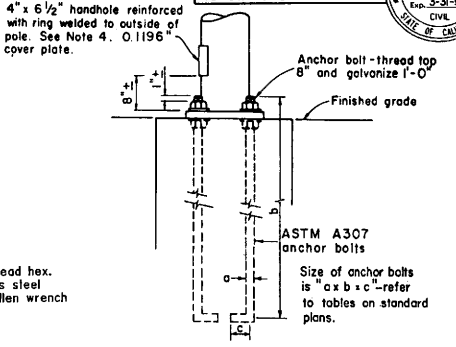
Attach a stamped metal tag with each pole's identification number to shaft above handhole. 1/4" high number minimum. A similar tag shall be attached to the top of the signal mast arm near the pole plate.

Sample Identification Number

19A - 3 - 70 - 30 - 77 - F

Type
Load Case
Design Wind Velocity
Signal Arm Length Maximum
Standard Plan Year
Only for poles with fatigue resistant welds

Use SL for special load case



HANDHOLE AND ANCHORAGE 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. When low pressure sodium lights are specified, the extension shall be 15".
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 only when specified.
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 only for 48,000 psi minimum yield.
9. Sheet steel shall have a minimum yield of 40,000 psi unless designated otherwise. See plans.
10. Handholes for lighting standards shall be located on the downstream side of the pole unless otherwise noted on the plans.
11. One 5/8" diameter hole may be drilled in mast arm to install pre-emption detector.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL AND LIGHTING STANDARDS DETAILS NO. 1

NO SCALE

ES-6S

STD. PLAN ES-6S

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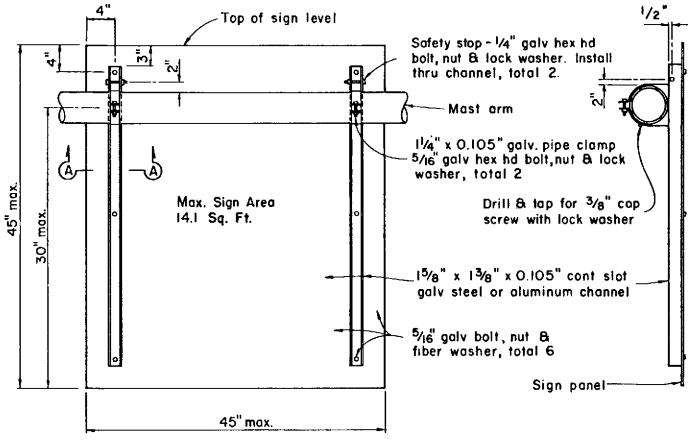
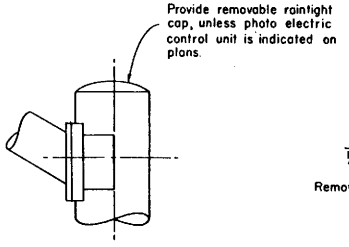
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA

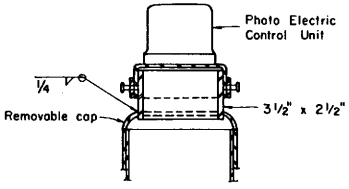


REAR VIEW — DETAIL U — SIDE VIEW

SIGN MOUNTING DETAILS

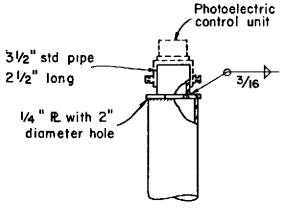


STANDARD TOP

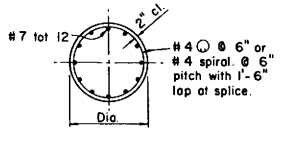


MOUNTING ADAPTER FOR PHOTO ELECTRIC CONTROL UNIT

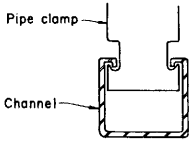
POLE TOP DETAILS



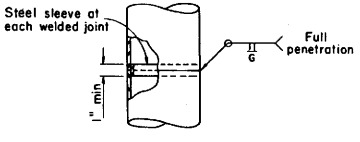
ALTERNATIVE MOUNTING ADAPTER



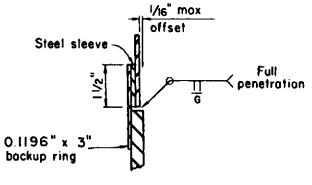
SECTION B-B



SECTION A-A

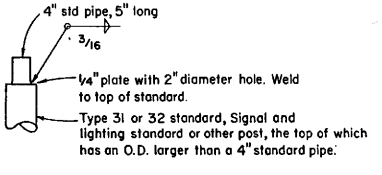


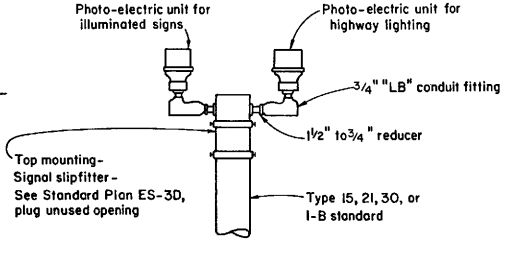
FOR UNIFORM TUBE THICKNESS



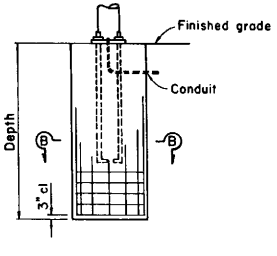
DETAIL T
AT TUBE THICKNESS CHANGE

POLE SPLICES

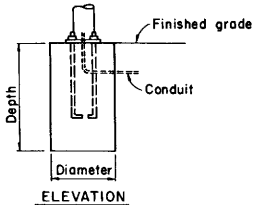




DUAL PE CONTROL MOUNTING DETAIL



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.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL AND LIGHTING STANDARDS DETAILS NO. 2

NO SCALE

ES-6T

STD. PLAN ES-6T

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REGISTERED CIVIL ENGINEER

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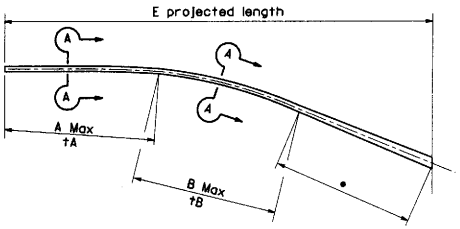

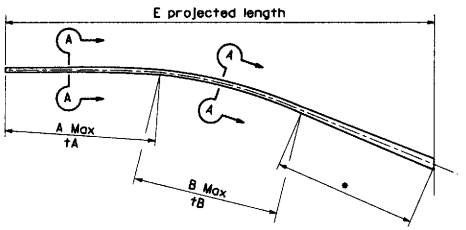

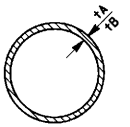

SECTION A-A

Case	E Projected Length	A Max	B Max	tA	tB
1	25'	•		•	
1	30'	•		•	
2	20'	10'	•	0.1196"	•
2	25'	10'	•	0.1196"	•
2	30'	10'	•	0.1196"	•
3	20'	10'	•	0.1196"	•
3	25'	10'	10'	0.1196"	0.1793"
3	30'	10'	10'	0.1196"	0.1793"
3	35'	10'	10'	0.1196"	0.1793"
3	40'	10'	10'	0.1196"	0.1793"
3	45'	10'	10'	0.1196"	0.1793"
4	25'	10'	10'	0.1196"	0.1793"
4	30'	10'	10'	0.1196"	0.1793"
4	35'	10'	10'	0.1196"	0.1793"
4	40'	10'	10'	0.1196"	0.1793"
4	45'	10'	10'	0.1196"	0.1793"
5	50'	10'	•	0.1196"	•
5	55'	10'	•	0.1196"	•

ALTERNATIVE MAST ARMS
WIND VELOCITY = 80 MPH

Case	E Projected Length	A Max	B Max	tA	tB
1	15'	•		•	
1	18'	•		•	
1	20'	•		•	
1	25'	•		•	
1	30'	•		•	
2	20'	•		•	
2	25'	•		•	
2	30'	•		•	
3	15'	•		•	
3	20'	10'	•	0.1196"	•
3	25'	10'	•	0.1196"	•
3	30'	10'	•	0.1196"	•
3	35'	10'	•	0.1196"	•
3	40'	10'	10'	0.1196"	0.1793"
3	45'	10'	10'	0.1196"	0.1793"
4	25'	10'	•	0.1196"	•
4	30'	10'	•	0.1196"	•
4	35'	10'	•	0.1196"	•
4	40'	10'	10'	0.1196"	0.1793"
4	45'	10'	10'	0.1196"	0.1793"
5	50'	10'	•	0.1196"	•
5	55'	10'	•	0.1196"	•

ALTERNATIVE MAST ARMS
WIND VELOCITY = 70 MPH

Standard Description Type - Case - Wind - Arm	Pole Data Min OD		Pole Thickness
	Base	Top	
17A - 1 - 70 - 20'	9"	4 1/8"	0.1793"
18 - 1 - 70 - 30'	9"	6 5/8"	0.1793"
17B - 2 - 70 - 20'	9"	4 3/4"	0.1793"
18 - 1 - 80 - 30'	9"	6 5/8"	0.1793"
16 - 2 - 80 - 20'	9"	6 5/8"	0.1793"
19 - 3 - 70 - 30'	11"	6 3/4"	0.1793"
19A - 2 - 80 - 30'	11"	6 1/8"	0.1793"
19A - 3 - 80 - 30'	11"	6 1/8"	0.1793"
23 - 4 - 70 - 35'	12"	9 5/8"	0.1793"

ALTERNATIVE POLES

NOTES

1. For details not shown, see Standard Plans, "Signal and Lighting Standards".
2. tA and tB indicates wall thickness of section in mast arms.
3. • indicates standard details, see Standard Plans, "Signal and Lighting Standards".
4. Alternative poles may be used with or without alternative mast arms.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL AND LIGHTING STANDARDS
POLE AND MAST ARM ALTERNATIVES

NO SCALE

ES-6TA

STD. PLAN ES-6TA

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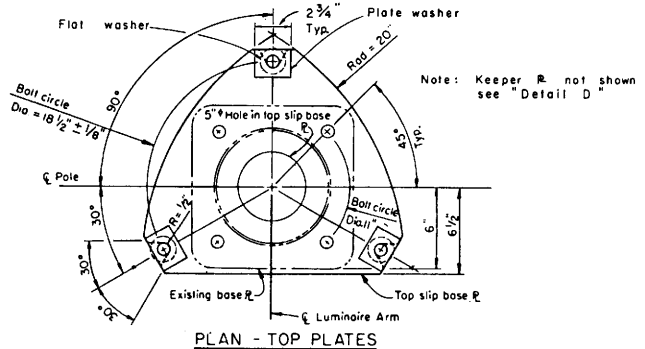
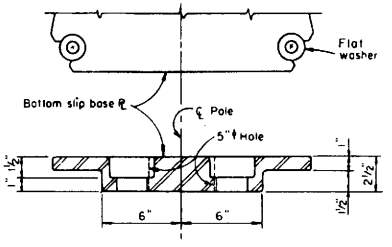


Note: Keeper ℞ not shown see "Detail D"

PLAN - TOP PLATES



SECTION C-C

CAST OPTION

Note:
For details not shown see Anchor Base ℞ Details" and "Plan - Bottom Plates.

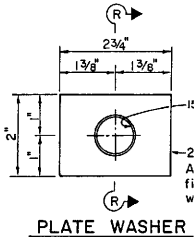
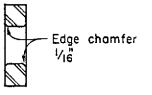
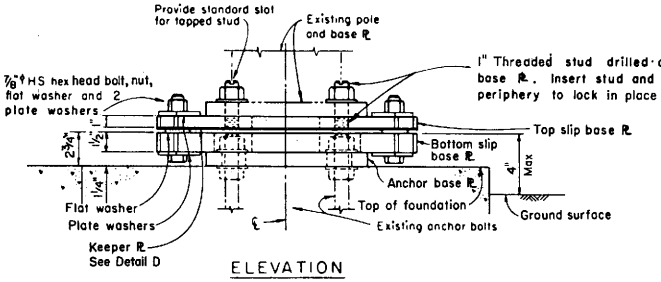


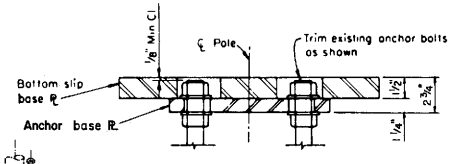
PLATE WASHER



SECTION R-R

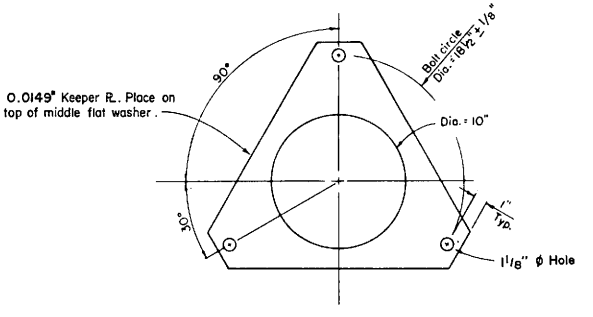


ELEVATION

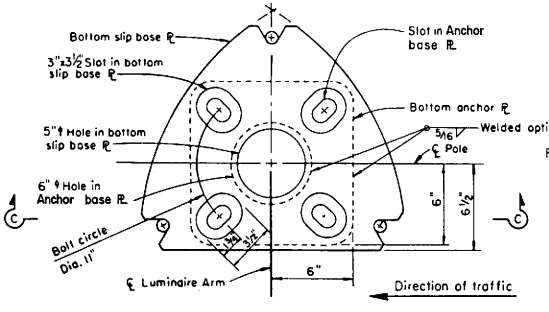


SECTION C-C

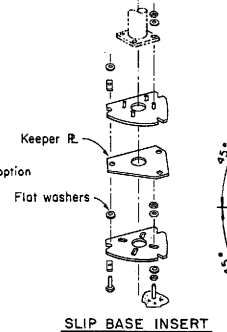
WELDED OPTION



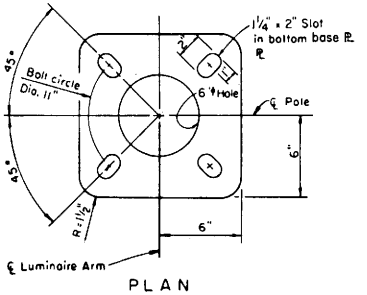
DETAIL D



PLAN - BOTTOM PLATES



SLIP BASE INSERT DETAIL



PLAN

Note: For Plate dimensions see "Plan - Top Plates".

SLIP BASE ℞ INSERT DETAILS

ANCHOR BASE ℞ DETAILS

Notes:

1. Conduit riser (including bushing) shall protrude no more than 2" above top of foundation.
2. When existing anchor bolts are 7/8" ø, provide 2 hardened washers of 2 1/4" Ø at each slot hole. Place on each side of anchor base plate.
3. Nuts on 7/8" Ø HS clamping bolts shall be lubricated and torqued as per specifications.
4. Torque requirements for nuts attaching anchor base ℞ to existing anchor bolts are waived. Wrench tighten.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

LIGHTING STANDARDS TYPES 10 AND 15 SLIP BASE INSERT

NO SCALE

ES-6U

STD. PLAN ES-6U

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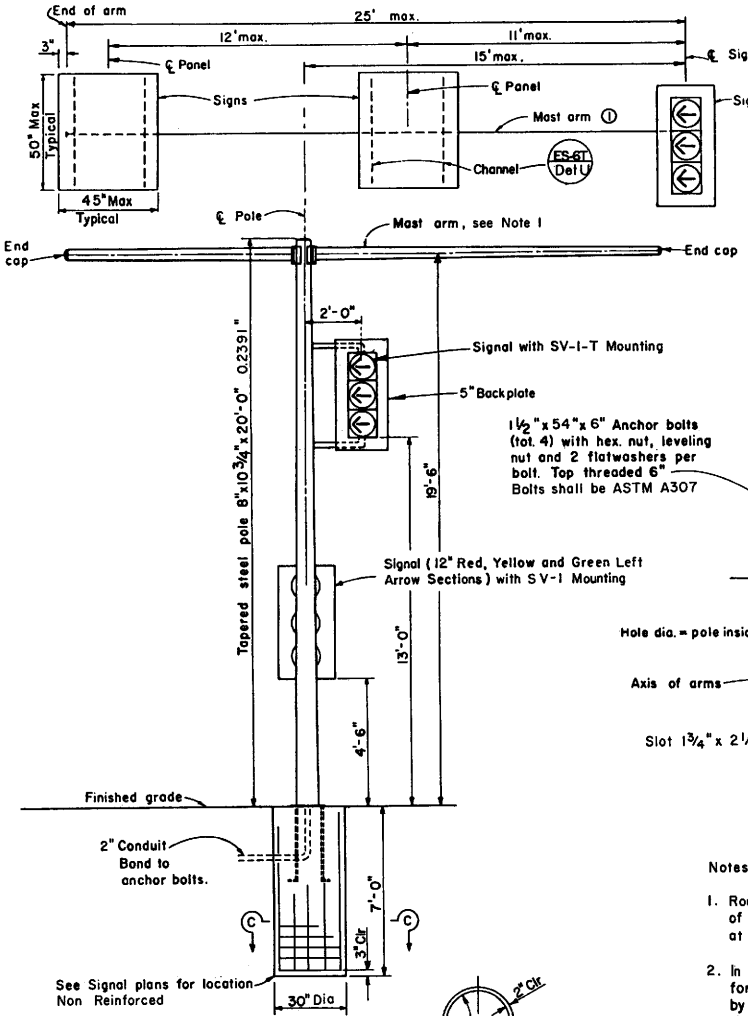

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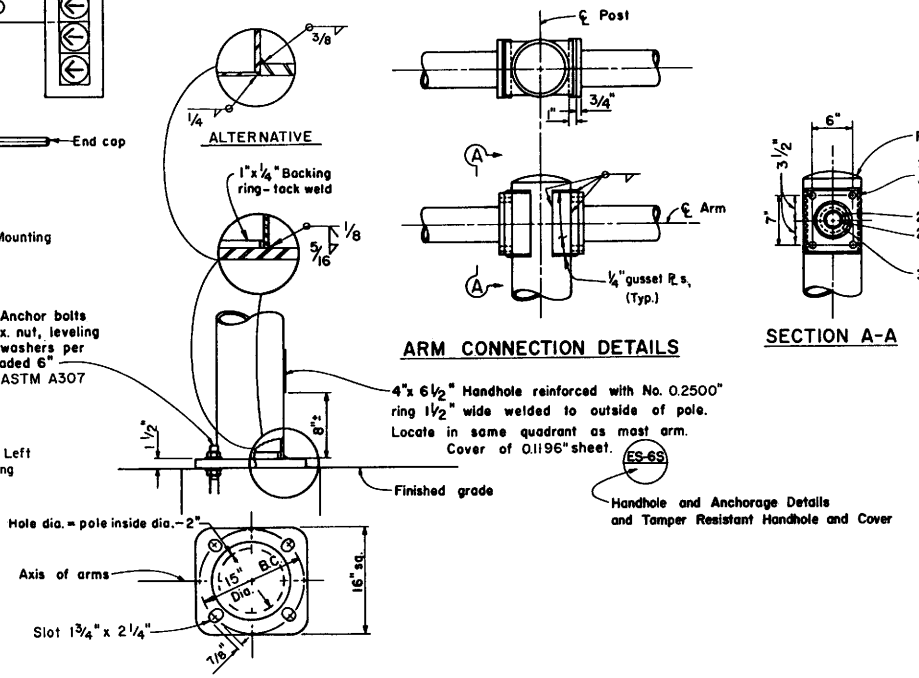

BASE PLATE

ARM CONNECTION DETAILS

SECTION A-A

Notes:

1. Round tapered steel tube 0.1793" with max taper of 0.14 inches per foot and 5 1/2" 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, 1/3 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 - Standard Plan ES-6S.
5. Sign area shall not exceed 14.6 square feet for each sign.
6. If all 3 signs are placed on one side of pole one sign must be placed adjacent to pole.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL AND SIGN STANDARDS TYPE 33 LEFT TURN

NO SCALE

ES-6V

STD. PLAN ES-6V

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Robert L. Donner
REGISTERED ELECTRICAL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

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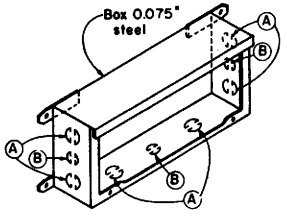
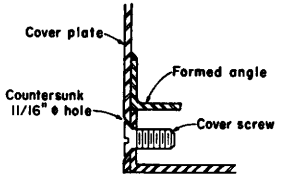
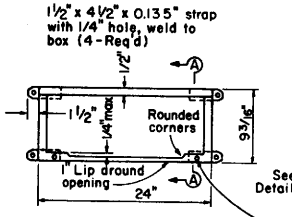


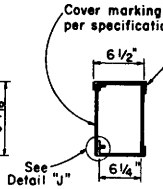


DETAIL J

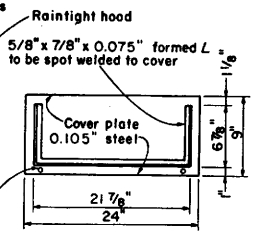


PLAN

3/8" Threaded hole on bottom lip for fastening cover plate Minimum thread length shall be 1/4" (Total 2)



SECTION A-A



COVER DETAIL

Countersink holes to permit seating of stainless steel flathead screw 3/8" x 16 x 3/4" (Total 2)

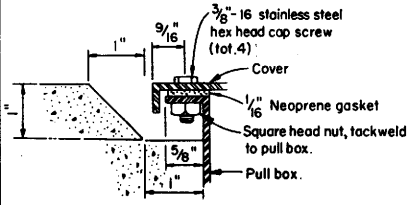
INSTALLATION NOTES:

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.

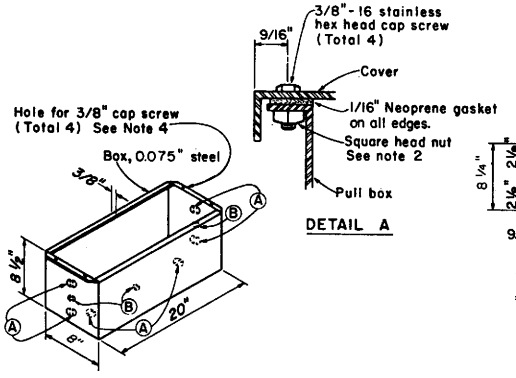
No.9 STRUCTURE PULL BOX

NOTES: No. 9 AND 9 A PULLBOX

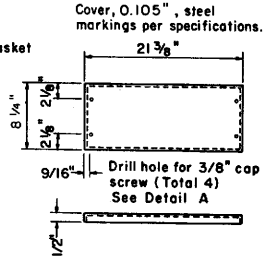
1. All corner joints to be lapped and secured by spot welding or riveting.
2. Where cap screws are used to attach cover to box, either of the following methods of providing adequate threading may be used:
   a. Tack weld square nut to bottom of flange (Total 4), or
   b. Tack weld a 1/4" x 5/8" x 8" 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 Standard Plan ES-8.



SECTION C-C



DETAIL A

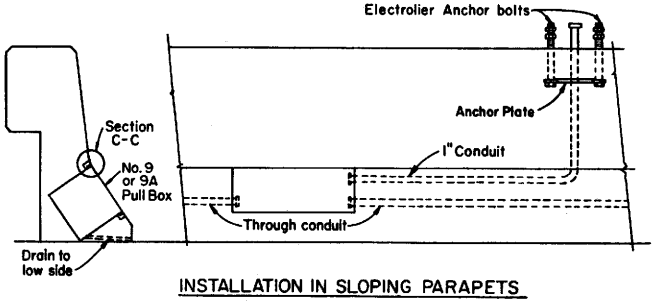


COVER DETAIL

No.9A STRUCTURE PULL BOX

KNOCKOUT SCHEDULE
No. 9 AND 9A PULLBOX

Ⓐ 1½" conduit, 2 each end, 2 on bottom.
Ⓑ 1" conduit, 1 each end, 1 on bottom.



INSTALLATION IN SLOPING PARAPETS

For reinforcement in area of electrolier, see railing sheets. For electrolier anchor bolts, see Standard Plan ES-7B.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL, LIGHTING AND ELECTRICAL SYSTEMS
ELECTRICAL DETAILS
STRUCTURE INSTALLATIONS

NO SCALE

ES-7A

STD. PLAN ES-7A

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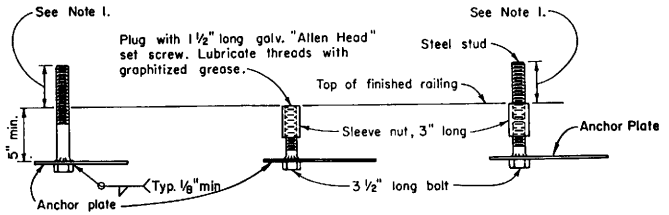
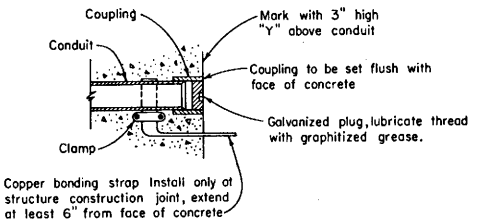


FOR IMMEDIATE INSTALLATION | FOR FUTURE INSTALLATION | FOR INSTALLATION ON FUTURE TYPE ANCHOR BOLTS

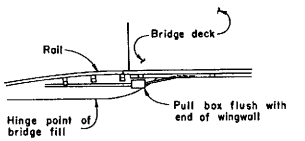
NOTES

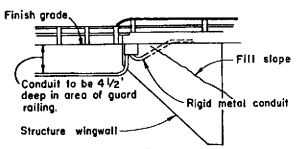
1. Anchor bolt or stud length shall be such that thread extends 1/2" maximum above nut on level base plate after grouting. See Detail "N".
2. Electrolier anchor bolts shall be held in position for pouring by means of anchor plates and suitable templates. Deviation from the true position, vertical and height, shall not exceed 1/16"
3. See railing sheets for reinforcement and structural details at electroliers and pull boxes.

DETAIL B
ELECTROLIER ANCHOR BOLTS

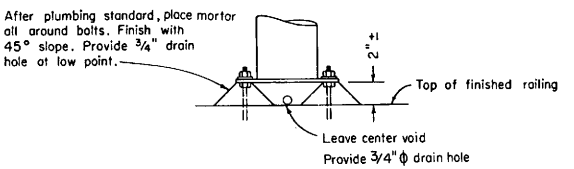


DETAIL C
CONDUIT TERMINATION





DETAIL I
CONDUIT TERMINATION



DETAIL N
GROUTING AT ELECTROLIER

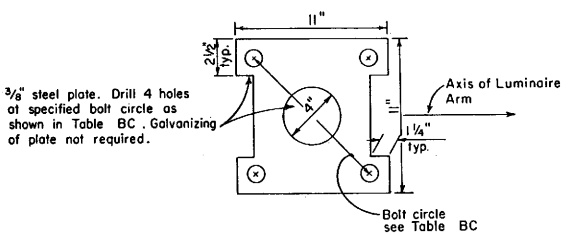


TABLE BC

Type	Bolt Circle	Anchor Bolt Diameter
15	11"	1"
21	12"	1 1/4"

ANCHOR PLATE

STATE OF CALIFORNIA
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NO SCALE

ES-7B

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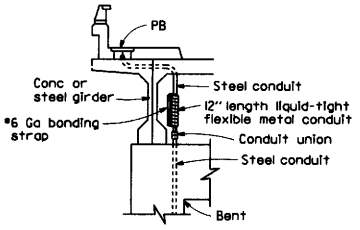
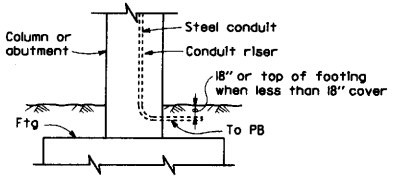
July 1, 1992
PLANS APPROVAL DATE

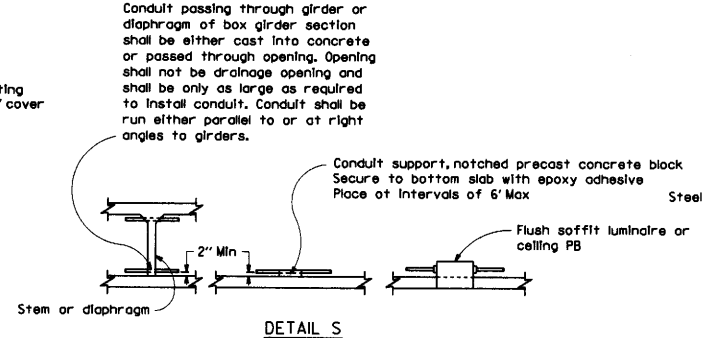
REGISTERED PROFESSIONAL ENGINEER R. L. Donner No. 7405 Exp. 9-30-94 ELECTRICAL STATE OF CALIFORNIA



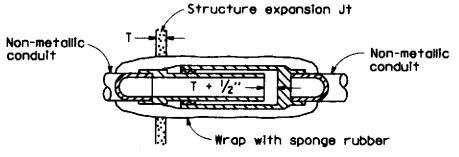
DETAIL R
CONDUIT RISER CONNECTION



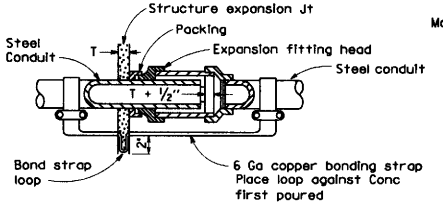
DETAIL T
LOWER END OF CONDUIT RISER AT COLUMN OR ABUTMENT



DETAIL S
CONDUIT INSTALLATION WITHIN BOX GIRDER SECTIONS

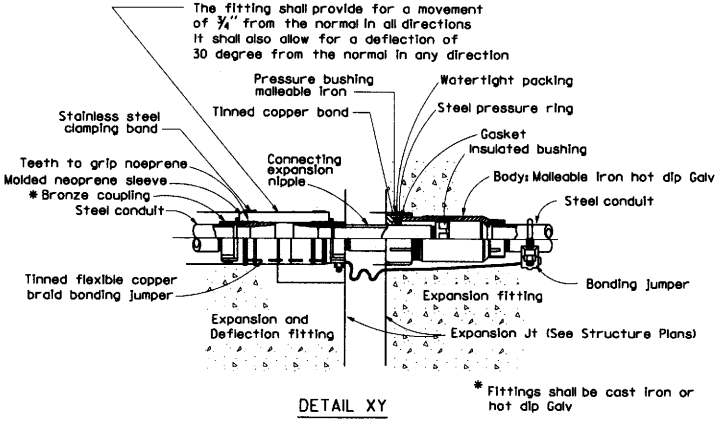


NON-METALLIC CONDUIT INSTALLATION

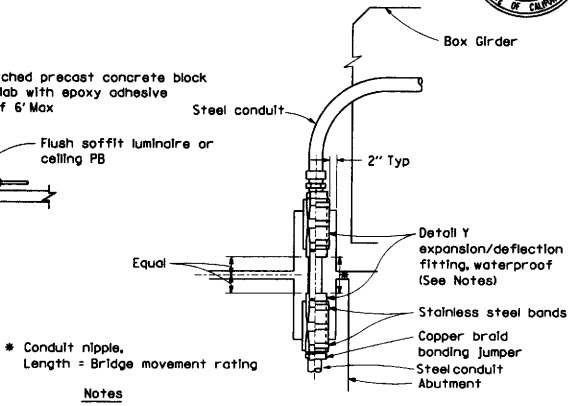


METALLIC CONDUIT INSTALLATION

DETAIL X
CONDUIT EXPANSION FITTINGS

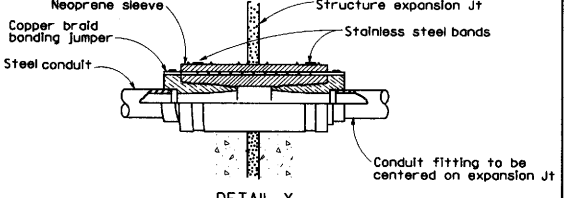


DETAIL XY
COMBINATION EXPANSION DEFLECTION FITTINGS



Notes
1. Fitting and pocket required only where movement can occur between girder and 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

NOTES
1. Except for sidewalk joints, a conduit expansion fitting or expansion-deifection fitting shall be installed at each 1/2 inch or greater structure joint, hinge or abutment.
2. Fittings or combination of fittings shall be installed to accomodate the movement rating as shown on the structure plans.
3. Fittings shall be installed parallel to superstructure girders.
4. Where lateral movement greater than 1/4" may occur, a neoprene sleeve expansion-deflection fitting shall be installed straddling the joint.
5. The external bond strap may be omitted when the fitting is provided with an internal bond equivalent to a No.6 copper bond in steel conduit or the No.8 equipment grounding conductor in non-metallic conduit.

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July 1, 1992
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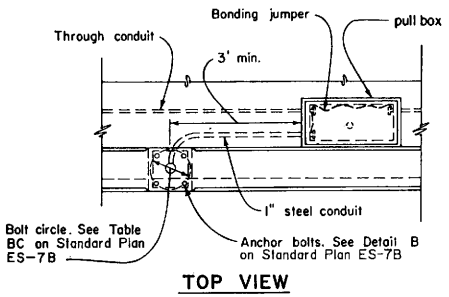
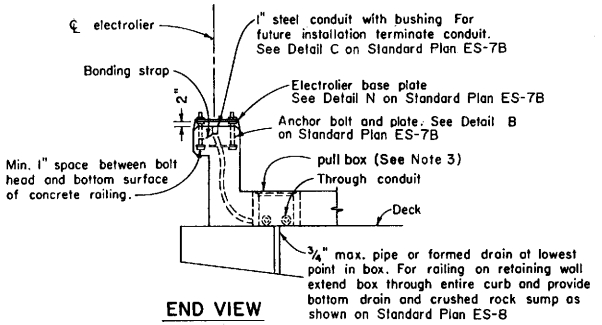
REGISTERED PROFESSIONAL ENGINEER R.L. Donner No. 7405 Exp. 9-30-94 ELECTRICAL STATE OF CALIFORNIA



TOP VIEW

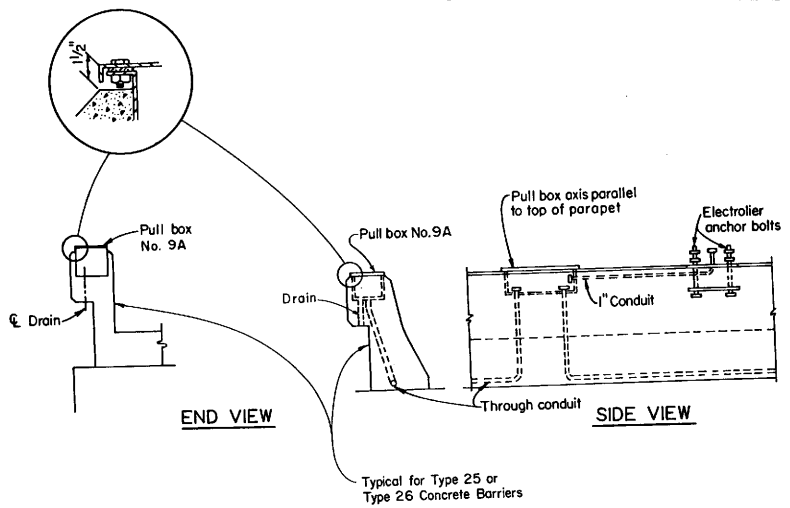


END VIEW

No. 3½, 5 or 6 PULL BOX INSTALLATION

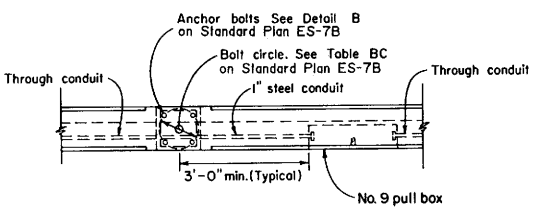
NOTES

1. Axis of pull box shall be parallel to top of barrier, sidewalk, or railing.
2. See railing sheet for reinforcement and structural details at electroliers and pull boxes.
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. 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.
6. For electrolier anchor bolts, see Standard Plan ES-7B

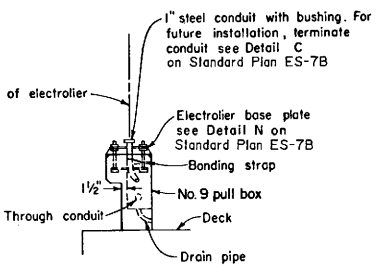


END VIEW

SIDE VIEW

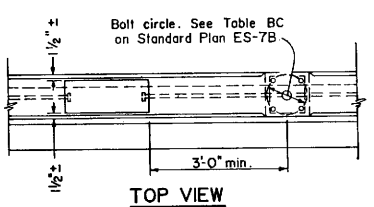


TOP VIEW

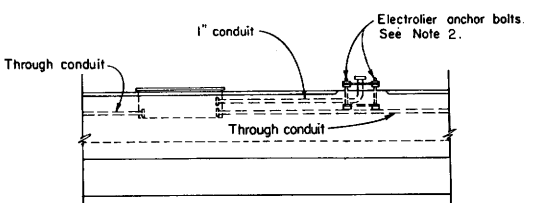


END VIEW

No. 9 PULL BOX INSTALLATION



TOP VIEW



SIDE VIEW

No. 9A PULL BOX INSTALLATION

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NO SCALE

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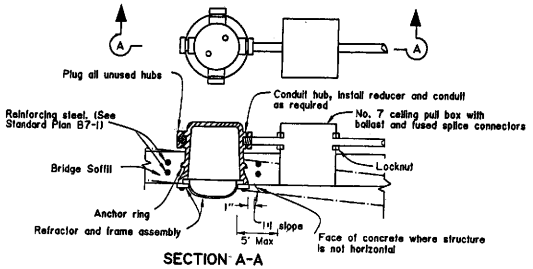
July 1, 1992
PLANS APPROVAL DATE

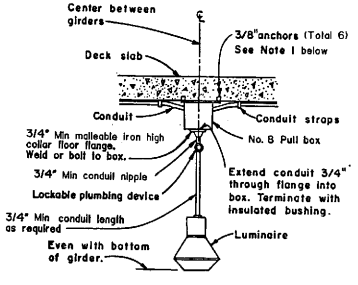
REGISTERED PROFESSIONAL ENGINEER R.L. Donner No. 7405 Exp. 9-30-94 ELECTRICAL STATE OF CALIFORNIA



SECTION A-A

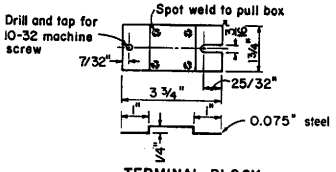
NOTES:
1. Place 1/4" plywood disk in body opening during pouring.
2. Install luminaire with axis vertical and "street side" of refractor oriented as indicated on lighting layout.
3. Luminaire shall be located so as to provide minimum clearance of 2 ft. from inside surface of girders and 1 ft. from near face of diaphragm.

DETAIL F
FLUSH SOFFIT LUMINAIRE INSTALLATION

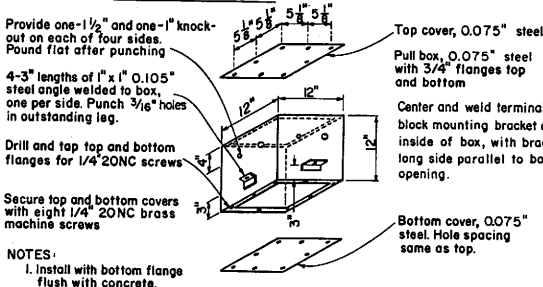


NOTES:
1. Cast-in-place inserts or expansion anchor.
2. For future installation, omit suspension conduit and luminaire, close flange with galvanized plug.
3. If conduit smaller than the knockout size is used it shall be bonded to the box.

DETAIL P
PENDANT SOFFIT LUMINAIRE INSTALLATION

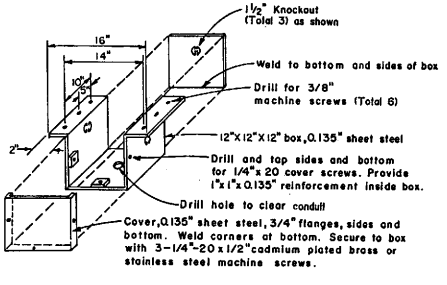


TERMINAL BLOCK MOUNTING BRACKET

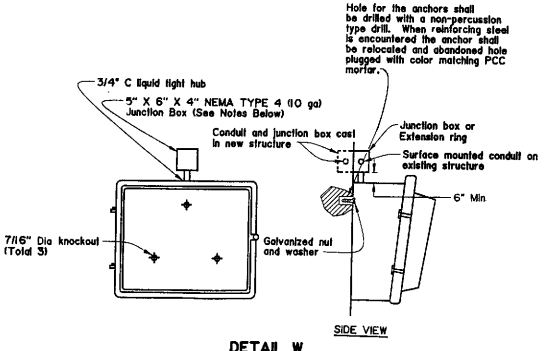


NOTES:
1. Install with bottom flange flush with concrete.
2. Both covers shall be on box during pouring.

No.7 CEILING PULL BOX



No.8 PULL BOX



DETAIL W
WALL LUMINAIRE INSTALLATION
(Typical)

NOTES:
1. For existing structures, provide external mounting lugs (Total 4).
2. For new structures, provide extension ring.

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NO SCALE

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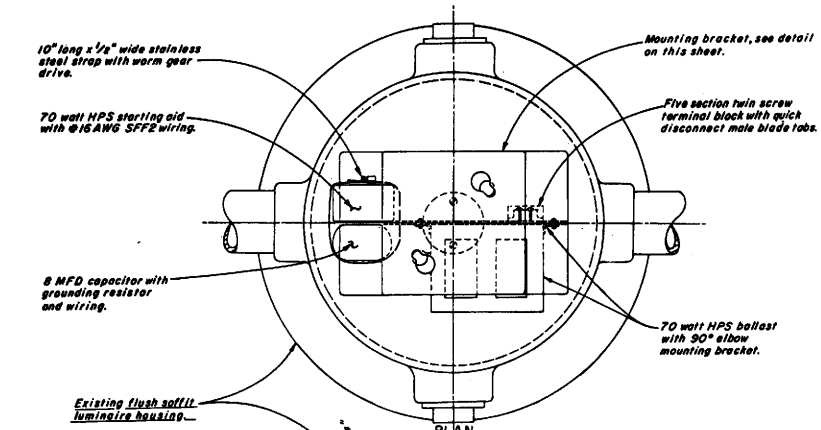
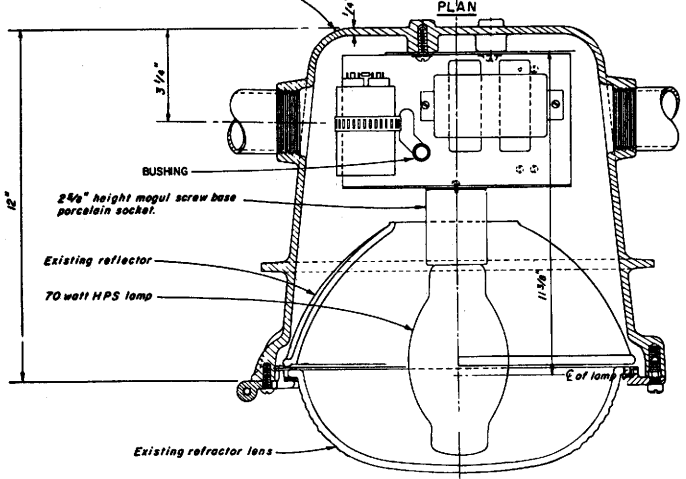
R.L. Donner
No. 7405
Exp. 9-30-94
ELECTRICAL
STATE OF CALIFORNIA

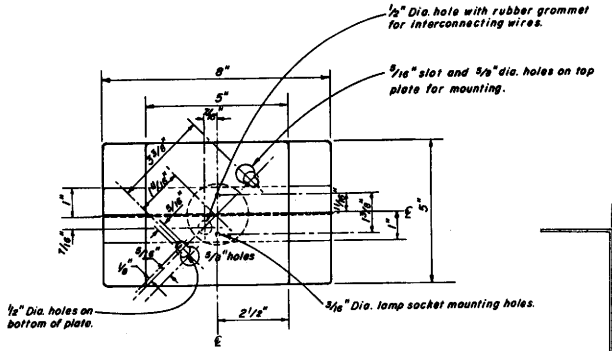


PLAN

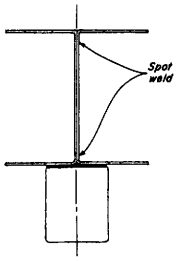


SECTION A-A

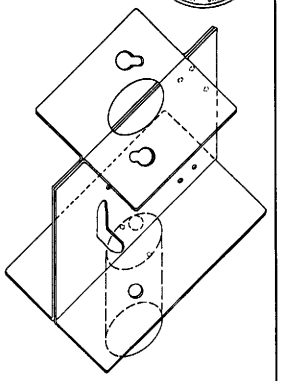
FLUSH SOFFIT LUMINAIRE ASSEMBLY



TOP VIEW

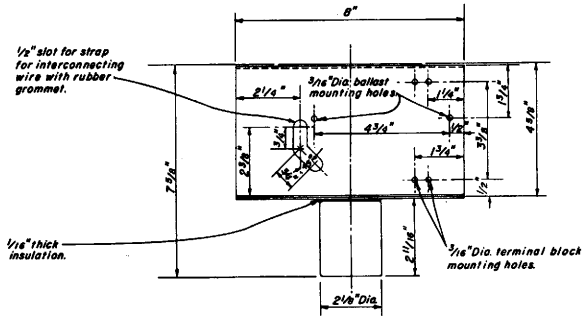


SIDE VIEW



Pre-form two sheets 1/16" mild steel as shown, spotweld together in each corner with four spotwelds.

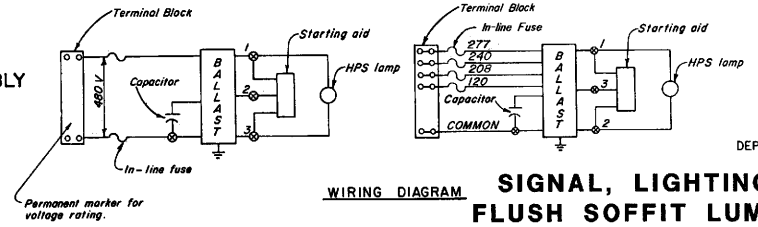
MOUNTING BRACKET DETAILS



FRONT VIEW

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.
3. In-line fuse as required on Standard Plan ES-14.



WIRING DIAGRAM

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL, LIGHTING AND ELECTRICAL SYSTEMS
FLUSH SOFFIT LUMINAIRE MODIFICATION DETAILS
STRUCTURE INSTALLATIONS

NO SCALE

ES-7F

STD. PLAN ES-7F

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REGISTERED PROFESSIONAL ENGINEER R.L. Donner No. 7405 Exp. 9-30-94 ELECTRICAL STATE OF CALIFORNIA

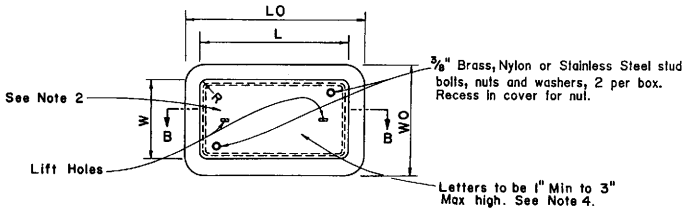
NOTES ON PULL BOXES

1. Traffic pull box shall be provided with steel cover and special concrete footing. 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 away from traffic, unless otherwise noted.
4. Pull box covers shall be marked as follows.

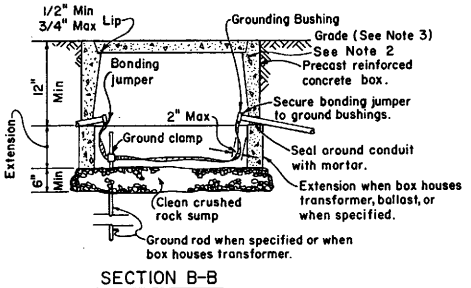
a. No. 3½ pull box
1) "SIGNAL" Traffic signal circuits with or without street and/or sign lighting circuits.
2) "ST LIGHTING" Street and/or sign lighting circuits where no voltage is above 600 V.
3) "SERVICE" Service circuits between service point and service disconnect.
4) "SPRINKLER-CONTR" Sprinkler control circuits, 50 volts or less.
5) "CALTRANS" On all pull boxes, excepting pull boxes marked "SPRINKLER-CONTR"
6) "TELEPHONE" Telephone service.

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, 50 volts or less.
6) "IRRIGATION" Circuits to irrigation controller 120 volts or more
7) "RAMP METER" Ramp meter circuits.
8) "COUNT STATION" Count and/or speed monitor circuits.
9) "COMMUNICATION" Communication circuits.
10) "CALTRANS" On all pull boxes, excepting pull boxes marked "SPRINKLER-CONTROL".
11) "TELEPHONE" Telephone service.
12) "TOS COMMUNICATIONS" TOS communications trunk line.
13) "TOS POWER" TOS power
14) "TDC Power" Telephone Demarcation Cabinet power.

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 ⅛ 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 ⅛ inch. Top outside edge of all concrete covers and pull boxes shall have a ¼" 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.
9. Pull box shall not be within the boundaries of new or existing wheelchair ramps.

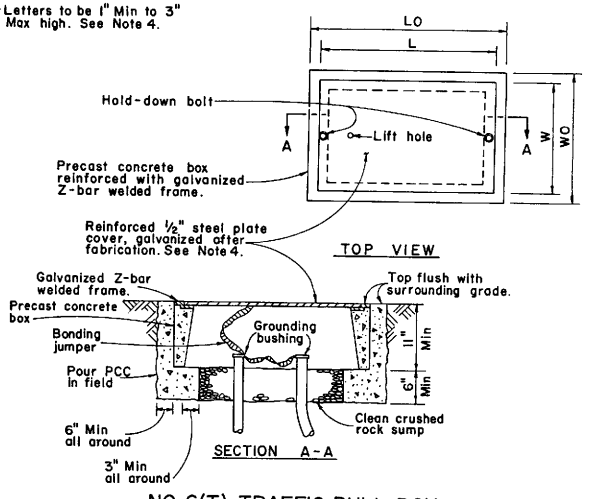


TOP VIEW



SECTION B-B

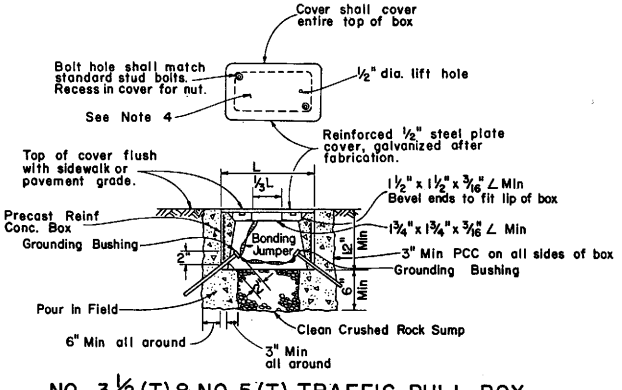
INSTALLATION DETAILS



TOP VIEW

SECTION A-A

NO. 6(T)-TRAFFIC PULL BOX
(CONCRETE BOX ONLY)



NO. 3½(T) & NO. 5(T) TRAFFIC PULL BOX
(CONCRETE BOX ONLY)

DIMENSION TABLE

Pull Box	CONCRETE BOX				COMPOSITE BOX		CONCRETE OR COMPOSITE COVERS				
	Min** Thickness	Min Depth Box and Extension	LO	WO	Min ** Thickness	Min Depth Box and Extension	L***	W***	R	Edge Thickness	Edge Taper
No. 3½	1"	No Extension	20"	14"	5/16"	No Extension	15 3/8"	10 1/8"	1 1/8"	1 3/4"	1/8"
No. 5	1"	22"	28"	18"	5/16"	20"	23 1/4"	13 3/4"	1 1/4"	2"	1/8"
No. 6	1 1/2"	24"	36"	23"	3/8"	20"	30 5/8"	17 5/8"	1 1/4"	2"	1/8"
No. 6(T)	2"	11"	36" ±	24" ±	Does Not Apply		33"±*	20"± *	0"	1/2" *	None

*Steel cover **Excluding conduit web. *** Top dimension.

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SIGNAL, LIGHTING AND ELECTRICAL SYSTEMS
PULL BOX DETAILS

NO SCALE

ES-8

STD. PLAN ES-8

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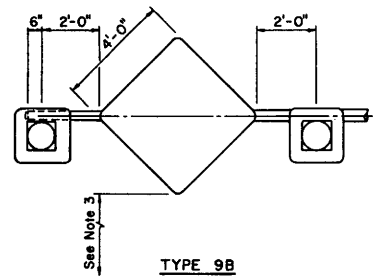
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

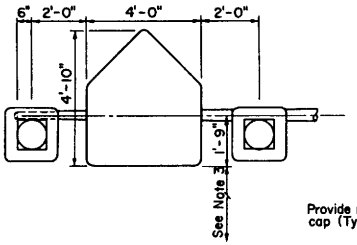
REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

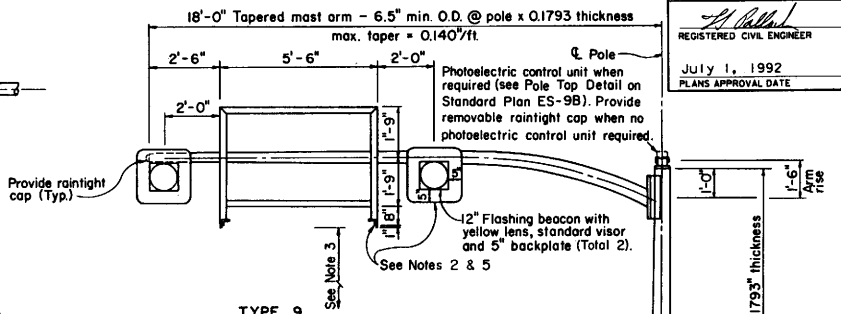
REGISTERED PROFESSIONAL ENGINEER
T. Pollock
No. 13332
Exp. 3-31-93
CIVIL
STATE OF CALIFORNIA



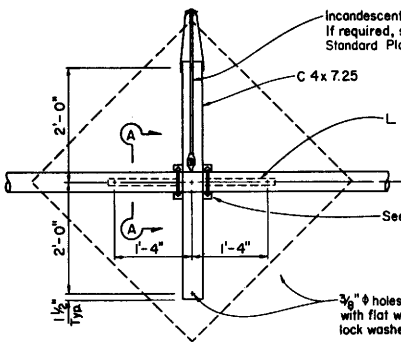
TYPE 9B



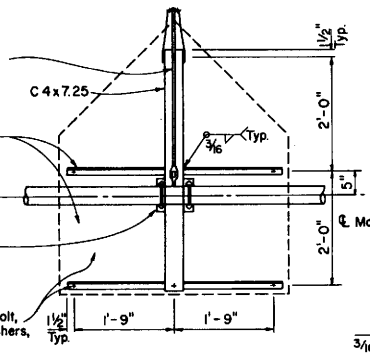
TYPE 9A



TYPE 9

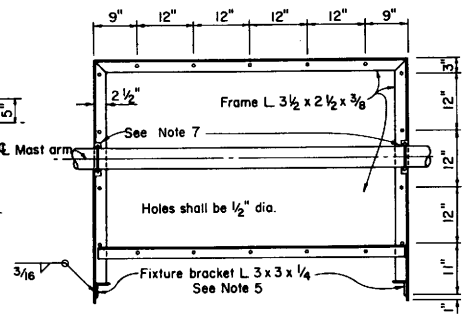


TYPE 9B

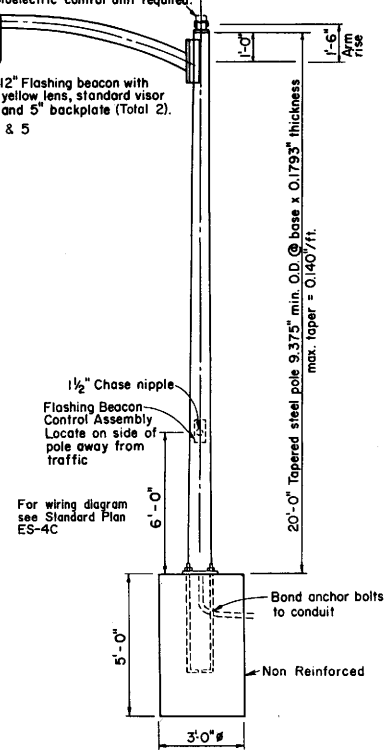


TYPE 9A

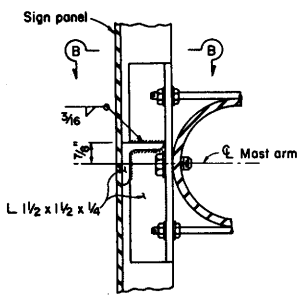
FRAME DETAILS



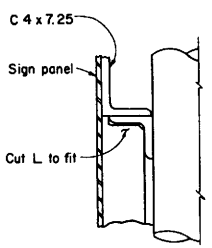
TYPE 9



ELEVATION



SECTION A-A



SECTION B-B

TYPE 9B

NOTES:
1. All splices between fluorescent fixture sockets shall be waterproofed.
2. Install flashing beacons and sign frame. Flashing beacons to be MAT mounted on pipe tenon. (See Standard Plan ES-6S Detail S)
3. Vertical clearance to be 17'-0" minimum between roadway and bottom of sign panel or lighting fixture bracket.
4. Special Provisions or plans will indicate when incandescent lighting fixture is required on Type 9A or 9B sign frames.
5. All Type 9 sign frames shall be provided with a 36" fluorescent fixture. For fluorescent lighting details see Standard Plan ES-30
6. Anchor bolts shall be A.S.T.M. A-307
7. See Standard Plan ES-9B for sign frame mounting details.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL, LIGHTING AND ELECTRICAL SYSTEMS
CANTILEVER FLASHING BEACON
TYPES 9, 9A, 9B

NO SCALE

ES-9A

STD. PLAN ES-9A

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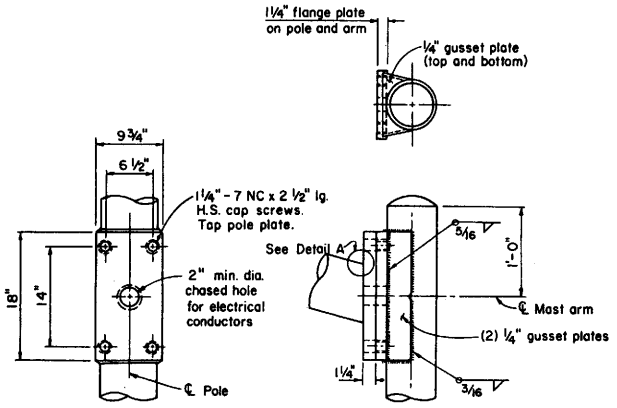
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

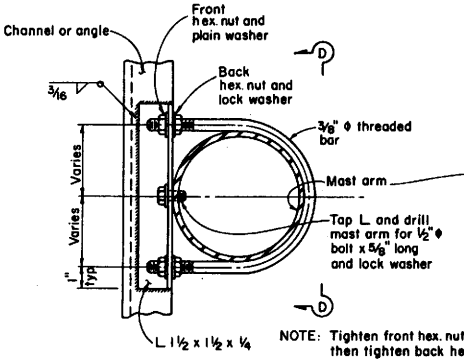
REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA

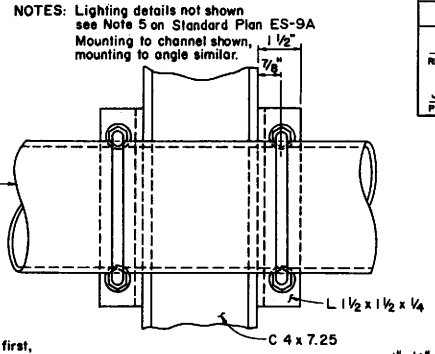


MAST ARM CONNECTION DETAILS



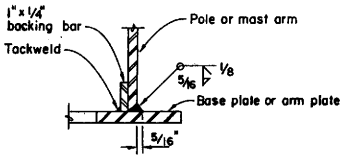
NOTE: Tighten front hex. nuts first, then tighten back hex. nuts

NOTES: Lighting details not shown see Note 5 on Standard Plan ES-9A
Mounting to channel shown, mounting to angle similar.

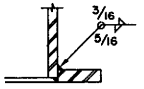


VIEW D-D

SIGN FRAME MOUNTING DETAILS
ALL TYPES

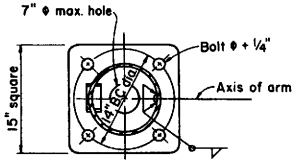


DETAIL A

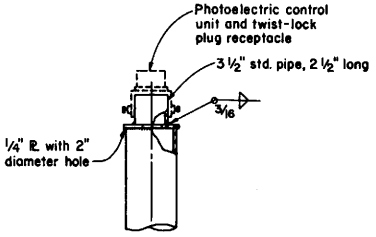


(For Pole-Base Plate only)

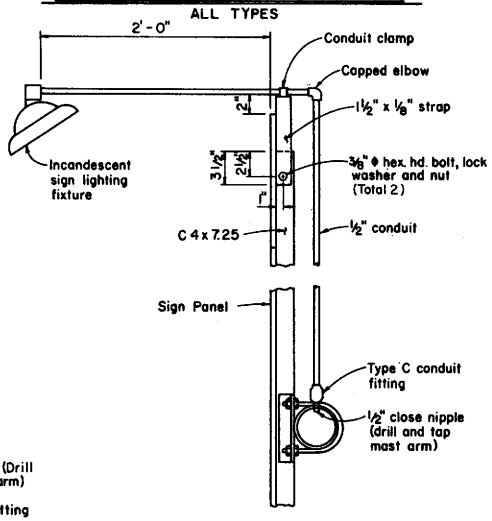
ALTERNATIVE DETAIL A



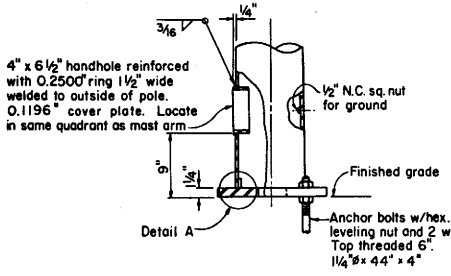
PLAN



POLE TOP DETAIL

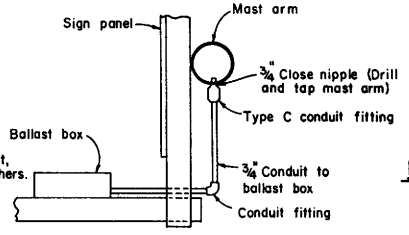


INCANDESCENT LIGHTING FIXTURE
TYPES 9A & 9B
See Note 4 on Standard Plan ES-9A



ELEVATION

BASE PLATE AND ANCHORAGE DETAILS



FLUORESCENT LIGHTING FIXTURE
TYPE 9 FRAME

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL, LIGHTING AND ELECTRICAL SYSTEMS
CANTILEVER FLASHING BEACON
TYPES 9, 9A, 9B

NO SCALE

ES-9B

STD. PLAN ES-9B

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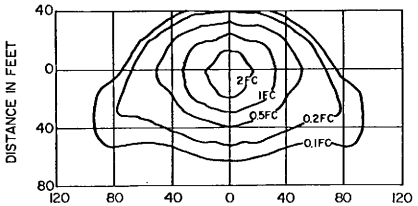
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

Robert L. Donner
REGISTERED ELECTRICAL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

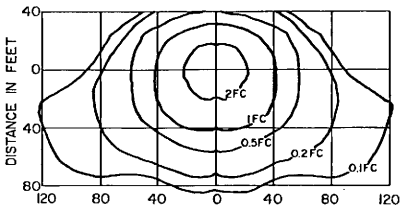
REGISTERED PROFESSIONAL ENGINEER
R.L. Donner
No. 7405
Exp. 9-30-94
ELECTRICAL
STATE OF CALIFORNIA

ISOFOOTCANDLE CURVE — MINIMUM



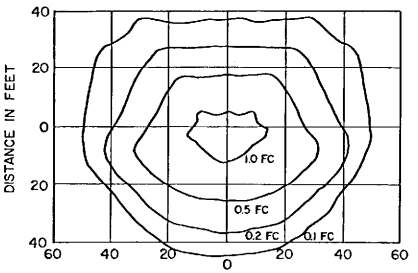
DISTANCE IN FEET
TYPE III MEDIUM CUTOFF
Cutoff Highway Lighting Luminaire
30' Mounting Height
LAMP OPERATED AT 22,000 LUMENS
200 WATT HIGH PRESSURE SODIUM LAMP
ANSI DESIGNATION S66

ISOFOOTCANDLE CURVE — MINIMUM



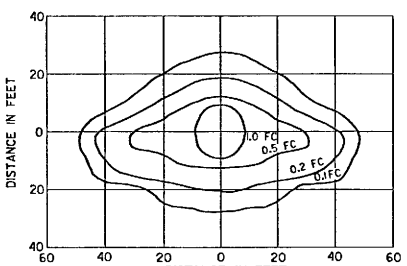
DISTANCE IN FEET
TYPE III MEDIUM CUTOFF
Cutoff Highway Lighting Luminaire
40' Mounting Height
LAMP OPERATED AT 37,000 LUMENS
310 WATT HIGH PRESSURE SODIUM LAMP
ANSI DESIGNATION S67

ISOFOOTCANDLE CURVE — MINIMUM



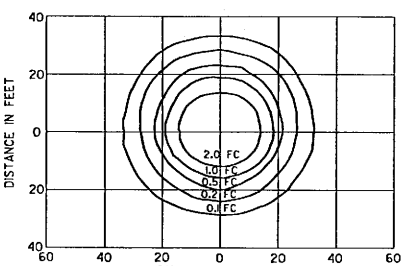
DISTANCE IN FEET
DETAIL "F" SOFFIT LUMINAIRE
17' Mounting Height
LAMP OPERATED AT 5,800 LUMENS
70 WATT HIGH PRESSURE SODIUM LAMP
ANSI DESIGNATION S62

ISOFOOTCANDLE CURVE - MINIMUM



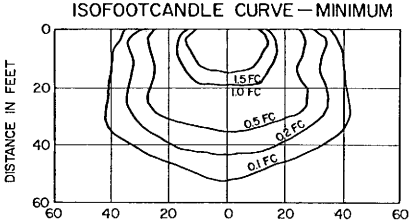
DISTANCE IN FEET
PENDANT SOFFIT LUMINAIRE - 70 WATTS
TYPE III SHORT
17' Mounting Height
LAMP OPERATED AT 5800 LUMENS
HIGH PRESSURE SODIUM LAMP
ANSI DESIGNATION S62

ISOFOOTCANDLE CURVE - MINIMUM



DISTANCE IN FEET
PENDANT SOFFIT LUMINAIRE - 70 WATTS
17' Mounting Height
LAMP OPERATED AT 5800 LUMENS
HIGH PRESSURE SODIUM LAMP
ANSI DESIGNATION S62

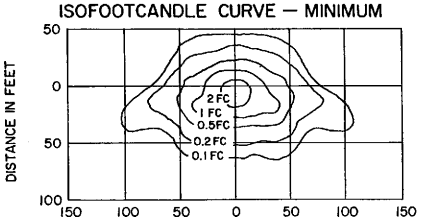
ISOFOOTCANDLE CURVE — MINIMUM



DISTANCE IN FEET
DETAIL "W" WALL LUMINAIRE
15' Mounting Height
LAMP OPERATED AT 9,500 LUMENS
100 WATT HIGH PRESSURE SODIUM LAMP
ANSI DESIGNATION S54

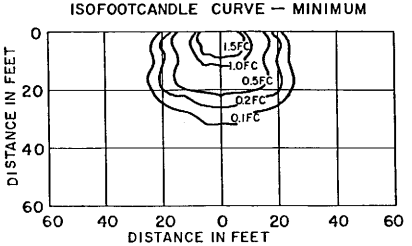
NOTE: Isolux diagrams show the minimum horizontal foot-candles required.

ISOFOOTCANDLE CURVE — MINIMUM



DISTANCE IN FEET
TYPE III MEDIUM CUTOFF
Cutoff Highway Lighting Luminaire
30' Mounting Height
LAMP OPERATED AT 16,000 LUMENS
150 WATT HIGH PRESSURE SODIUM LAMP
ANSI DESIGNATION S55

ISOFOOTCANDLE CURVE — MINIMUM



DISTANCE IN FEET
DETAIL "W" WALL LUMINAIRE
15' Mounting Height
LAMP OPERATED AT 5800 LUMENS
70 WATT HIGH PRESSURE SODIUM LAMP
ANSI DESIGNATION S62

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL, LIGHTING AND ELECTRICAL SYSTEMS
ISOLUX DIAGRAMS

NO SCALE

ES-10

STD. PLAN ES-10

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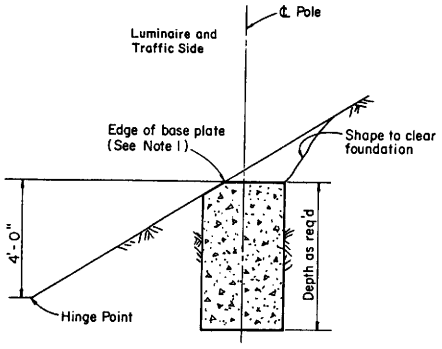
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

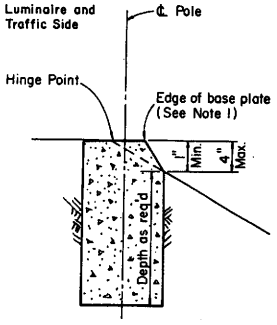
REGISTERED ELECTRICAL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

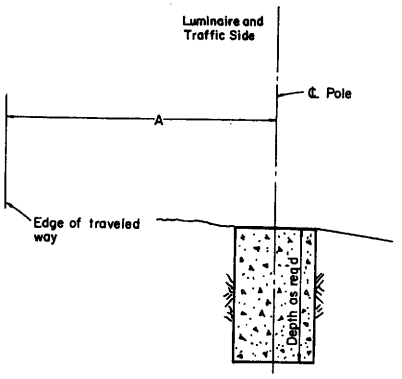
R.L. Donner No. 7405 Exp. 9-30-94 ELECTRICAL



CUT SLOPES
STEEPER THAN 4:1
SEE NOTE 3



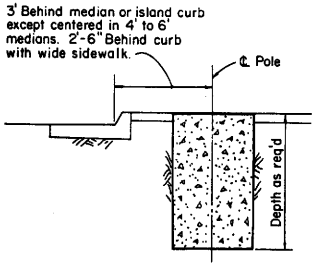
FILL SLOPES
STEEPER THAN 4:1
SEE NOTE 3



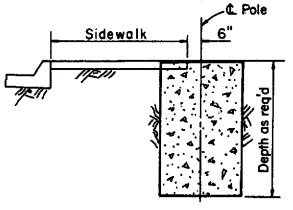
FLAT SECTIONS, CUT OR FILL SLOPES
4:1 OR FLATTER

Standard Type	set back (Dimension A)
32	30' min.
31	20' min.
30	Mast Arm Length (Min.)
15	

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.
3. Horizontal Setbacks on cut and fill slopes steeper than 4:1 shall not exceed the distances shown for flat sections.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL, LIGHTING AND ELECTRICAL SYSTEMS FOUNDATION INSTALLATIONS

NO SCALE

ES-11

STD. PLAN ES-11

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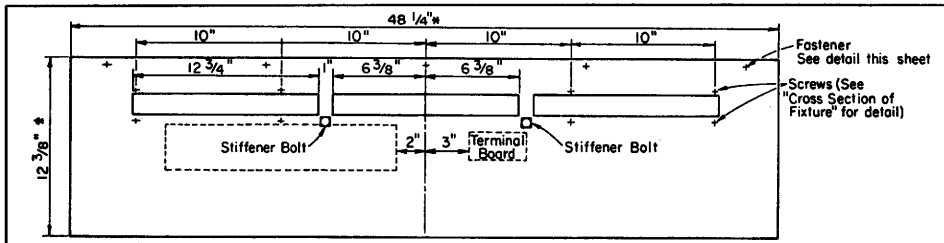
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

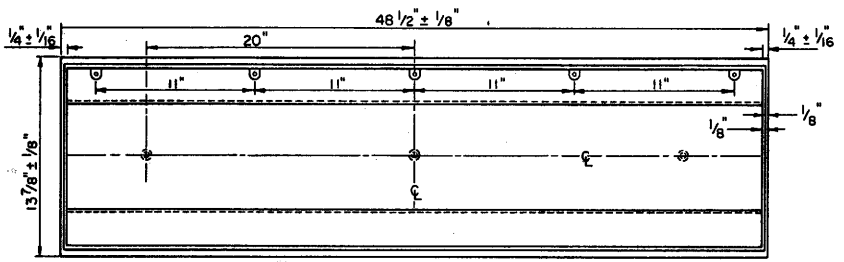
Robert L. Donner
REGISTERED ELECTRICAL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

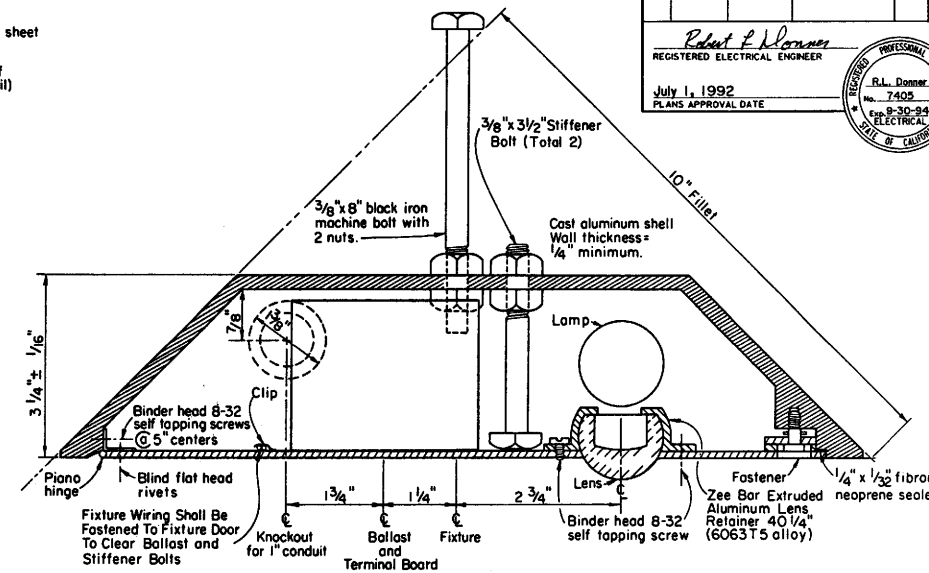
REGISTERED PROFESSIONAL ENGINEER R.L. Donner No. 7405 Exp. 9-30-94 ELECTRICAL STATE OF CALIFORNIA



DOOR OF FIXTURE



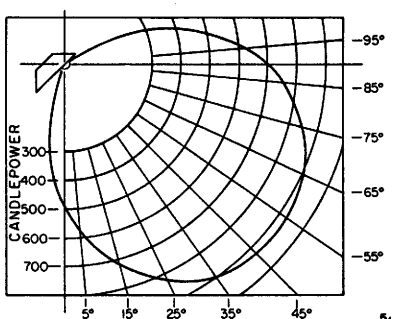
SHELL OF FIXTURE



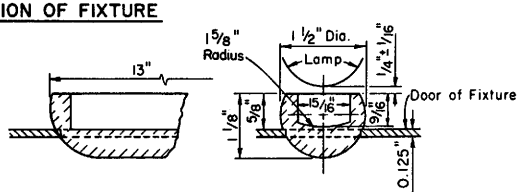
CROSS SECTION OF FIXTURE

*Dimensions of door shall vary to fit fixture shell within 1/16" of actual door recess dimensions

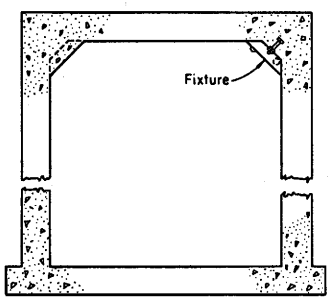
NOTES;
1. The max. tolerance between door and lens shall be 1/64 inch.
2. Casting dimensions of shell are nominal and are subject to such tolerances as are consistant with sound foundry practice.
3. For fixture locations see Highway or Structure Lighting Plan.



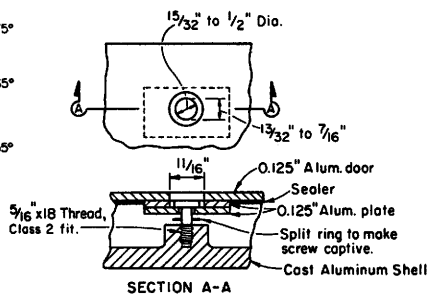
TYPICAL CANDLEPOWER DISTRIBUTION



FIXTURE LENS

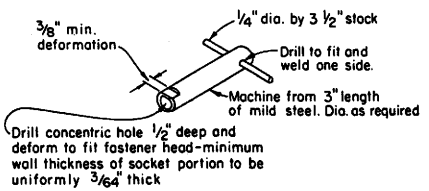


CROSS SECTION OF PEDESTRIAN U.C.



FASTENER DETAIL

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.



SPECIAL SOCKET WRENCH

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL, LIGHTING AND ELECTRICAL SYSTEMS
PEDESTRIAN UNDERCROSSING
FLUORESCENT LIGHTING FIXTURE

NO SCALE

ES-12

STD. PLAN ES-12

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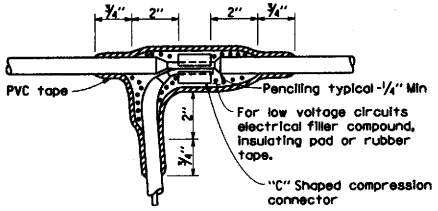
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED ELECTRICAL ENGINEER

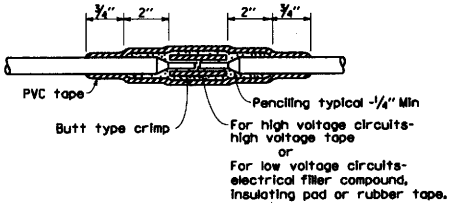
July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER R. L. Donner No. 7405 Exp. 9-30-94 ELECTRICAL STATE OF CALIFORNIA



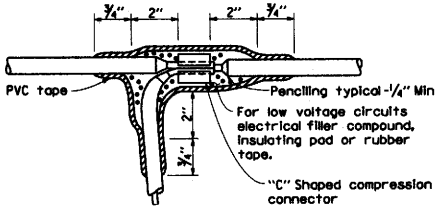
TYPE "C" SPLICE

Between 1 free-end and 1 through conductor



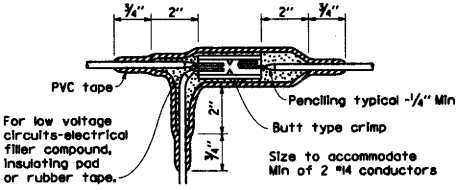
TYPE "S" SPLICE

Between 2 free-ends



TYPE "T" SPLICE

For 3 free-ends



TYPE "ST" SPLICE

For signal conductors

NOTES:

1. All dimensions are minimal.
2. Rubber tapes shall be rolled after application.

INSULATION METHODS

Low Voltage Circuits (0-600 Volts)

METHOD "A" (Used only when specified)

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.
4. Cover entire splice with an electrical insulating coating and allow to dry.

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.
4. Cover entire splice with an electrical insulating coating and allow to dry.

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.
4. Cover entire splice with an electrical insulating coating and allow to dry.

STATE OF CALIFORINA
DEPARTMENT OF TRANSPORTATION

SIGNAL, LIGHTING AND ELECTRICAL SYSTEMS SPLICING DETAILS

NO SCALE

ES-13

STD. PLAN ES-13

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

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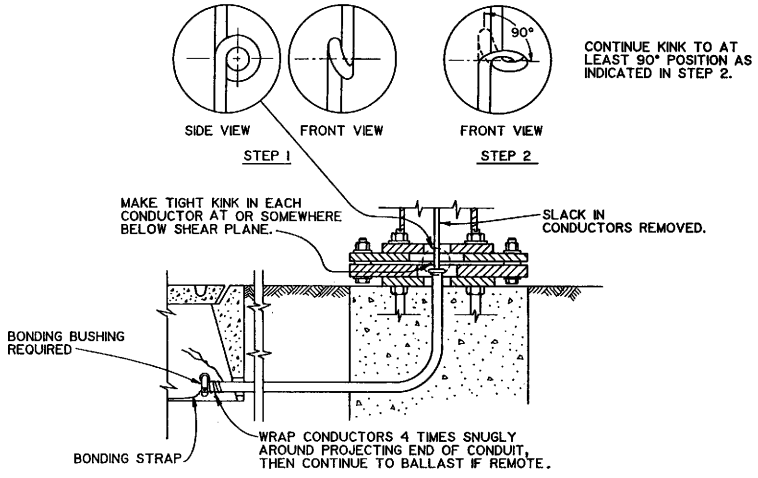
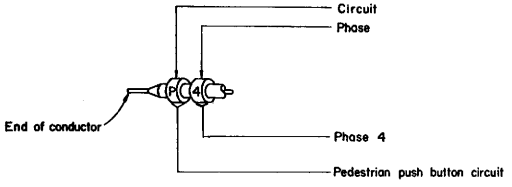
REGISTERED ELECTRICAL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER R.L. Donner No. 7405 Exp. 9-30-94 ELECTRICAL STATE OF CALIFORNIA



KINKING DETAIL FOR SLIP BASE STANDARDS



TYPICAL BANDING OF CONDUCTOR ENDS

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							LOW PRESSURE SODIUM BALLAST					MERCURY LAMP BALLAST	MULTIPLE TO MULTIPLE TRANSFORMERS (PRIMARY SIDE)		
		70 WATT	100 WATT	150 WATT	200 WATT	250 WATT	310 WATT	400 WATT	35 WATT	55 WATT	90 WATT	135 WATT	180 WATT	175 WATT	1KVA	2KVA	3KVA
120 V	250V	5	5	5	5	6	10	10	5	5	8	10	10	10	10	25	35
240V	250 V	5	5	5	5	5	5	5	3	3	4	5	5	5	6	10	20
480V	500-600V	5	5	5	5	5	5	5	2	2	2	3	3	5	3	6	10

FUSE RATINGS FOR FUSED CONNECTORS

LUMINAIRE BALLAST FUSING

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL, LIGHTING AND ELECTRICAL SYSTEMS
WIRING DETAILS AND FUSE RATINGS

NO SCALE

ES-14

STD. PLAN ES-14

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July 1, 1992
PLANS APPROVAL DATE

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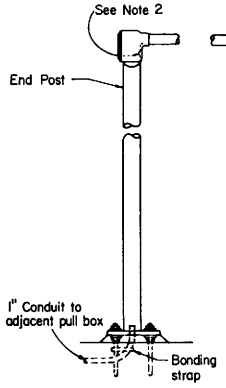
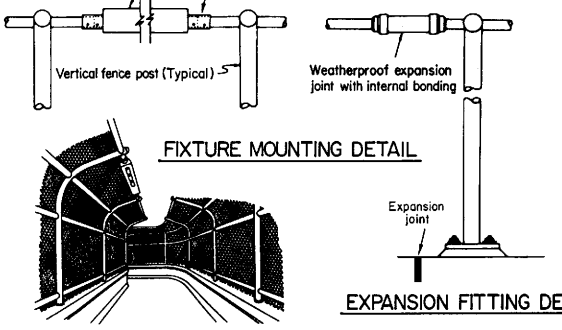


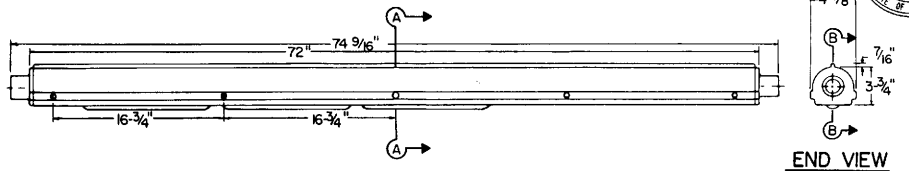
END POST DETAIL



FIXTURE MOUNTING DETAIL

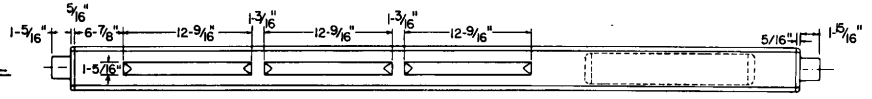
TYPICAL ARRANGEMENT

EXPANSION FITTING DETAIL

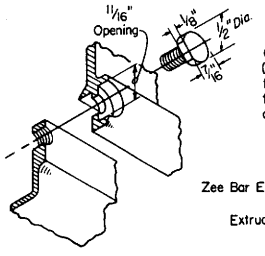


SIDE VIEW

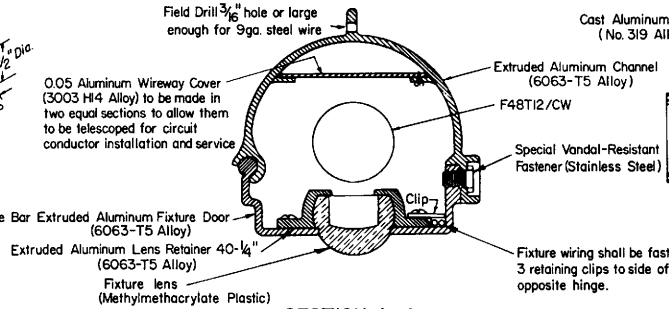
END VIEW



BOTTOM VIEW

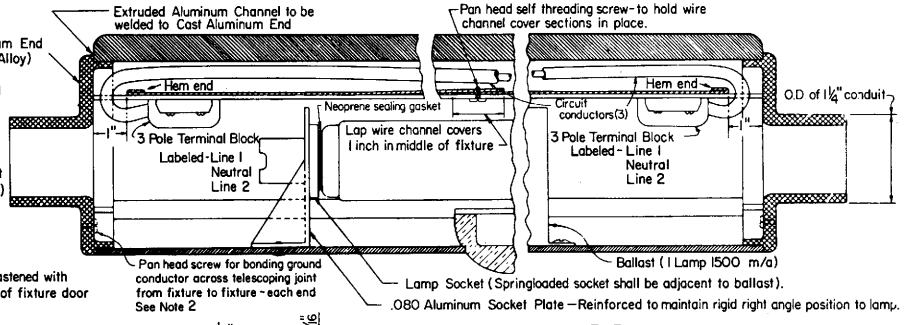


FASTENER DETAIL

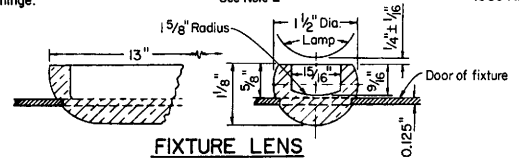


BOTTOM VIEW

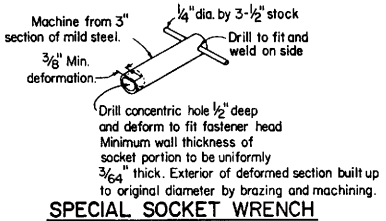
SECTION A-A



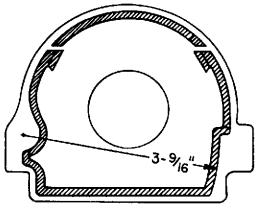
SECTION B-B



FIXTURE LENS



SPECIAL SOCKET WRENCH



INSIDE VIEW OF END CASTING

NOTE: 1. The max. tolerance between door & lens is 1/64". Casting dimensions of shell are nominal and are subject to such tolerances as are consistant with sound foundry practice.
2. Continuous grounding between fixtures and from fixture to end post carrying conductors shall be provided.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL, LIGHTING AND ELECTRICAL SYSTEMS
PEDESTRIAN OVERCROSSING
FLUORESCENT LIGHTING FIXTURE

NO SCALE

ES-15

STD. PLAN ES-15

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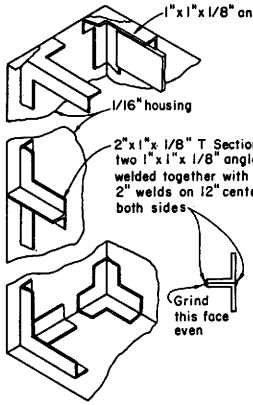
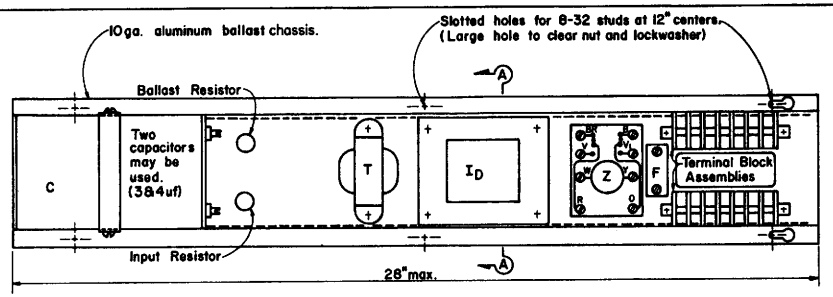
REGISTERED ELECTRICAL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

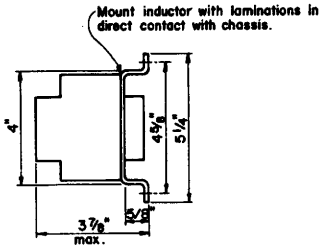
REGISTERED PROFESSIONAL ENGINEER
R.L. Donner
No. 7405
Exp. 9-30-94
ELECTRICAL
STATE OF CALIFORNIA



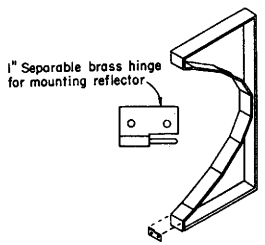
FRAMING DETAILS



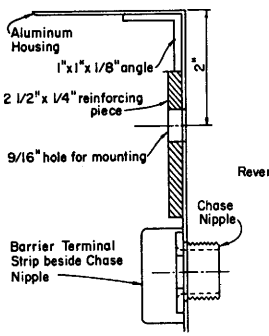
BALLAST CHASSIS COMPONENT LAYOUT



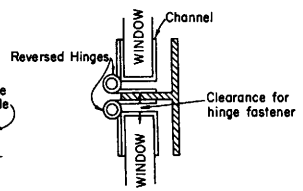
SECTION A-A



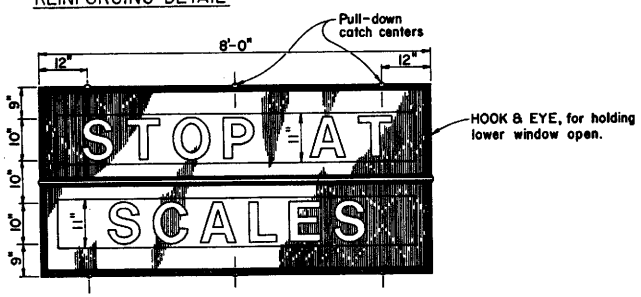
REFLECTOR RIB & HINGE DETAILS



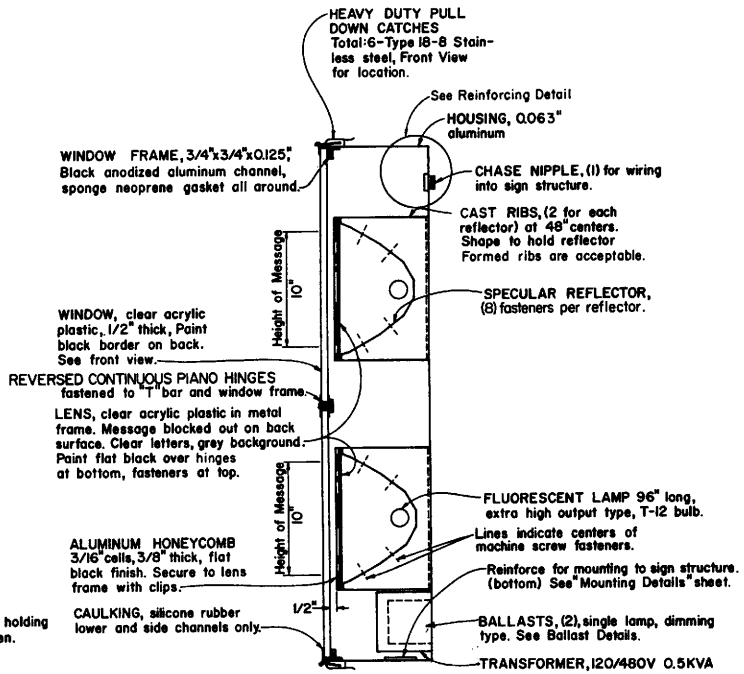
REINFORCING DETAIL



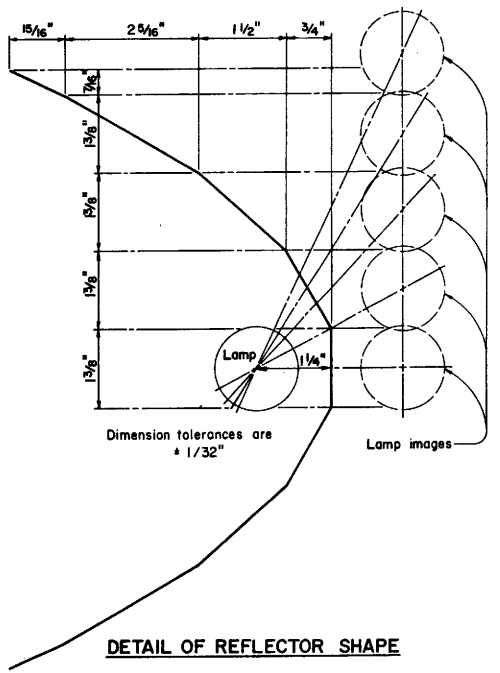
HINGE DETAIL



FRONT VIEW OF SIGN UNIT



CROSS-SECTION OF SIGN



DETAIL OF REFLECTOR SHAPE

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL, LIGHTING AND ELECTRICAL SYSTEMS
EXTINGUISHABLE MESSAGE SIGN
10" LETTERS

NO SCALE

ES-27A

STD. PLAN ES-27A

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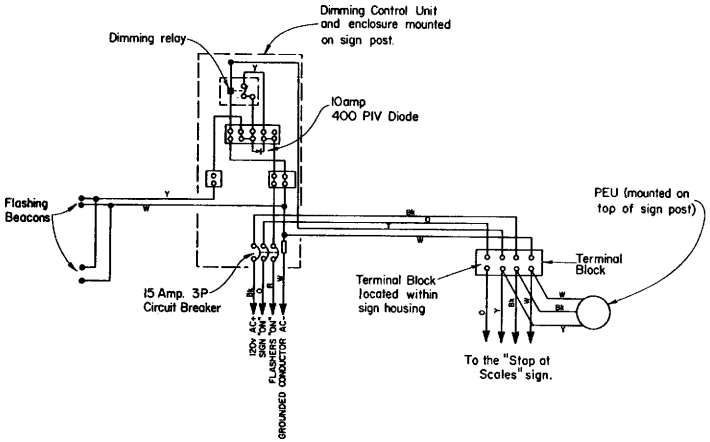
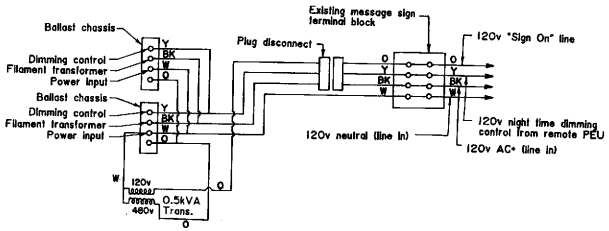
REGISTERED ELECTRICAL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

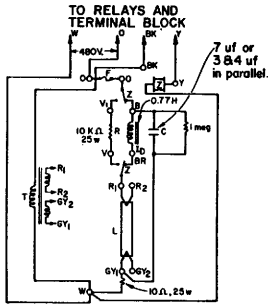
REGISTERED PROFESSIONAL ENGINEER R.L. Donner No. 7405 Exp. 9-30-94 ELECTRICAL STATE OF CALIFORNIA



CONTROL CIRCUITS FROM CONTROL ASSEMBLY



POWER AND CONTROL DIAGRAM



BALLAST WIRING DIAGRAM

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 filament 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, 5.0 Amp., 600v, 13/32" D x 1½" L, non-time delay type.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL, LIGHTING AND ELECTRICAL SYSTEMS
EXTINGUISHABLE MESSAGE SIGN
10" LETTERS

NO SCALE

ES-27B

STD. PLAN ES-27B

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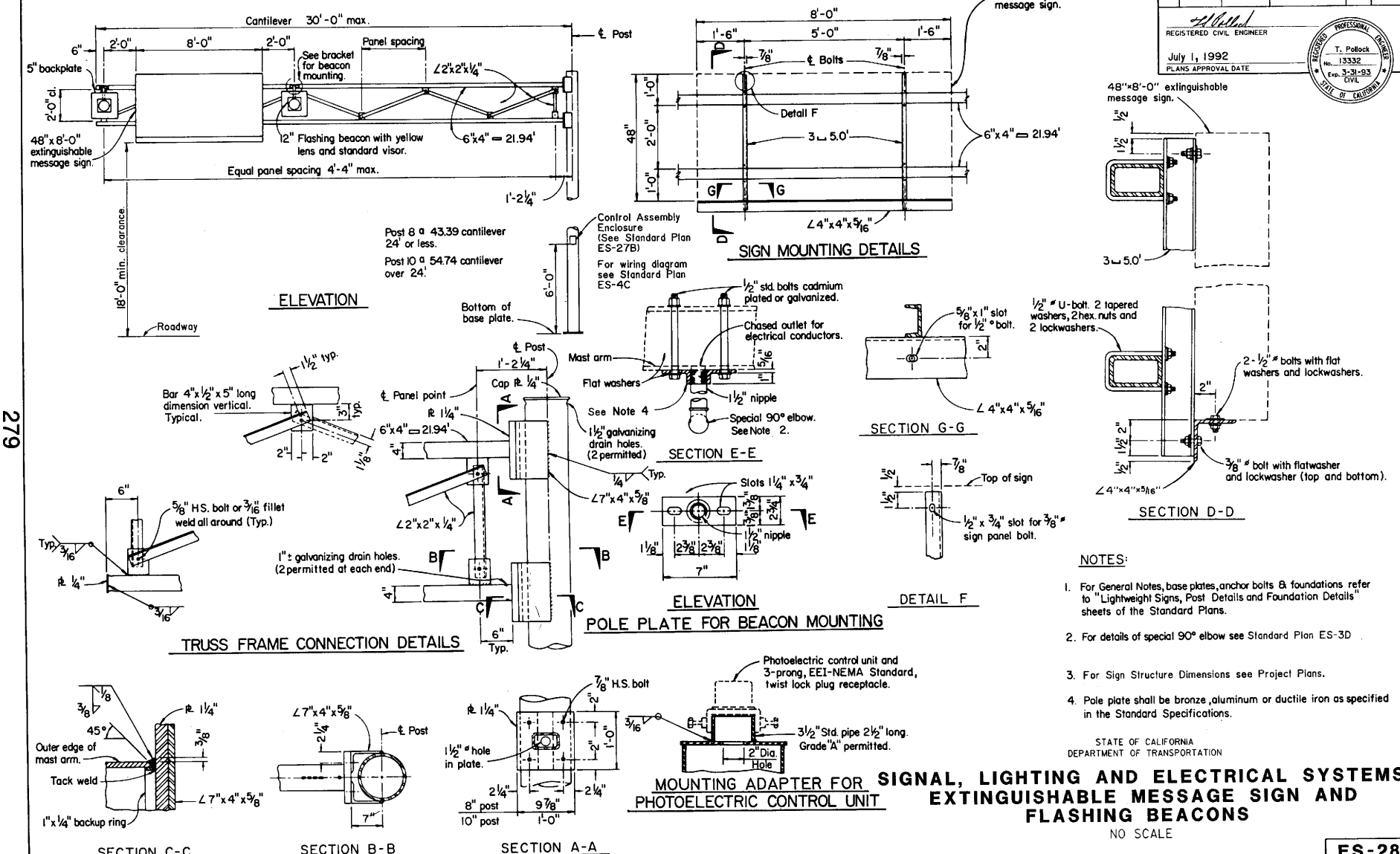
REGISTERED CIVIL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER T. Pollock No. 13332 Exp. 3-31-93 CIVIL STATE OF CALIFORNIA



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 Standard Plan ES-3D.
3. For Sign Structure Dimensions see Project Plans.
4. Pole plate shall be bronze, aluminum or ductile iron as specified in the Standard Specifications.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGNAL, LIGHTING AND ELECTRICAL SYSTEMS EXTINGUISHABLE MESSAGE SIGN AND FLASHING BEACONS

NO SCALE

ES-28

STD. PLAN ES-28

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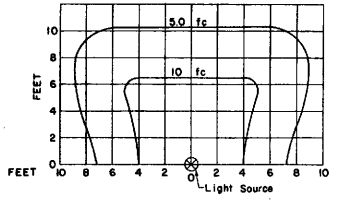
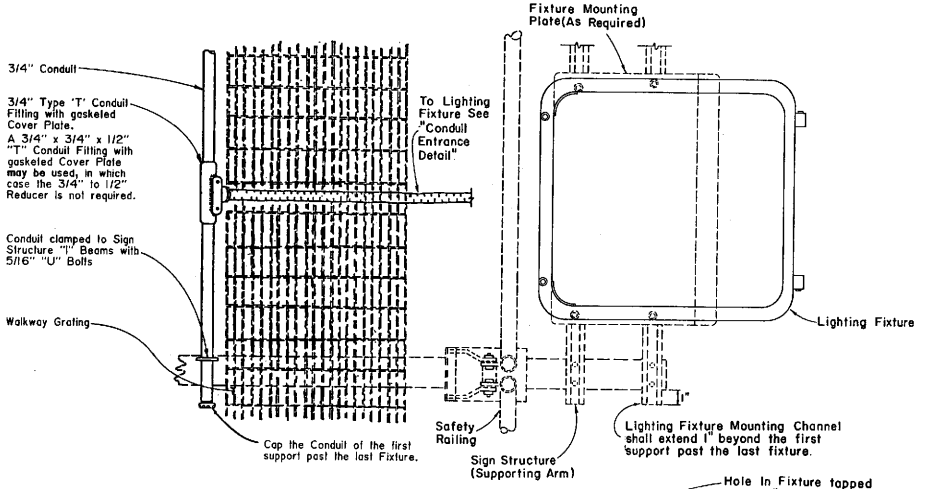
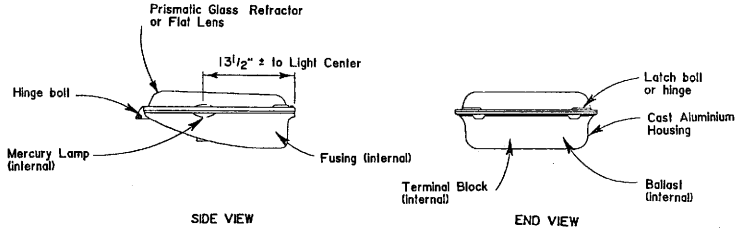


NOTES:
1. Curves represent the minimum footcandles of initial illumination on a 10' by 20' panel.
2. The footcandles shown are with the fixture attached to the Light Fixture Mounting Channel which places the center of the source 56" in front of panel and 1 foot below the bottom edge.
3. Applicable Lamp:

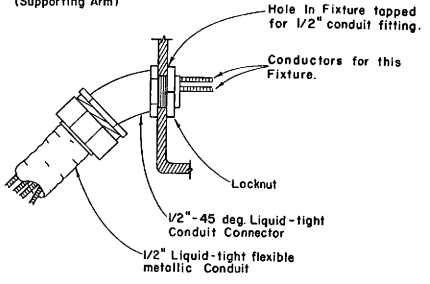
   175-Watt Deluxe White Mercury, H 39KC - RI75/DX rated at approximately 8,150 lumens.

LIGHTING FIXTURE ISOFOOTCANDLE DIAGRAM





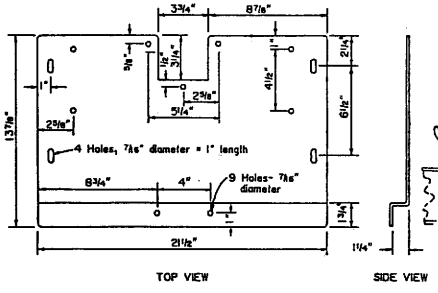
175 WATT MERCURY SIGN LIGHTING FIXTURE (TYPICAL)



CONDUIT ENTRANCE DETAIL

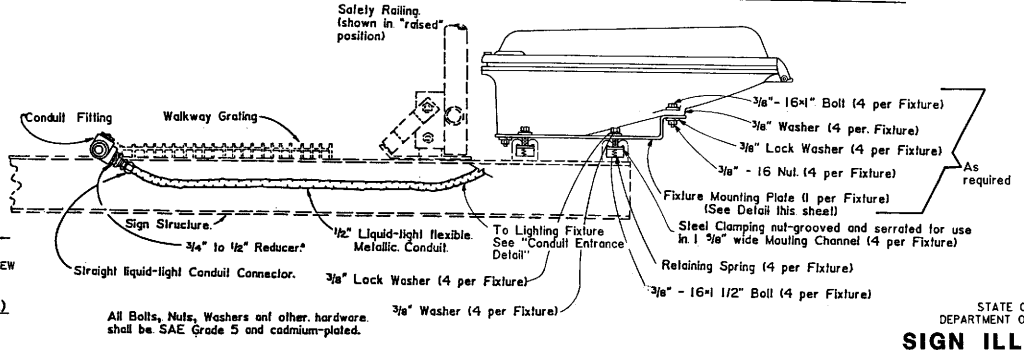
LENGTH OF PANEL (FEET)	NUMBER OF FIXTURES (EACH)	FIXTURE SPACING (INCHES) SEE NOTES #1 & #2	LAMP SIZE (WATTS)	SIGN LOAD (WATTS)
5	1	30	175	202
6		36		
7		42		
8		48		
9		54		
10		60		
11		66		
12		72		
13		78		
14		84		
15		90		
16		96		
17	2	51;102		404
18		54;108		
19		57;114		
20		60;120		
21		63;126		
22		66;132		
23		69;138		
24		72;144		
25		75;150		
26		78;156		
27		81;162		
28		84;168		
29		87;174		
30		90;180		
31		93;186		
32		96;192		
33	3	66;132		606
34		68;136		
35		70;140		
36		72;144		
37		74;148		
38		76;152		
39		78;156		
40		80;160		
41		82;164		
42		84;168		
43		86;172		
44		88;176		
45		90;180		
46		92;184		
47		94;188		
48		96;192		
49	4	73.5;147		808
50		75.0;150		
51		76.5;153		
52		78.0;156		
53		79.5;159		
54		81.0;162		
55		82.5;165		
56		84.0;168		
57		85.5;171		
58		87.0;174		
59		88.5;177		
60		90.0;180		
61		91.5;183		
62		93.0;186		
63		94.5;189		
64		96.0;192		

NOTES:
1. The frist 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 Panel (and spaces) shall be considered shall be considered a single Panel.
3. Phisical configuration and mounting details may vary from what shown.
4. Separate pair of conductors shall be provided between Sign Control Enclosure and each fixture.



SIGN ILLUMINATION FIXTURE MOUNTING PLATE (TYPICAL)

- Material: 10 Ga Hot-dip Galvanized Sheet Steel after fabrication
- Left side is symmetrical with right side.



All Bolts, Nuts, Washers and other. hardware. shall be SAE Grade 5 and cadmium-plated.

LIGHTING FIXTURE MOUNTING DETAIL (TYPICAL)

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGN ILLUMINATION
MERCURY SIGN ILLUMINATION EQUIPMENT

NO SCALE

ES-29

STD. PLAN ES-29

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

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REGISTERED ELECTRICAL ENGINEER

July 1, 1992
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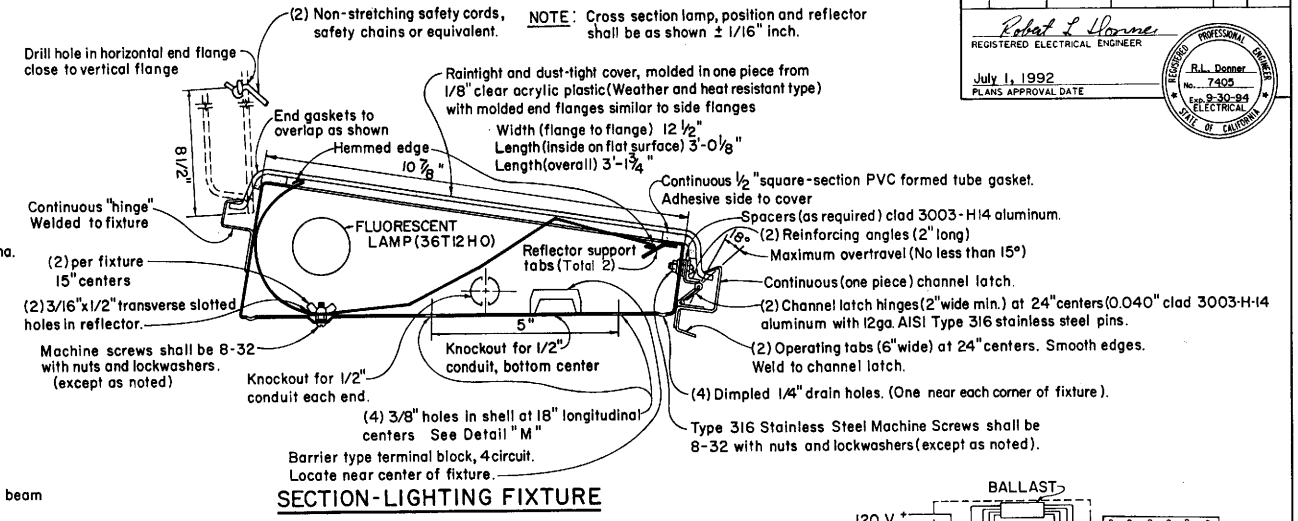
REGISTERED PROFESSIONAL ENGINEER R.L. Donner No. 7405 Exp. 9-30-94 ELECTRICAL STATE OF CALIFORNIA

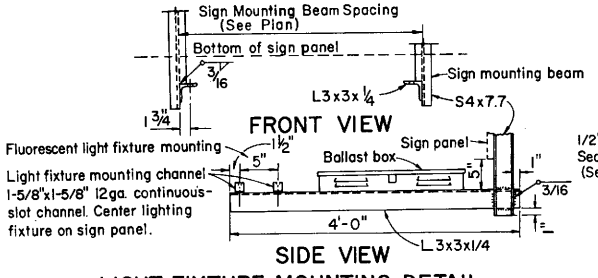
—NOTES—

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. An alternative Cover design shall be submitted for approval.
4. Ballasts shall be one, two or three lamp types as required, rated at 800 ma.
5. Each ballast shall be fused with a 1¼" x ¼" slow-blow glass tube fuse.
6. Fuseholder shall be a panel mounted type, with screw type finger knob.
7. 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.

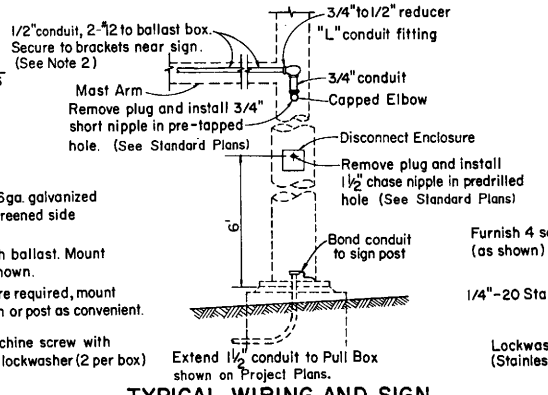
NOTE: Cross section lamp, position and reflector shall be as shown ± 1/16" inch.



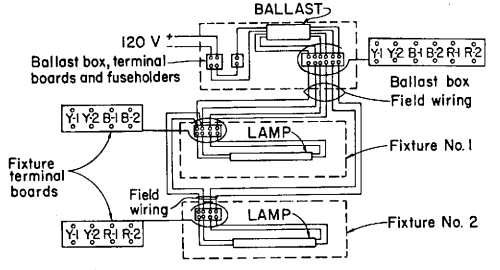
SECTION-LIGHTING FIXTURE



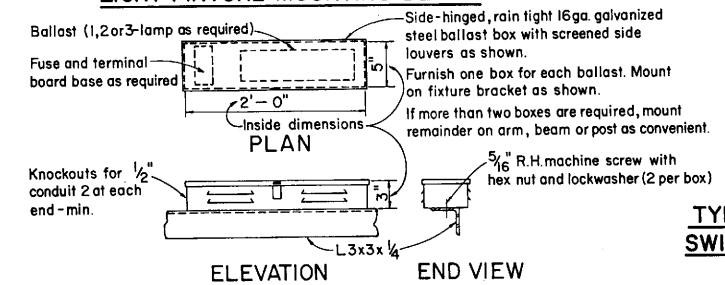
LIGHT FIXTURE MOUNTING DETAIL



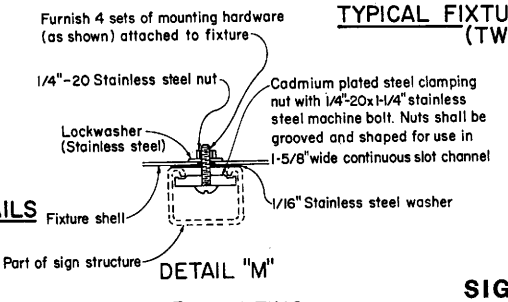
TYPICAL WIRING AND SIGN SWITCH INSTALLATION DETAILS



TYPICAL FIXTURE WIRING DIAGRAM (TWO LAMP)



BALLAST BOX DETAILS



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

SIGN ILLUMINATION 36" FLUORESCENT SIGN ILLUMINATION EQUIPMENT

NO SCALE

ES-30

STD. PLAN ES-30

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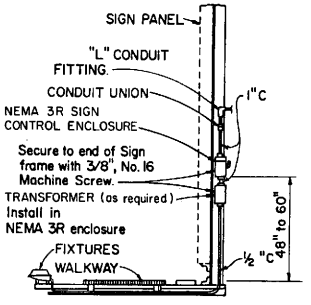
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

Robert L. Donner
REGISTERED ELECTRICAL ENGINEER

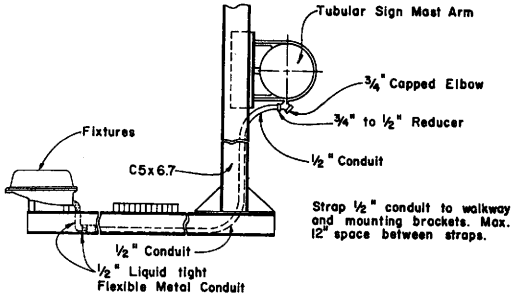
July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
R.L. Donner
No. 7405
Exp. 9-30-94
ELECTRICAL
STATE OF CALIFORNIA

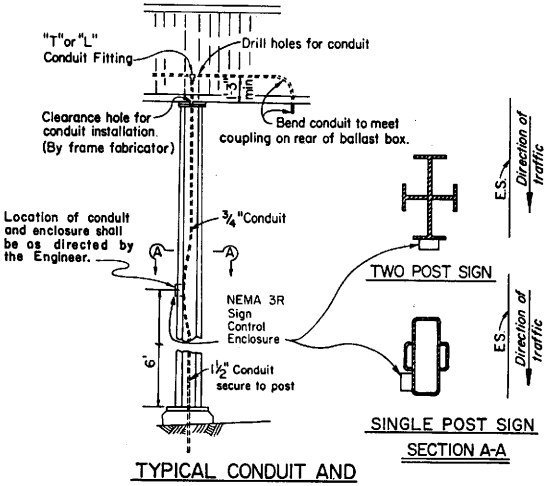


TYPICAL DETAIL BRIDGE MOUNTED SIGN

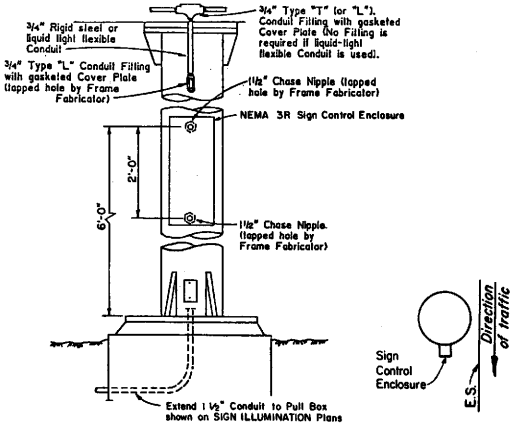
Sign control enclosure shall be readily accessible from the sign walkway.



TYPICAL CONDUIT INSTALLATION FOR TUBULAR OVERHEAD SIGNS



TYPICAL CONDUIT AND SIGN CONTROL INSTALLATION FOR BOX BEAM POST



TYPICAL CONDUIT AND SIGN CONTROL INSTALLATION FOR ROUND POST

NOTES

1. 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.
2. See Standard Plans for Overhead Signs and Frame Juncture Details for photoelectric unit installation.
3. Enclosures and straps shall be secured by ¼" maximum size screws.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGN ILLUMINATION
SIGN ILLUMINATION EQUIPMENT

NO SCALE

ES-32A

STD. PLAN ES-32A

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

REGISTERED ELECTRICAL ENGINEER

July 1, 1992
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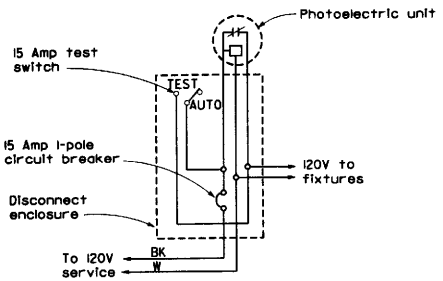
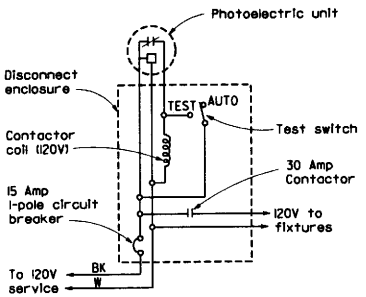


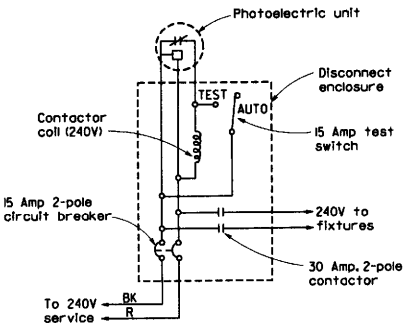
TYPE SC1 SIGN CONTROL

For 120V unswitched sign circuit with no more than 4 mercury fixtures

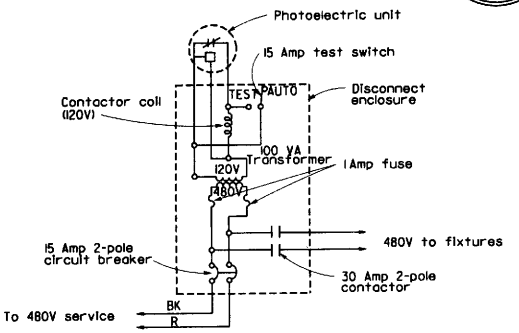


TYPE SC2 SIGN CONTROL

For 120V Unswitched Sign Circuit

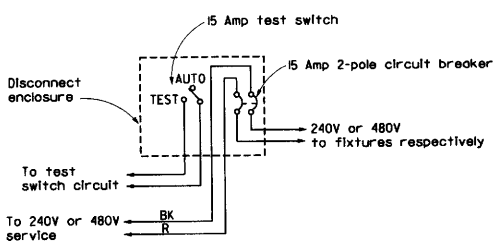


(For 240V Unswitched Sign Circuit)



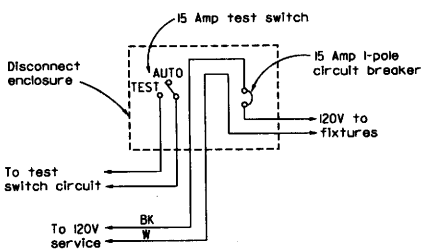
(For 480V Unswitched Sign Circuit)

TYPE SC3 SIGN CONTROL



TYPE SC4 SIGN CONTROL

For 240V or 480V switched sign circuit
See Note 4 for type SC4A



TYPE SC5 SIGN CONTROL

For 120V Switched Sign Circuit
See Note 4 for type SC5A

NOTES: (FOR SIGN CONTROLS)

1. The ballast voltages of fixtures shall match line service voltages.
2. Voltage ratings of sign control equipment shall conform to the service voltages indicated on the plans.
3. Terminal strip shall be provided for wiring to fixtures. Separate pair of terminals shall be provided for each fixture.
4. Types SC4A and SC5A are similar to Types SC4 and SC5 respectively except test switch and wiring are not required.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGN ILLUMINATION
SIGN ILLUMINATION CONTROL

NO SCALE

ES-32B

STD. PLAN ES-32B

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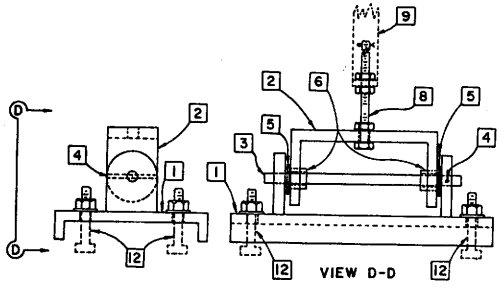
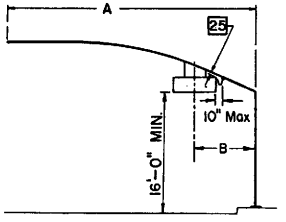
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

Robert L. Donner
REGISTERED ELECTRICAL ENGINEER

July 1, 1992
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
R.L. Donner
No. 7405
Exp. 9-30-94
ELECTRICAL
STATE OF CALIFORNIA

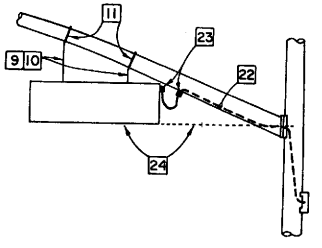




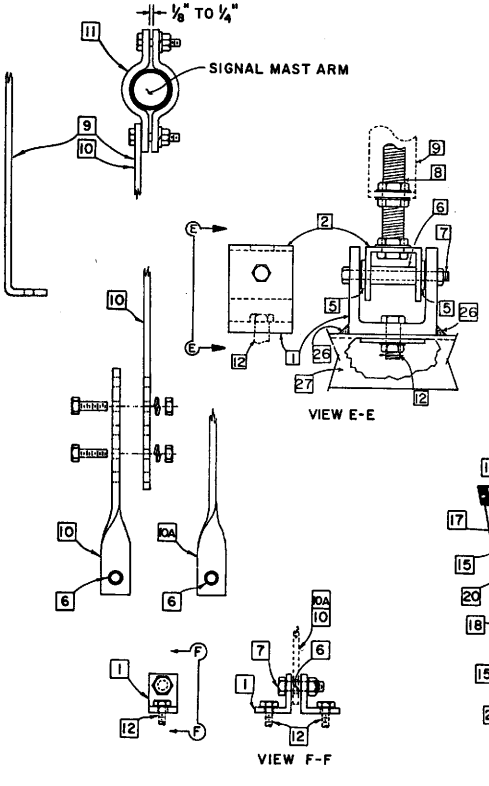
SIGN PLACEMENT

A	B *	
	6' SIGN	8' SIGN
20	7' - 9"	8' - 9"
25	9' - 1"	10' - 1"
30	9' - 6"	10' - 6"
35	10' - 6"	11' - 6"
40	12' - 6"	13' - 6"
45	12' - 6"	13' - 6"
50	12' - 6"	13' - 6"
55	12' - 6"	13' - 6"

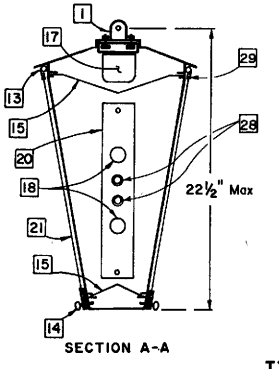
SIGN PLACEMENT
* For 8' sign, Poles of 80 mph wind velocity shall be used.



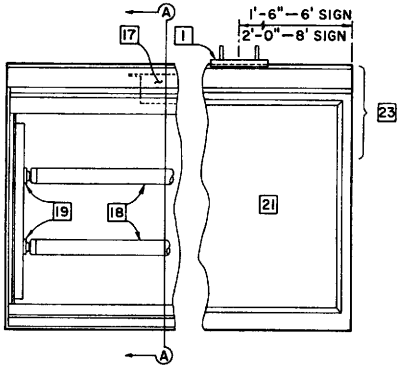
SIGN MOUNTING



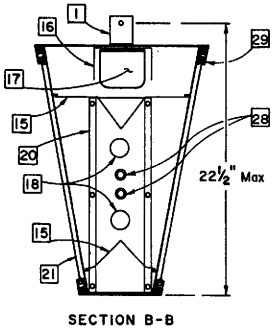
MOUNTING ASSEMBLY OPTIONS



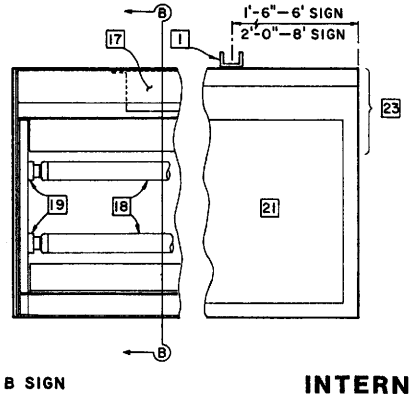
SECTION A-A



TYPE A SIGN



SECTION B-B



TYPE B SIGN

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—1/4" FILLET WELD, 1 1/4" LONG
27—SIGN FRAME
28—FUSE HOLDER AND FUSE
29—CLOSED CELL NEOPRENE GASKET (CONTINUOUS)

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SIGN ILLUMINATION
INTERNALLY ILLUMINATED STREET NAME SIGN

NO SCALE

ES-33

STD. PLAN ES-33

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