STANDARD PLANS

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

JANUARY, 1981

ISSUED BY
DEPARTMENT OF TRANSPORTATION

Caltrans

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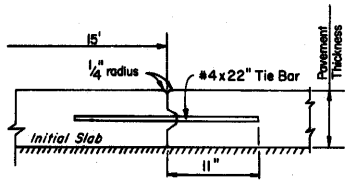
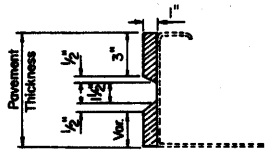


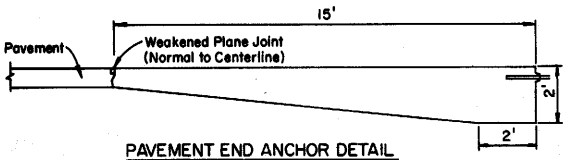
SECTION A-A

TRANSVERSE CONTACT JOINT WITH KEYWAY AND TIE BARS

NOTE- Transverse Contact Joints with Keyway and Tie Bars shall be used at all construction joints, and elsewhere if ordered by the Engineer. Tie Bars to be placed in the middle 1/3 of the slab thickness.

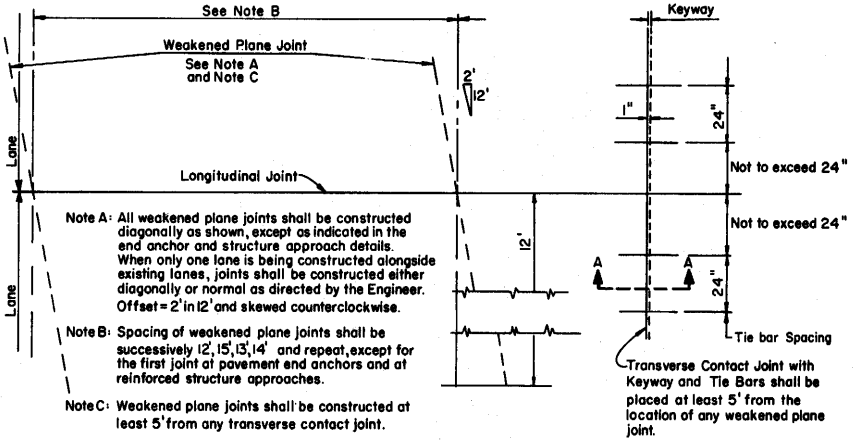


DETAIL OF METAL OR WOODEN INSERTS TO BE PLACED ON FORM



PAVEMENT END ANCHOR DETAIL

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

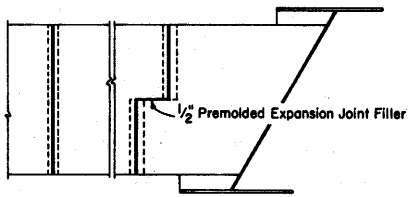


Note A: All weakened plane joints shall be constructed diagonally as shown, except as indicated in the end anchor and structure approach details. When only one lane is being constructed alongside existing lanes, joints shall be constructed either diagonally or normal as directed by the Engineer. Offset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

Note B: Spacing of weakened plane joints shall be successively 12', 15', 13', 14' and repeat, except for the first joint at pavement end anchors and at reinforced structure approaches.

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

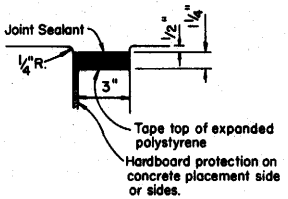
PLAN - PAVEMENT



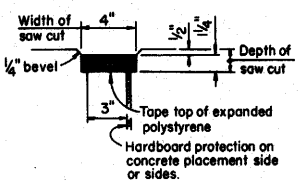
NORMAL JOINT STAGGERED JOINT

PLAN

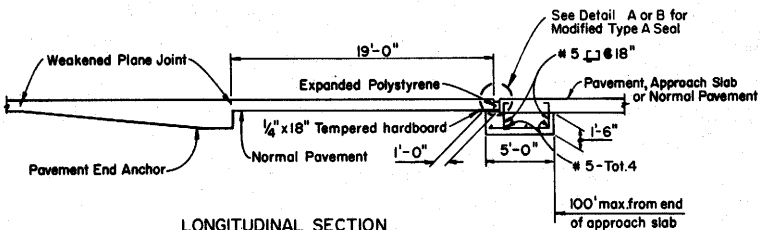
(Pavement Pressure Relief Joints when Placed at Ends of Approach Slabs).



FORMED JOINT DETAIL A



OPTIONAL SAW CUT DETAIL B



LONGITUDINAL SECTION

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

PAVEMENT PRESSURE RELIEF JOINT

DISTRICT	COUNTY	ROUTE	POST MILES	SHEET NO.	TOTAL SHEETS

Chief, Office of Planning and Design
Registered Civil Engineer No. 8623

Approved July 1, 1980

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

P.C.C. PAVING DETAILS

A35-A

A35-A

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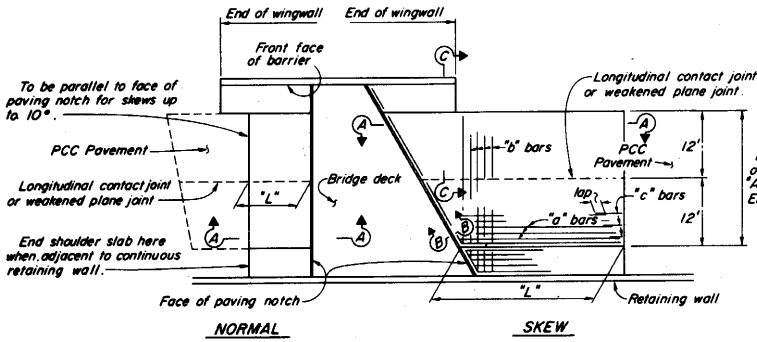
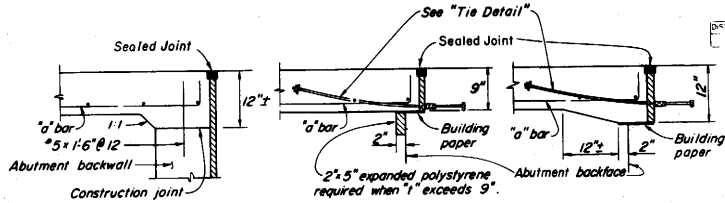
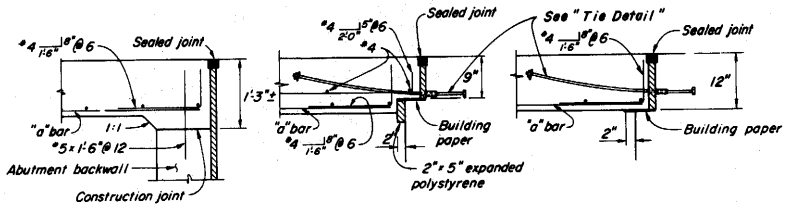


PLAN



ABUTMENT WITH BACKWALL — 9" PAVING NOTCH — 12" PAVING NOTCH

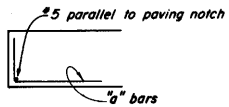
TYPE 1 APPROACH SLAB



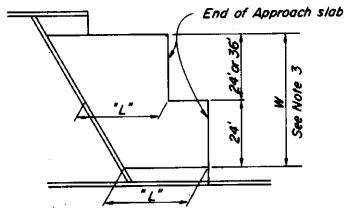
ABUTMENT WITH BACKWALL — 9" PAVING NOTCH — 12" PAVING NOTCH

TYPE 2 APPROACH SLAB

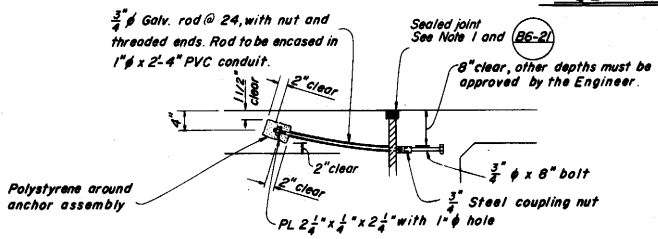
DETAIL "G"



SECTION B-B



APPROACH SLAB - END STAGGER DETAIL



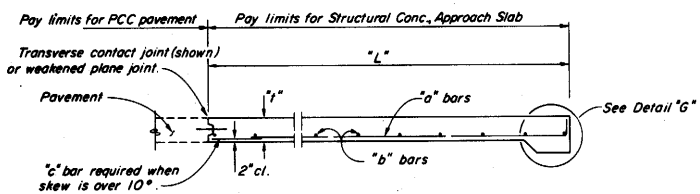
TIE DETAIL

Place Parallel to ℄ Roadway

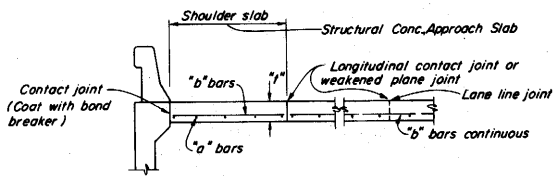
NOTES:

1. Sealed joint M.R. (Movement Rating) as shown on other detail sheets. Adjust bar reinforcement to clear a sawcut for sealed joint, when required.
2. At the Contractor's option, the overall width of approach slab may be 2" (max) less than the pavement width to accomodate slipform pavers.
3. When W is greater than 36', the end of approach slab shall be staggered. The stagger widths shall be in multiples of 24' with one 36' width permitted. At the Contractor's option, and upon the Engineer's approval, the end stagger detail may be altered to accomodate paving operations. The reinforcement shall be adjusted so that the approach slab is continuously fully reinforced to the transverse joint.

Approach Slab Type	"L"	"t"	Bar Reinforcement Table			
			"a" bars	"b" bars	"c" bars	Lap
Type 1	10'-6"	0.65'	#6 x 10'-2" @ 6	#4 @ 12	#4 @ 12	1'-11"
Type 2	30'-0"	1.00'	#8 x 29'-8" @ 6	#5 @ 12	#5 @ 12	2'-4"



SECTION A-A



SECTION C-C

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

APPROACH SLAB

A 35-B

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

APPROVED July 1, 1980

A 35-B

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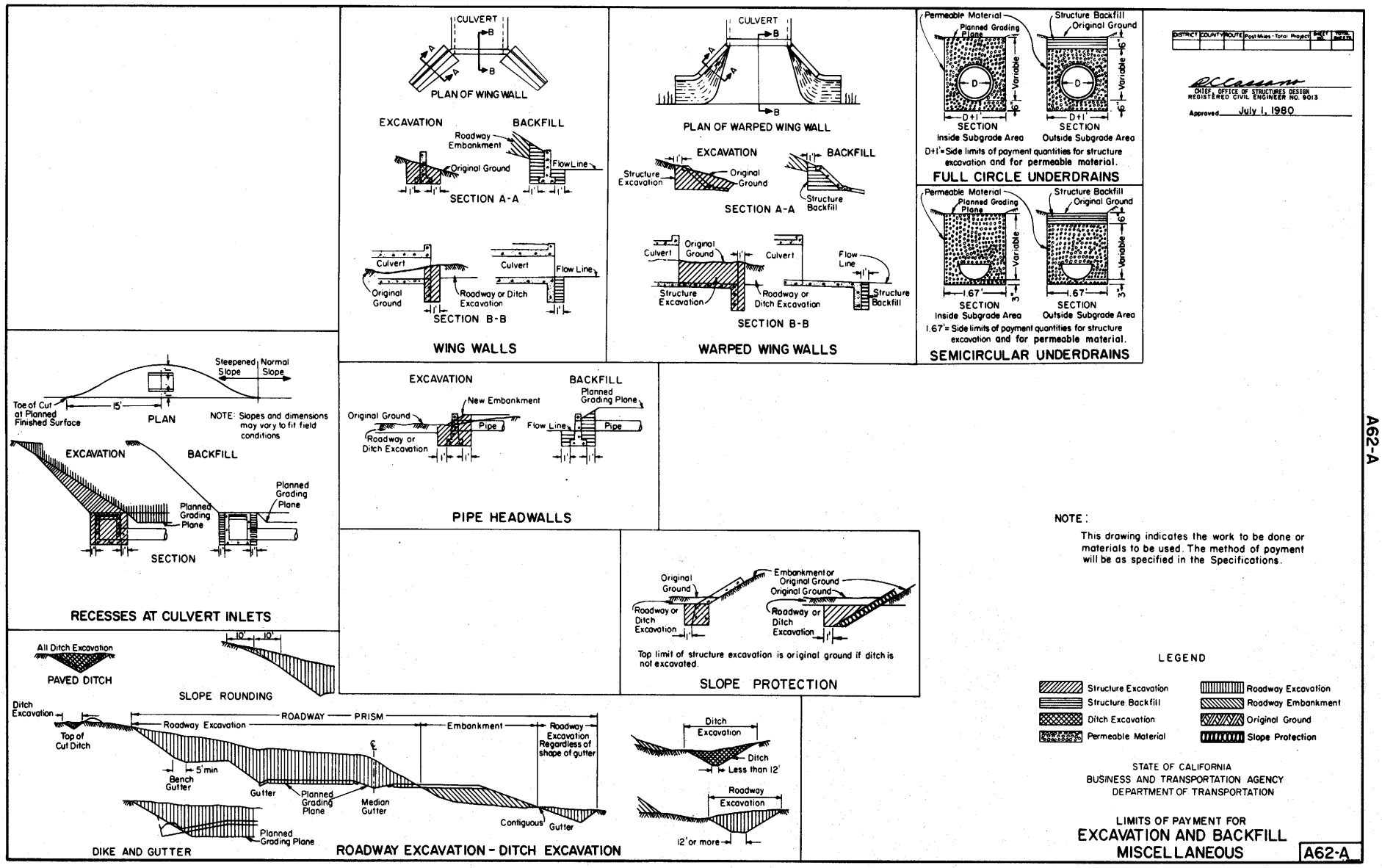

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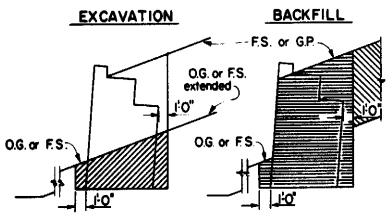
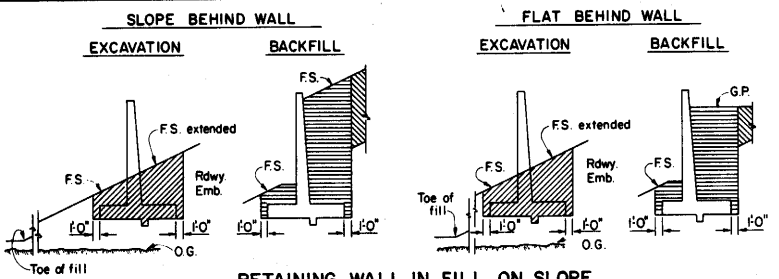
DIST	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	REGD. PROJ. ENG.	TOTAL PROJECT

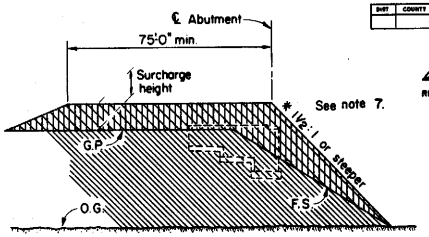
CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013
APPROVED July 1, 1980



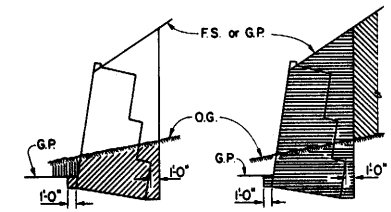
CRIB WALL, ON SLOPE



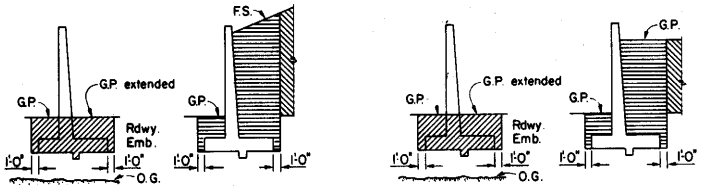
RETAINING WALL IN FILL, ON SLOPE



ELEVATION



REINFORCED CONCRETE or TIMBER CRIB WALL



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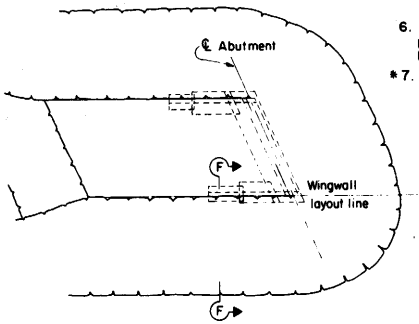
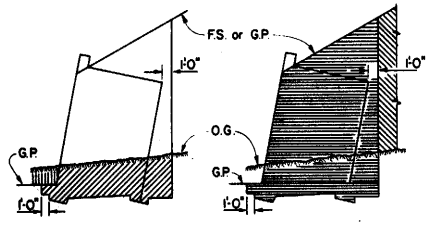
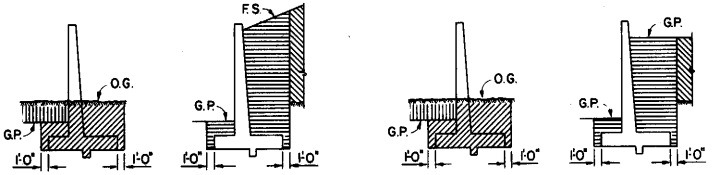


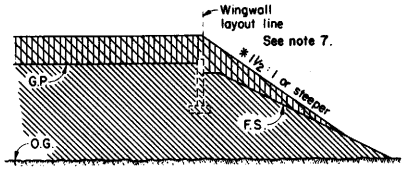
PLAN



METAL CRIB WALL

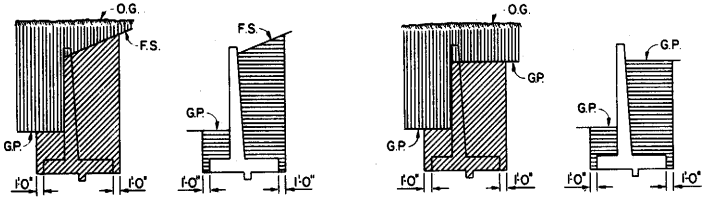


RETAINING WALL IN FILL & CUT



SECTION F-F

BRIDGE EMBANKMENT SURCHARGE



RETAINING WALL IN CUT

SURCHARGE NOTES

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

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

ABBREVIATIONS

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

LEGEND

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

GENERAL NOTES:

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

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

LIMITS OF PAYMENT FOR
EXCAVATION AND BACKFILL
BRIDGE SURCHARGE AND WALL

A62-B

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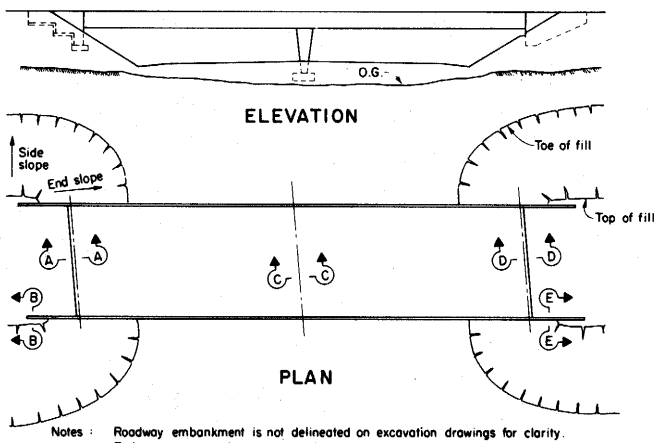
DIST	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	PROJ. NO.	SHEET NO.

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

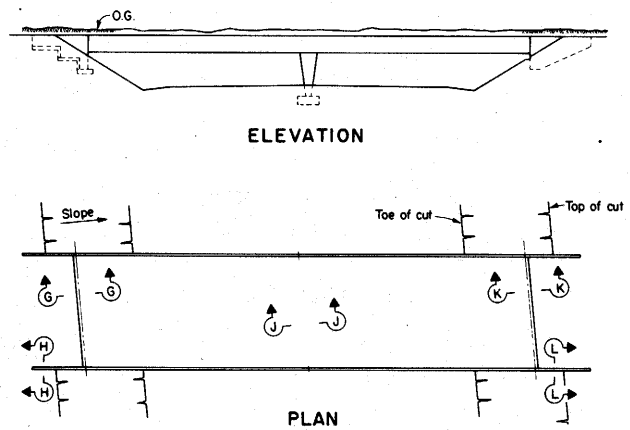
APPROVED July 1, 1980

IN FILL



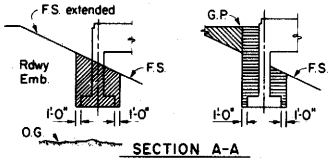
Notes: Roadway embankment is not delineated on excavation drawings for clarity. Embankment must be in place before structure excavation is made.

IN CUT

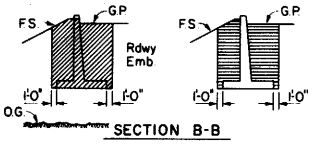


Note: If no roadway excavation is involved at bridge, structure excavation is measured from original ground.

EXCAVATION — BACKFILL



SECTION A-A



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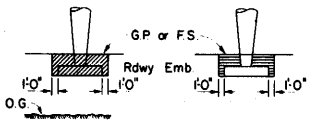
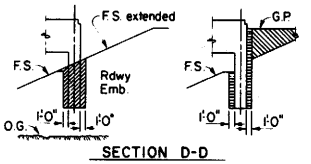


SECTION C-C

EXCAVATION — BACKFILL



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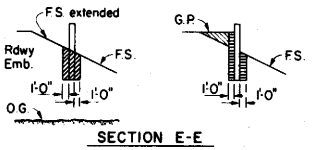
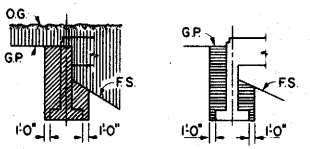
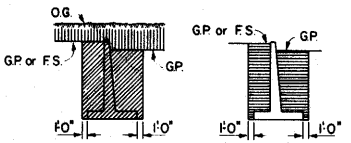


SECTION E-E

EXCAVATION — BACKFILL



SECTION G-G



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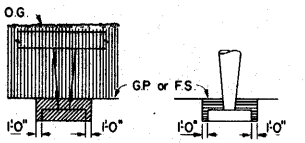
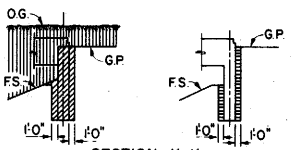
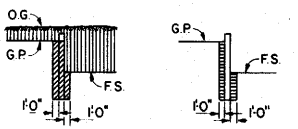


SECTION J-J

EXCAVATION — BACKFILL



SECTION K-K



SECTION L-L

ABBREVIATIONS

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

LEGEND

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

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

LIMITS OF PAYMENT FOR
EXCAVATION AND BACKFILL
BRIDGE

A62-C

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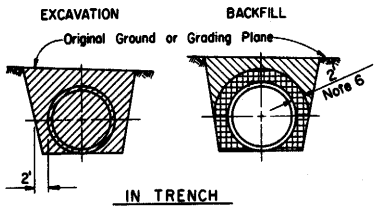

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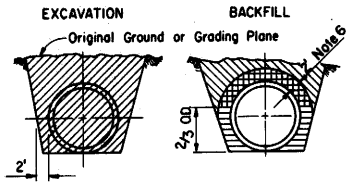

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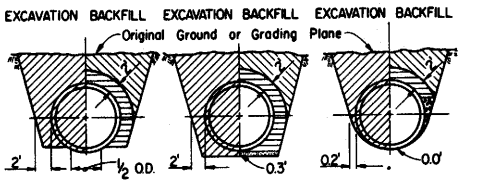
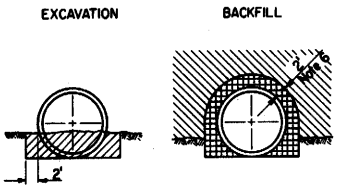


SHAPED BEDDING | SAND BEDDING | SOIL CEMENT BEDDING

IN TRENCH



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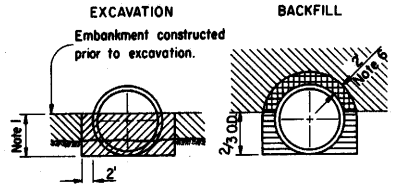

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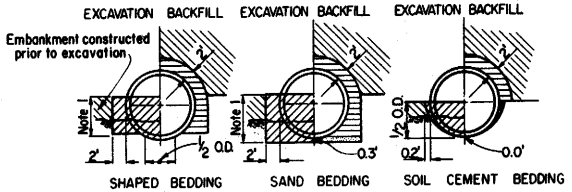


SHAPED BEDDING | SAND BEDDING | SOIL CEMENT BEDDING

IN EMBANKMENT

MINIMUM ALLOWABLE CLASSES OF RCP FOR METHOD 1

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

Notes 8 and 9

CIRCULAR REINFORCED CONCRETE PIPE

METHOD 1

Pipes with inside diameter of 78" and smaller.

MINIMUM ALLOWABLE CLASSES OF RCP FOR METHOD 2

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

Notes 8 and 9

REINFORCED CONCRETE PIPE AND ASBESTOS-CEMENT PIPE

Note 5

METHOD 2

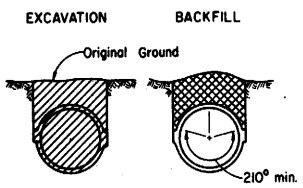
MINIMUM ALLOWABLE CLASSES OF RCP FOR METHOD 3

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

Notes 7, 8 and 9

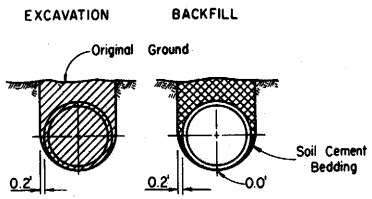
CIRCULAR REINFORCED CONCRETE PIPE

METHOD 3



IN TRENCH ONLY

CAST-IN-PLACE CONCRETE PIPE



IN TRENCH ONLY

NON-REINFORCED PRECAST CONCRETE PIPE

LEGEND

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

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

R.C.P. = Reinforced concrete pipe.

NOTES

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

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

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

EXCAVATION AND BACKFILL DETAILS CONCRETE AND ASBESTOS-CEMENT PIPE CULVERTS

A62-D

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013
DATE APPROVED July 1, 1980

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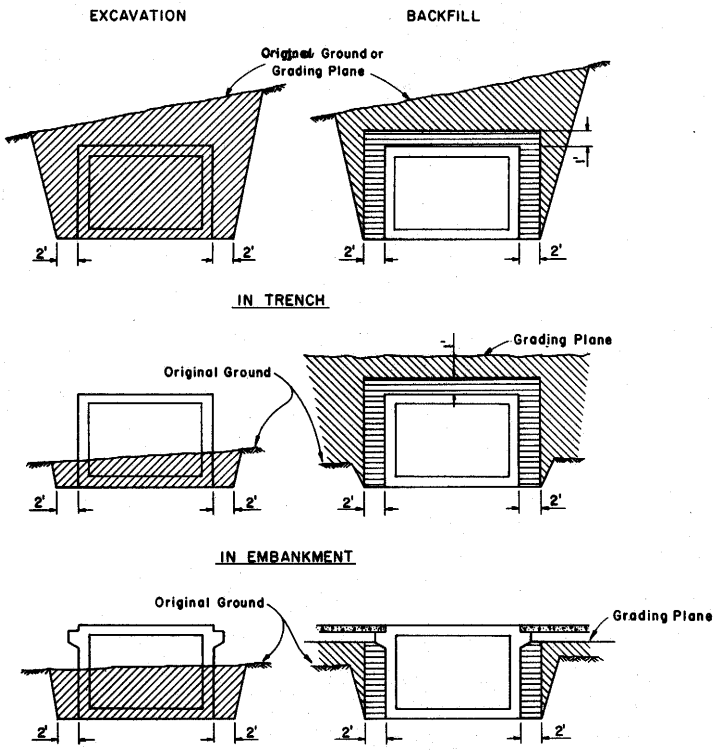
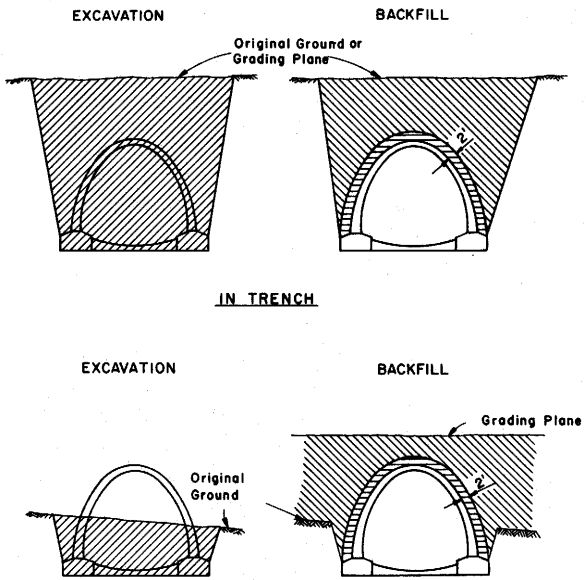
CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 8013

DATE APPROVED July 1, 1980



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
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

EXCAVATION AND BACKFILL DETAILS
REINFORCED CONCRETE BOX AND ARCH CULVERTS

A62-E

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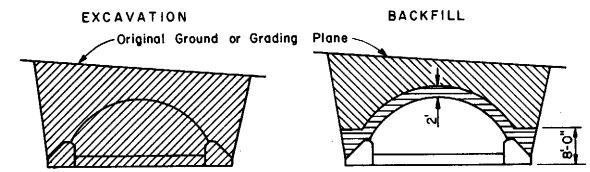
Dist.	County	Route	Post Mile Total Project	Sheet No.	Total Sheets

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER No. 8013

DATE APPROVED July 1, 1980



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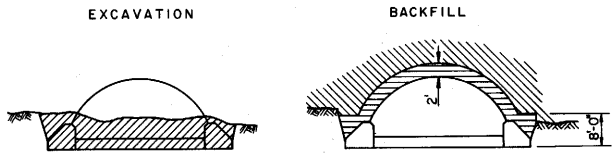
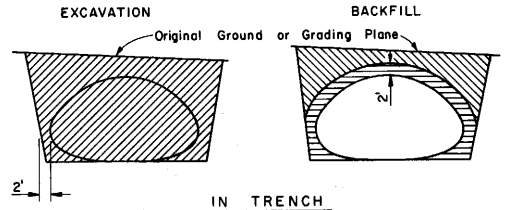


IN EMBANKMENT

STRUCTURAL STEEL PLATE ARCHES



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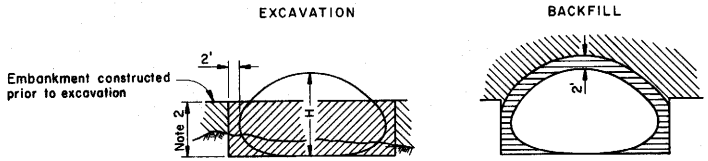

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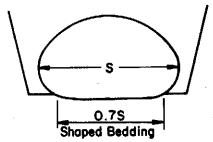
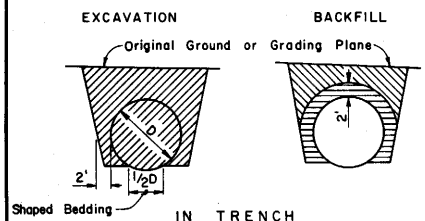
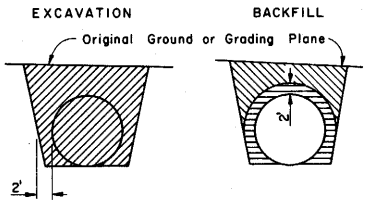


SHAPED BEDDING
S= Larger than 84"

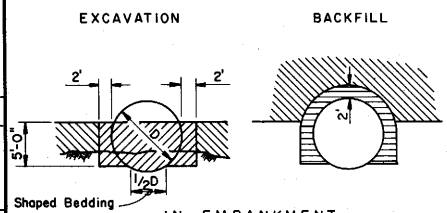
STRUCTURAL STEEL PLATE PIPE ARCHES AND VEHICULAR UNDERCROSSING



IN TRENCH

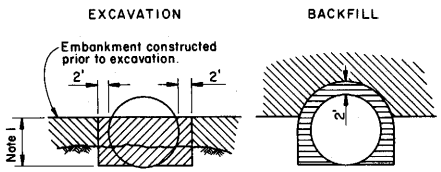


IN TRENCH



IN EMBANKMENT

PIPES
Larger than 84"



IN EMBANKMENT

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.

LEGEND

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

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

EXCAVATION AND BACKFILL DETAILS METAL CULVERTS

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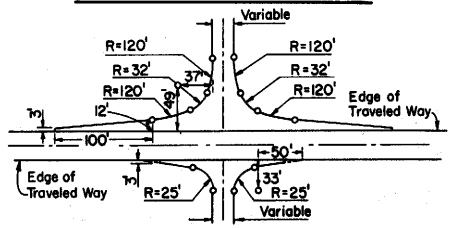
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

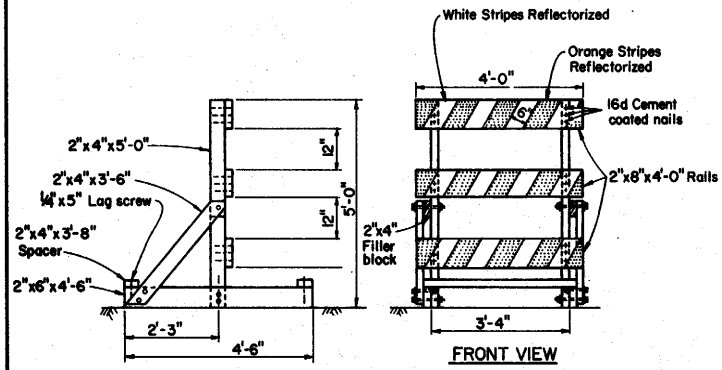
CHIEF, OFFICE OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 16110

APPROVED July 1, 1980

PUBLIC ROAD INTERSECTION



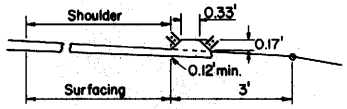
PRIVATE ROAD INTERSECTION



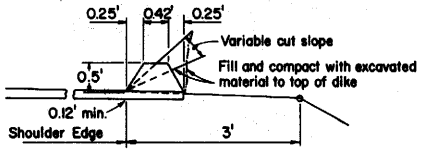
END VIEW

FRONT VIEW

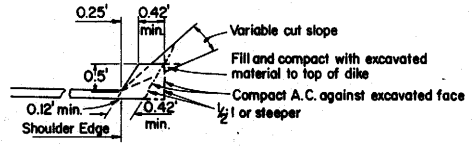
TYPE III BARRICADE



0.17' DIKE



0.5' DIKE-TYPE A



0.5' DIKE-TYPE B

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

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BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

TYPE III BARRICADE
DIKES AND ROAD INTERSECTIONS | A73

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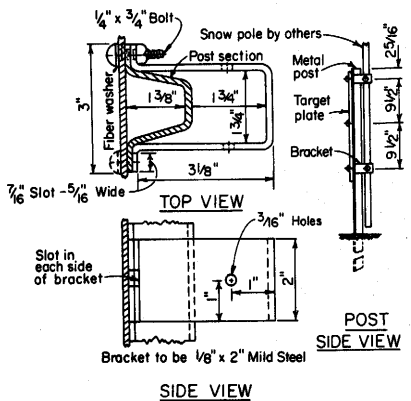
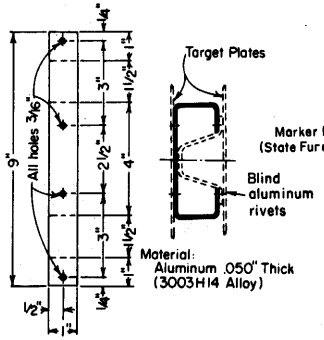
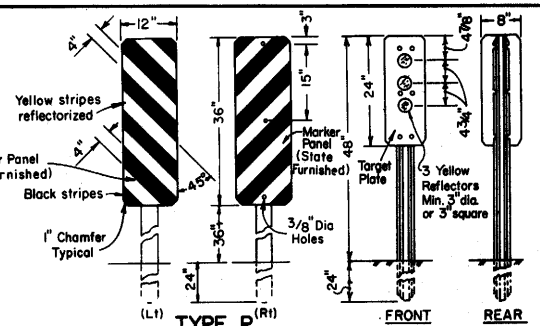


SNOW POLE BRACKET



TWO PLATE POST MOUNT



TYPE P OBJECT MARKER
(Metal Post or 4" x 4" Wood Post)

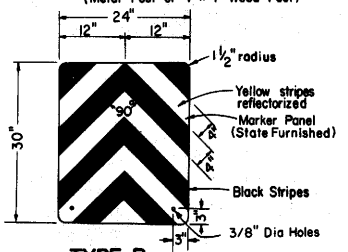
TYPE L OBJECT MARKER
(Metal Post)

CLASS 1 DELINEATOR REFLECTORIZATION			
TYPE	COLOR	FRONT	BACK
E	WHITE	ONE	ONE
F	WHITE	ONE	NONE
G	YELLOW	ONE	NONE
I	YELLOW	ONE	ONE

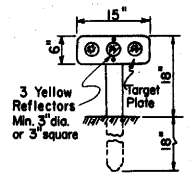
CLASS 2 DELINEATOR REFLECTORIZATION			
TYPE	COLOR	FRONT	BACK
E	CLEAR	ONE	ONE
F	CLEAR	ONE	NONE
G	YELLOW	TWO	NONE
I	YELLOW	TWO	ONE
J	YELLOW	ONE	NONE

The type of reflectorization and the class of delineator to be installed will be designated on the plans as E-1, F-2, etc.

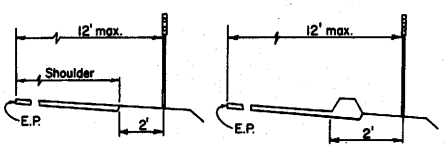
DELINEATOR REFLECTORIZATION



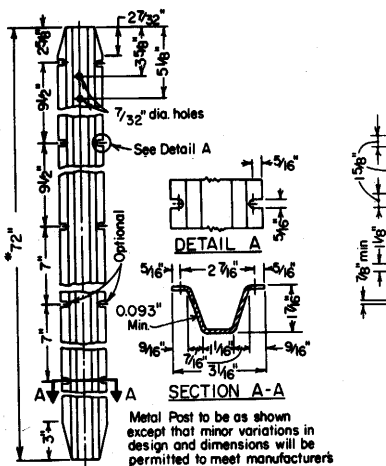
TYPE R OBJECT MARKER



TYPE K OBJECT MARKER
(Metal or Flexible Post)

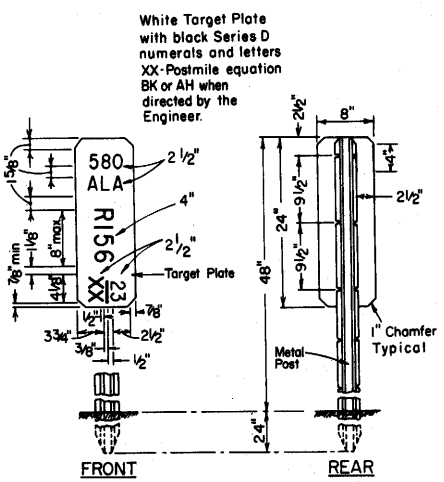


DELINEATOR POSITIONING

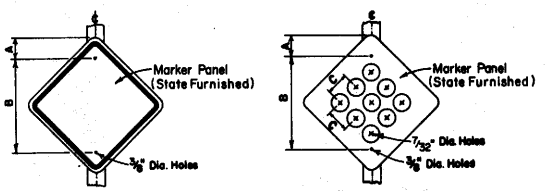


*96" for Type P object marker & 36" for Type K object marker

METAL POST DETAIL



MILEPOST MARKER TYPE M

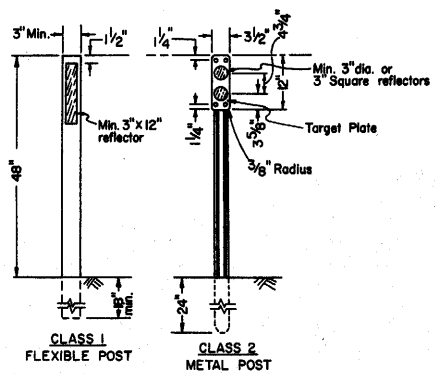


TYPE N-1,N-2,N-3 TYPE N-4,N-5

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

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

OBJECT MARKERS



DELINEATORS

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

MARKERS & DELINEATORS

A74-A

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

Chief, Office of Traffic Engineering
Registered Civil Engineer No. 11210

APPROVED July 1, 1980

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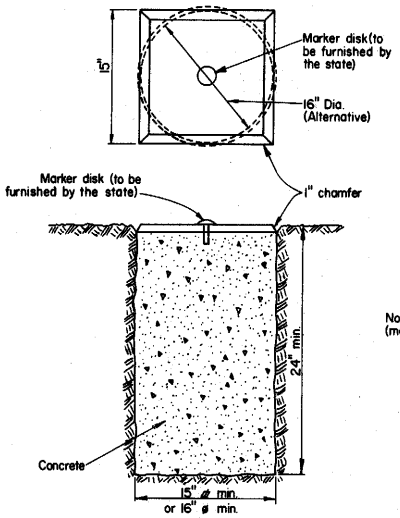
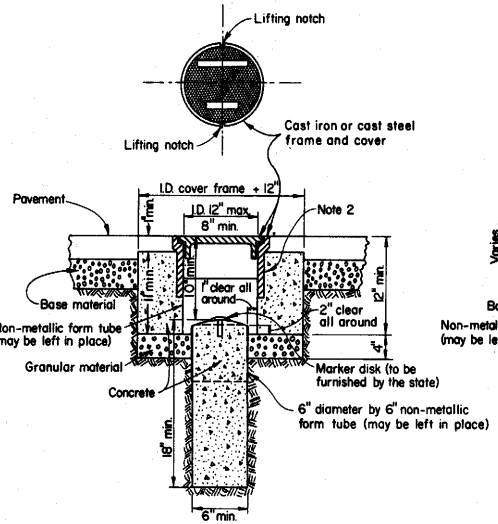
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 11210

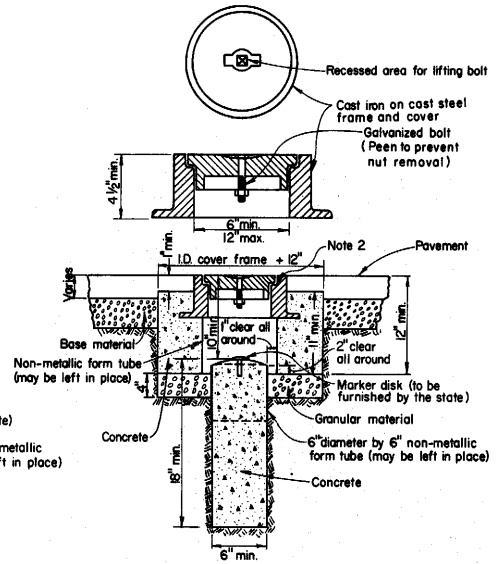
APPROVED July 1, 1980



TYPE A



TYPE D
(Alternative No. 1)



TYPE D
(Alternative No. 2)

NOTES:

1. The configuration of the cast iron or cast steel frame and cover may vary from that shown.
2. Frame shall be embedded in concrete a minimum of 3".
3. Type D monument shall be either alternative No. 1 or alternative No. 2 at the contractors option.

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

SURVEY MONUMENTS

A74-B

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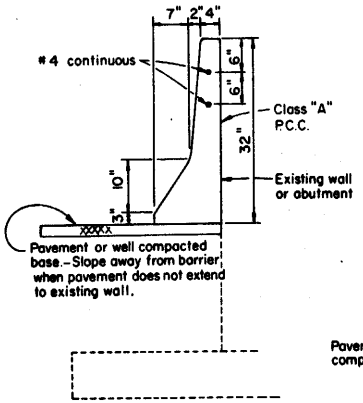
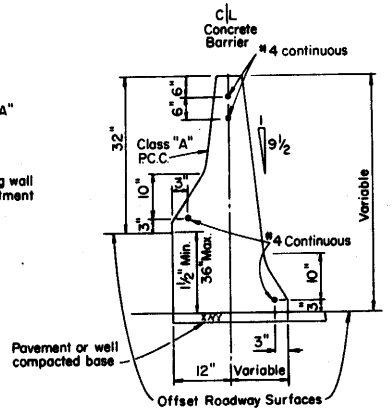


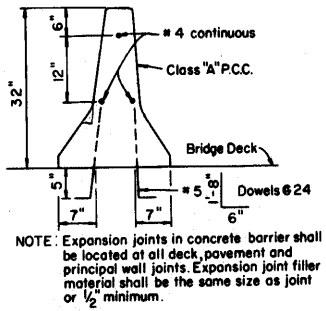
CONCRETE BARRIER
(TYPE 50D)

(Details similar to Type 50 except as noted.)



CONCRETE BARRIER
(TYPE 50C)

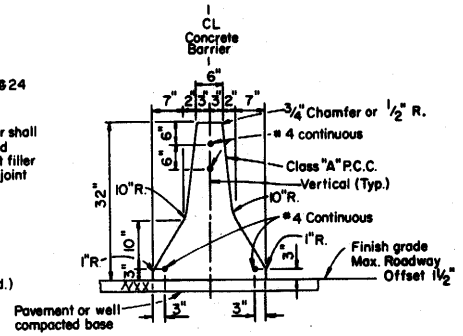
(Details similar to Type 50 except as noted. Barrier End Anchor when necessary.)



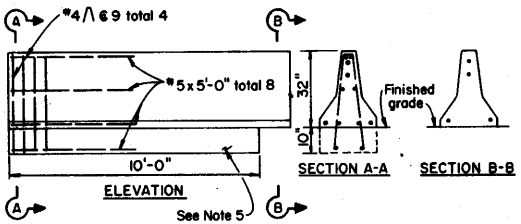
NOTE: Expansion joints in concrete barrier shall be located at all deck, pavement and principal wall joints. Expansion joint filler material shall be the same size as joint or ½" minimum.

CONCRETE BARRIER
(TYPE 50A)

(Details similar to Type 50 except as noted.)

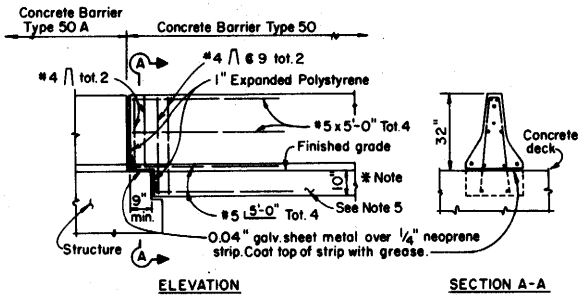


CONCRETE BARRIER
(TYPE 50)



BARRIER END ANCHOR

For Transition to other barriers
See Standard Plan A81



CONNECTION TO STRUCTURE

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

GENERAL NOTES

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

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

CHIEF, OFFICE OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO 11210

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CONCRETE BARRIER TYPE 50 | A75-A

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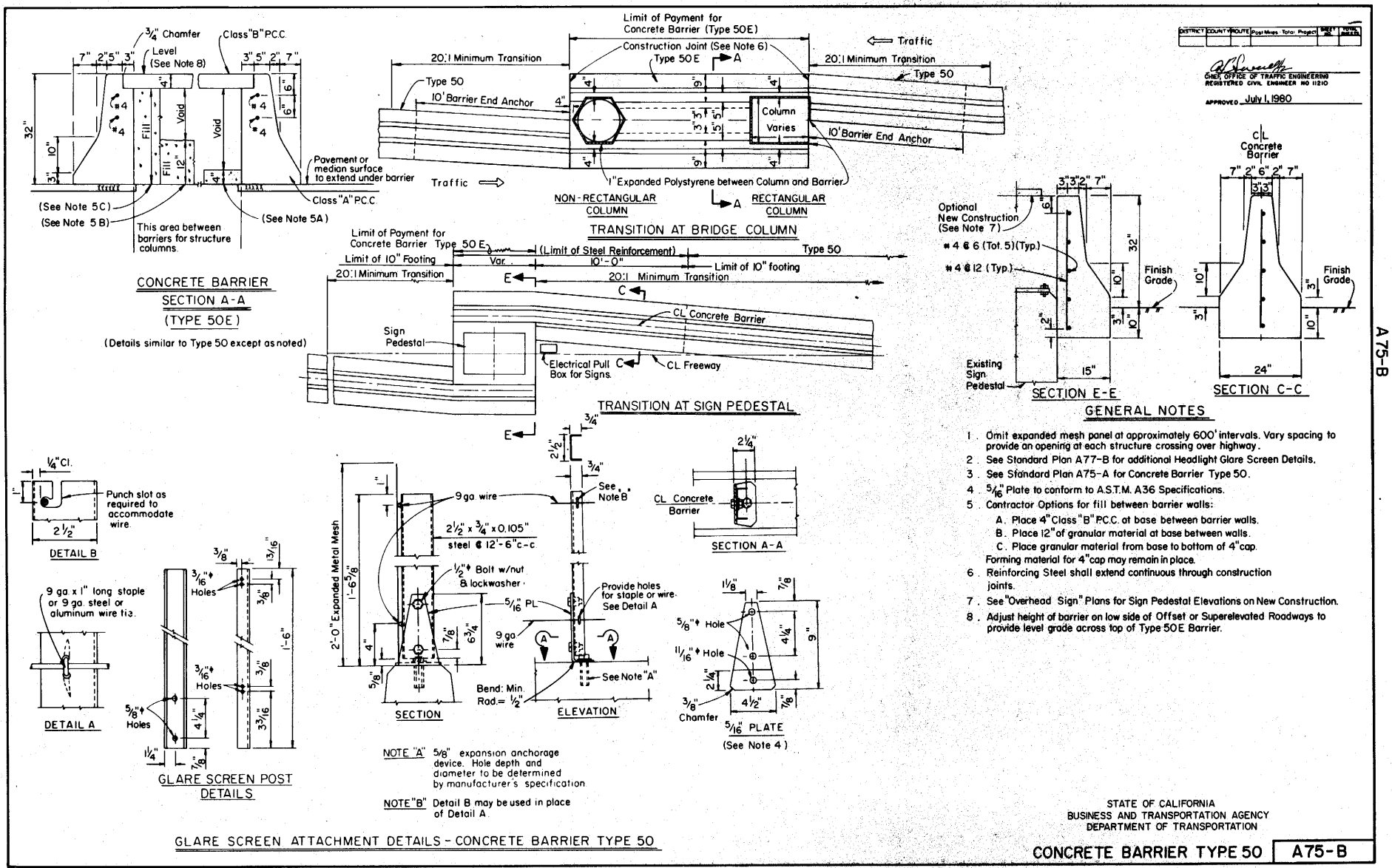

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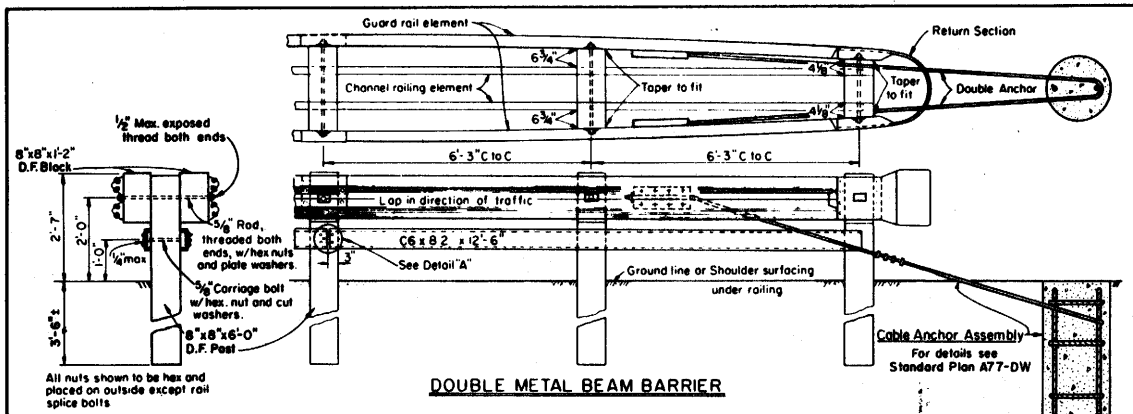
GENERAL NOTES

1. Washers as required or noted.
2. Terminal sections will not be installed on the trailing end of single metal beam barrier placed adjacent to one way roadways.

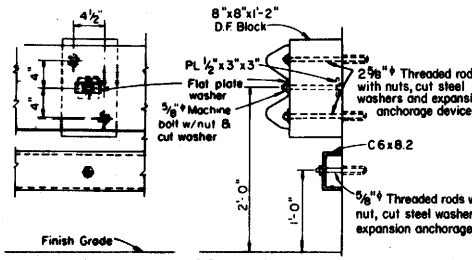
DISTRICT	COUNTY	ROUTE	POST MILE	TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 1280

APPROVED July 1, 1980

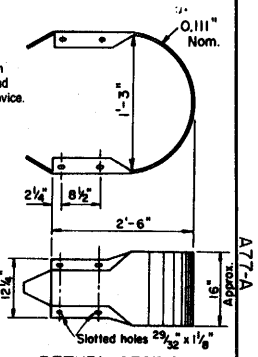


DOUBLE METAL BEAM BARRIER

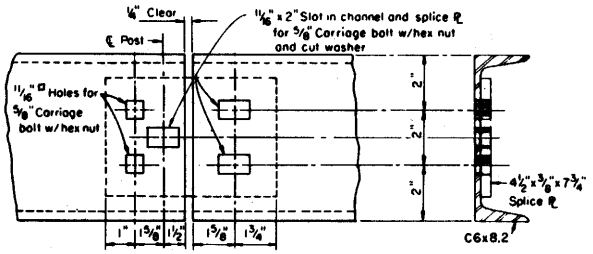


DETAIL B

(For Abutments and Walls only. For Columns use separate posts.)

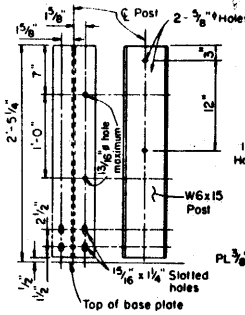


RETURN SECTION

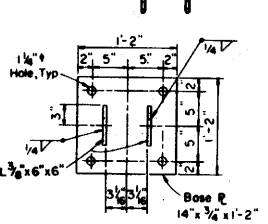


DETAIL "A" OF BOTTOM RAIL SPLICE

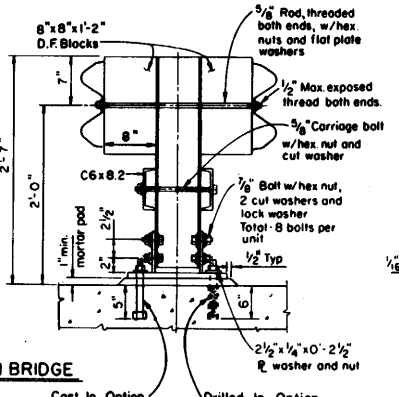
(Rail splices to occur at posts only)



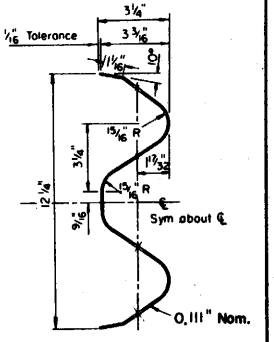
POST DETAILS



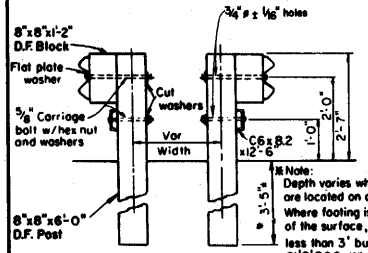
BASE PLATE PLAN



DOUBLE METAL BEAM BARRIER ON BRIDGE



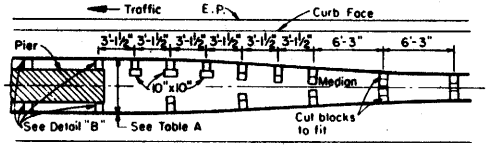
SECTION THRU W-BEAM RAIL ELEMENT



Post spacing 6'-3" c to c

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

SINGLE METAL BEAM BARRIER

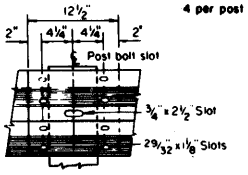


METAL BEAM BARRIER AT OBSTRUCTIONS

PLAN AT BRIDGE PIERS OR MEDIAN OBSTRUCTIONS

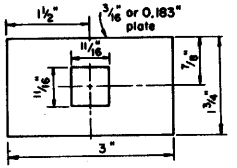
TABLE A

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

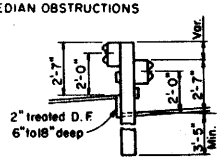


5/8" x 1 1/4" Button head oval shoulder bolts with 1 1/4" recessed hex nuts - Total 8 per splice and 4 per terminal section.
Lap in direction of traffic

RAIL SPLICE



FLAT PLATE WASHER



SAW TOOTH INSTALLATIONS

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
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METAL BEAM BARRIER | A77-A

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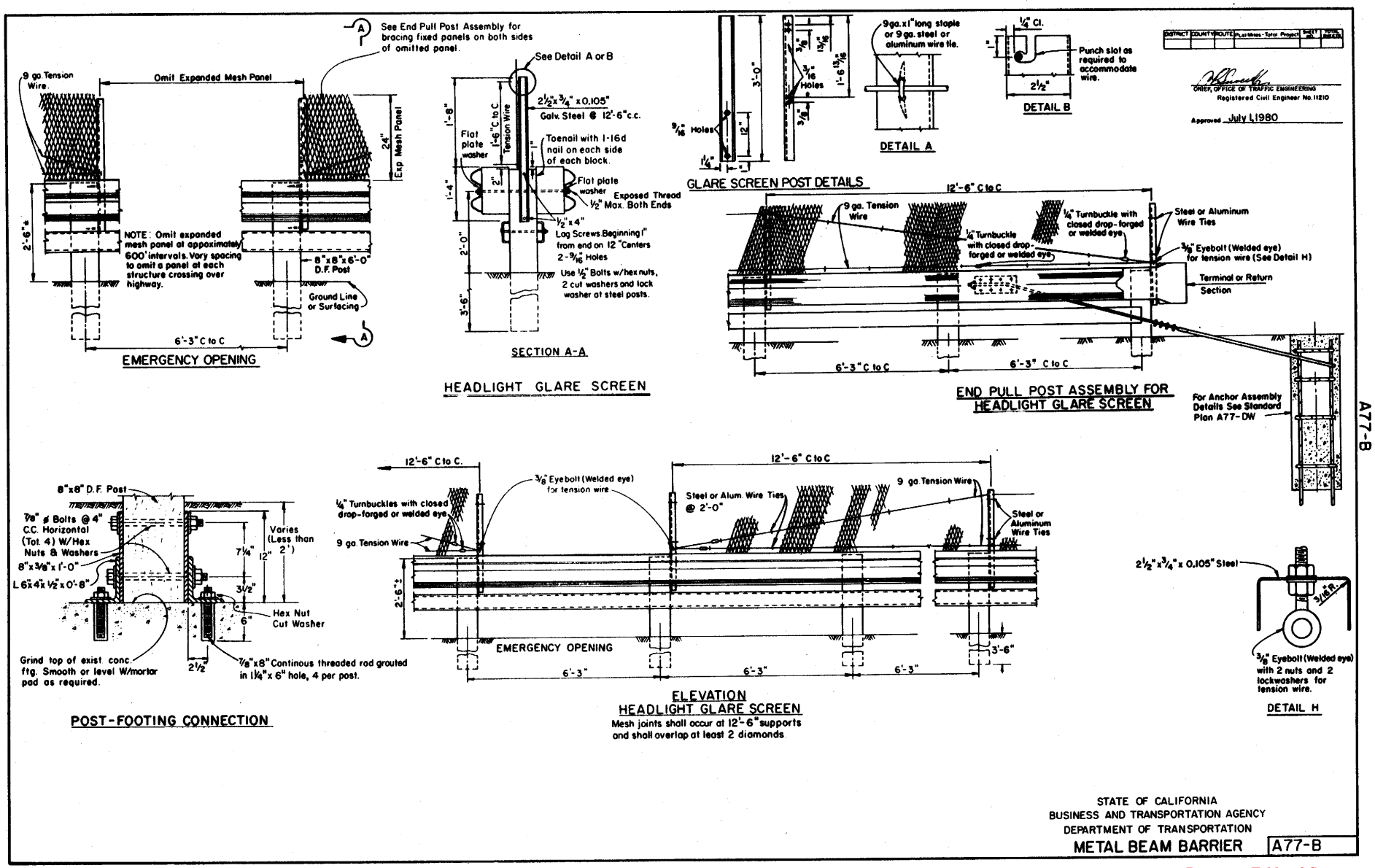

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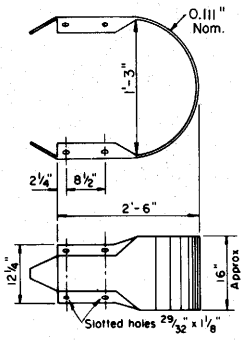
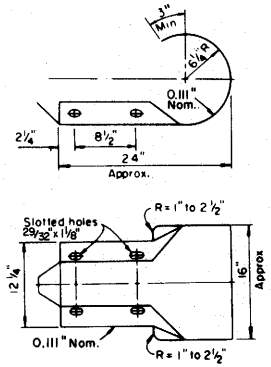
DISTRICT	COUNTY	ROUTE	Post Mile - Total Project	SHEET	TOTAL SHEETS

CHIEF, OFFICE OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 11210

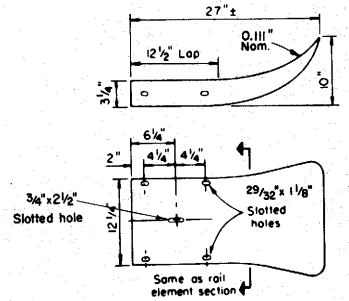
APPROVED July 1, 1980



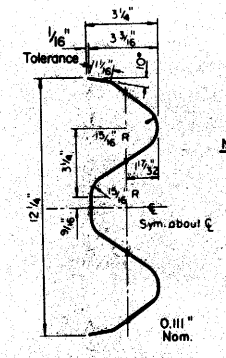
RETURN SECTION



TERMINAL SECTION
TYPE "A"



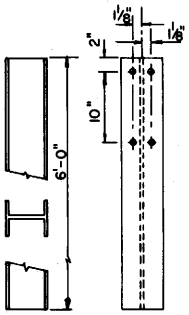
TERMINAL SECTION
TYPE "B"



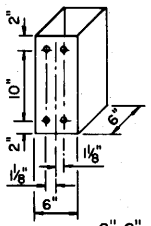
SECTION THRU
W-BEAM
RAIL ELEMENT

NOTES:

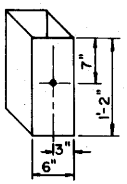
1. All holes in posts and blocks shall be 13/16" ϕ maximum.
2. Rail mounts to block with bolt on approaching traffic side of block and post web.
3. Block mounts to post with 2 bolts staggered. Lower bolt on approaching traffic side of block and post web.
4. For End Anchorage see Standard Plans A77-DS,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



W6X15 STEEL POST

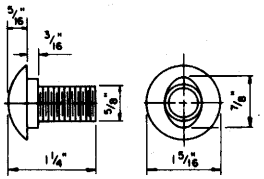


BACK

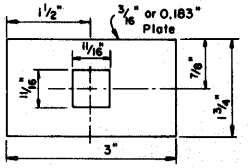


FRONT

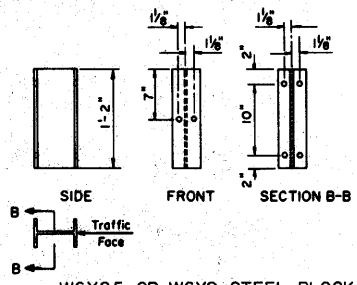
6"x6"x1'-2"(0.1875" thick)
TUBULAR STEEL BLOCK



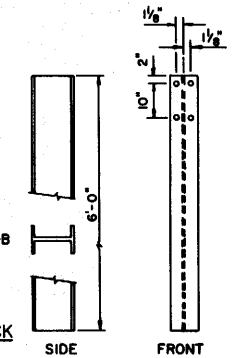
5/8" ϕ BUTTON HEAD BOLT



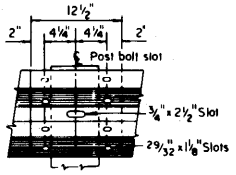
FLAT PLATE WASHER



W6X8.5 OR W6X9 STEEL BLOCK

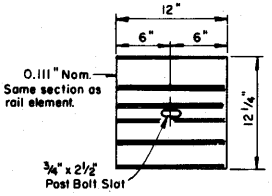


W6X8.5 OR W6X9
STEEL POST



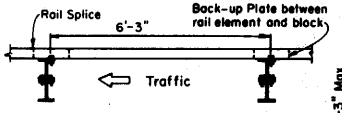
5/8" x 1¼" Button head oval shoulder bolts with 1¼" recessed hex nuts - Total 8 per splice and 4 per terminal section
Lap in direction of traffic.

RAIL SPLICE

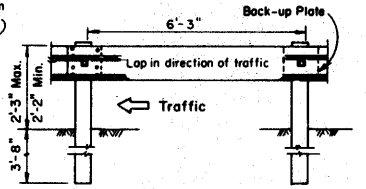


BACK-UP PLATE

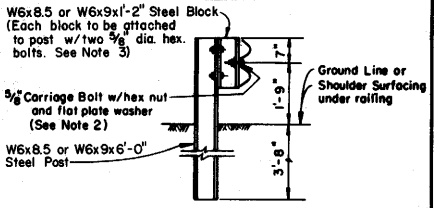
(For use between guard rail and steel block at posts between rail splices.)



PLAN

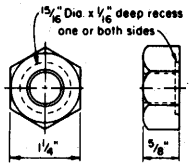


ELEVATION



Post spacing 6'-3" C to C

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



5/8" ϕ RECESS NUT

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

STEEL POST
METAL BEAM GUARD RAILING | A77-CS

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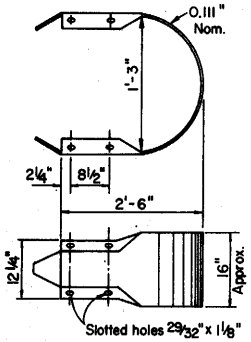
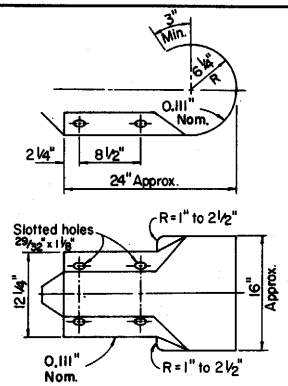
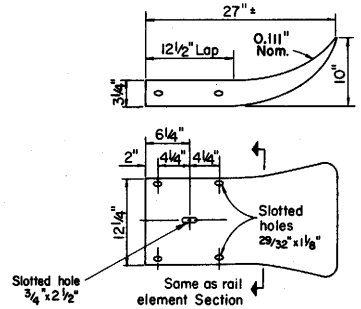


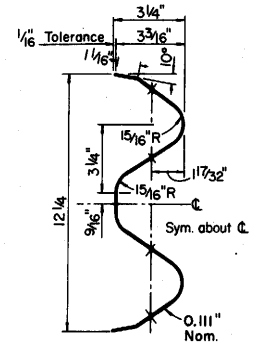
RETURN SECTION



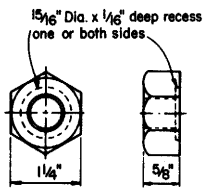
TERMINAL SECTION
TYPE "A"



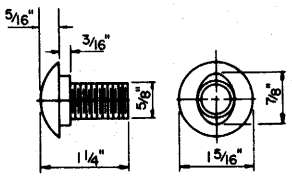
TERMINAL SECTION
TYPE "B"



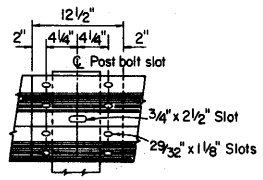
SECTION THRU
RAIL ELEMENT



5/8" ø RECESS NUT

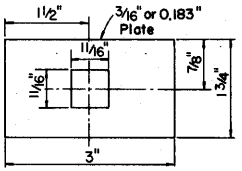


5/8"ø BUTTON HEAD BOLT

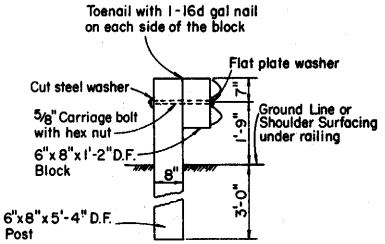


⅝" x 1¼" Button head oval shoulder bolts with 1¼ recessed hex nuts - Total: 8 per splice and 4 per terminal section
Lap in direction of traffic.

RAIL SPLICE

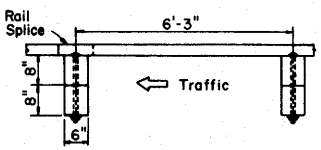


FLAT PLATE WASHER

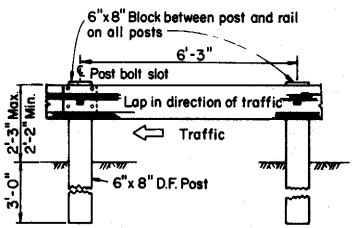


Post spacing 6'-3" C to C.

LINE POSTS



PLAN



ELEVATION

NOTES:

1. For end anchorage details see Standard Plan A77-DW, A79-C, A79-D.
2. Terminal sections will not be installed on the trailing end of guard rail placed adjacent to one-way roadways.
3. All holes in posts and blocks shall be ¾"ø ± 1/16".

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

CHIEF, OFFICE OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 11310

APPROVED July 1, 1980

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

WOOD POST
METAL BEAM GUARD RAILING

A77-CW

A77-CW

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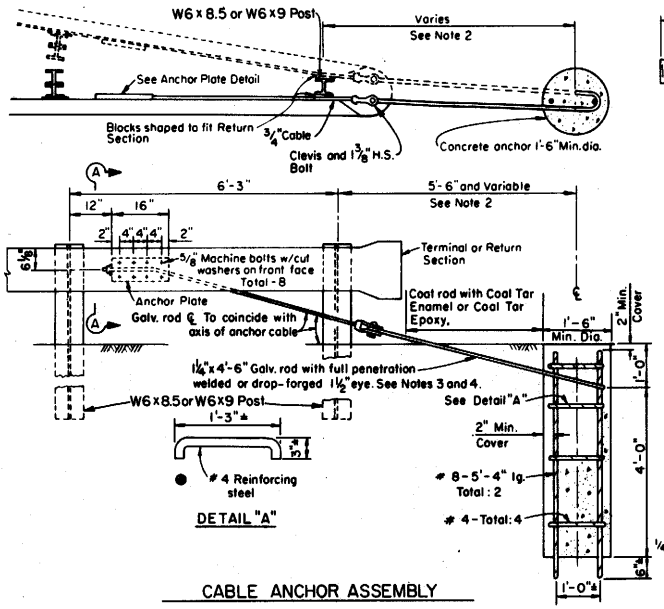
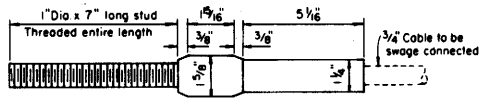
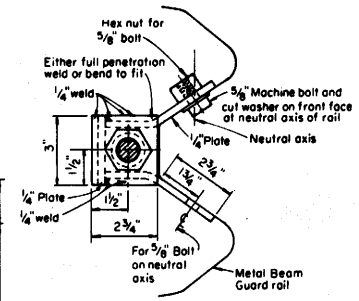


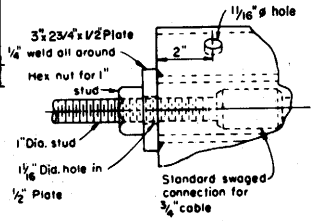
NOTE: Other alternative for attaching cable to anchor rod Must be approved by the Engineer.



SWAGED FITTING AND STUD



SECTION A-A



ANCHOR PLATE DETAILS

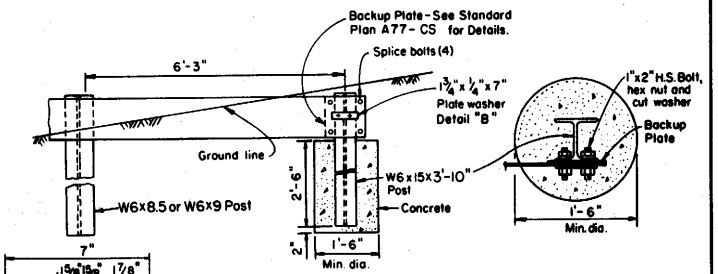
NOTES

1. Cable to be parallel to guard rail for straight runs of rail. Cable may have angle point at anchor plate if guard rail is curved.
2. 5'-6" with terminal section. May be less with return sections if separate rods connect to concrete anchor.
3. Anchor rod hooks to be in contact with anchor reinforcement when concrete is placed.
4. Wire ties may be used to position anchor rod.

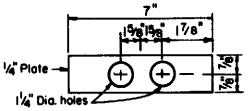
DISTRICT	COUNTY	ROUTE	Post Mile - Total Project	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER 11210

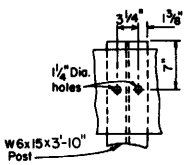
APPROVED July 1, 1980

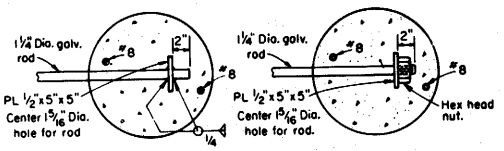


BURIED POST ANCHOR

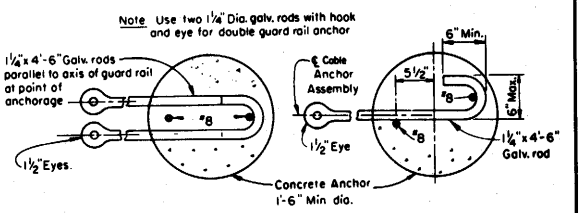


DETAIL "B"

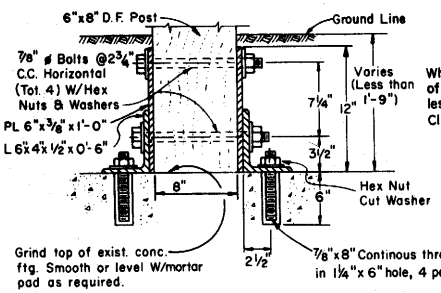




OPTIONAL ANCHOR ROD END DETAILS
(Single Anchors only)



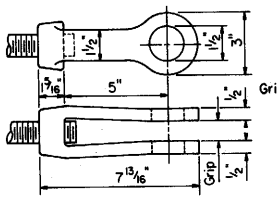
DOUBLE ANCHOR SINGLE ANCHOR



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

NOTE: Use 6" x 8" x Var. D.F. Post with this detail in lieu of W6 x 8.5 or W6 x 9 Steel Post where spread footing is encountered. See Standard Plan A77-CW for rail fastening details.

POST-FOOTING CONNECTION



Grip = Thickness of eye on anchor rods + 1/4"

CLEVIS

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

STEEL POST GUARD RAIL ANCHORS

A77-DS

A77-DS

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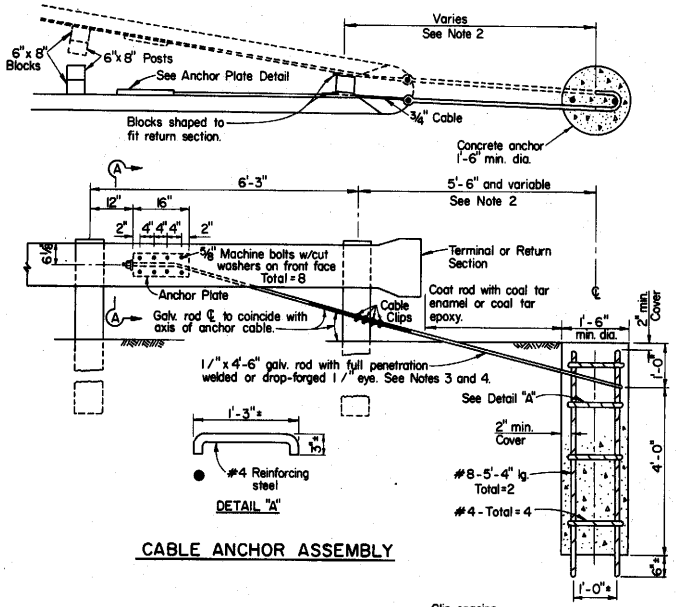
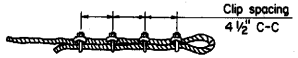
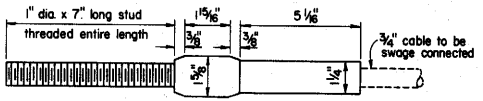


CABLE ANCHOR ASSEMBLY

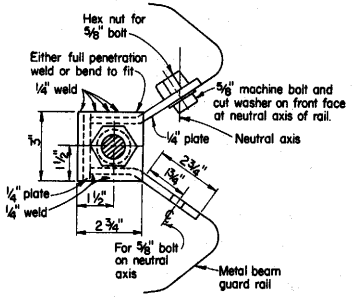


"U" bolts of clip on short end of cable only
"U" bolts tightened to 50 ft. lbs. torque

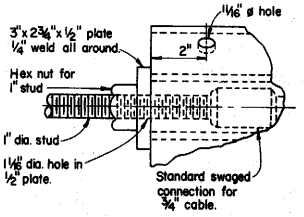
CABLE CLIP INSTALLATION



SWAGED FITTING AND STUD



SECTION A-A



ANCHOR PLATE DETAILS

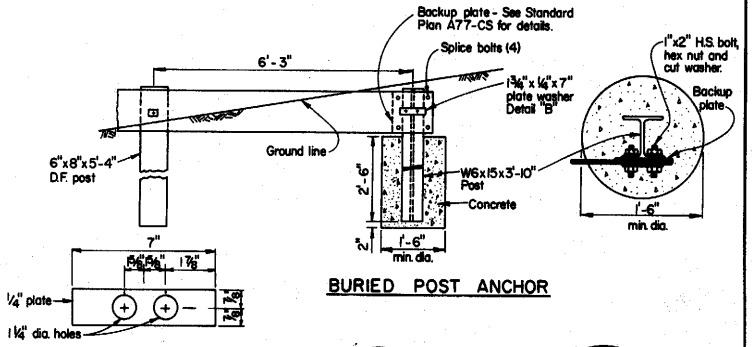
NOTES:

1. Cable to be parallel to guard rail for straight runs of rail. Cable may have angle point at anchor plate if guard rail is curved.
2. 5'-6" with terminal section. May be less with return sections if separate rods connect to concrete anchor.
3. Anchor rod hooks to be in contact with anchor reinforcement when concrete is placed.
4. Wire ties may be used to position anchor rod.

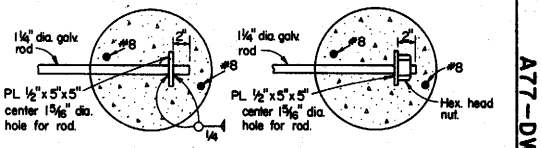
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 1280

APPROVED July 1, 1980

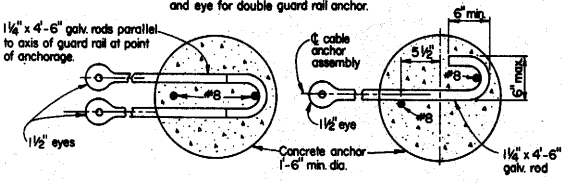


BURIED POST ANCHOR



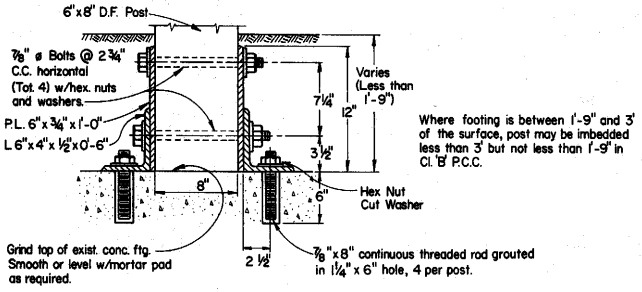
OPTIONAL ANCHOR ROD END DETAILS
(Single anchors only)

NOTE: Use two 1¼" dia. galv. rods with hook and eye for double guard rail anchor.



DOUBLE ANCHOR

SINGLE ANCHOR



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

POST-FOOTING CONNECTION

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

WOOD POST BARRIER AND GUARD RAIL ANCHORS

A77-DW

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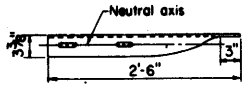
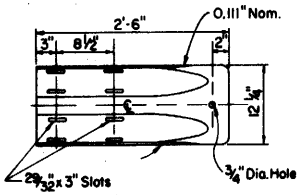
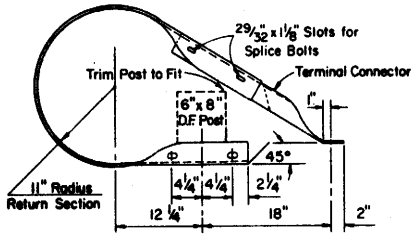
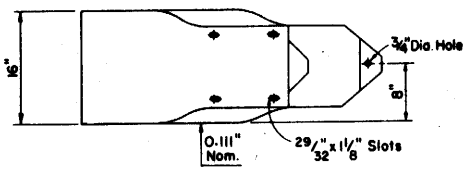




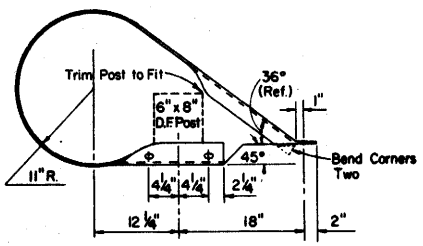
TERMINAL CONNECTOR



OPTIONAL DESIGN TERMINAL SECTION

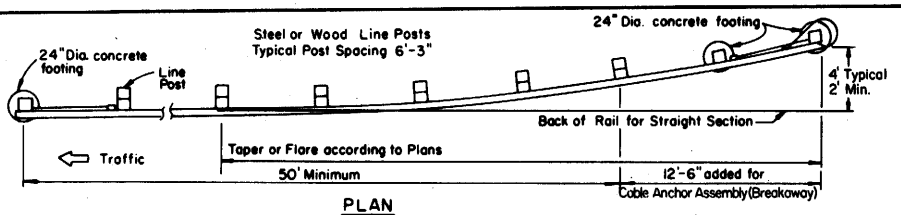


TERMINAL SECTION-ELEVATION

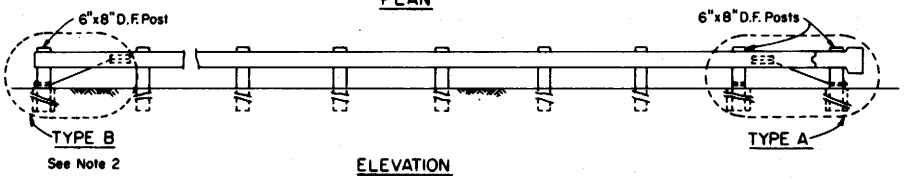


TERMINAL SECTION TYPE C

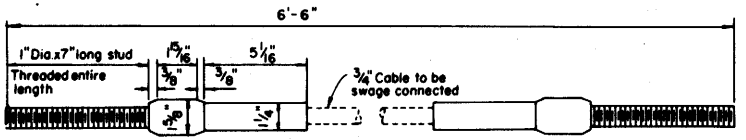
DETAIL A



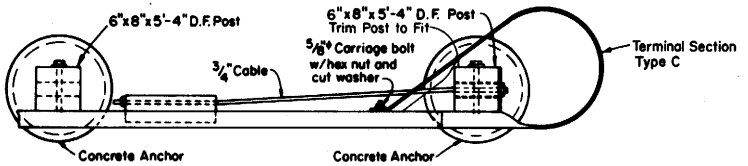
PLAN

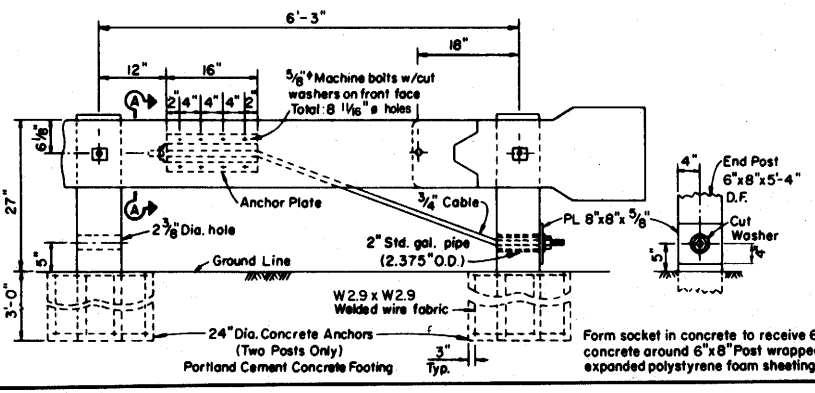


ELEVATION

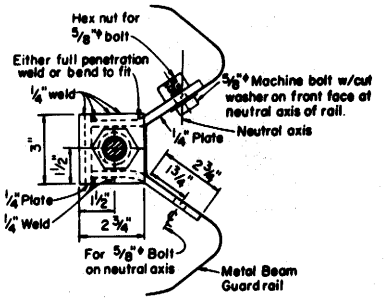


SWAGED FITTING AND STUD

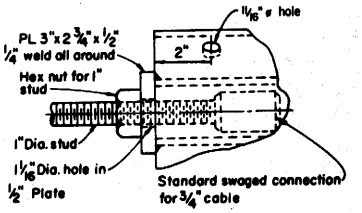




Form socket in concrete to receive 6"x8" Post or place concrete around 6"x8" Post wrapped with 1 layer of ½" thick expanded polystyrene foam sheeting.



SECTION A-A



ANCHOR PLATE DETAILS

NOTES

1. Used with Steel or Wood Post Guardrail.
2. For Trailing end of guardrail adjacent to one-way roadway omit Terminal Section. Next to last post to be a Line Post.
3. For details not shown see Standard Plans.
4. Posts to be centered in concrete footing.

DISTRICT	COUNTY	ROUTE	Post Mile - Total Project	SHEET	TOTAL SHEETS

CHIEF, OFFICE OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 11210

APPROVED July 1, 1980

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRASPORTATION

CABLE ANCHOR ASSEMBLY (BREAKAWAY)

A77-E

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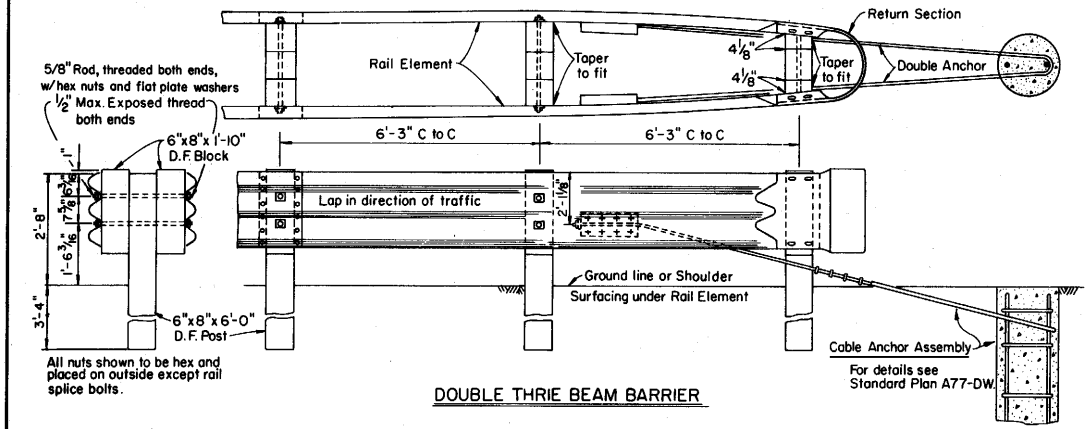


DOUBLE THRIE BEAM BARRIER

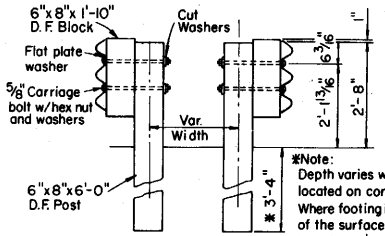
GENERAL NOTES

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

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

CHIEF, OFFICE OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 11210

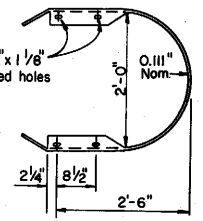
APPROVED July 1, 1980



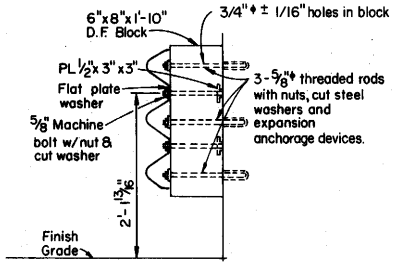
Post spacing 6'-3" c.to c.

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

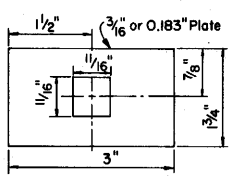
SINGLE THRIE BEAM BARRIER



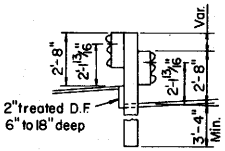
RETURN SECTION



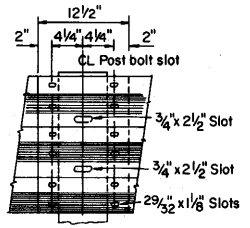
DETAIL B
For Abutments and Walls only
Not for Columns



FLAT PLATE WASHER

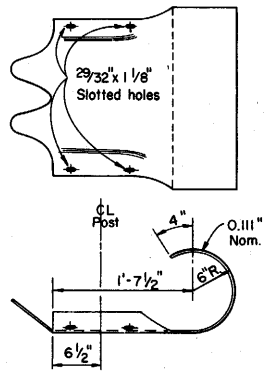


SAW TOOTH INSTALLATIONS

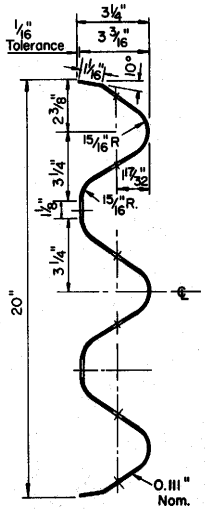


5/8"x1 1/4" Button head oval shoulder bolts with 1 1/4" recessed hex nuts - Total: 12 per splice and 4 per terminal section or return section.
Lap in direction of traffic.

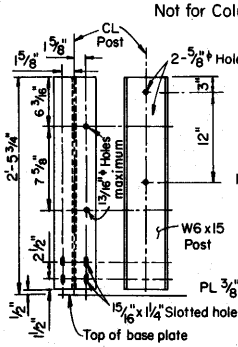
RAIL SPLICE



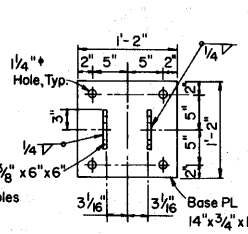
TERMINAL SECTION



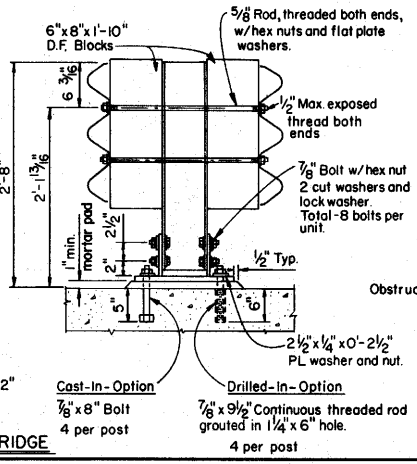
SECTION THRU RAIL ELEMENT



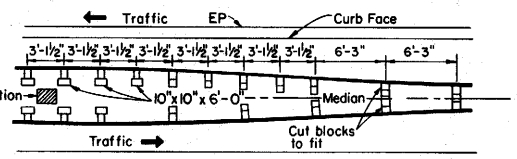
POST DETAILS



BASE PLATE PLAN



DOUBLE THRIE BEAM BARRIER ON BRIDGE



THRIE BEAM BARRIER AT OBSTRUCTIONS
PLAN AT MEDIAN OBSTRUCTIONS

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

THRIE BEAM BARRIER

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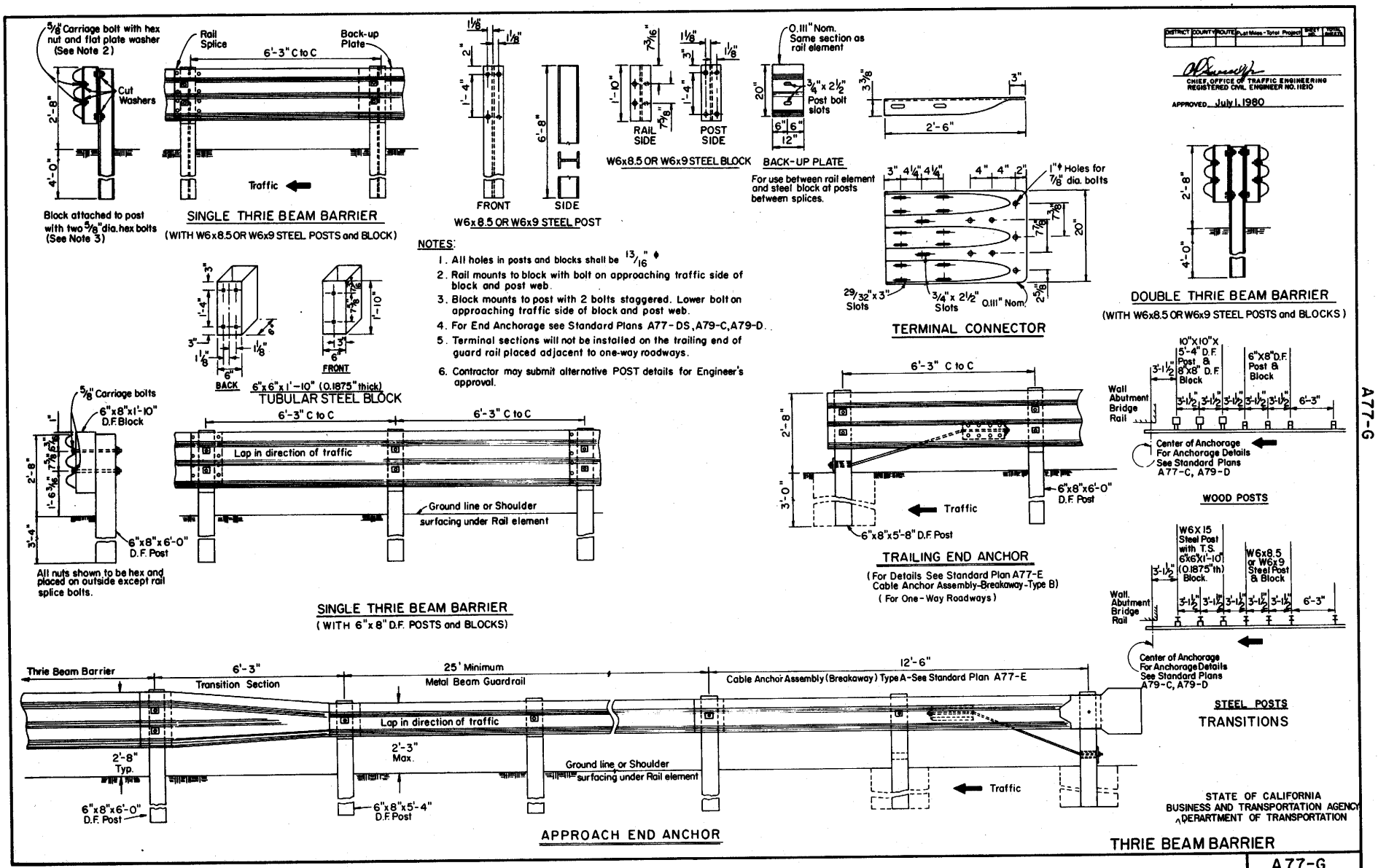

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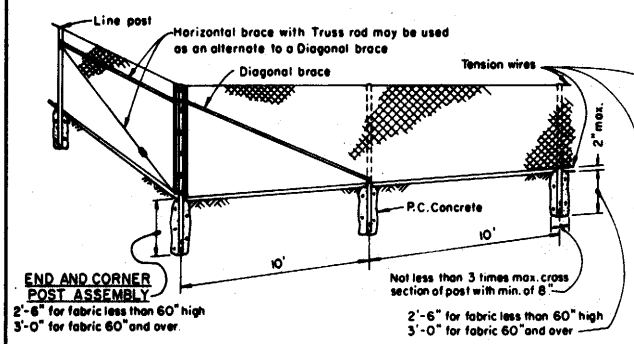
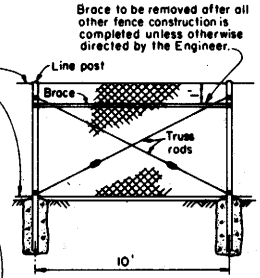
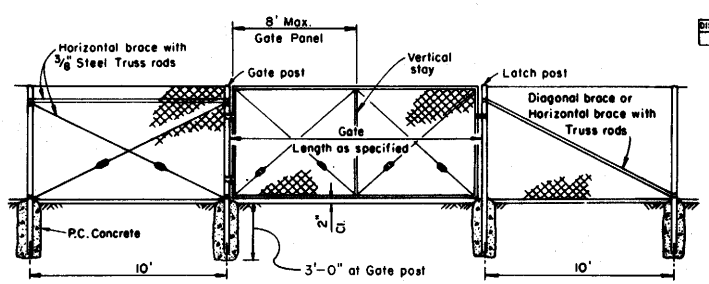




Line posts at 1000' max. intervals braced and trussed in both directions except that this bracing and trussing may be omitted when the fabric is stretched by equipment

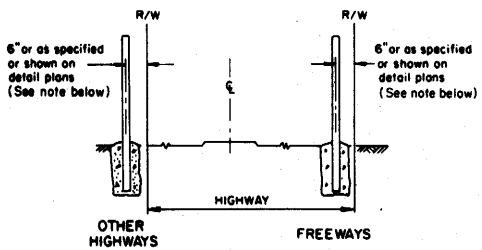


Type CL-4 = 48" fabric
Type CL-6 = 72" fabric

DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET	TOTAL SHEETS

Chief, Office of Planning and Design
Registered Civil Engineer No. 8623

Approved July 1, 1980



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

FENCE LOCATION

TYPICAL MEMBER DIMENSIONS

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

NOTES:

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

GATE POST

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

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

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

CHAIN LINK FENCE | A78-A

A78-A

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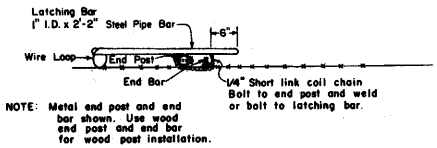
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

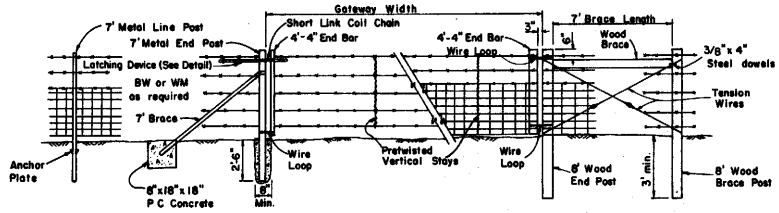
Chief, Office of Planning and Design
Registered Civil Engineer No. 8623

Approved July 1, 1980



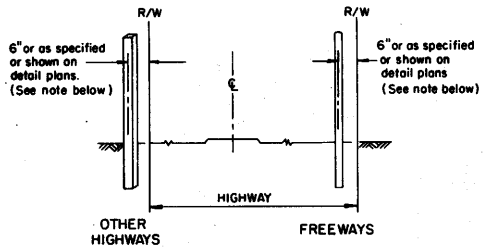
NOTE: Metal end post and end bar shown. Use wood end post and end bar for wood post installation.

LATCHING DEVICE FOR GATEWAYS



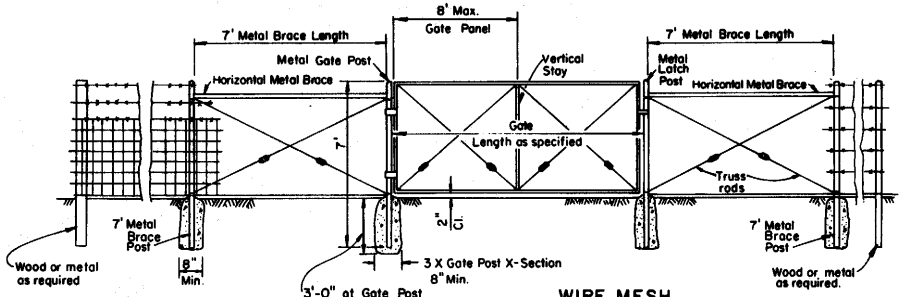
GATEWAY

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



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

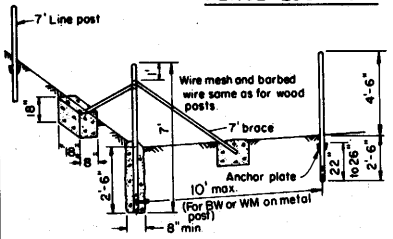
FENCE LOCATION



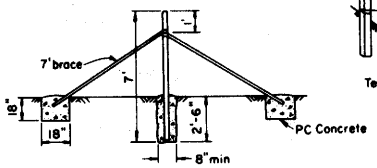
WIRE MESH GATE INSTALLATION FOR EITHER WOOD OR METAL POST FENCES

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

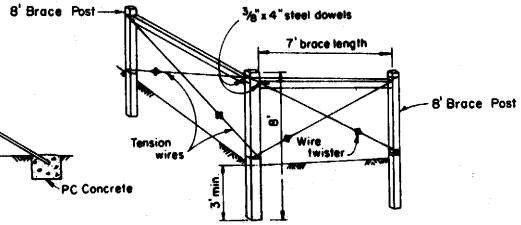
NOTE:
Above post dimensions and weights are minimums.
Larger sizes may be used on approval of Engineer.



END AND CORNER POST ASSEMBLY

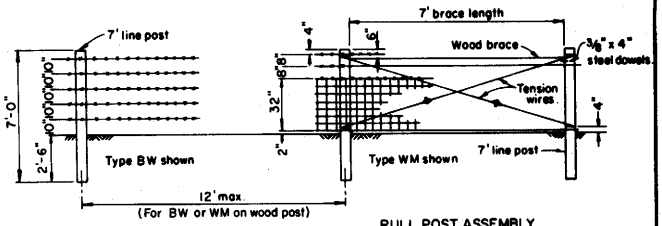


PULL POST ASSEMBLY
At 660' maximum intervals for WM fence
At 1320' maximum intervals for BW fence



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

METAL POST INSTALLATION



WOOD POST INSTALLATION

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

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

BARBED WIRE AND WIRE MESH FENCES | A78-B

A78-B

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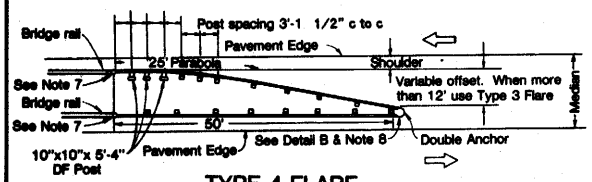
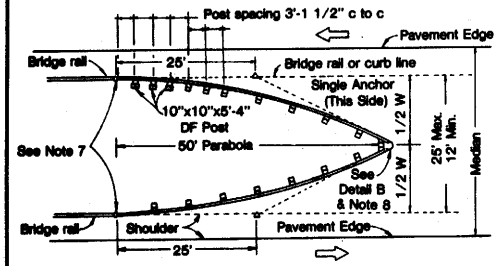
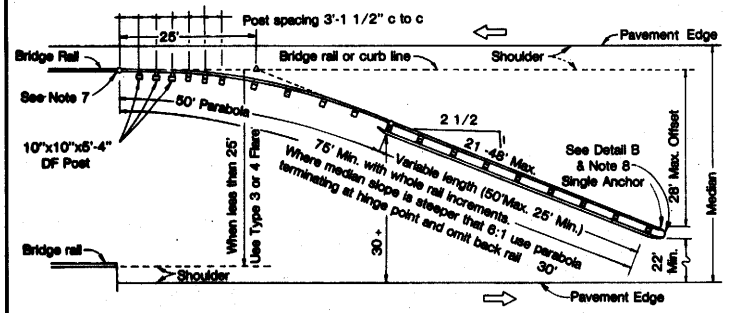


TYPE 4 FLARE

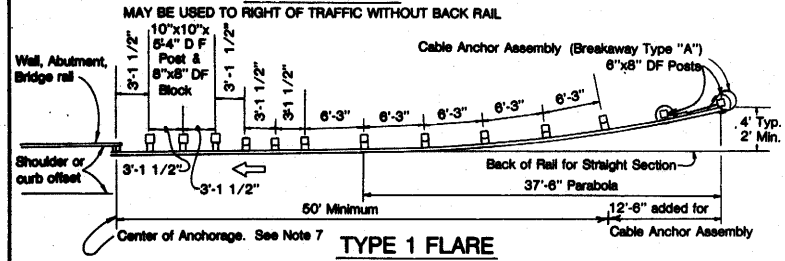


TYPE 3 FLARE



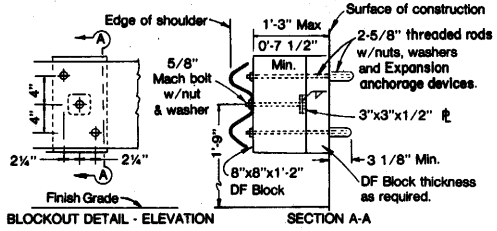
TYPE 2 FLARE

MAY BE USED TO RIGHT OF TRAFFIC WITHOUT BACK RAIL



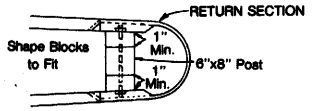
TYPE 1 FLARE

SHOULDER ENCROACHMENTS (RT. or LT.)



METAL BEAM RAIL OBSTRUCTION DETAIL A

(FOR ABUTMENTS AND WALLS ONLY. FOR COLUMNS USE SEPARATE POSTS)



DETAIL B

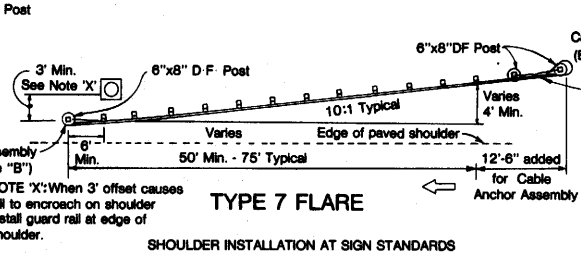
GENERAL NOTES

1. Use timber shims without posts where rail to wall clearance is less than 15" (See Detail A).
2. Where spread footing is between 1'-9" and 3' of surface post may be embedded less than 3' but not less than 1'-9" in Class B PCC. When footings are less than 1'-9" from surface, attach to footing using Post-Footing Connection Detail - Standard Plan Sheet A77-D.
3. All posts and blocks to be as shown on Standard Plan.
4. All guard rail post spacing to be 6'-3" center to center except as noted.
5. Height of rail 27" maximum above ground and parallel to grade of shoulder.
6. Direction of traffic indicated by arrow.
7. For connection details see Standard Plan A79-C or A79-D.
8. For anchor details see Standard Plan A77-D.
9. 6"x8" D.F. Posts and Blocks shown. W6x8.5 or W6x9 Steel Posts and Blocks may be specified where applicable. 10"x10" D.F. Posts and 8"x8" D.F. Blocks shown. W6x15 Steel Posts and T.S. 6"x6"x1'-2" (0.1875" thick) Blocks may be specified where applicable. (See Standard Plan A77-CS).
10. Terminal Sections will not be installed on trailing end of guard rail placed adjacent to one way roadways.
11. Parabola portion of Type 1 Flare used at approach end of embankment guard rail.

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

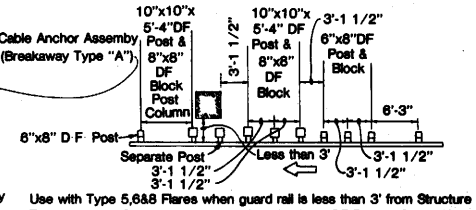
CHIEF, OFFICE OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER 11210

APPROVED July 1, 1980



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

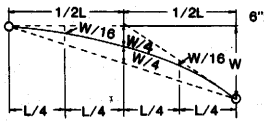
TYPE 7 FLARE



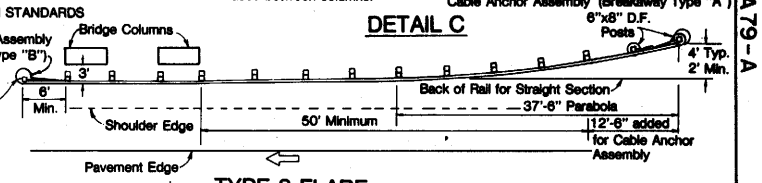
Use with Type 5,6&8 Flares when guard rail is less than 3' from Structure Support. For a series of Columns additional 10"x10"x5'-4" DF Posts@3'-1 1/2" c.c. to be used between columns.

DETAIL C

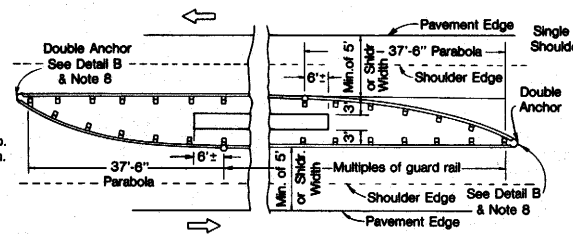
SHOULDER INSTALLATION AT SIGN STANDARDS



TYPICAL PARABOLIC LAYOUT

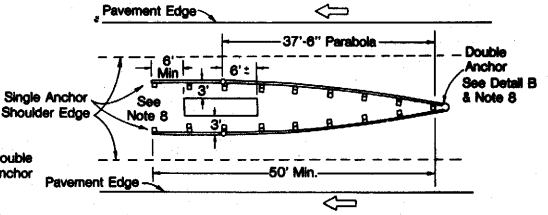


TYPE 8 FLARE



TYPE 5 FLARE

MEDIAN INSTALLATION AT BRIDGE AND/OR SIGN STANDARDS
Where clearance shown cannot be obtained see Detail C.



TYPE 6 FLARE

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

GUARD RAIL FLARES

A79-A

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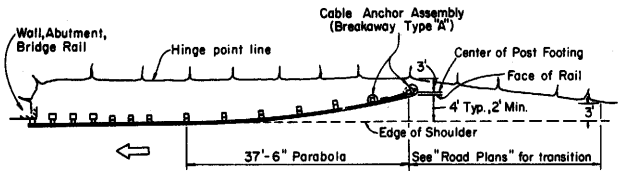
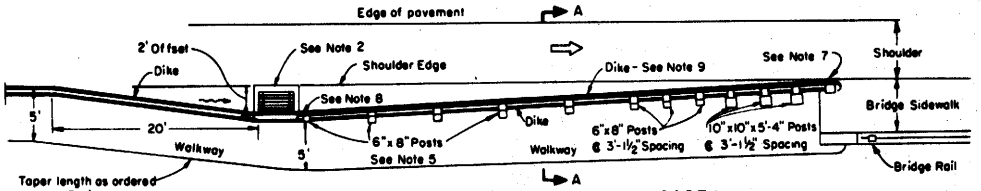
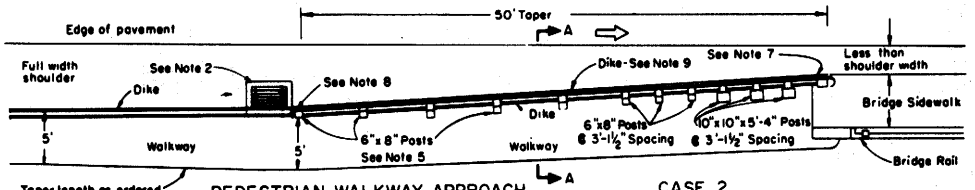


EMBANKMENT WIDENING DIAGRAM

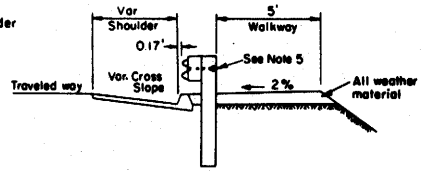


CASE I
Full Width Bridge Shoulder



PEDESTRIAN WALKWAY APPROACH TO BRIDGE SIDEWALK

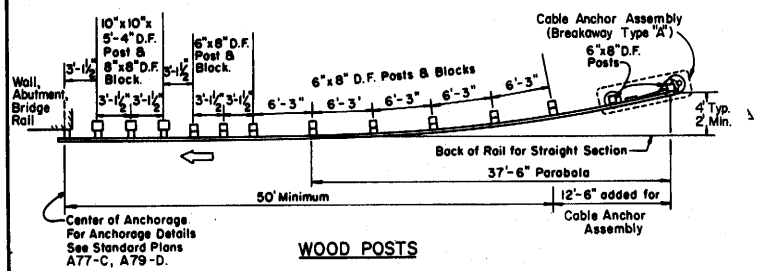
CASE 2
Partial Width Bridge Shoulder



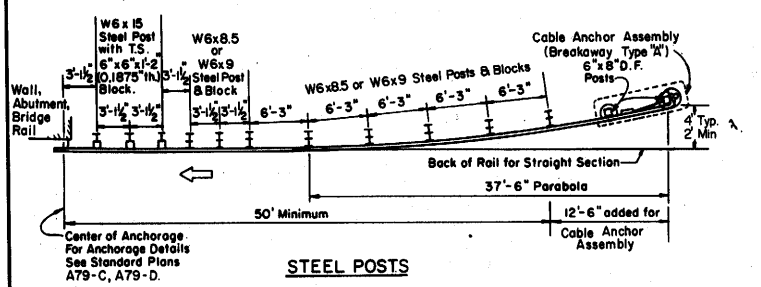
SECTION A-A
(Both Cases)

NOTES:

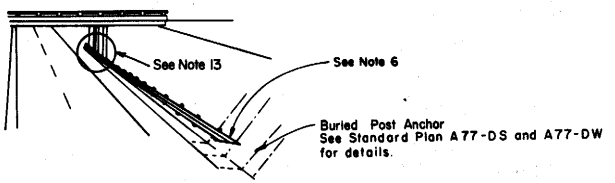
1. For guard rail details see Standard Plans A77-CS, A77-CW, A77-DS and A77-DW.
2. Depress grate 0.2 foot.
3. Walkway outside edge of shoulder to be paved when shown on Typical Cross Section.
4. Guard rail post spacing to be 6'-3" center to center unless otherwise noted.
5. Countersink nut and washer and ends of bolts shall be flush with post.
6. Top of rail to be 27" maximum above edge of road.
7. For connection details, see Standard Plan A79-C or A79-D.
8. For end anchors, see Standard Plans A77-DS and A77-DW or A77-E.
9. When necessary to place dike in front of guard rail, only the 0.17' high dike may be used.
10. Use timber shims without posts where rail to wall or abutment clearance is less than 15", (Standard Plan A79-A, Detail "A". For piers and columns use separate posts.
11. Terminal sections will not be installed on the trailing end of guard rail adjacent to one way roadway.
12. 6"x8" D.F. Posts and Blocks shown, W6x8.5 or W6x9 Steel Posts and Blocks may be specified where applicable. 10"x10" D.F. Posts and 8"x8" D.F. Blocks shown. W6x15 Steel Posts and T.S. 6"x6"x1'-2" (0.1875" thick) Blocks may be specified where applicable. (See Std. Plan A77-CS).
13. For Type 8 Flare details, See Standard Plan A79-A.



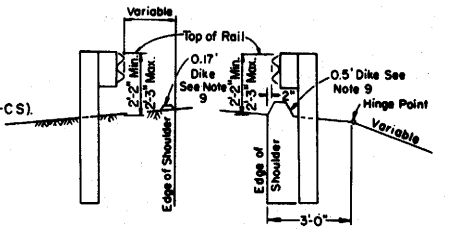
WOOD POSTS



STEEL POSTS
(Alternative Installations)



GUARD RAIL IN CUT



For dike details see Standard Plan A73

LINE POSTS
6'-3" C to C

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

GUARD RAIL FLARES AND MISCELLANEOUS GUARD RAIL DETAILS

A79-B

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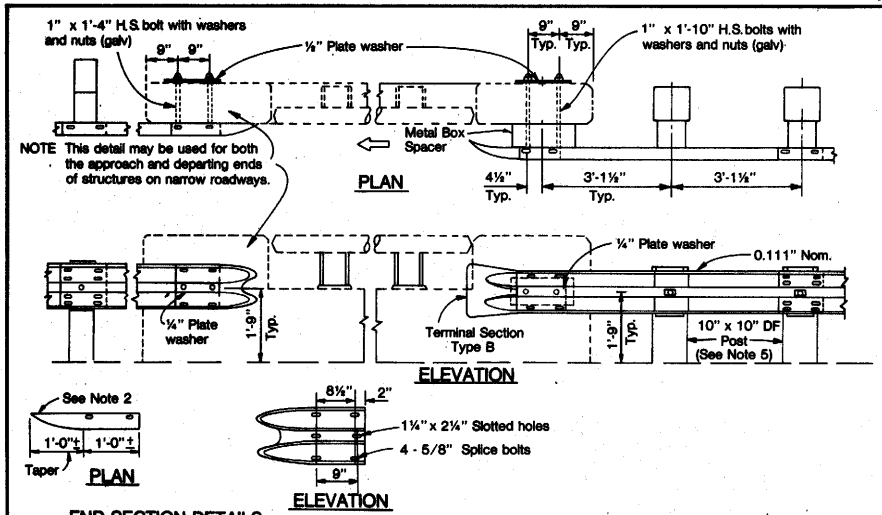
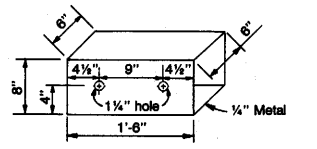
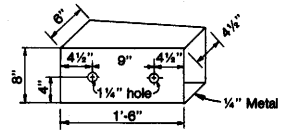


EXISTING STRUCTURE WITH NEW GUARD RAIL



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



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

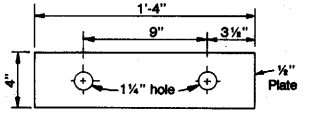


PLATE WASHER
FOR BACKSIDE OF PARAPET

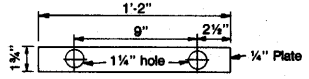
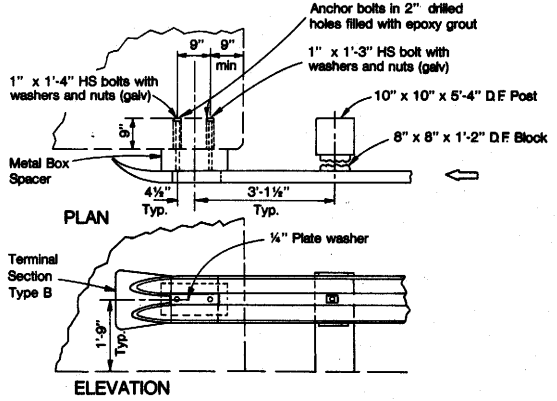
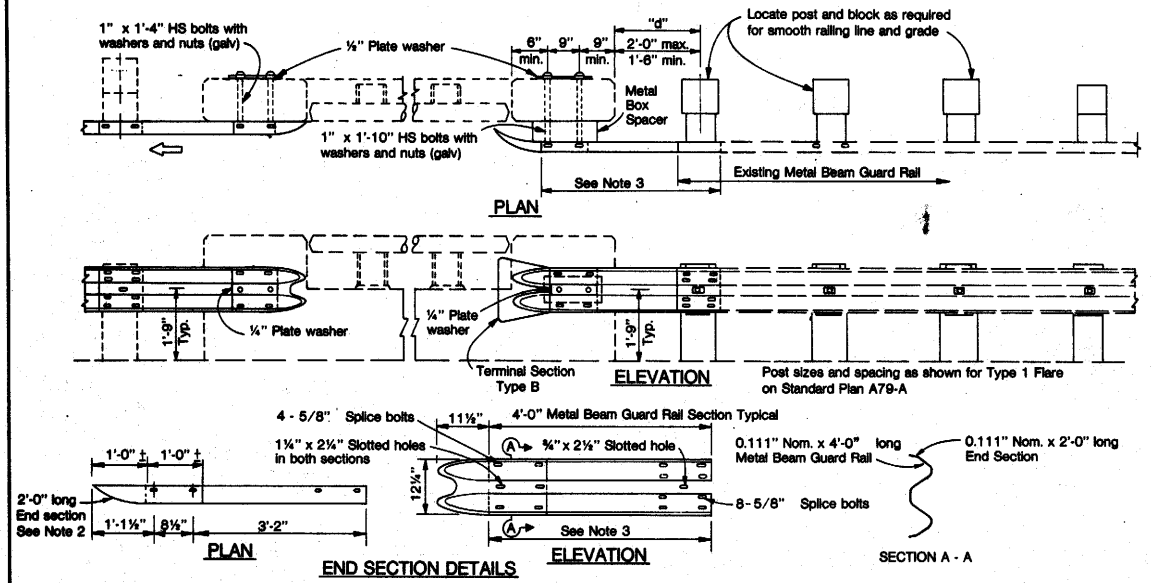


PLATE WASHER
FOR GUARD RAIL



GUARD RAIL ANCHORAGE TO WALL OR ABUTMENT FACE



EXISTING STRUCTURE AND EXISTING GUARD RAIL

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

CHIEF, OFFICE OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 11210
APPROVED JULY 1, 1980

GENERAL NOTES

1. These connection details apply to bridge rails, abutments and retaining walls. Do not connect guardrail to bridge columns.
2. End sections may be cut from Type B terminal section or fabricated.
3. The 4'-0" end section makes provision for a variable dimension "d". If the limits are exceeded at existing installations the Metal Beam Guard Rail end section must be modified to fit.
4. Direction of traffic indicated by ⇨
5. For post size and spacing See Type 1 Flare on Standard Plan A 79-A.
6. When metal box spacer is installed, place 1¼" x 5" and 1¼" x 4" pipe spacers on 1" bolts passing through interior of tapered box and 1¼" x 5¼" pipe spacers on 1" bolts passing through interior of straight box.
7. 6" x 8" D.F. Posts and Blocks shown. W6x8.5 or W6x9 Steel Posts and Blocks may be specified where applicable. 10"x10" D.F. Posts and 8"x8" D.F. Blocks shown. W6x15 Steel Posts and T.S. 6"x6"x1'-2" (0.1875" thick) Blocks may be specified where applicable. (See Standard Plan A77-CS).
8. Terminal Sections will not be installed on trailing end of guard rail placed adjacent to one way roadways. When terminal section is not installed, use backup plate. (See Standard Plan A77-CS or A77-CW).

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

GUARD RAIL CONNECTIONS TO BRIDGE RAILS, RETAINING WALLS AND ABUTMENTS

A79-C

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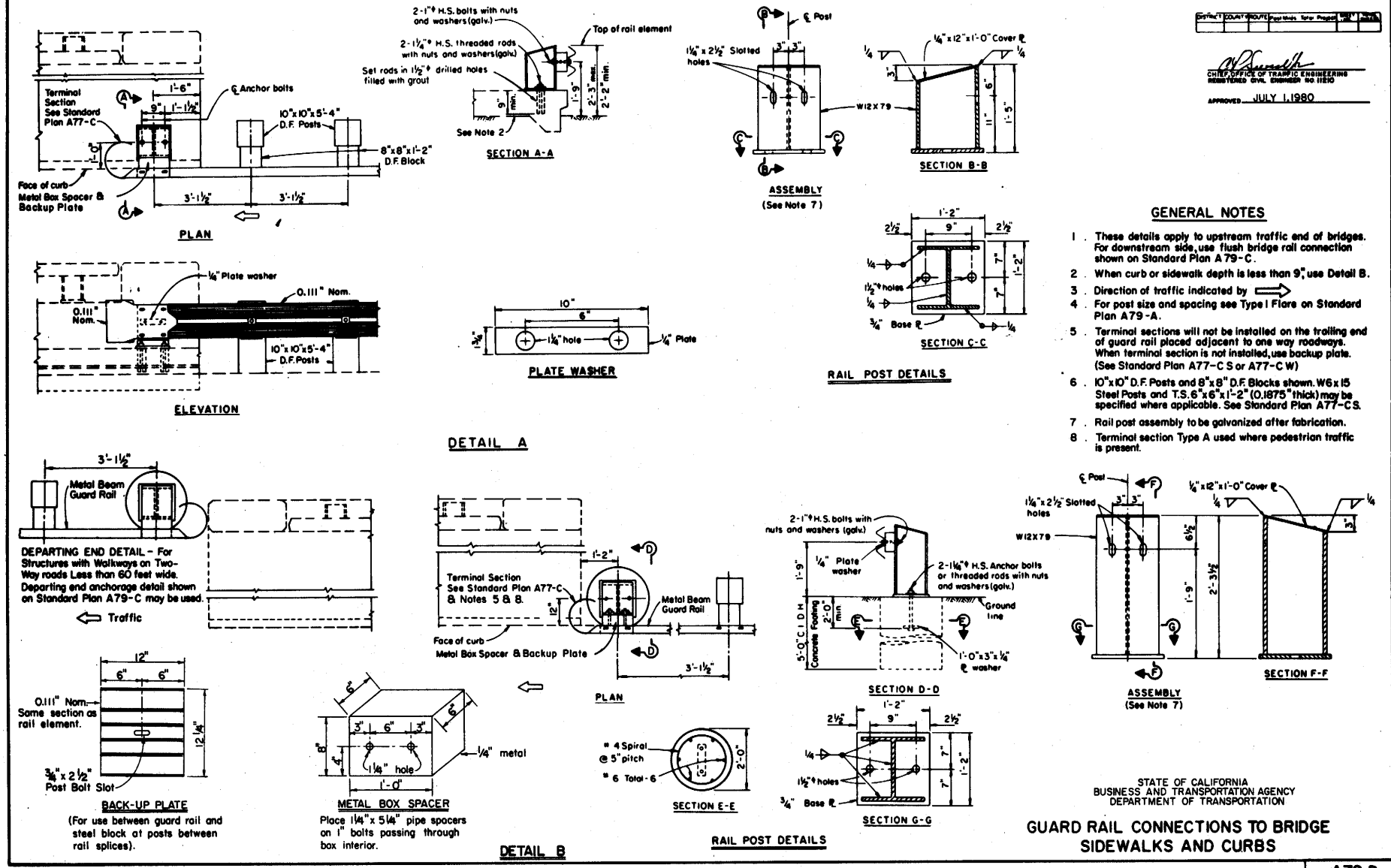

GENERAL NOTES

1. These details apply to upstream traffic end of bridges. For downstream side, use flush bridge rail connection shown on Standard Plan A79-C.
2. When curb or sidewalk depth is less than 9", use Detail B.
3. Direction of traffic indicated by ⇨
4. For post size and spacing see Type I Flare on Standard Plan A79-A.
5. Terminal sections will not be installed on the trailing end of guard rail placed adjacent to one way roadways. When terminal section is not installed, use backup plate. (See Standard Plan A77-C S or A77-C W)
6. 10"x10" D.F. Posts and 8"x8" D.F. Blocks shown. W6x15 Steel Posts and T.S. 6"x6"x1'-2" (0.1875" thick) may be specified where applicable. See Standard Plan A77-C S.
7. Rail post assembly to be galvanized after fabrication.
8. Terminal section Type A used where pedestrian traffic is present.

District	County	Route	Post Mile	Total Project	Sheet	Total Sheets

CHIEF, OFFICE OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 11510

APPROVED JULY 1, 1980

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

GUARD RAIL CONNECTIONS TO BRIDGE SIDEWALKS AND CURBS

A79-D

A79-D

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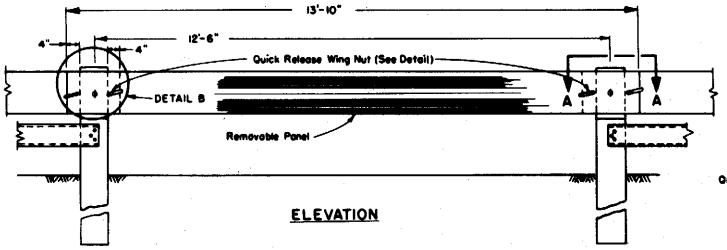
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

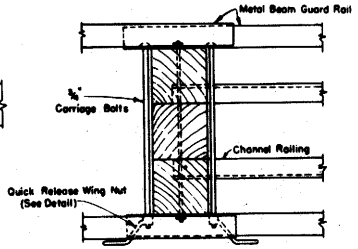
CHIEF, OFFICE OF TRAFFIC ENGINEERING
Registered Civil Engineer No. 11210

Approved JULY 1, 1980

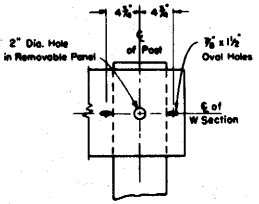


ELEVATION

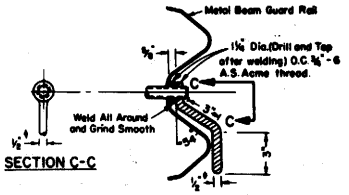
PASSAGEWAY IN METAL BEAM MEDIAN BARRIER



SECTION A-A

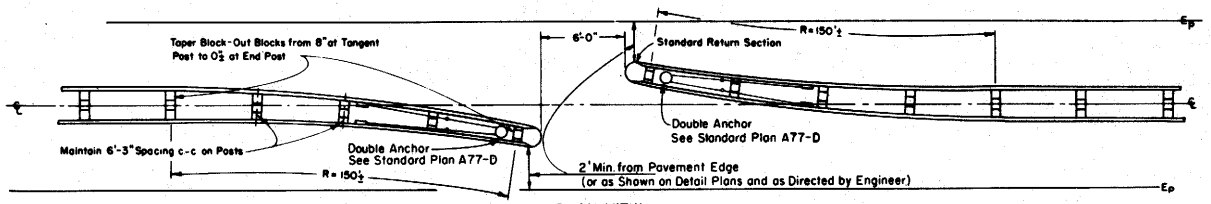


DETAIL B



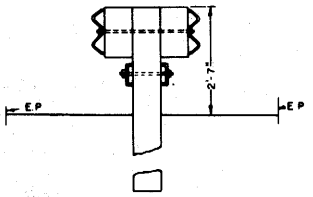
SECTION C-C

QUICK RELEASE WING NUT



PLAN VIEW

MOTORCYCLE PASSAGEWAY IN METAL BEAM MEDIAN BARRIER



TYPICAL SECTION

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

EMERGENCY PASSAGEWAYS | A80

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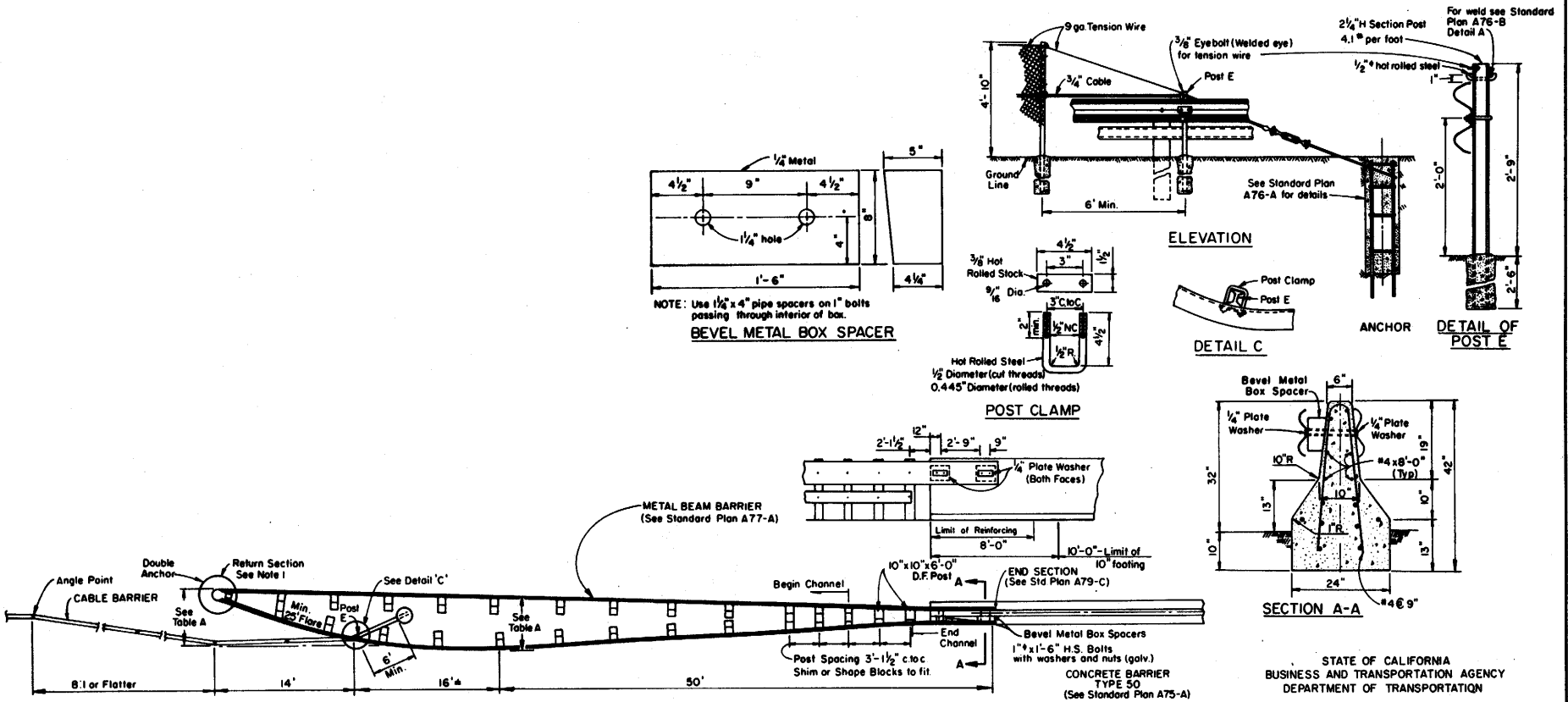
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET	TOTAL SHEETS

GENERAL NOTES

1. Shape blocks to fit.
2. Terminal sections will not be installed on the trailing end of guardrail placed adjacent to one way roadways.
3. Lap rail in direction of traffic.

CHIEF, OFFICE OF TRAFFIC ENGINEERING
Registered Civil Engineer No. 11210

APPROVED JULY 1, 1980



TRANSITIONS

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

OBSTRUCTION DEFLECTORS AND BARRIER TRANSITIONS

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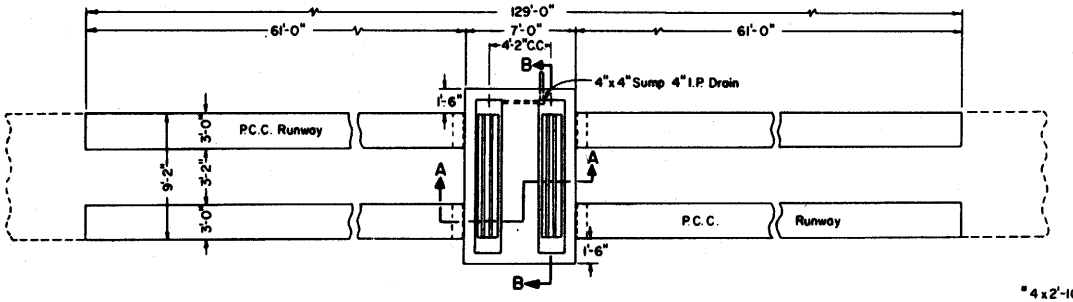
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET	TOTAL

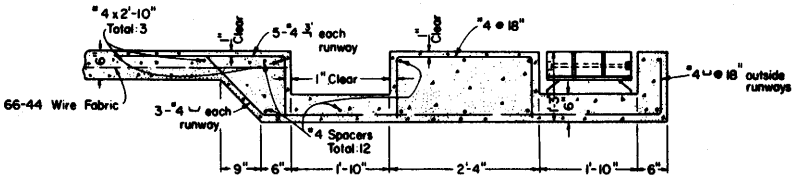
J. R. Crabber
CHIEF, OFFICE OF PLANNING AND DESIGN
REGISTERED CIVIL ENGINEER NO. 8623

Approved JULY 1, 1980

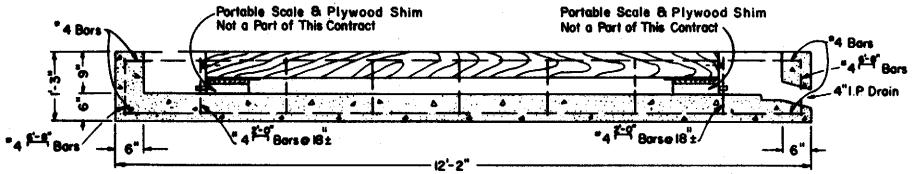


PLAN VIEW

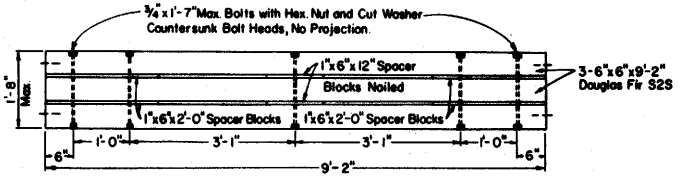
Note: Installation to be level in all directions for full length of runways.

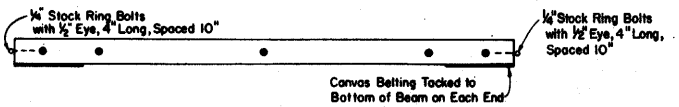


SECTION A-A

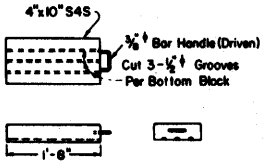


SECTION B-B

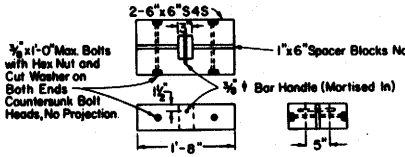




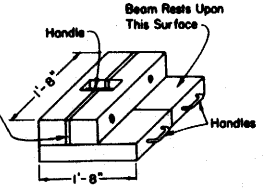
DETAILS OF BEAM CONSTRUCTION



TIMBER FILLER BLOCK
(Make - 8 per installation)



TIMBER FILLER BLOCK
(Make - 4 per installation)



FILLER BLOCK ASSEMBLY

To fill space when Portable Scale is not in use.

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

PORTABLE SCALE PIT | A83

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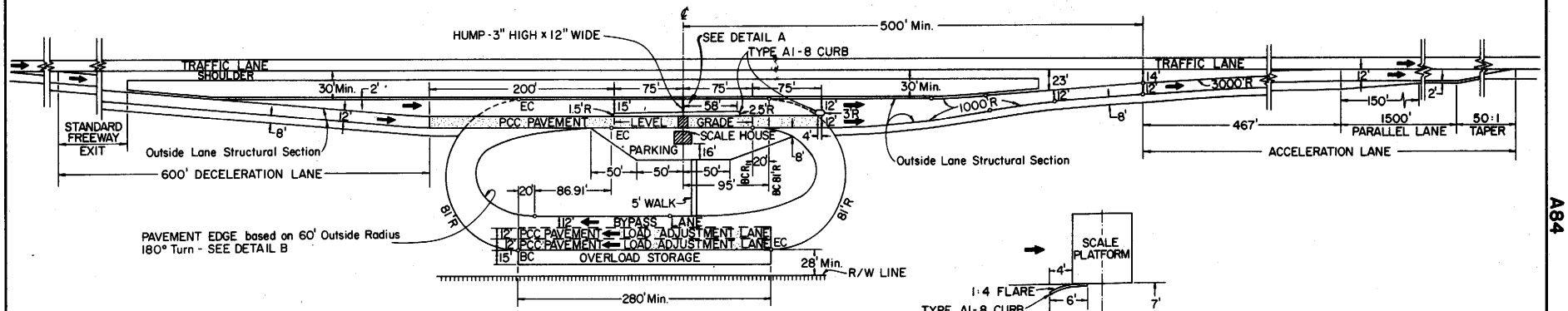
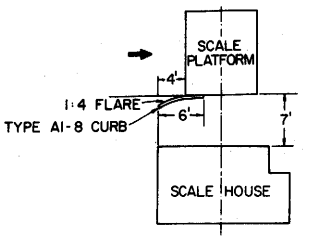
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

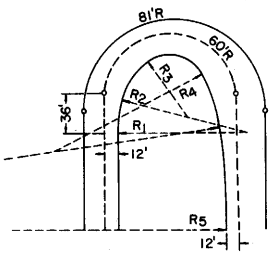
CHIEF, OFFICE OF PLANNING AND DESIGN
REGISTERED CIVIL ENGINEER NO. 6623

APPROVED JULY 1, 1980





DETAIL A



DETAIL B

CURVE DATA FOR DETAIL B

R_1 = 115.00'	Δ_1 = 15°00'00"
R_2 = 60.00'	Δ_2 = 39°30'00"
R_3 = 32.00'	Δ_3 = 98°31'01"
R_4 = 150.00'	Δ_4 = 17°58'59"
R_5 = 600.00'	Δ_5 = 9°00'00"

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

TYPICAL PLATFORM SCALE INSTALLATION (FREEWAY)

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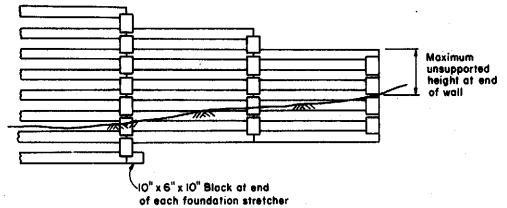
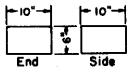
NUMBER OF UNITS REQUIRED FOR ONE INTERMEDIATE 6' PANEL OF HEIGHTS AS SHOWN

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



WALL LAYOUT DETAILS

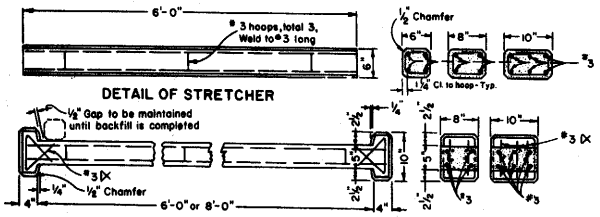


DETAIL OF FILLER BLOCK

DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET	TOTAL SHEETS

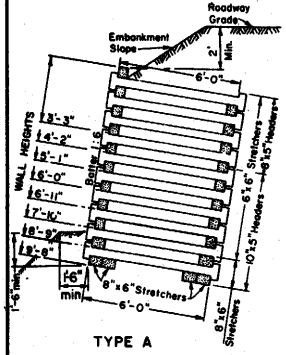
CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 8013

APPROVED July 1, 1980



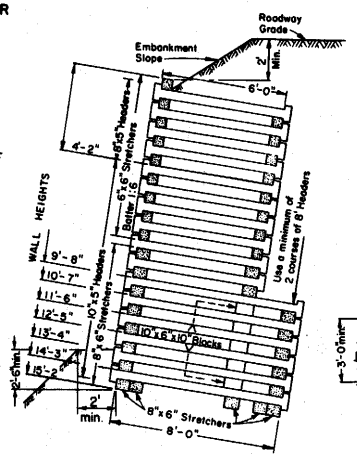
DETAIL OF STRETCHER

DETAIL OF HEADER



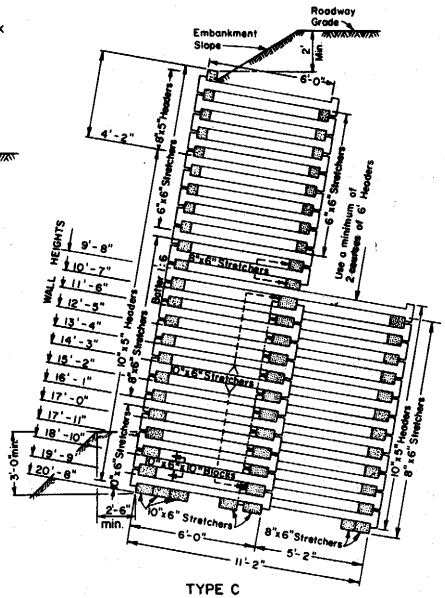
TYPE A

Walls 9'-8" or less in height



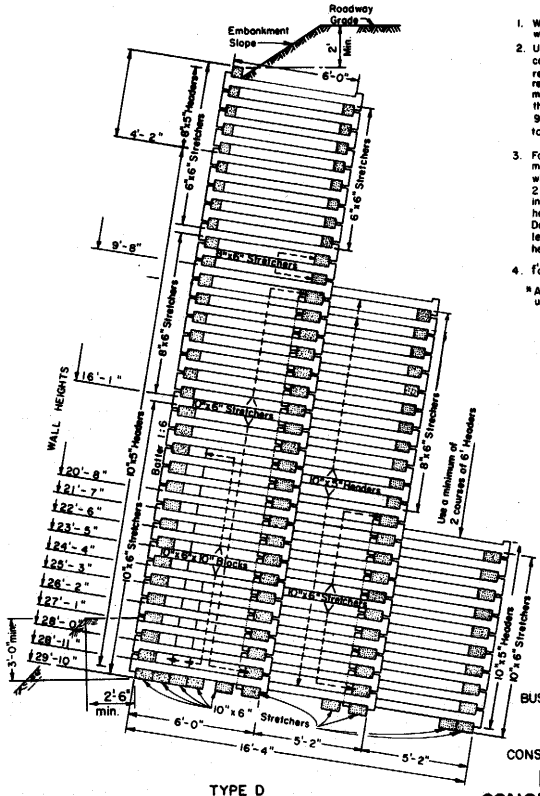
TYPE B

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



TYPE C

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



TYPE D

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

GENERAL NOTES

1. Walls 12'-5" or less in height may be constructed with no batter.
2. Units shown in Table are for Intermediate Panels. In computing a wall of say 7 panels, it is necessary to remember that 7+1 or 8 vertical rows of headers are required. In addition, another vertical row of headers must be added whenever in the case of long walls, the wall is "broken" at panel points of approximately 96 feet. Table of number of units required apply to battered walls.
3. For battered walls, steps in width are to be made at the wall heights shown on this sheet when the next lower level consists of at least 2 courses of headers. For vertical walls, steps in width are to be made at the limiting total height for each wall shown on the graphs on the Design Data sheet providing the next lower level consists of at least 2 courses of headers.
4. $f'c = 3250$ psi, $fy = 40{,}000$ psi *

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

For Design Data see Standard Plan Sheet C7-D

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

CONSTRUCTION DETAILS FOR

REINFORCED CONCRETE CRIB WALL TYPES A, B, C, & D

C7-A

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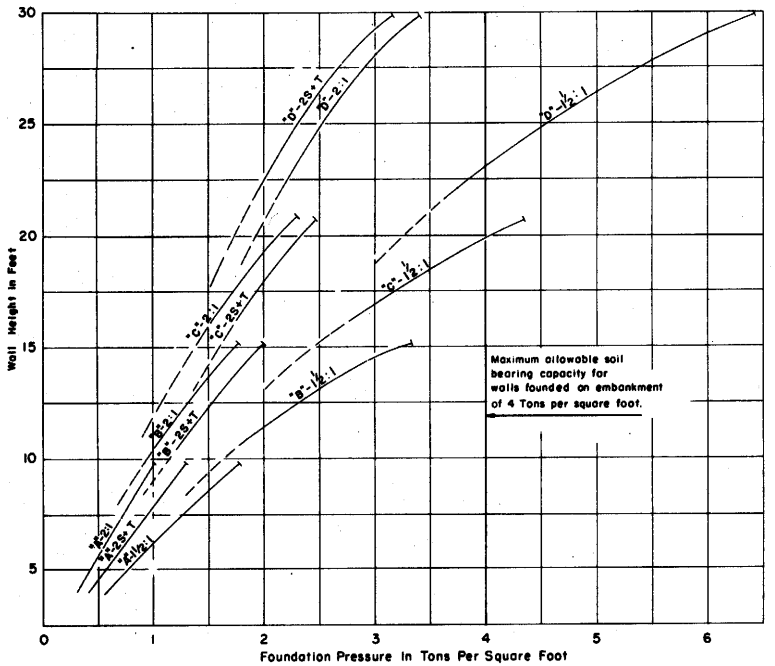
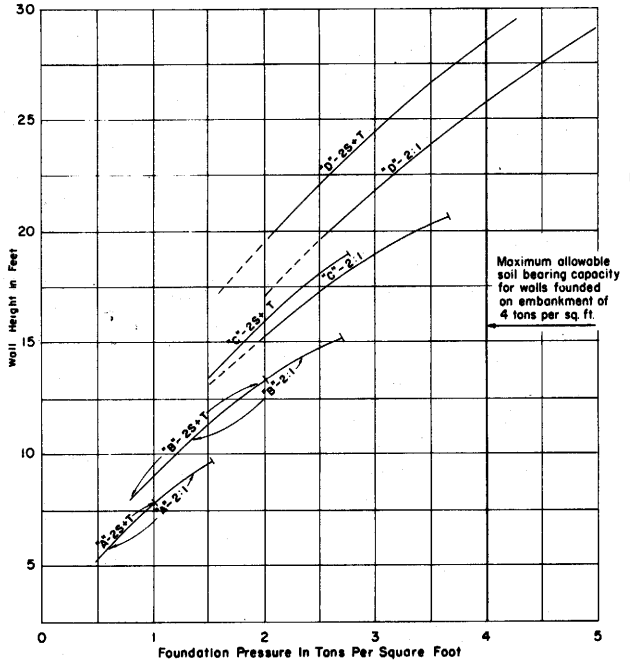
DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

CHIEF • BUREAU OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 8013

APPROVED July 1, 1980



1:6 BATTERED WALL



VERTICAL WALL

DESIGN EXAMPLES

Example No. 1
Given: Wall Height 24'
2:1 embankment slope to be retained. Base founded in embankment.
Select: Either vertical or battered "D" wall. Both walls require a 5' depth embankment at 95% compaction below base. However, for the vertical wall with a foundation pressure of 3.0 TSF this embankment material must be "Structure Backfill" (See Design Note 1)

Example No. 2
Given: Wall Height 20'
2:1 cut slope to be retained. Foundation site investigation indicates lateral pressure from material above will be equivalent to 2:1 embankment slope, and the allowable soil bearing capacity is 2.5 TSF.
Select: Battered "C" wall. Also a vertical "D" wall can be used. By increasing the allowable bearing capacity of the original ground (see Design Note 2), a vertical "C" wall can be used.

Example No. 3
Given: Wall Height 9'
2' level surcharge with traffic loading to be retained. Base founded in embankment.
Select: Battered "A" wall or vertical "B" wall. If vertical "B" wall is used, the actual height of the wall will be 9'-8". The first step in the wall will be 7'-10" which is the limiting height of the "A" wall for the 2S+T surcharge. A minimum of 2 courses of 8' headers is provided. (See Note 3, Construction Details sheet)

DESIGN NOTES

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

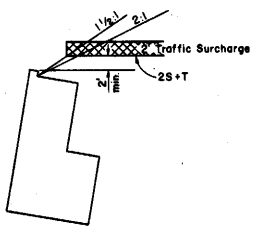
2. Wall base in original ground: Allowable soil pressure at toe of wall shall be determined by foundation site investigation. Walls that are to retain cut slopes shall be designed for lateral and toe pressures determined from site investigation data. Overall stability of slope with wall in place must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

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

LEGEND FOR GRAPHS

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

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



DESIGN SURCHARGES

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

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

C7-B

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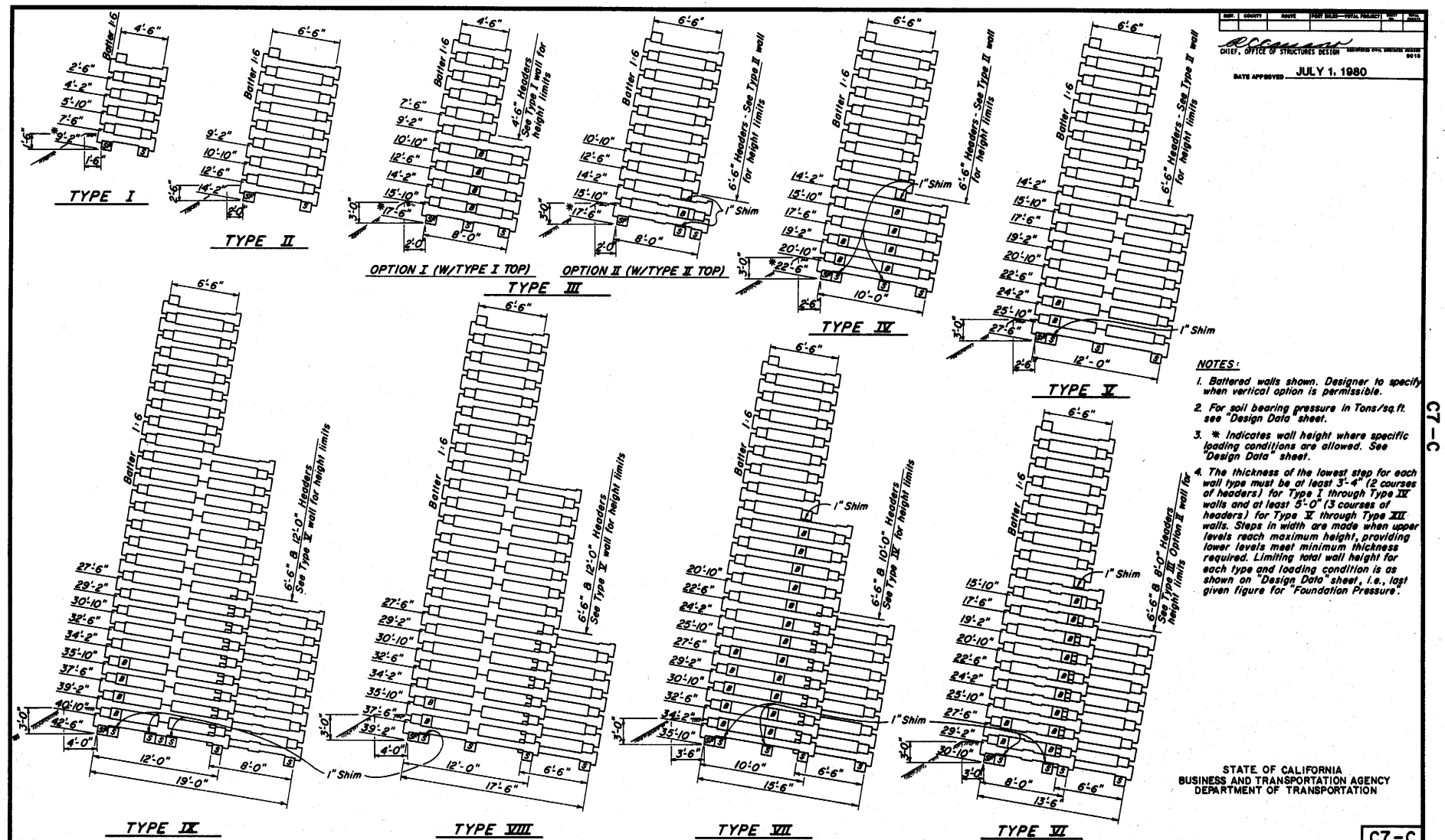


CHIEF, OFFICE OF STRUCTURES DESIGN

DATE APPROVED JULY 1, 1980

NOTES:

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

C7-C

STANDARD DRAWING

FILE NO. XS-3-60	DESIGN By W. BAKER	Checked J.C. Moese	Approved Recommended for
DRAWING DATE 10/78	DETAILS By K.C. Blechinger	Checked J.C. Moese	
	SUBMITTED BY		REGISTERED CIVIL ENGINEER NUMBER 8198

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER

BRIDGE NO. POST MILE

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

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU WO

Disregard prints bearing earlier revision dates

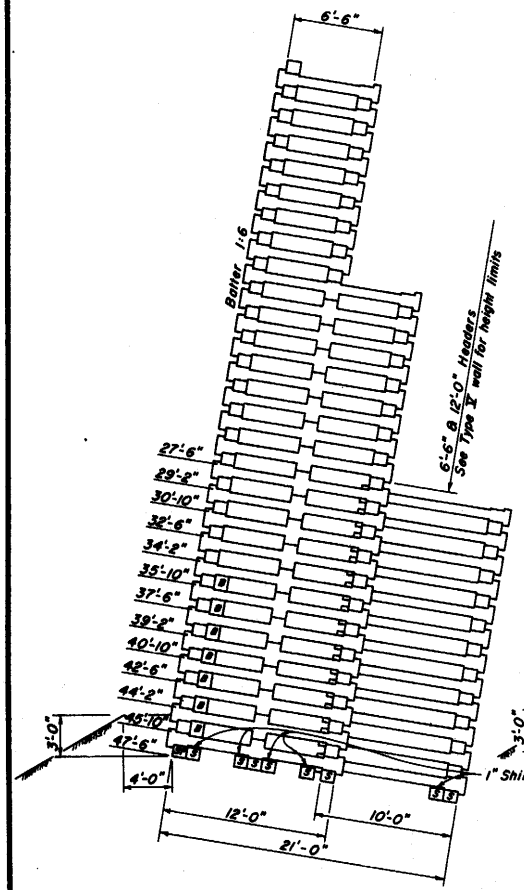
REVISION DATES (PRELIMINARY STAGE ONLY) SHEET OF

Return to Table of Contents

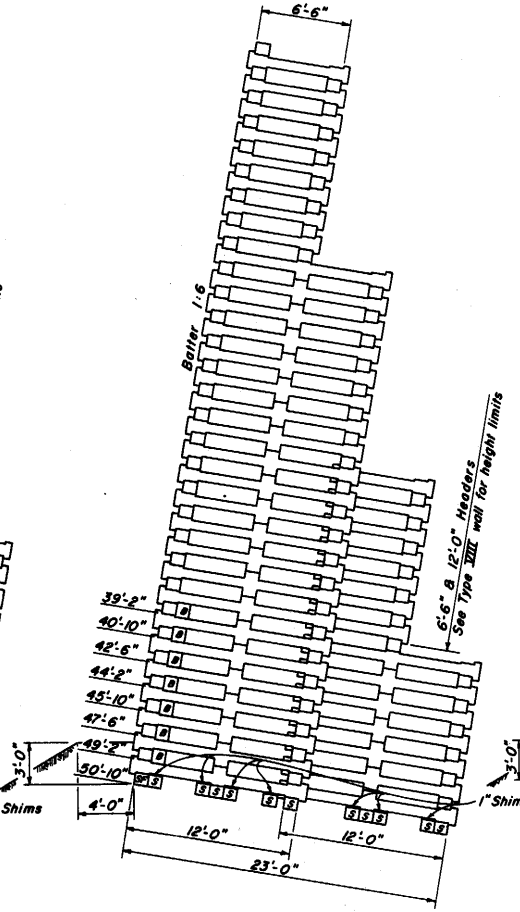
DIST	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF STRUCTURES DESIGN

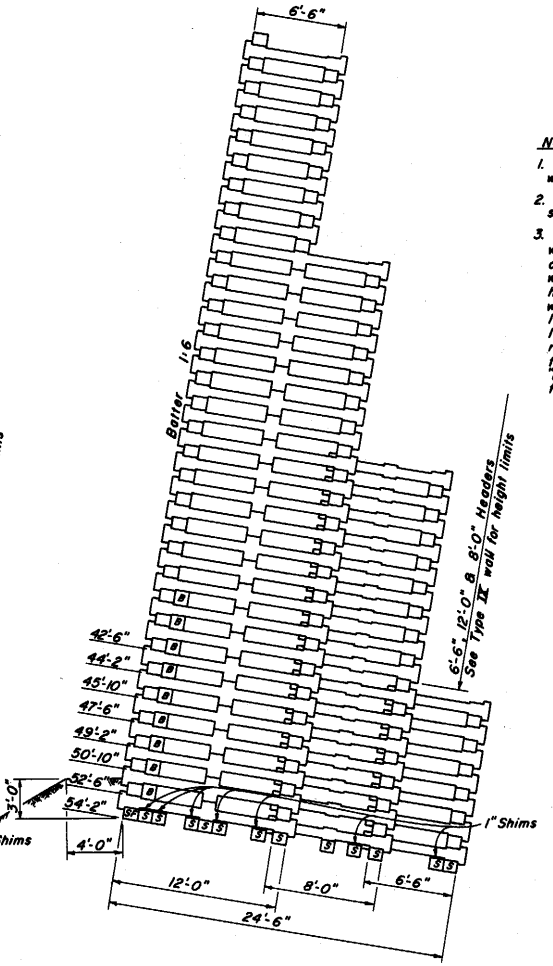
DATE APPROVED JULY 1, 1980



TYPE X



TYPE XI



TYPE XII

NOTES:

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

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

C7-D

STANDARD DRAWING

FILE No. XS-3-61	DESIGN	by H. Baker	Checked J.C. Moore	Approved recommended by Dwight Marcell
DRAWING DATE 10/78	DETAILS	by H.C. Blechinger	Checked J.C. Moore	
	SUBMITTED BY		9737	8/28

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER

BRIDGE No.

POST MILE

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

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU
WO

Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY) SHEET OF

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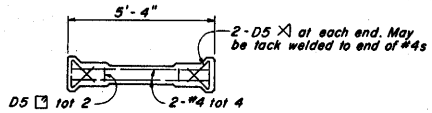
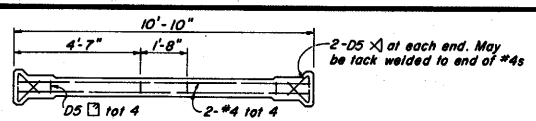
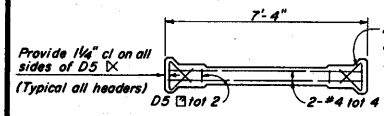


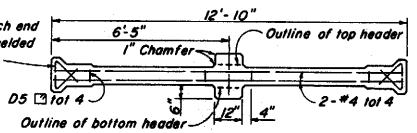
4'-6" HEADERS



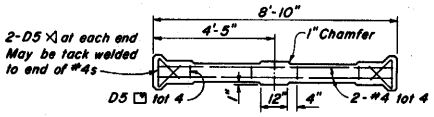
10'-0" HEADERS



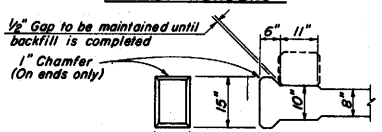
6'-6" HEADERS



12'-0" HEADERS



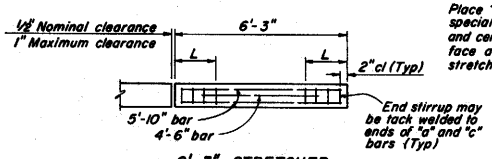
8'-0" HEADERS



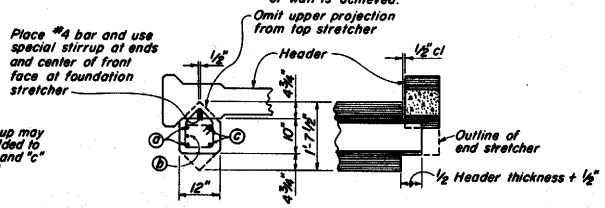
8"	Above 35'-10" level
10"	Between 35'-10" and 47'-6" levels
12"	Below 47'-6" level

Note: Adjust changes in header width such that a uniform appearance of wall is achieved.

HEADER DETAILS

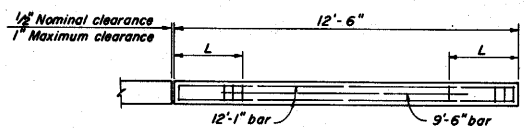


6'-3" STRETCHER

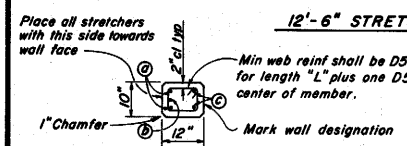


CLOSED FACE STRETCHER

Note: Closed face stretcher details same as open face stretcher except as noted



12'-6" STRETCHER



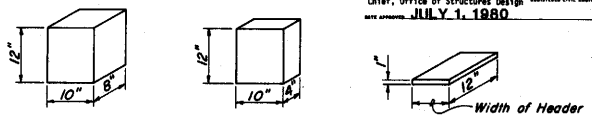
SECTION

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

*Required concrete compressive strength for stretchers increases with increased distance from the top of the crib wall as follows;

0' thru 22'-6", f'_c = 3250 psi
> 22'-6" thru 27'-6", f'_c = 4000 psi
> 27'-6" thru 39'-2", f'_c = 4500 psi
> 39'-2", f' = 5000 psi

STRETCHER DETAILS

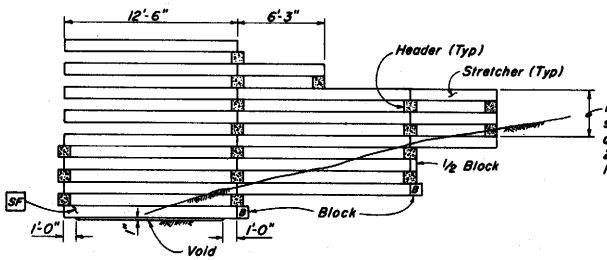


BLOCK — ½ BLOCK — 1" SHIM

S — Foundation stretchers placed thus (Mark, 10", 12") on a 4" layer of loose structure backfill material. Details and reinforcement are the same as other stretchers.

B — Blocks - a block is required immediately behind the front stretchers on each front header for a minimum of two courses above the foundation stretcher for Type IV through Type VI walls. Place a block behind the front stretcher at each front header from the base to the upper limits shown for Type VII through Type XII walls.

SF — Front face foundation stretcher, place as shown below.



BLOCK & STRETCHER PLACEMENT DETAILS

GENERAL NOTES

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

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

C7-E

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

Chief, Office of Structures Design — REGISTERED CIVIL ENGINEER NUMBER 9019
DATE APPROVED: JULY 1, 1980

STANDARD DRAWING

FILE No. XS-3-62	DESIGN	By W. Baker	Checked J.C. Moese	Approved / Recommended By
DRAWING DATE 8/78	DETAILS	By K.C. Blechinger	Checked J.C. Moese	
	SUBMITTED BY		9737	REGISTERED CIVIL ENGINEER NUMBER 8198

State of CALIFORNIA
DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER

BRIDGE No.

POST MILE

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

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU
WO

Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY) — SHEET — OF

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

RICHARD ... CHIEF, OFFICE OF STRUCTURES DESIGN — REGISTERED CIVIL ENGINEER 6010

DATE APPROVED JULY 1, 1980

1:6 BATTER WALL

Foundation Pressure in Tons Per Sq Ft

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

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

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

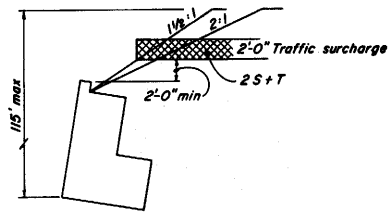
VERTICAL WALL

Foundation Pressure in Tons Per Sq Ft

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

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

29'-2"
3.6
4.4
3.3
4.1



DESIGN SURCHARGE

DESIGN NOTES

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

Legend for Chart

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

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

1½:1 = 1½:1 Slope above wall }

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

DESIGN EXAMPLES

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

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

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

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

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

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

C7-F

STANDARD DRAWING

FILE No. XS-3-63	DESIGN	By W. BAKER	Checked J. C. HOESE	Approved Recommended by
DRAWING 5/77 DATE	DETAILS	By K.C. Blechinger	Checked J. C. HOESE	
	SUBMITTED BY		9/77	REGISTERED CIVIL ENGINEER NUMBER 8188

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER

BRIDGE NO.

POST MILE

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

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

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Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY) SHEET OF

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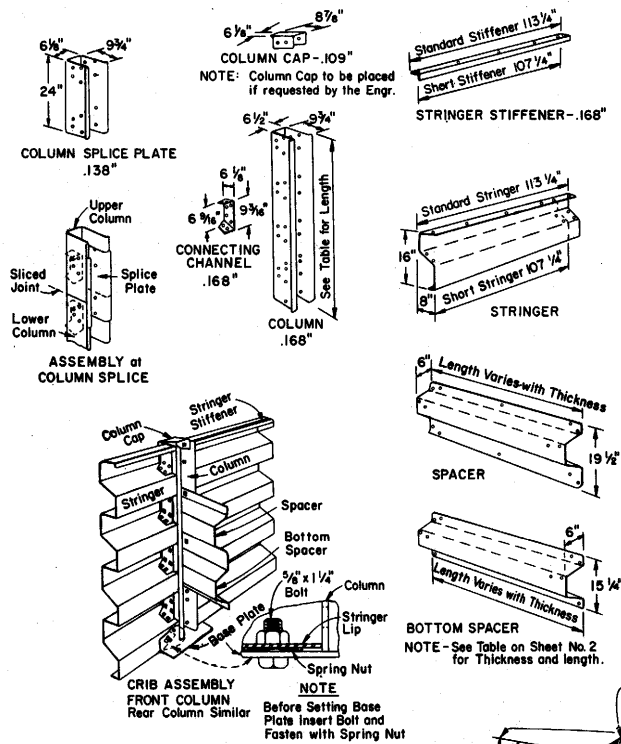
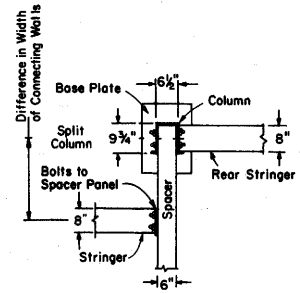
DISTRICT	COUNTY	ROUTE	Post Miles Total Project	SHEET NO.	TOTAL SHEETS

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

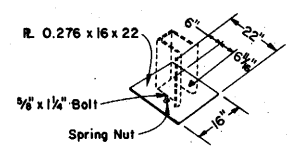
DATE APPROVED July 1, 1980

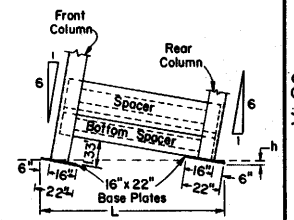




NOTE

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





WALL WIDTH TYPE	h	L
"A"	3"	6'-7⅝"
"B"	1⅜"	8'-9⅝"
"C"	5 13/16"	10'-11 15/16"
"D"	10 3/16"	13'-2 1/16"
"E"	14⅝"	15'-4 5/16"
"F"	18¾"	17'-8½"

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

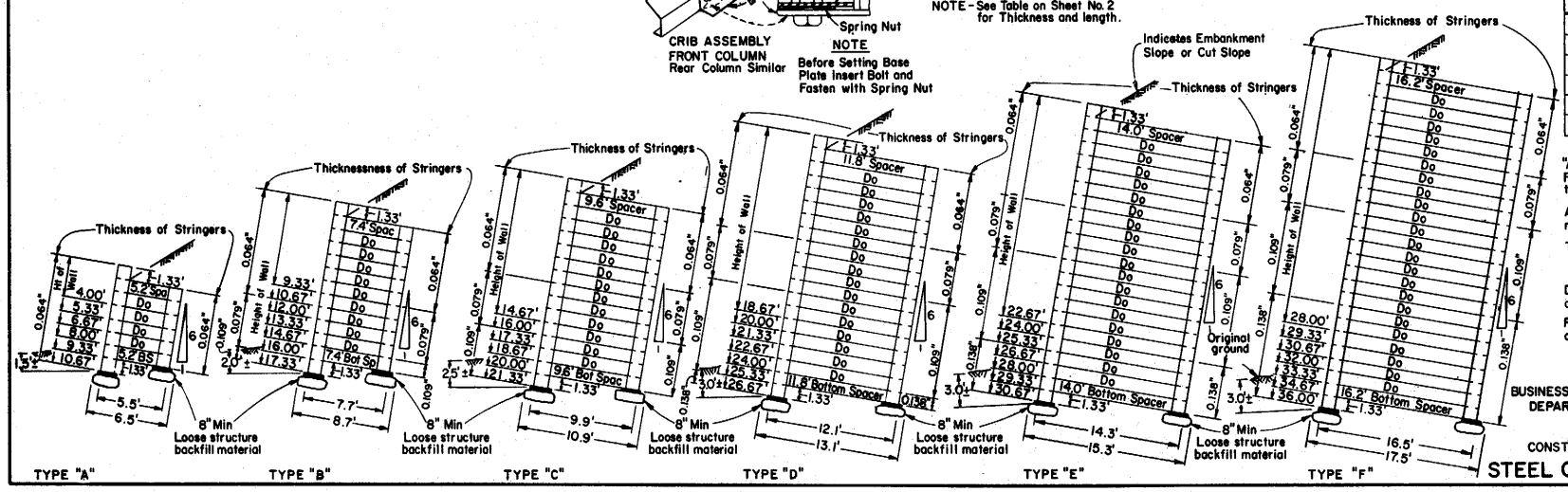
All bolts to be ⅝" with a minimum length of 1¼".

Thickness given in inches.

GENERAL NOTES

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

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



STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

CONSTRUCTION DETAILS FOR

STEEL CRIB WALL Sheet No.1

C8-A

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

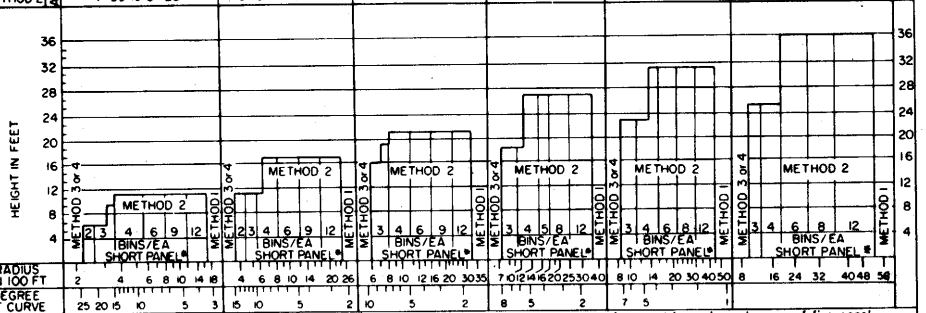
CHIEF - OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

APPROVED July 1, 1980

CURVATURE CHART - 1 TO 6 BATTER

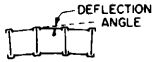
THIS DATA, OMITTING HEIGHT RESTRICTIONS, CAN BE USED FOR VERTICAL WALLS

DESIGN	A BASE WIDTH 5.5'	B BASE WIDTH 7.7'	C BASE WIDTH 9.9'	D BASE WIDTH 12.1'	E BASE WIDTH 14.3'	F BASE WIDTH 16.5'
METHOD 1 (ANGLE)	0° to 0°-26'	0° to 0°-20'	0° to 0°-14'	0° to 0°-12'	0° to 0°-10'	0° to 0°-8'
METHOD 2 (ANGLE)	4°-59' to 5°-25'	3°-34' to 3°-54'	2°-47' to 3°-01'	2°-16' to 2°-28'	1°-55' to 2°-05'	1°-18' to 1°-26'



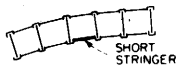
EXAMPLE - To build a Design "D" wall 20.00' high on a 1400' radius curve, use Method 2 with one set of short stringers in each group of five panel sections.

METHOD 1



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

METHOD 2

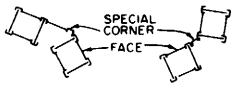


Use short panel sections (9'-6" face or rear) in addition to play in bolt holes. Curvature chart indicates number * of bins in each group, including a modified bin, necessary to build a curved wall at a required height and radius.

METHOD 3

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

METHOD 4



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

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

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

NOTE - Use Graphs shown on Steel Crib Wall Sheet No.3 to determine base width to height ratio for the various surcharges on both vertical and batter walls.

UNITS REQUIRED PER SHORT PANEL SECTION

WALL HEIGHT	SHORT STRINGERS IN FRONT OF WALL										SHORT STRINGERS IN REAR OF WALL									
	.064"		.079"		.109"		.138"		St'd		.064"		.079"		.109"		.138"		St'd	
	St'd	Short	St'd	Short	St'd	Short	St'd	Short	Str		St'd	Short	St'd	Short	St'd	Short	St'd	Short	Str	
FEET	9.5'	9.0'	9.5'	9.0'	9.5'	9.0'	9.5'	9.0'	St'r		9.5'	9.0'	9.5'	9.0'	9.5'	9.0'	9.5'	9.0'	St'r	
4.00	1	3							1		3	1							1	
5.33	2	4							1		4	2							1	
6.67	3	5							1		5	3							1	
8.00	4	6							1		6	4							1	
9.33	5	7							1		7	5							1	
10.67	6	8							1		8	6							1	
12.00	6	8							1		8	6							1	
13.33	6	8	2	2					1		8	6	2	2					1	
14.67	6	8	3	3					1		8	6	3	3					1	
16.00	6	8	4	4					1		8	6	4	4					1	
17.33	6	8	4	4	1	1			1		8	6	4	4	1	1			1	
18.67	6	8	4	4	2	2			1		8	6	4	4	2	2			1	
20.00	6	8	4	4	3	3			1		8	6	4	4	3	3			1	
21.33	6	8	4	4	4	4			1		8	6	4	4	4	4			1	
22.67	6	8	4	4	5	5			1		8	6	4	4	5	5			1	
24.00	6	8	4	4	6	6			1		8	6	4	4	6	6			1	
25.33	6	8	4	4	7	7			1		8	6	4	4	7	7			1	
26.67	6	8	4	4	7	7	1	1	1		8	6	4	4	7	7	1	1	1	
28.00	6	8	4	4	7	7	2	2	1		8	6	4	4	7	7	2	2	1	
29.33	6	8	4	4	7	7	3	3	1		8	6	4	4	7	7	3	3	1	
30.67	6	8	4	4	7	7	4	4	1		8	6	4	4	7	7	4	4	1	
32.00	6	8	4	4	7	7	5	5	1		8	6	4	4	7	7	5	5	1	
33.33	6	8	4	4	7	7	6	6	1		8	6	4	4	7	7	6	6	1	
34.67	6	8	4	4	7	7	7	7	1		8	6	4	4	7	7	7	7	1	
36.00	6	8	4	4	7	7	8	8	1		8	6	4	4	7	7	8	8	1	

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

UNITS REQUIRED PER TRANSVERSE SECTION

WALL HEIGHT	BEARING PLATE	FRONT COLUMN HEIGHT IN FEET				REAR COLUMN HEIGHT IN FEET				Total Col Length in Feet	Column Splice	Column Cap	SPACERS Thickness & Length						BOT SPACER Thickness & Length						UNITS REQUIRED PER PANEL SECTION STRINGERS				St'r St'r	WALL HEIGHT
FEET	16" x 22"	1st Lift	2nd Lift	3rd Lift	Total Height	1st Lift	2nd Lift	3rd Lift	Total Height				.064 5.2	.064 7.4	.079 9.6	.109 11.8	.109 14.0	.109 16.2	.064 5.2	.064 7.4	.079 9.6	.109 11.8	.109 14.0	.109 16.2	.064 9.5'	.079 9.5'	.109 9.5'	.138 9.5'	9.5'	FEET
4.00	2	4.00			4.00	1.33			1.33	5.33		1													4				1	4.00
5.33	2	5.33			5.33	2.67			2.67	8.00		1	1						1						6				1	5.33
6.67	2	6.67			6.67	4.00			4.00	10.67		1	2						1						8				1	6.67
8.00	2	8.00			8.00	5.33			5.33	13.33		1	3						1						10				1	8.00
9.33	2	9.33			9.33	6.67			6.67	16.00		1	4						1						12				1	9.33
10.67	2	10.67			10.67	8.00			8.00	18.67		1	5	5					1	1					14				1	10.67
12.00	2	12.00			12.00	9.33			9.33	21.33		1		6						1					14	2			1	12.00
13.33	2	8.00	5.33		13.33	10.67			10.67	24.00	1	1		7						1					14	4			1	13.33
14.67	2	8.00	6.67		14.67	12.00			12.00	26.67	1	1		8	8					1	1				14	6			1	14.67
16.00	2	8.00	8.00		16.00	8.00	5.33		13.33	29.33	2	1		9	9					1	1				14	8			1	16.00
17.33	2	12.00	5.33		17.33	8.00	6.67		14.67	32.00	2	1		10	10					1	1				14	8	2		1	17.33
18.67	2	12.00	6.67		18.67	8.00	8.00		16.00	34.67	2	1			11	11					1	1			14	8	4		1	18.67
20.00	2	12.00	8.00		20.00	12.00	5.33		17.33	37.33	2	1			12	12					1	1			14	8	6		1	20.00
21.33	2	12.00	9.33		21.33	12.00	6.67		18.67	40.00	2	1			13	13					1	1			14	8	8		1	21.33
22.67	2	12.00	10.67		22.67	12.00	8.00		20.67	42.67	2	1				14	14					1	1		14	8	10		1	22.67
24.00	2	12.00	12.00		24.00	12.00	9.33		21.33	45.33	2	1				15	15					1	1		14	8	12		1	24.00
25.33	2	12.00	8.00	5.33	25.33	12.00	10.67		22.67	48.00	3	1				16	16					1	1		14	8	14		1	25.33
26.67	2	12.00	8.00	6.67	26.67	12.00	12.00		24.00	50.67	3	1				17	17					1	1		14	8	14	2	1	26.67
28.00	2	12.00	8.00	8.00	28.00	12.00	8.00	5.33	25.33	53.33	4	1					18	18					1	1	14	8	14	4	1	28.00
29.33	2	12.00	12.00	5.33	29.33	12.00	8.00	6.67	26.67	56.00	4	1					19	19					1	1	14	8	14	6	1	29.33
30.67	2	12.00	12.00	6.67	30.67	12.00	8.00	8.00	28.00	58.67	4	1					20	20					1	1	14	8	14	8	1	30.67
32.00	2	12.00	12.00	8.00	32.00	12.00	12.00	5.33	29.33	61.34	4	1						21						1	14	8	14	10	1	32.00
33.33	2	12.00	12.00	9.33	33.33	12.00	12.00	6.67	30.67	64.01	4	1						22						1	14	8	14	12	1	33.33
34.67	2	12.00	12.00	10.67	34.67	12.00	12.00	8.00	32.00	66.68	4	1						23						1	14	8	14	14	1	34.67
36.00	2	12.00	12.00	12.00	36.00	12.00	12.00	9.33	33.33	69.35	4	1						24						1	14	8	14	16	1	36.00

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

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

DESIGN DATA FOR

STEEL CRIB WALL Sheet No.2

NOTE - For Construction Details See Sheet C8-A

C8-B

C8-B

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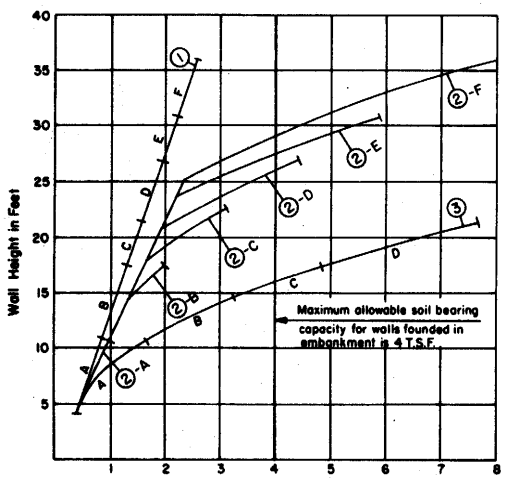
DISTRICT	COUNTY	ROUTE	Post Mileg - Total Project	SHEET NO.	TOTAL SHEETS

CHIEF - OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013
DATE APPROVED July 1, 1980



1:6 BATTERED WALL

DESIGN EXAMPLES

EXAMPLE NO. 1

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

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

EXAMPLE NO. 2

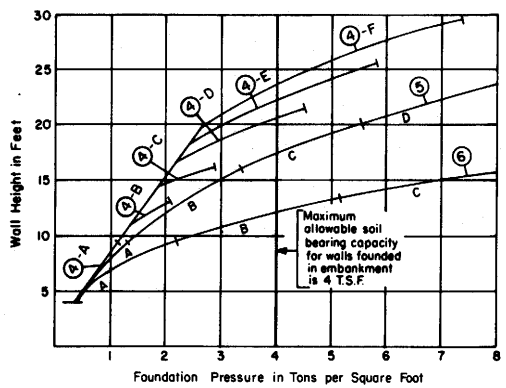
Given: Wall Height 29'.
2:1 cut slope to be retained. Foundation site investigation indicates lateral pressure from material above will be equivalent to 2:1 embankment slope. Base in excavation level at toe of wall. Foundation investigation determines the allowable soil bearing capacity at 3 T.S.F.

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

EXAMPLE NO. 3

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

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



VERTICAL WALL

Surcharge / Batter	Level 2' Min. Sur.	2:1 With Finite * Surcharge	1½:1 With Finite * Surcharge
Wall On 1:6 Batter	1 ¼ 2S	2 2:1	3 1½:1
Wall Vertical	4 ¼ 2S	5 2:1	6 1½:1

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

LEGEND FOR GRAPHS

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

DESIGN NOTES

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

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

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

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

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

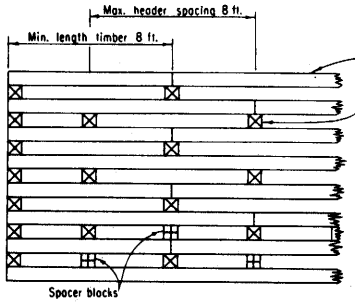
NOTE-For Construction Details See Sheet C8-A

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

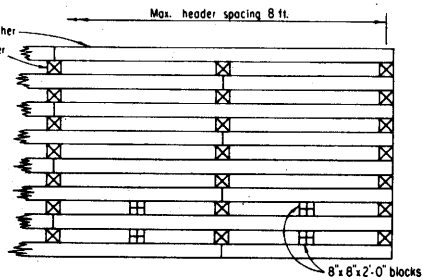
DESIGN DATA FOR
STEEL CRIB WALL Sheet No.3

C8-C

Return to Table of Contents

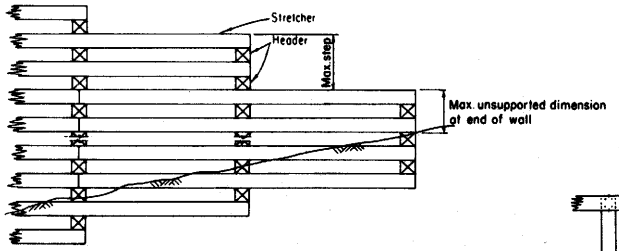


HEADERS STAGGERED
(ALTERNATIVE)

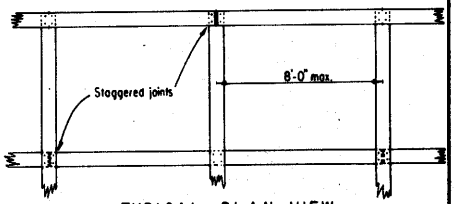


HEADERS IN LINE
(ALTERNATIVE)

OPEN FACE CRIB ELEVATION



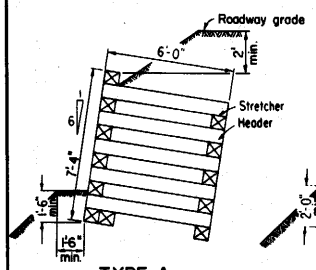
WALL LAYOUT DETAILS



TYPICAL PLAN VIEW

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

For Design Data see Plan Sheet C9-B



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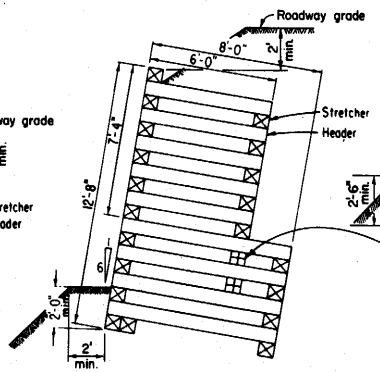

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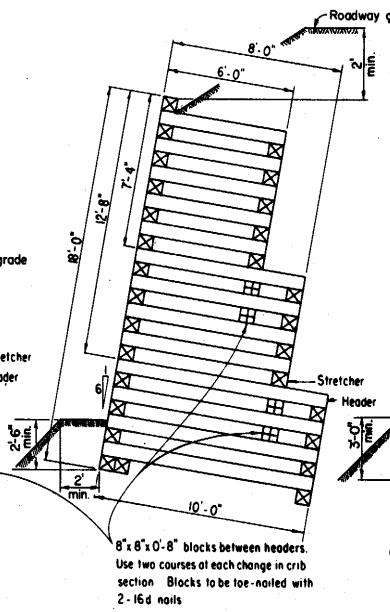
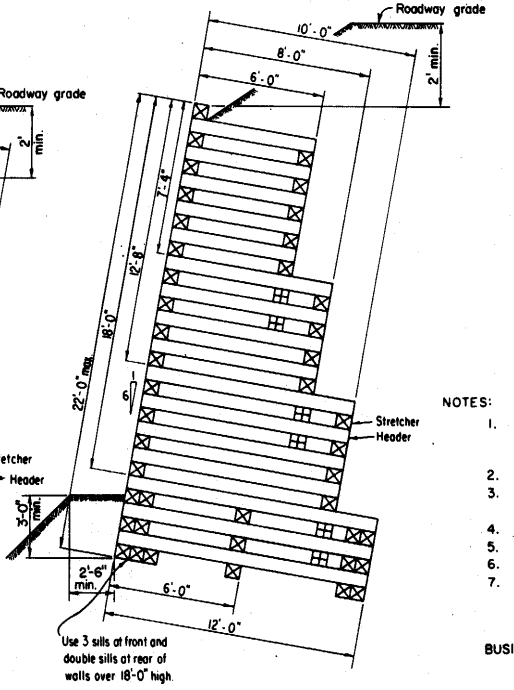
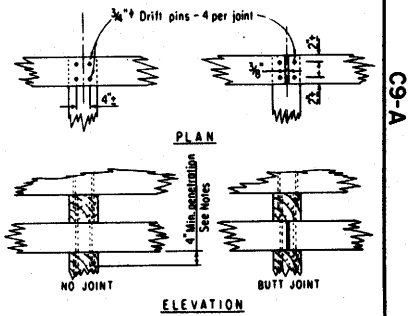


TYPE C



TYPE D



TYPICAL END CONNECTIONS

NOTES:

1. All timber to be 8"x8" rough, No. 1 Structural Douglas Fir-Larch, treated after fabrication All required cuts or bored holes to be swabbed with 2 coats of the same type of preservative used for treating the timber.
2. Drift pins and holes to be 3/4" ϕ.
3. Drift pins to be of sufficient length to penetrate thru 2 members and 4" min. into the third member.
4. All stretchers to be laid horizontal.
5. Vertical walls are not permitted.
6. Maximum allowable wall height is 22'-0".
7. All walls 18'-0" high or under shall have double sills at front and single sill at rear. When wall exceeds 7'-4", 12'-8" or 18'-0" use a minimum of two courses of next longer headers.

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

CONSTRUCTION DETAILS FOR
TIMBER CRIB WALL - TYPES A, B, C, & D

C9-A

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

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013
APPROVED July 1, 1980

C9-A

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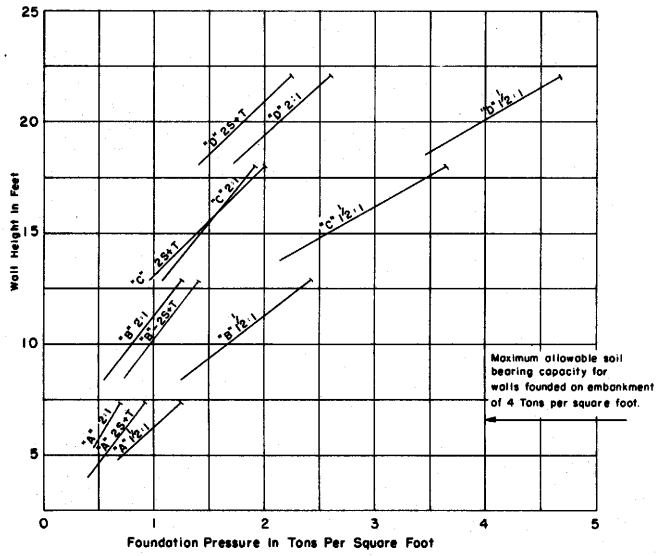
DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 8013
DATE APPROVED July 1, 1980



1:6 BATTERED WALL

DESIGN EXAMPLES

EXAMPLE NO. 1

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

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

EXAMPLE NO. 2

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

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

EXAMPLE NO. 3

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

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

DESIGN NOTES

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

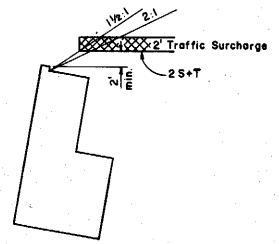
2. Wall base in original ground: Allowable soil pressure at toe of wall shall be determined by foundation site investigation. Walls that are to retain cut slopes shall be designed for lateral and toe pressures determined from site investigation data. Overall stability of slope with wall in place must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

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

LEGEND FOR GRAPHS

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

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



DESIGN SURCHARGES

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

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

C9-B

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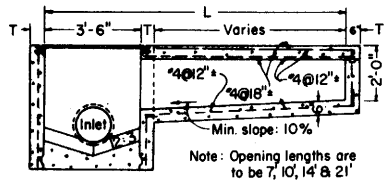
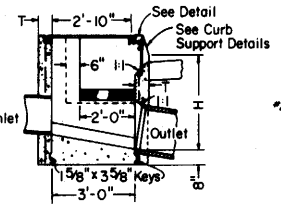
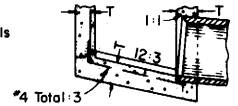


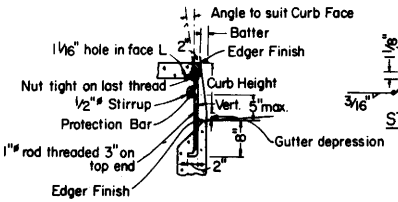
SECTION A-A



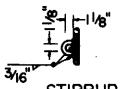
SECTION B-B



ALTERNATIVE REINFORCED BOTTOM



CURB SUPPORT DETAILS
(Shown for Type A Curbs)



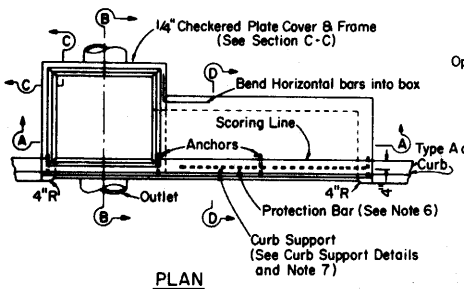
STIRRUP

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

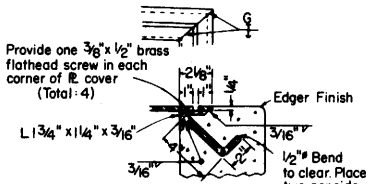
CHIEF, OFFICE OF PLANNING AND DESIGN
REGISTERED CIVIL ENGINEER NO. 8623
APPROVED JULY 1, 1980

GENERAL NOTES

1. "H" is the difference in elevation between the outlet pipe flow line and the normal gutter grade line undepressed at the curb face.
2. For "T" wall thickness see Table.
3. Height of curb opening will vary with the type of curb and the depth of the local depression.
4. Wall reinforcing not required when H=8' or less and the unsupported width or length = 7' or less. Walls exceeding these limits shall be reinforced with #4 bars @ 18"± centers placed 1½" clear to inside of box unless otherwise shown.
5. Steps - None required where "H" is less than 30 inches. Where "H" is 30 inches or more, install steps with lowest rung 12 inches above the floor, and highest rung not more than 6 inches below top of inlet. The distance between steps shall not exceed 12 inches and shall be uniform throughout the length of the wall. Place steps in the wall without an opening.
6. When shown on the project plans, place a #6 protection bar horizontally across the entire length of the opening and bend back 4" into the inlet wall on each side.
7. Curb supports shall be evenly spaced and minimal in number such that maximum span of unsupported curb is 7'.
8. Pipe (s) can be placed in any wall.
9. Curb section shall match adjacent curb.
10. Except for inlets used as junction boxes, basin floor shall have a minimum slope of 12:3 from all directions toward outlet pipe and shall have a wood trowel finish.
11. Galvanizing: See Standard Specification or Special Provisions.
12. See "Standard Grate Details" D77-A & D77-B for Grate and Frame Details and Weights of Miscellaneous Iron and Steel.
13. See Standard Plan D78 for Depression Details.
14. Full penetration butt welds may be substituted for the fillet welds on all anchors.
15. Standard square, hexagon, round or equivalent headed anchors may be substituted for the right angle hooks on the anchors shown on this plan.
16. Cast-in-place or Precast alternative is optional with contractor. See Standard Specifications.

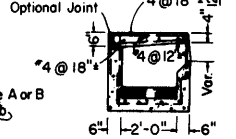


PLAN



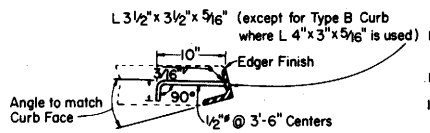
SECTION C-C

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



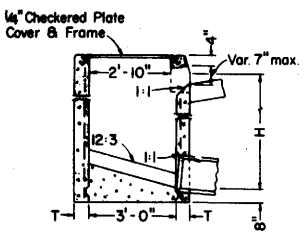
SECTION D-D

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

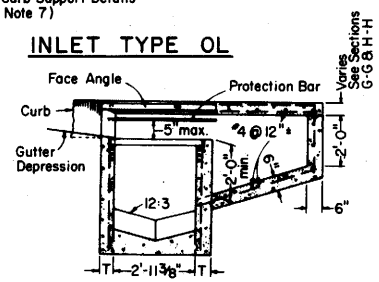


FACE ANGLE ANCHOR DETAIL

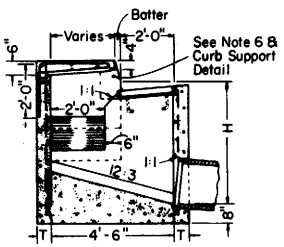
INLET TYPE OL



SECTION E-E



SECTION F-F



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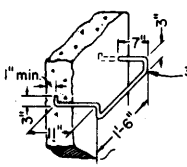
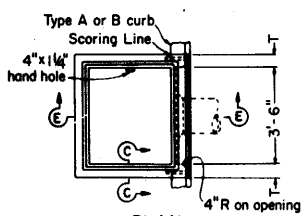
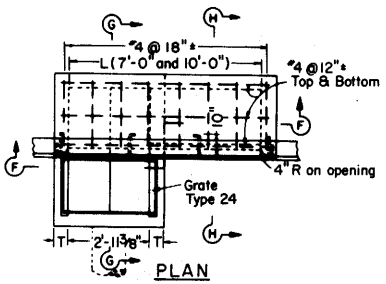


STEP DETAIL

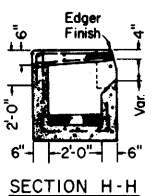


PLAN

INLET TYPE OS

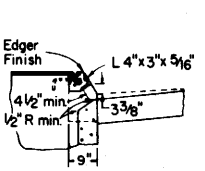


PLAN

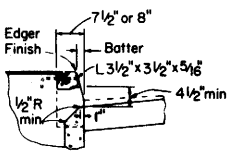


SECTION H-H

INLET TYPE GOL



TYPE B CURBS



TYPE A CURBS

CURB OPENING DETAILS

CONCRETE CUBIC YARDS

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

* Based on H=3.1'

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

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

DRAINAGE INLETS D72

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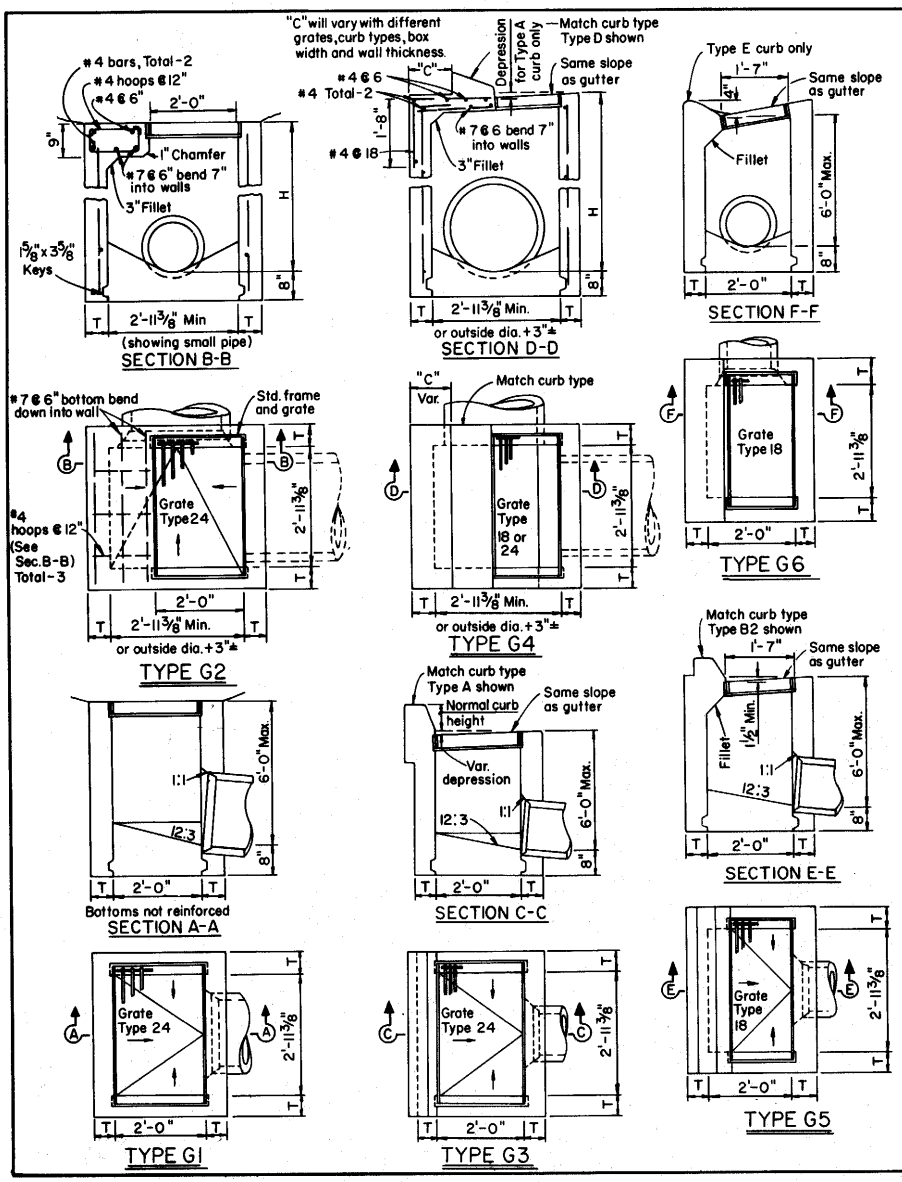
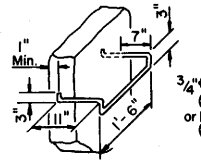
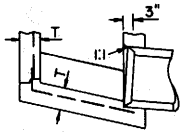
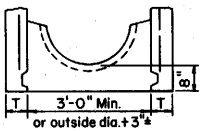




STEP DETAIL



ALTERNATIVE REINFORCED BOTTOM



ALTERNATIVE HALF ROUND BOTTOM

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

CHIEF OFFICE OF PLANNING AND DESIGN
REGISTERED CIVIL ENGINEER NO. 8625

APPROVED JULY 1, 1980

GENERAL NOTES

1. "H" is the difference in elevation between the outlet pipe flow line and the normal gutter grade line undepressed.
2. For "T" wall thickness, see Table.
3. Wall reinforcing not required when H = 8' or less and the unsupported width or length = 7' or less. Walls exceeding these limits shall be reinforced with #4 bars @ 18"± centers placed 1½" clear to inside of box unless otherwise shown.
4. Steps - None required where "H" is less than 30 inches. Where "H" is 30 inches or more, install steps with lowest rung 12 inches above the floor, and highest rung not more than 6 inches below top of inlet. The distance between steps shall not exceed 12 inches and shall be uniform throughout the length of the wall. Place steps in the wall without an opening.
5. Details shown apply to both metal and concrete pipe.
6. Pipe(s) can be placed in any wall.
7. Curb section shall match adjacent curb.
8. Basin floors shall have wood trowel finish and a minimum slope of 12:3 from all directions toward outlet pipe.
9. Galvanizing - See Standard Specifications or Special Provisions.
10. Cast-in-place or Precast alternative is optional with contractor, See Standard Specifications.
11. Set inlet so that grate bars are parallel to direction of principal surface flow.
12. See "Standard Grate Details" D77-A & D77-B Grate and Frame Details and Weights of Miscellaneous Iron and Steel.

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

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

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

DRAINAGE INLETS D73

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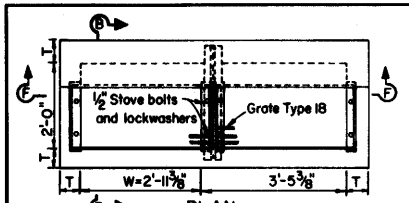
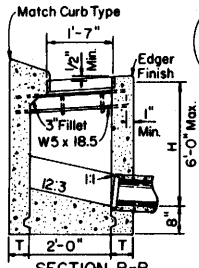
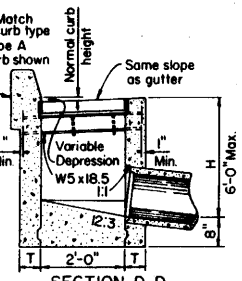


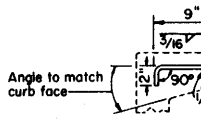
PLAN
TYPE GT1



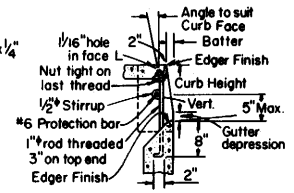
SECTION B-B



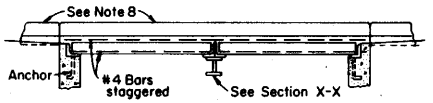
SECTION D-D



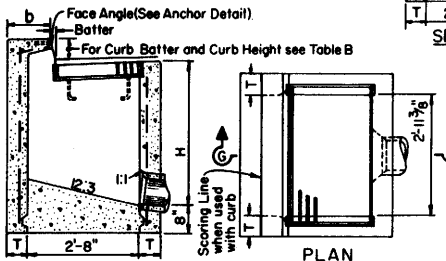
FACE ANGLE ANCHOR DETAIL



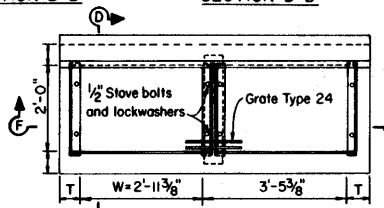
PROTECTION BAR DETAIL
(See Note 6)



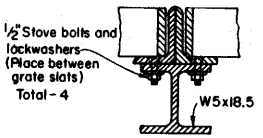
SECTION F-F



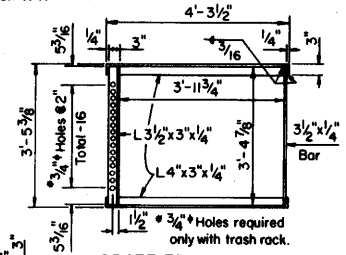
SECTION G-G
TYPE GO
PLAN



PLAN
TYPE GT3



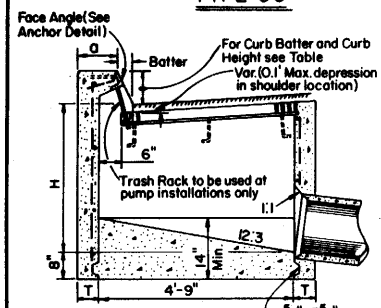
SECTION X-X



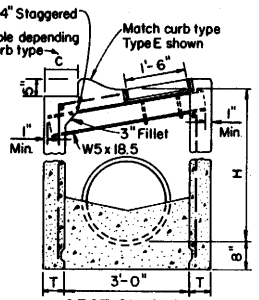
GRATE FRAME DETAILS

TABLE A

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



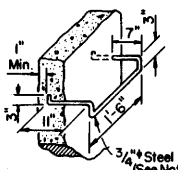
SECTION A-A



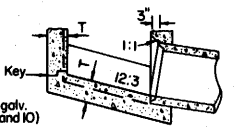
SECTION C-C

TABLE B

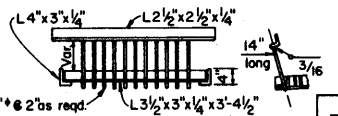
Curb Type	Normal Curb Height	Curb Batter	a	b
A-6	6"	1½"	T+7½"	12½"
A-8	8"	2"	T+7"	12
B	6"	4"	T+5"	10
Dike	6"	3"	T+6"	



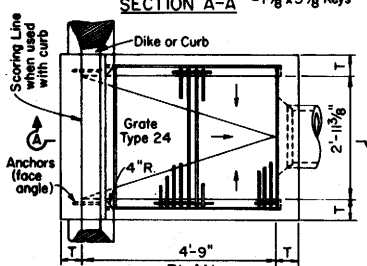
STEP DETAIL



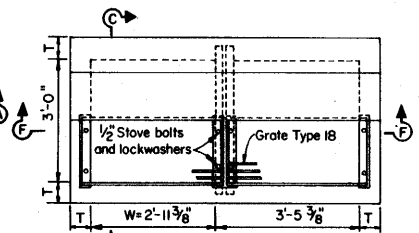
ALTERNATIVE REINFORCED BOTTOM



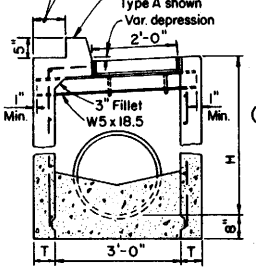
TRASH RACK
(For use with pump installation)



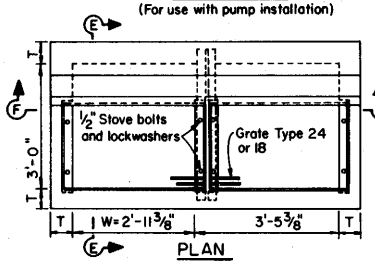
PLAN
TYPE GDO



PLAN
TYPE GT2



SECTION E-E



PLAN
TYPE GT 4

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

CONCRETE CUBIC YARDS

(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.

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

CHIEF, OFFICE OF PLANNING AND DESIGN
REGISTERED CIVIL ENGINEER NO. 8623

APPROVED JULY 1, 1980

GENERAL NOTES

1. "H" is the difference in elevation between the outlet pipe flow line and the normal gutter grade line undepressed.
2. For "t" wall thickness, see table A.
3. Wall reinforcing not required when H = 8' or less and the unsupported width or length = 7' or less. Walls exceeding these limits shall be reinforced with #4 bars @ 18" ± centers placed 1½" clear to inside of box unless otherwise shown.
4. Steps - None required where "H" is less than 30 inches. Where "H" is 30 inches or more, install steps with lowest rung 12 inches above the floor and highest rung not more than 6 inches below top of inlet. The distance between steps shall not exceed 12 inches and shall be uniform throughout the length of the wall. Place steps in the wall without an opening.
5. When shown on the project plans, Place a #6 protection bar horizontally across the length of the opening and bend back 4" into the inlet wall on each side.
6. Curb supports shall be evenly spaced and minimal in number such that maximum span of unsupported curb is 7'.
7. Pipe(s) can be placed in any wall.
8. Curb section shall match adjacent curb.
9. Basin floors shall have wood trowel finish and a minimum slope of 12:3 from all directions toward outlet pipe.
10. Galvanizing - See Standard Specifications or Special Provisions.
11. W = 2'-11⅜" for one grate. Add 3'-5⅜" for additional grates in tandem.
12. See "Standard Grate Details" D77-A & D77-B for Grate and Frame Details and Weights of Miscellaneous Iron & Steel.
13. See Standard Plan D78-A for Depression Details.
14. Full penetration butt welds may be substituted for the fillet welds on all anchors.
15. Standard square, hexagon, round or equivalent headed anchors may be substituted for the right angle hooks on the anchors shown on this plan.
16. Cast-in-place or Precast alternative is optional with contractor See Standard Specifications.

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

DRAINAGE INLETS

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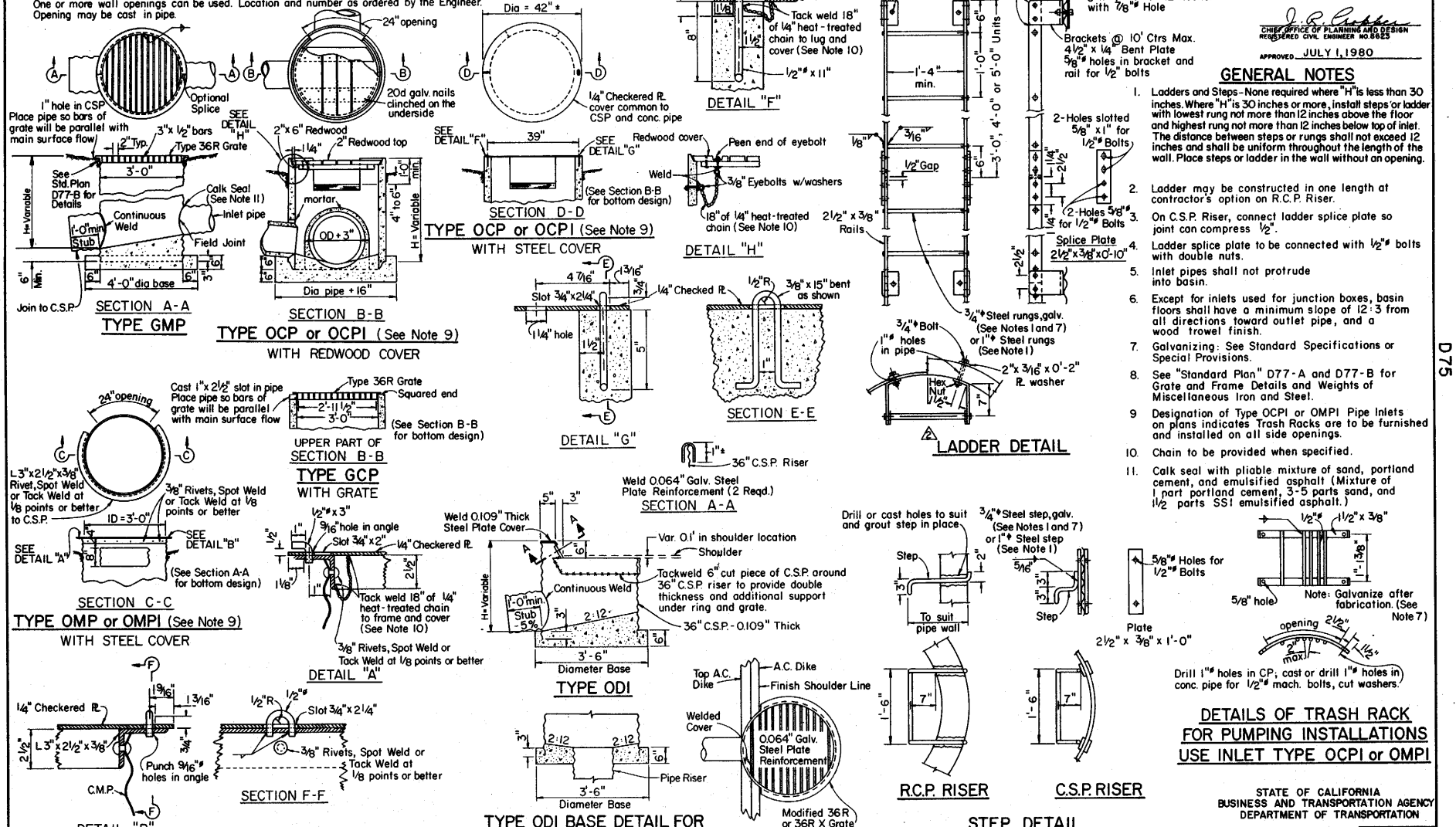
Note to Designer

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

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



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

CHIEF OFFICE OF PLANNING AND DESIGN
REGISTERED CIVIL ENGINEER NO. 8625

APPROVED JULY 1, 1980

GENERAL NOTES

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

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

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

PIPE INLETS

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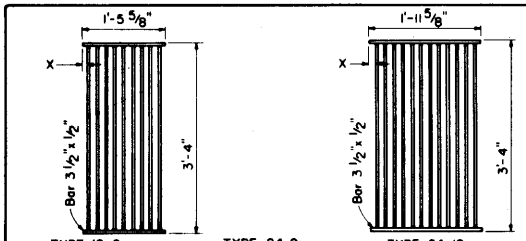
DISTRICT	COUNTY	ROUTE	P.M. Miles Total Project	SHEET NO.	TOTAL SHEETS

Chief Office of Planning and Design
Registered Civil Engineer No. 8623
Approved JULY 1, 1980

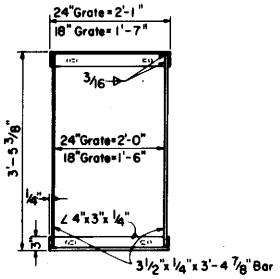


TYPE 18-9
1 3/8" Clear Spacing
Use within the roadbed on highways where bicycles and pedestrians are excluded.

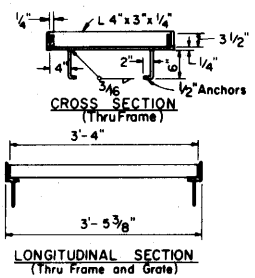
TYPE 24-9
2" Clear Spacing
Use in locations off the roadbed on all types of highways.

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

RECTANGULAR GRATE DETAILS
(SEE TABLE BELOW)



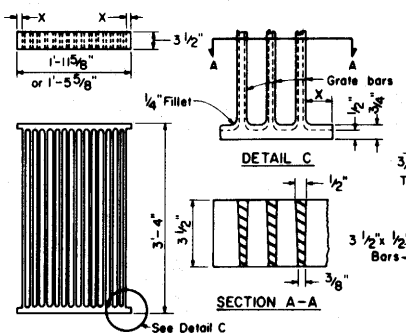
TYPICAL FRAME



CROSS SECTION
(Thru Frame)

LONGITUDINAL SECTION
(Thru Frame and Grate)

RECTANGULAR FRAME DETAILS
(FOR ALL RECTANGULAR GRATES)

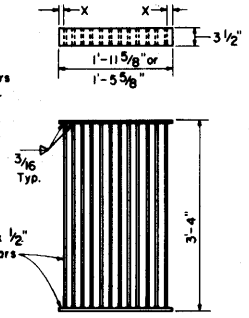


DETAIL C

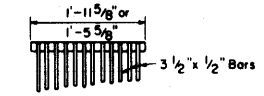
SECTION A-A

ALTERNATIVE CAST NODULAR IRON GRATE OR CAST STEEL GRATE

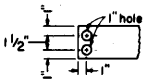
INLET TYPE	GRATE TYPE	NO. GRATES	WEIGHT LBS
GDO	24-12	2	634
GOL-7	24-12	1	326
GOL-10	24-12	1	326
GO,G1,G2,G3,G4 (24")	24-9	1	263
	24-12	1	326
G4 (18"),G5,G6	18-9	1	249
GT-1	18-9	2	498
GT-2	18-9	2	498
GT-3	24-12	2	652
GT-4	24-12	2	652
TRASH RACK			22



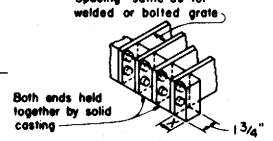
ALTERNATIVE WELDED GRATE



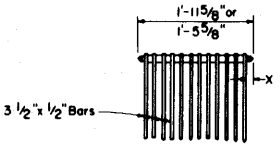
CAST END BLOCK



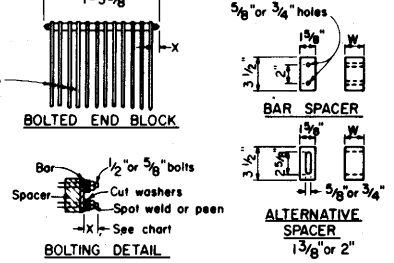
END OF BAR



ALTERNATIVE CAST NODULAR IRON OR CAST STEEL END BLOCK GRATE



BOLTED END BLOCK



ALTERNATIVE BOLTED GRATE

GENERAL NOTES

1. Grate type numbers refer to width of grate in inches and number of bars, respectively.
2. Contractor has the option of using cast nodular iron, cast steel, welded, bolted, or cast end block grate.
3. See Special Provisions for requirements pertaining to galvanizing or asphalt dipping of grates and frames.
4. Rounded top of bars optional on all grates.
5. Pipe inlets with a grate shall be placed so that bars parallel direction of principle surface flow.
6. Full penetration butt welds may be substituted for the fillet welds on all anchors.
7. Standard square, hexagon, round or equivalent headed anchors may be substituted for the right angle hooks on the anchors shown on this plan.
8. Grate and frame weights are based on welded grates. (weights of face angles, steps, protection bars, etc. are not included)

GRATE BAR SPACING TABLE

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

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

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

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

GRATE DETAILS D77-A

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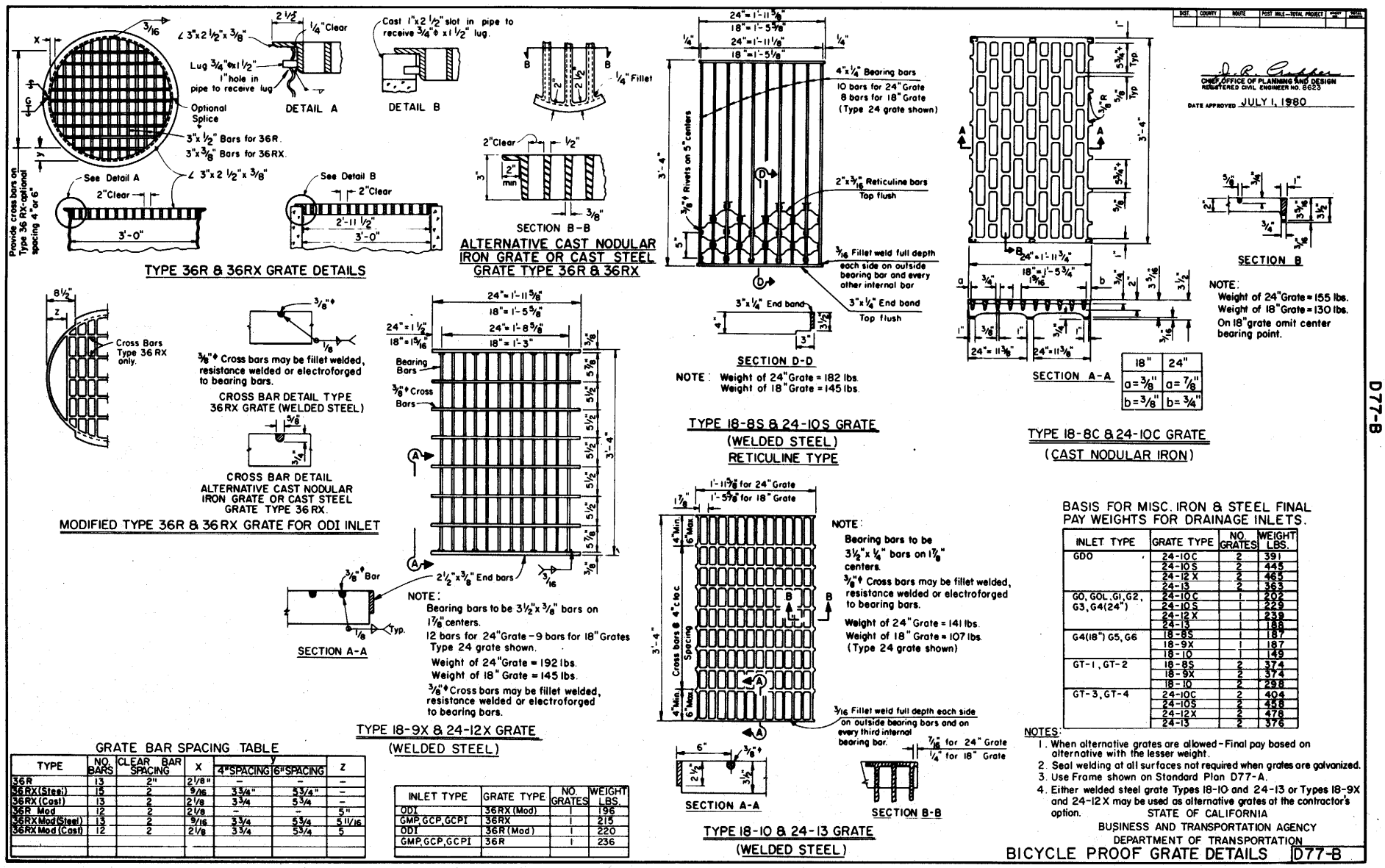

GRATE BAR SPACING TABLE

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

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

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
	24-12X	2	465
	24-13	2	363
GO, GOL, G1, G2, G3, G4(24")	24-10C	1	202
	24-10S	1	229
	24-12X	1	239
	24-13	1	188
G4(18") G5, G6	18-8S	1	187
	18-9X	1	187
	18-10	1	149
GT-1, GT-2	18-8S	2	374
	18-9X	2	374
	18-10	2	298
GT-3, GT-4	24-10C	2	404
	24-10S	2	458
	24-12X	2	478
	24-13	2	376

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

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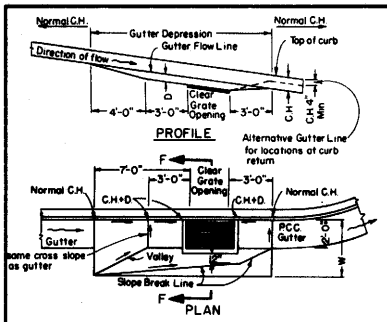
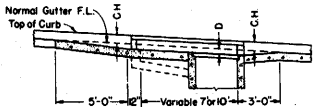
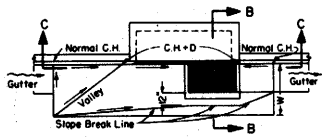


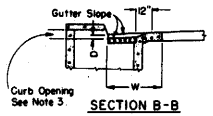
TYPE G_1 THRU G_6 INLETS ON GRADE



SECTION C-C



TYPE GOL INLET ON GRADE



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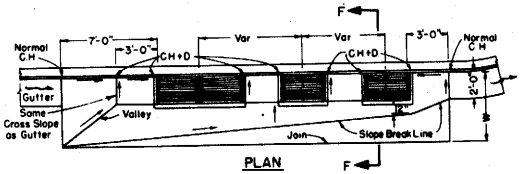
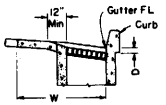
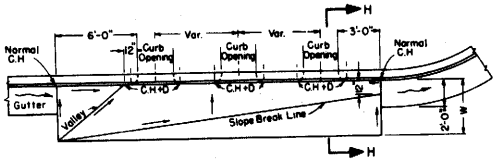


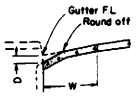
GRATE INLET IN SERIES



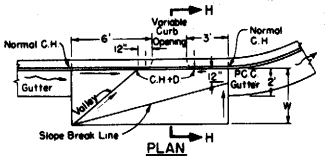
SECTION F-F



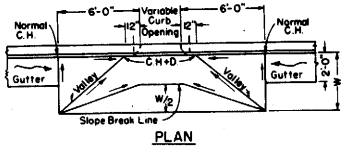
TYPE OS & OL INLETS IN SERIES ON GRADE



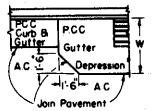
SECTION H-H



TYPE OS & OL INLETS ON GRADE

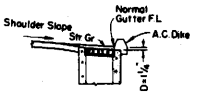


TYPE OS & OL INLETS IN GRADE SAG



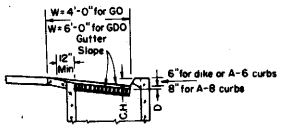
DETAIL OF ASPHALT CONCRETE PAVEMENT

(See Note 4)

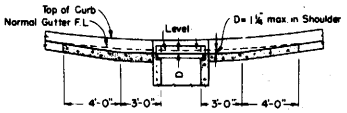


DETAIL OF INLET WITH DIKE

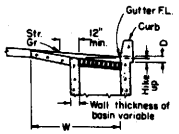
(SINGLE GRATE SHOWN)



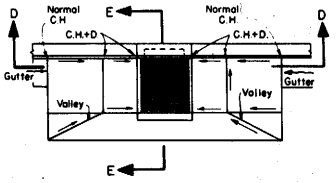
SECTION E-E



SECTION D-D

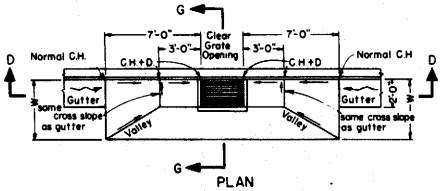


SECTION G-G



TYPE GO & GDO INLET IN GRADE SAG

(GDO SHOWN)



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

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

Chief, Office of Planning and Design
Registered Civil Engineer No. 8623

Approved JULY 1, 1980

GENERAL NOTES

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

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

GUTTER DEPRESSIONS

D78

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SPAN		4					5					6							7								8								
HEIGHT		2		3		4	2		3		4	5	3		4		5		6	3		4		5		6		7	4		5		6		7		8
Maximum Earth Cover	'	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20
Conc. Roof	T1 "	7	7	7	7	7	7½	7½	7½	7½	7½	7½	7½	7½	7½	8	8	8	8	8	8	8	8	8	8	8	8	8	9	8	9	8½	9	8½	9	8½	9
Conc. Walls	T2 "	6	6	6	6	6½	6	6	6	6	7	6½	6	6	6	7	6½	7½	7	6	6	6	7	6½	7½	7	8½	8	9½	6	7	6½	7½	7	8½	8	9½
Conc. Invert	T3 "	6	6	6	6	6½	6½	7	6½	7	6½	7	7	8	7	8	7	8	8	8	9	8	9	8	9	8	9	8	9	8	9½	8	10	8	10	8	10
Reinf. Spacing	"	7	7	7	7	7	8½	6	8½	5½	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
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	6	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	7	7	7	4	4	5	5	6	6	6	6	7	7	7	7
Quan. Concrete	CF/LF	7.4	7.4	8.4	8.4	9.4	10.1	8.9	9.2	10.0	10.2	11.0	12.0	12.5	13.7	11.7	12.3	12.7	14.2	14.2	15.9	15.9	18.3	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
Quan. Reinforcement	lbs/LF	48	48	50	55	58	67	58	60	58	68	67	81	82	105	70	81	82	96	97	120	124	148	94	94	105	118	121	147	130	177	160	192	123	151	131	171

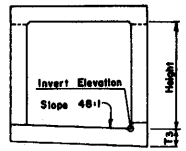
SPAN		10											12												14												
HEIGHT		5		6		7		8		9		10	6		7		8		9		10		11		12	7		8		9		10		11		12		13		14
Maximum Earth Cover	'	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20
Conc. Roof	T1 "	8	10½	8	10½	8	10½	8	10½	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	10½	14	11	14
Conc. Walls	T2 "	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	T3 "	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	15	11	15	11½	15
Reinf. Spacing	"	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
Reinf. "a" ⑤	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
Reinf. "b"	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	7	7	6	7	6	7	7	7	7	7	7	7	6	8	7	8	7	8
Reinf. "b"	Dimension "B" ' "	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	3-9	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	4-9	6-0
Reinf. "b"	Dimension "Bw" ' "	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
Reinf. "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	7	8	8	8	8	8
Reinf. "c"	Dimension "C" ' "	3-4	3-4	7-4	4-8	7-7	4-8	8-2	4-8	7-7	4-8	7-7	4-8	4-4	3-7	8-1	5-7	8-1	5-7	8-1	5-7	8-1	5-7	8-1	5-7	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
Reinf. "e" ⑤	Size Bar #	4	4	4	4	4	4	4	4	4	4	5	5	4	4	4	4	4	4	4	4	4	4	5	5	5	5	4	4	4	4	4	4	4	4	4	4	5	5	6	6	6	6
Quan. Concrete	CF/LF	21.6	26.8	23.0	29.5	24.3	31.0	25.6	34.1	27.8	37.7	32.1	42.3	26.8	37.7	29.3	40.1	30.3	41.9	32.2	45.4	34.5	49.8	40.7	54.2	45.4	59.9	36.2	51.0	37.8	53.1	39.5	54.9	41.9	58.7	45.9	64.1	49.9	65.5	55.6	75.8	61.6	81.3
Quan. Reinforcement	lbs/LF	191	267	233	285	260	325	300	339	314	327	360	373	295	362	353	409	365	420	402	413	415	424	440	471	466	534	374	471	449	522	446	587	449	580	492	596	537	605	564	634	604	759

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

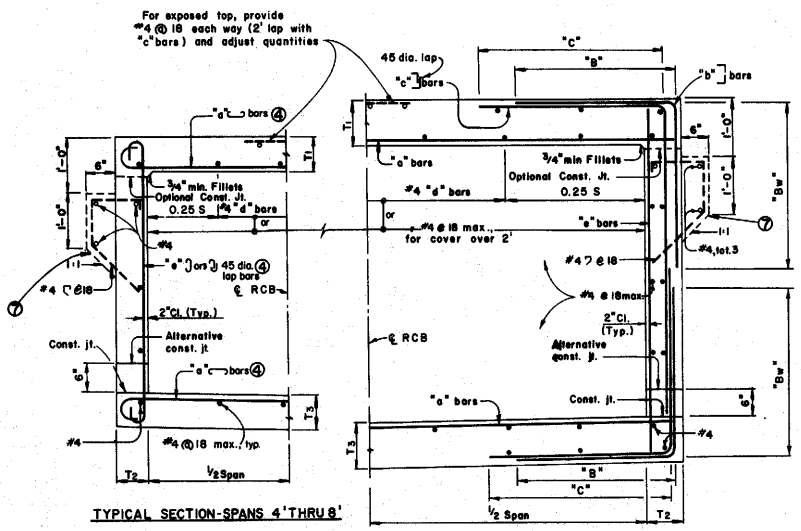
CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

DATE JULY 1, 1980

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

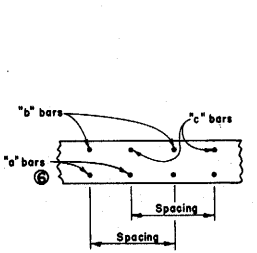


SLOPED INVERT

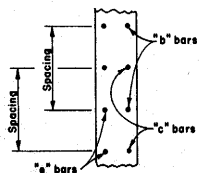


TYPICAL SECTION-SPANS 4' THRU 8'

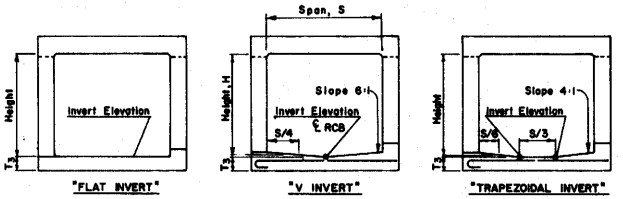
TYPICAL SECTION-SPANS 10' THRU 14'



ROOF SECTION
SPANS 10' THRU 14'
Invert similar



WALL SECTION
SPANS 10' THRU 14'



"FLAT INVERT" "V INVERT" "TRAPEZOIDAL INVERT"

ALTERNATIVE INVERTS

GENERAL NOTES

1. For boxes with Span or Height less than any of those shown in table, use next greater size box concrete dimensions and reinforcement. Make necessary changes in bar lengths and quantities.
2. Quantities are approximate and for design purposes only.
3. For boxes with Span or Height or cover greater than those shown in tables, a special design is required.
4. It is permissable to eliminate the 180° hooks on every other bar.
5. "e" bars are at half spacing.
6. "a" bars are at half spacing.
7. Provide paving notch when top is exposed and when pavement is P.C.C., and adjust quantities.

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

SINGLE BOX CULVERT

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

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9015

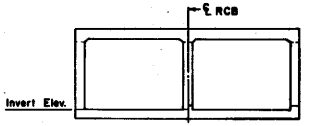
APPROVED JULY 1, 1980

SPAN			4				5					6					7							8							
HEIGHT			2	3		4	2	3		4	5	3		4		5		6	3	4	5		6		7	4		5		6		7	8
Maximum Earth Cover			10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20
Concrete	Roof	T1	7	7	7	7	7	7	7½	7	7½	7	7½	7	7½	7	7½	7	7	9	7	9	7	9	7½	10	7½	10	7½	10	7½	10	8	10	8	11	8	11	8	11	8	11	8	11
	Exterior Walls	T2	6	6	6	6	6	6	6	6	6	6	6	6	6½	7½	6	6	6	7	6	6	6	7	6½	7½	7	9	8	9½	6	7½	6½	8	7	9	8	10	8½	11
	Invert	T3	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		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
	"e"	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
	"a" ⑥	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	6	6	6	6	6	7	4	5	5	6	6	6	7	6	6	7
Quan.	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	25.7	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	lbs/LF	78	89	84	96	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	263	237	302	266	340	279	350	312	360	326

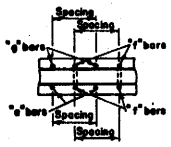
SPAN			10										12						14												
HEIGHT			5	6		7	8		9		10	6	7		8		9		10	11		12	7		8		9		10		11		12	13		14
Maximum Earth Cover			10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20
Concrete	Roof	T1	9	12½	9	12½	9	12½	9	12½	9½	12½	9½	12½	10	14½	10	14½	10	14½	10	14½	10	14½	10	14½	10	14½	10	14½	10	14½	10	14½	11½	16½	11½	16½	11½	16½	11½	16½	11½	16½
	Exterior Walls	T2	8	8	8	8½	8	9½	8	10½	8½	11½	9½	12½	8	8½	8	9	8½	10½	9	11½	9½	12½	9	11½	9	11½	9	11½	9	11½	9	11½	9½	12½	10½	14	11½	15	12½	16½	13	17½
	Invert	T3	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	10	15	10	15	10	15	11½	17	11½	17	11½	17	11½	17	11½	17
Reinf.	Spacing		11	7½	10½	7½	10	8	10	8	10½	8	10½	8½	9	8	9	8	9	7½	8	7½	8½	7½	8½	8	8½	8	8½	8	8½	8	8½	8	8½	8	8½	8	8½	8	8½	8	8½	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	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
	"e"	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
	"a" ⑥	Size Bar #	5	5	4	5	5	5	5	6	6	6	6	6	5	5	5	6	5	6	5	6	6	6	5	6	6	6	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	"b"	Dimension "B"	1-9	2-7	2-0	2-9	2-3	2-9	2-7	3-1	2-7	3-1	2-7	3-1	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
		Dimension "Bw"	4-0	4-11	4-0	4-11	4-0	4-11	4-0	4-11	4-0	4-11	4-0	4-11	4-1	3-2	4-1	3-2	4-1	3-4	4-1	3-7	3-9	3-7	3-9	3-7	3-9	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
		Dimension "C"	3-1	2-9	3-9	3-3	4-6	4-3	5-6	4-6	6-0	4-9	6-0	4-9	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	6-6	6-3	9-0	6-9	9-3	6-9	9-3	6-9
	"a" ⑥	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
Quan.	Concrete	CF/LF	42.7	55.6	44.7	58.2	46.7	61.8	48.7	65.6	52.5	70.0	56.3	74.5	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	lbs/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	753	764	662	710	715	783	756	820	807	846	833	873	881	958	884	978	1002	1110

GENERAL NOTES:

1. For boxes with Span or Height less than any of those shown in table, used next greater size box concrete dimensions and reinforcement. Make necessary changes in bar lengths and quantities.
2. For boxes with Span or Height or cover greater than those shown in tables, a special design is required.
3. Quantities are approximate and for design purposes only.
4. It is permissible to eliminate the 180° hooks on every other "e" bar.
5. "e" bars are at half spacing.
6. Provide paving notch when top is exposed and when pavement is P.C.C. and adjust quantities.

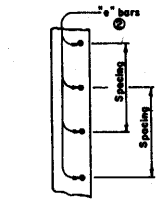


"FLAT INVERT" ALTERNATIVE

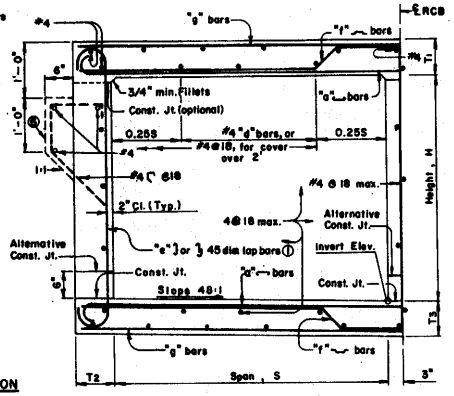


ROOF SECTION
SPANS 4' THRU 8'
INVERT SIMILAR

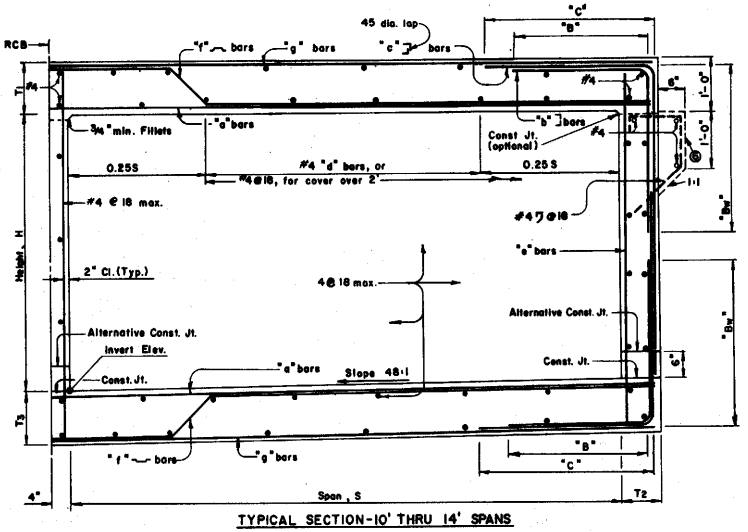
"d" bars, for earth covers of 2' and less								
Span	4'	5'	6'	7'	8'	10'	12'	14'
Number/Cell	4	5	6	8	10	11	13	15



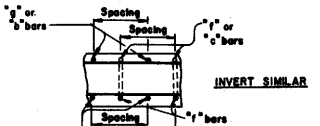
EXTERIOR WALL SECTION
SPANS 4' THRU 8'



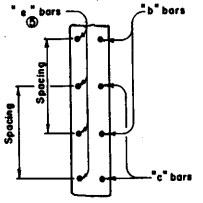
TYPICAL SECTION - 4' THRU 8' SPANS



TYPICAL SECTION - 10' THRU 14' SPANS



ROOF SECTION
SPANS 10' THRU 14'



EXTERIOR WALL SECTION
SPANS 10' THRU 14'

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

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

DOUBLE BOX CULVERT

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

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

DATE APPROVED JULY 1, 1980

DESIGN NOTES

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

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

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

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

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

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

The horizontal earth pressure shall not be diminished for slab positive moment, up to 3' cover.

Unit stresses:
$f'c = 3.4$ KSI
$fy = 60$ KSI
$n = 9$

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

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

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

CONSTRUCTION NOTES

Construction loads:
Strutting required as shown on standard plan "Construction Loads on Culverts."

Expansion joints:
Invert:
No expansion joints shall be permitted.
Roof and walls:
When cover is less than span length -
Place 1/2" expansion joint filler at 30'± centers outside the paved roadway lanes and place standard bridge detail 3-2 at 30' centers under paved roadway lanes.
When cover is more than span length -
Place 1/2" expansion joint filler at 30'± centers and additional 1/2" expansion joints at locations of change in foundation character, as directed by the engineer.

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

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

Earthwork:
See Standard Plan A62-E

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

GENERAL NOTES

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

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

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

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

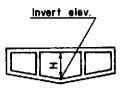
Special reinforcement coverage:
Box standard plans are not to be used for culverts in a corrosive environment or where there is a severe abrasive flow condition or in freeze-thaw locations.

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

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

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

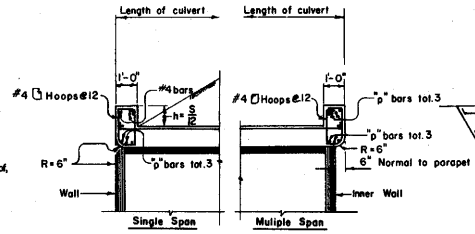
DESIGN BEARING PRESSURE (TSF)



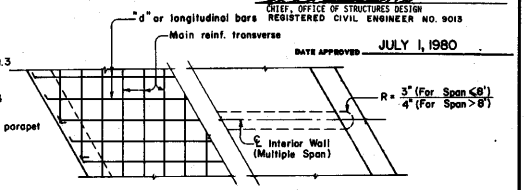
TYPICAL 3 CELL

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

PARAPET REINFORCEMENT

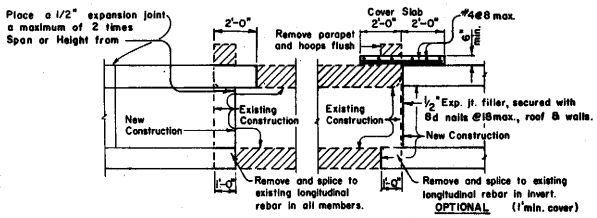


PART SECTION
S=Clear Span

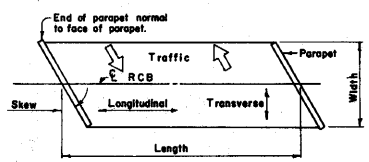


PART PLAN-SKEWED

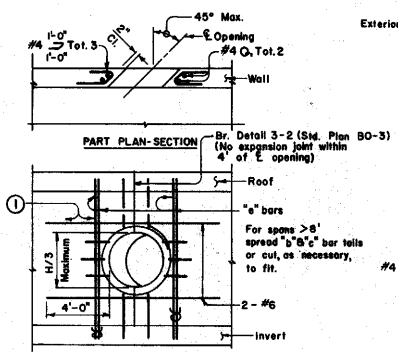
PARAPET DETAIL



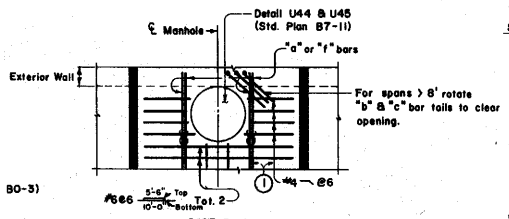
CULVERT EXTENSION
20° Skew Maximum



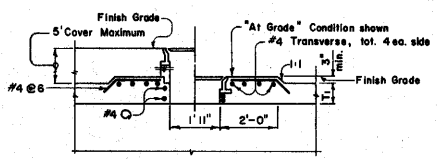
RCB TERMINOLOGY



UTILITY OPENING-WALL
H = Height

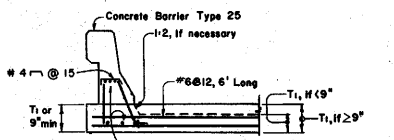


PART PLAN



PART LONGITUDINAL SECTION

MANHOLE



BARRIER SECTION (30' MINIMUM)

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

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

SPECIAL DETAILS

BOX CULVERT
MISCELLANEOUS DETAILS

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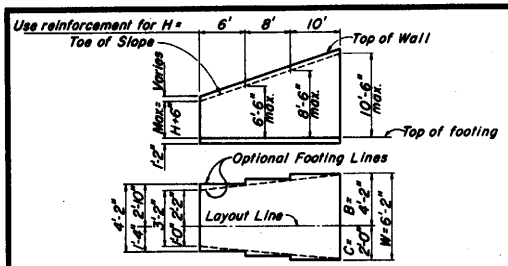
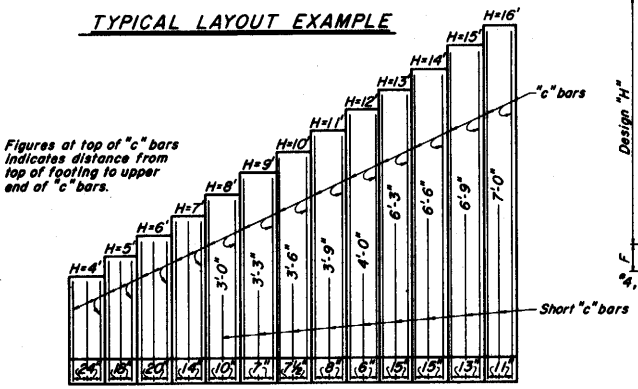
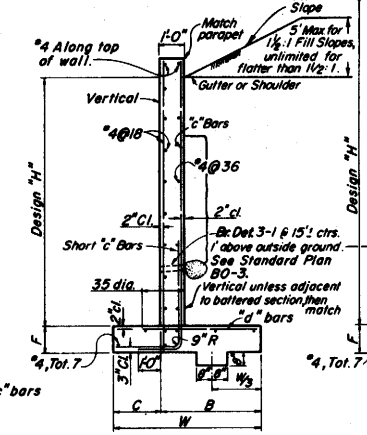
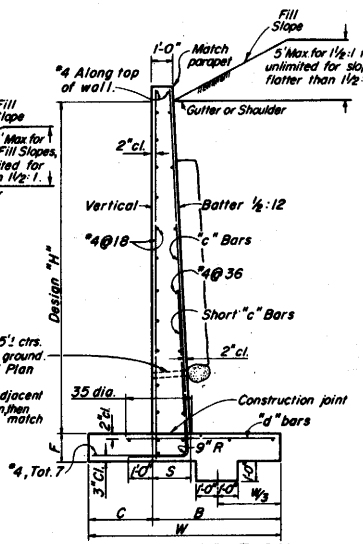


TYPICAL LAYOUT EXAMPLE



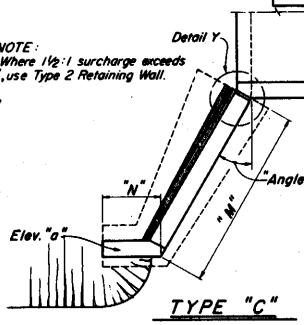


TYPICAL SECTION
H=4' THRU 12'

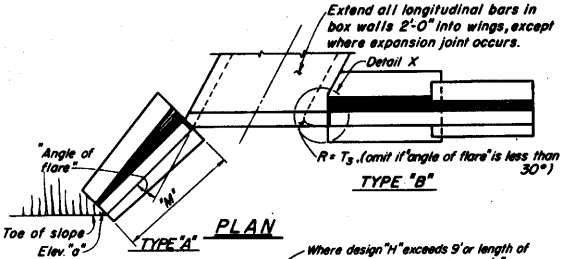


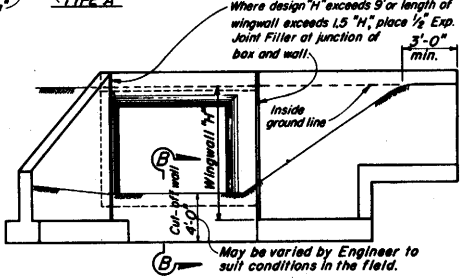
TYPICAL SECTION
H=13' THRU 16'

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



TYPE "C"





END ELEVATION

TYPE "A" TYPE "B"

STRAIGHT WINGWALLS

REINFORCED CONCRETE WINGWALLS													
"H"	4'	5'	6'	7'	8'	9'	10'	11'	12'	13'	14'	15'	16'
W	3'-2"	3'-8"	4'-2"	4'-8"	5'-2"	5'-8"	6'-2"	6'-8"	7'-2"	7'-8"	8'-2"	8'-8"	9'-2"
C	1'-0"	1'-2"	1'-4"	1'-6"	1'-8"	1'-10"	2'-0"	2'-2"	2'-4"	2'-6"	2'-8"	2'-10"	3'-0"
B	2'-2"	2'-6"	2'-10"	3'-2"	3'-6"	3'-10"	4'-2"	4'-6"	4'-10"	5'-2"	5'-6"	5'-10"	6'-2"
F	1'-2"												
Batter	None									½:12			
S	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-6½"	1'-7"	1'-7½"	1'-8"
"c" Bars	#4@24	#4@18	#5@20	#5@14	#5@10	#5@7	#6@7½	#7@8	#7@6	#9@15	#10@15	#10@13	#10@11
"d" Bars	#4@24	#4@18	#5@20	#5@14	#5@10	#6@14	#7@15	#8@16	#7@12	#8@15	#9@15	#9@13	#9@11
Conc. C.Y./L.F.	0.32	0.38	0.44	0.49	0.55	0.61	0.67	0.73	0.79	1.02	1.10	1.18	1.26
Reinf. lbs./L.F.	13	16	19	25	30	37	49	62	76	73	90	104	125

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

Design Notes:

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

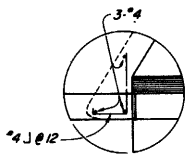
Maximum Toe Pressure = 1½ Tons/sq. ft.

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

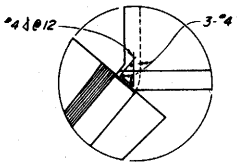
Dimensions "H", "L", "M" "N", Elev. "a" and "Angle of flare" (as apply) are shown on the plans.

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

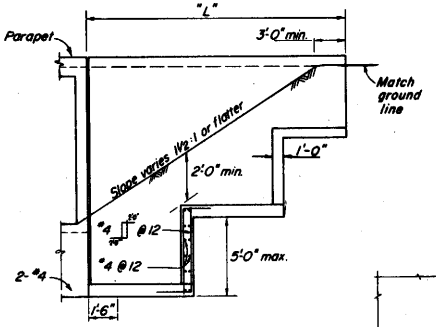
Eliminate cut-off wall if adjacent channel is paved and skew is 20° maximum.



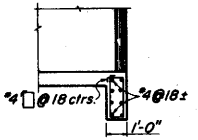
DETAIL X



DETAIL Y



ELEVATION



SEC B-B

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

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

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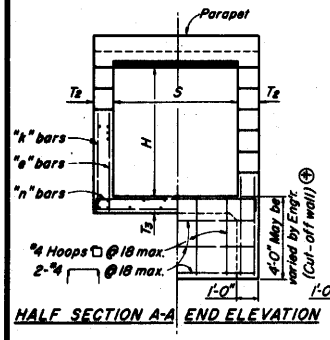
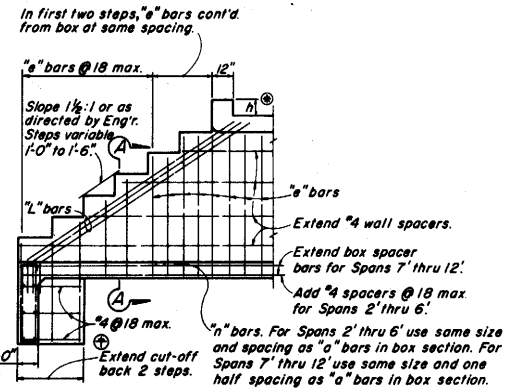
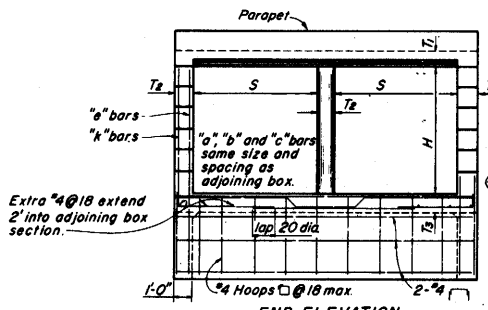
Note: Dimensions S, H, T_1, T_2 and T_3 to be same as adjacent box.



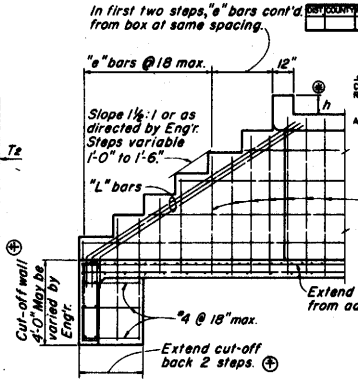
HALF SECTION A-A END ELEVATION



LONGITUDINAL SECTION
(Showing reinforcement in inside face)



END ELEVATION

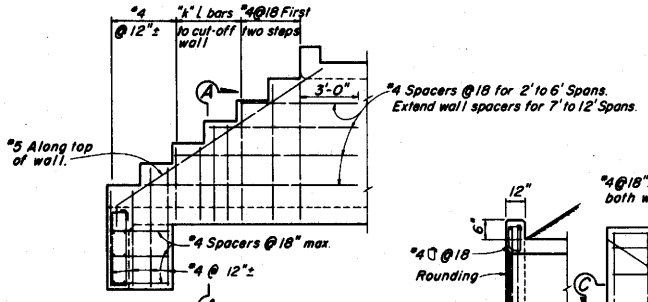


LONGITUDINAL SECTION
(Showing reinforcement in inside face)

DIST	COUNTY	ROUTE	Post Miles	Total Project	Sheet	No. Sheets

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

APPROVED JULY 1, 1980

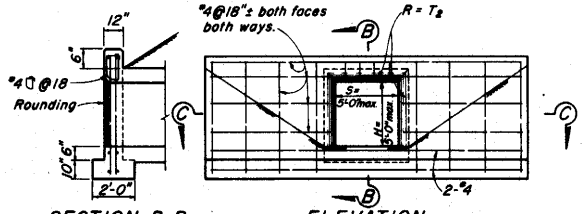


LONGITUDINAL SECTION
(Showing reinforcement in outside face)

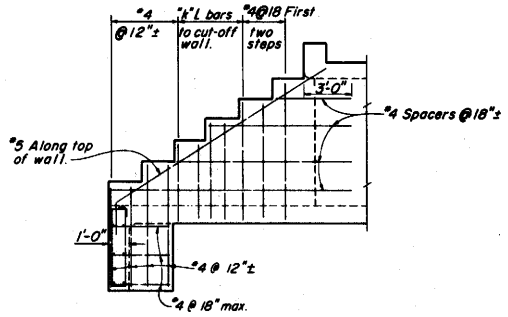
TYPE "E" STEPPED WINGWALL

SINGLE BOX

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



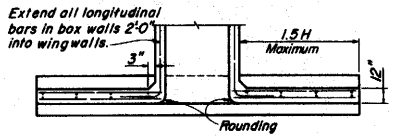
SECTION B-B ELEVATION



LONGITUDINAL SECTION
(Showing reinforcement in outside face)

TYPE "E" STEPPED WINGWALL

MULTIPLE BOXES



SECTION C-C
TYPE "D"

STRAIGHT WINGWALL

Details similar for multiple span boxes.

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

● h" = S', 6" minimum unless otherwise designated

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DEPARTMENT OF TRANSPORTATION

BOX CULVERT WINGWALLS TYPES "D" AND "E"

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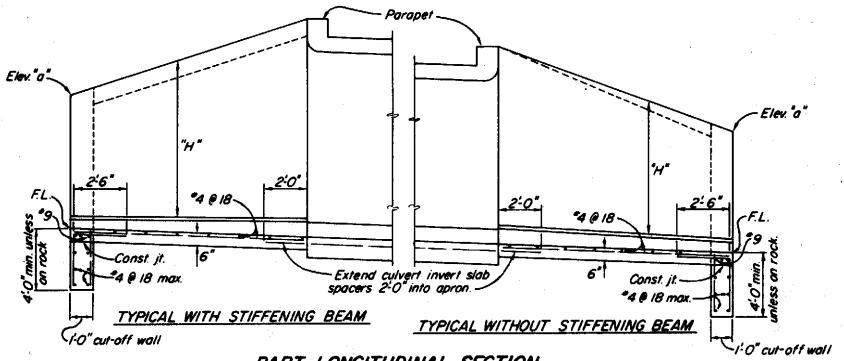
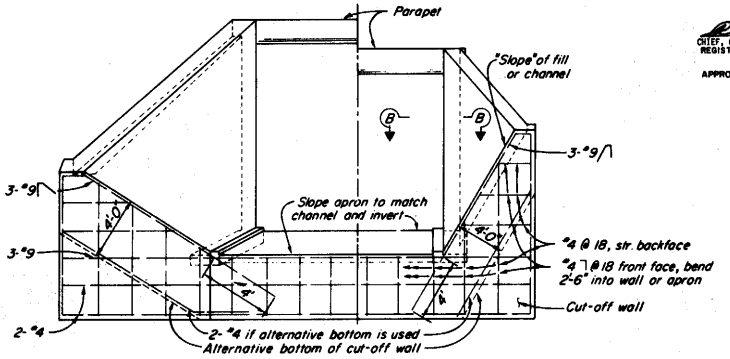
DIST	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

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

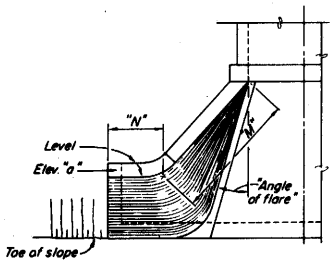
APPROVED JULY 1, 1980



PART LONGITUDINAL SECTION

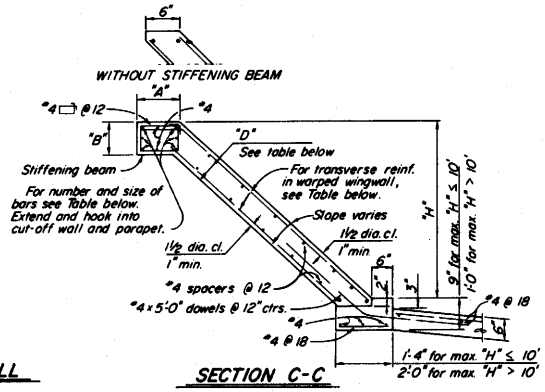


END ELEVATION

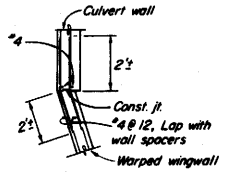


ALTERNATIVE WARPED WINGWALL

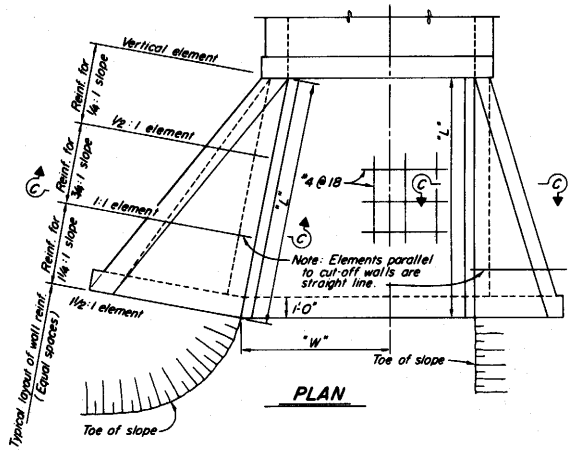
Use where additional protection to toe of embankment is required.



SECTION C-C



SECTION B-B



PLAN

WARPED WINGWALLS

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

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

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

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

BOX CULVERT WARPED WINGWALLS

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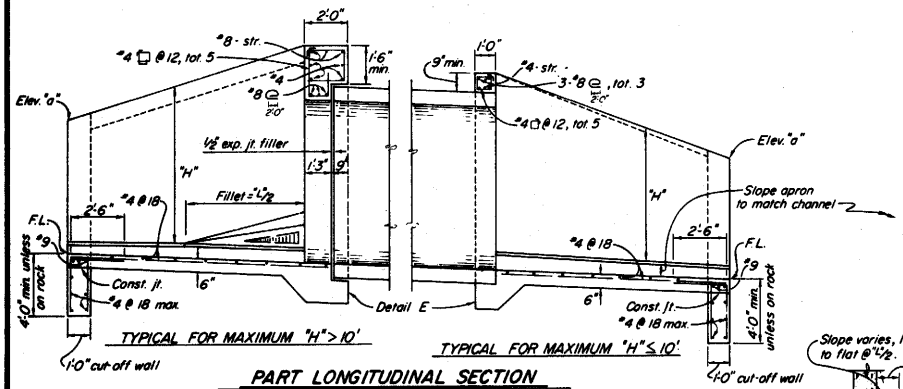
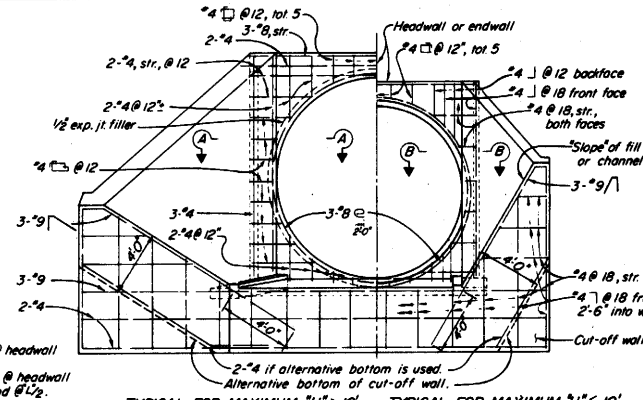


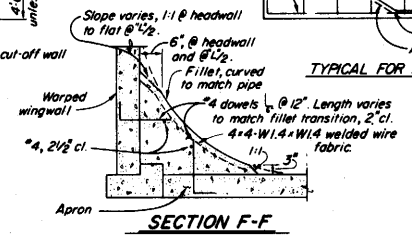
PART LONGITUDINAL SECTION

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

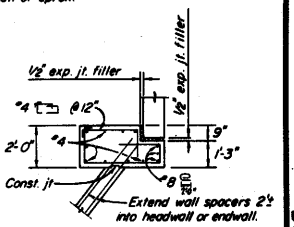


END ELEVATION

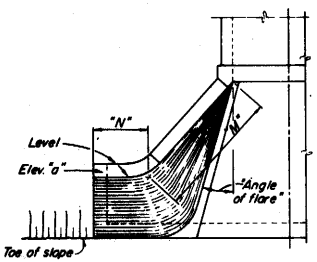
If at upstream end, fillet is not shown



SECTION F-F

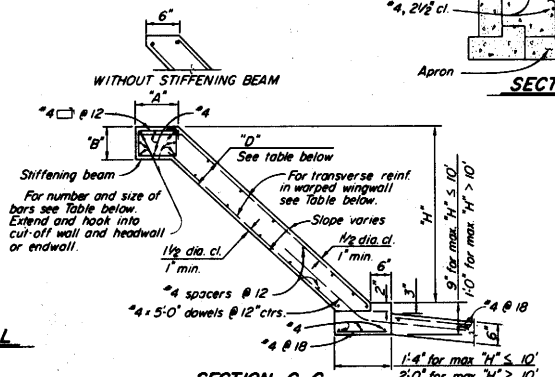


SECTION A-A



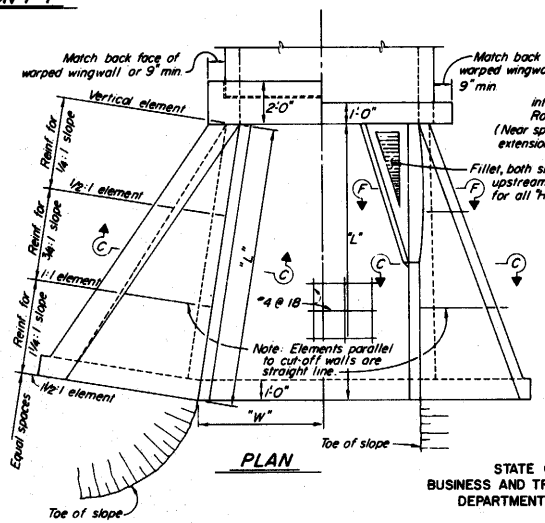
ALTERNATIVE WARPED WINGWALL

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

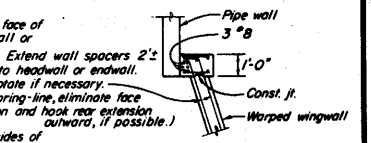


SECTION C-C

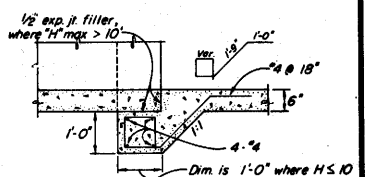
Where abrasion is anticipated, increase apron thickness to 7" min. to provide 2" min. reinforcement coverage.



PLAN



SECTION B-B



DETAIL E

WARPED WINGWALLS

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

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

Notes: Walls designed for 2' surcharge; earth load = 120#/cu. ft.; equivalent fluid pressure = 36#/cu. ft.
Vary "D" 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.

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

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

APPROVED JULY 1, 1980

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

PIPE CULVERT
HEADWALLS, ENDWALLS & WARPED WINGWALLS

D86-B

D86-B

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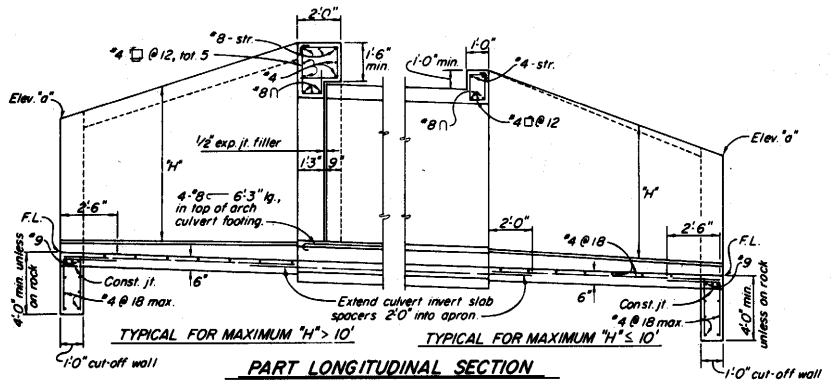
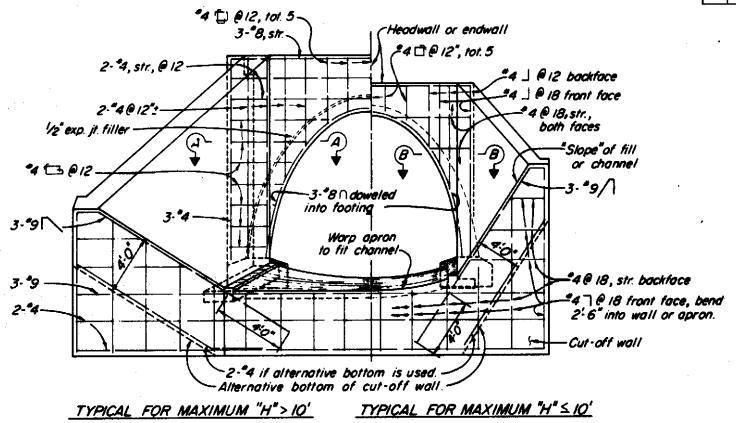
DIST	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

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

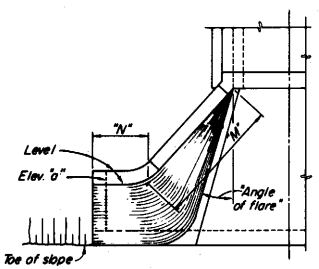
APPROVED JULY 1, 1980



PART LONGITUDINAL SECTION

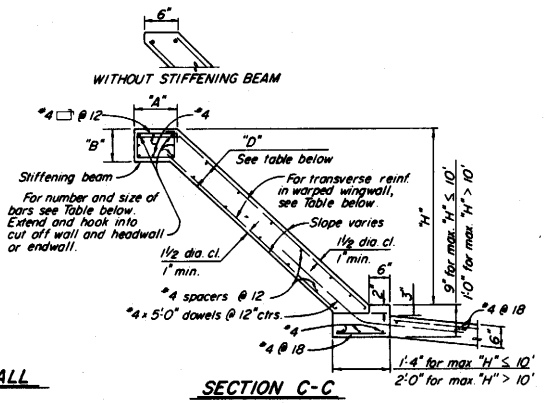


END ELEVATION



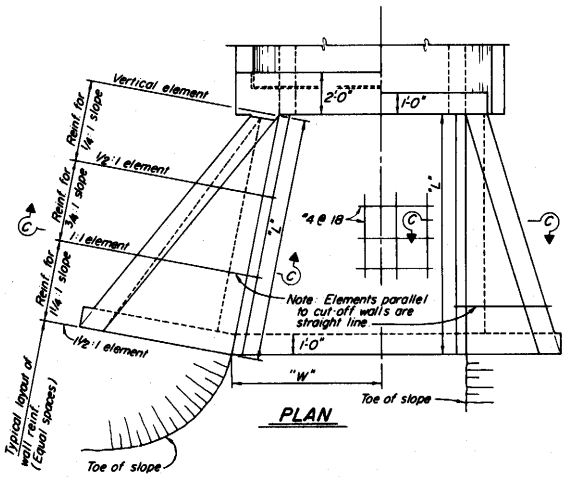
ALTERNATIVE WARPED WINGWALL

Use where additional protection to toe of embankment is required.

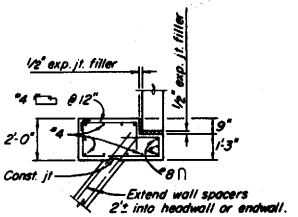


SECTION C-C

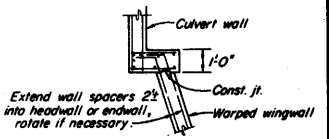
Where abrasion is anticipated, increase apron thickness to 7" min. to provide 2" min. reinforcement coverage.



PLAN



SECTION A-A



SECTION B-B

WARPED WINGWALLS

Element Slope	"H"	8' or less	10'	12'	14'	16'	18'	20'
		WALL DIMENSIONS AND REINFORCING						
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
3/8 : 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
1/4 : 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"

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

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

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

ARCH CULVERT
HEADWALLS, ENDWALLS & WARPED WINGWALLS

D86-C

D86-C

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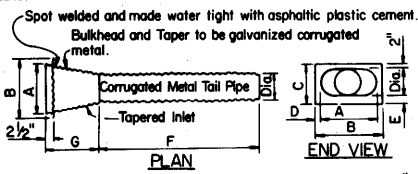
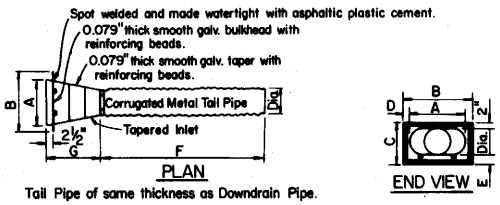


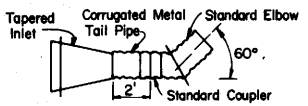
Bulkhead and Taper of same thickness as Tail Pipe with 0.079" Max. Tail Pipe of same thickness as Downdrain Pipe.

ENTRANCE TAPER-TYPE I ALTERNATIVE A



Tail Pipe of same thickness as Downdrain Pipe.

ENTRANCE TAPER-TYPE I ALTERNATIVE B



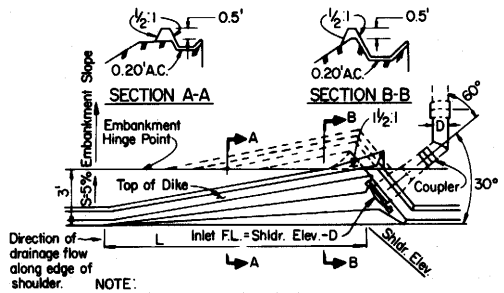
ENTRANCE TAPER-TYPE 2

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

C.S.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.



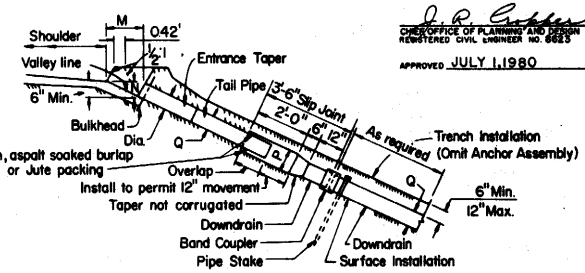
DIA. D	MIN. L
8"	15'
12"	20'
15"	30'
18"	35'
24"	45'

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

PLAN

TYPE 2

(Recommended for grades of 2% or greater)



SECTION A-A (TYPE I)

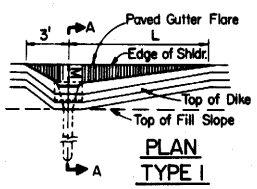
NOTE: (1) Cable, slip joint or anchor assembly to be placed when specified.
(2) Slip joint to be omitted when completely buried.
(3) Slip joint for Type I entrance taper shown. Type 2 similar.

ENTRANCE TAPER AND PIPE DOWNDRAIN

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

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

ENTRANCE TAPER-TYPE I ALTERNATIVE A & B

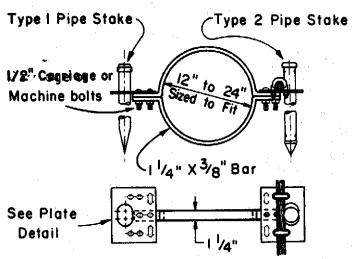


PLAN

TYPE I

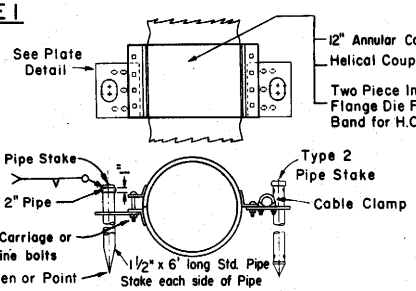
DIA.	MIN. L	M	N
8"	10'	18"	8"
12"	15'	20"	12"
15"	25'	24"	15"
18"	30'	30"	16"
24"	40'	36"	18"

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

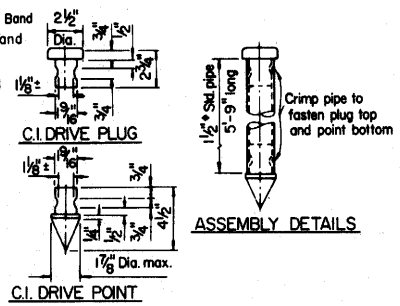


ANCHOR ASSEMBLY ALTERNATIVE A

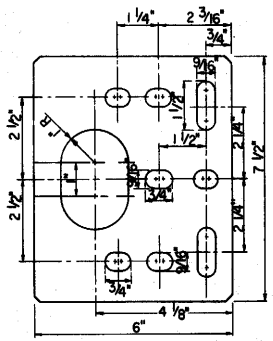
Note: Cable and cable clamps to be used when required by the Special Provisions.



ANCHOR ASSEMBLY ALTERNATIVE B



TYPE 2 PIPE STAKE



Material to be 1/4" plate galvanized after fabrication

PLATE DETAIL

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

OVERSIDE DRAINS | D87-A

DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET	TOTAL SHEETS

CHIEF OFFICE OF PLANNING AND DESIGN
REGISTERED CIVIL ENGINEER NO. 6623
APPROVED JULY 1, 1980

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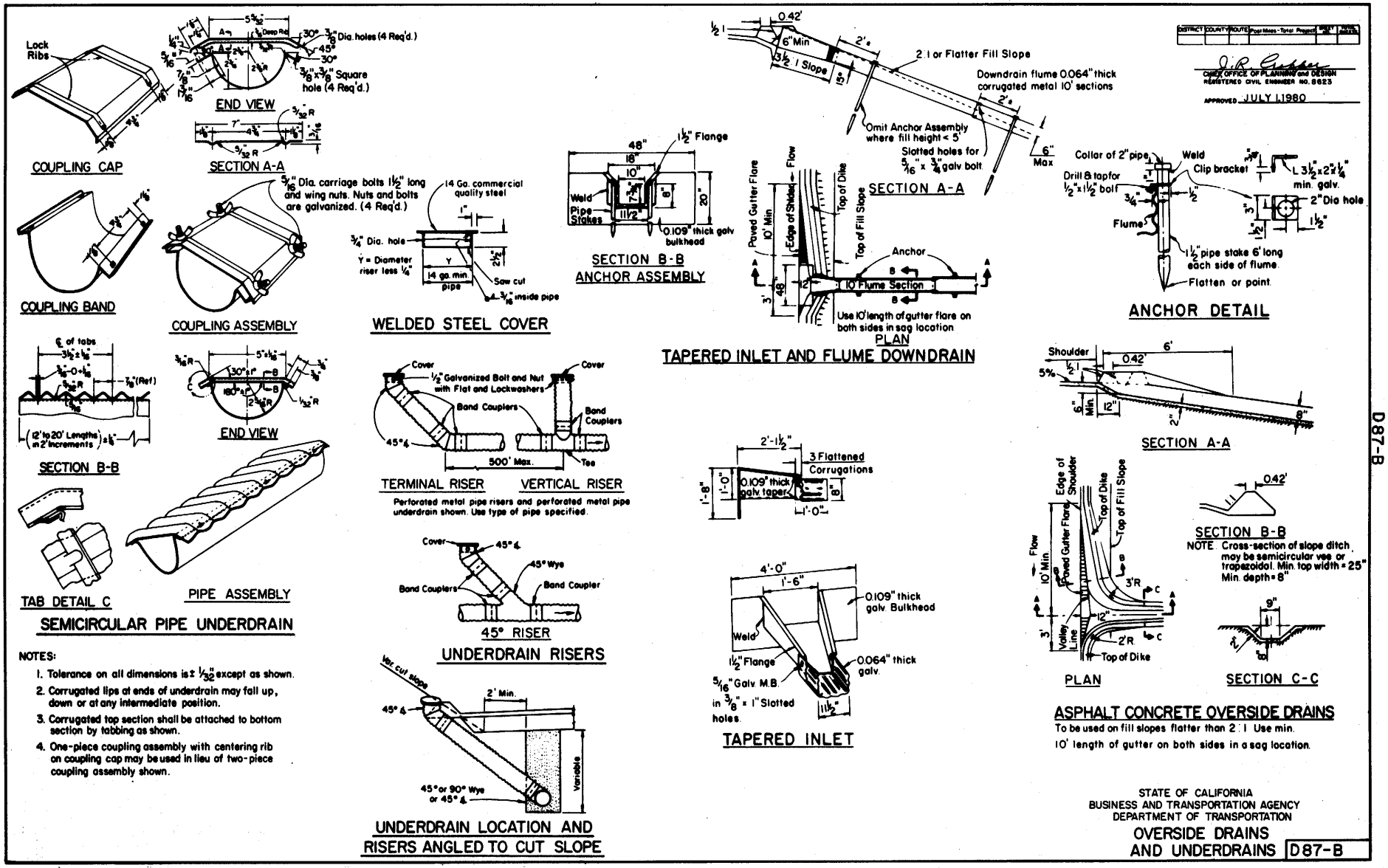

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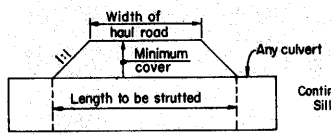
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

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

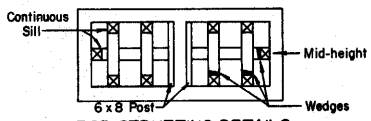
APPROVED JULY 1, 1980

TABLE OF MIN. FILL AND STRUTTING REQUIREMENTS

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



MINIMUM LENGTH OF STRUTTING



RCB STRUTTING DETAILS

GENERAL NOTES

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

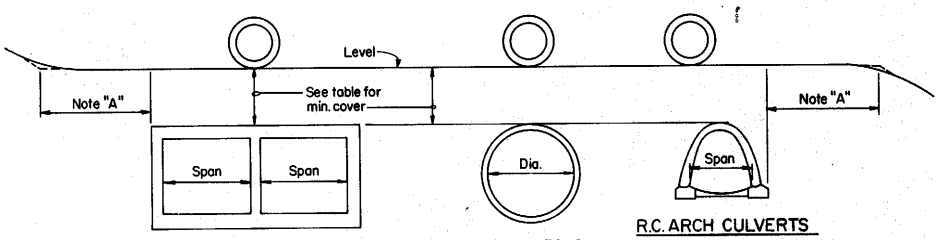
Assumed tire patterns _____:

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

Impact = 10%.

Sills to be glue-laminated or solid timber.

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



BOX CULVERTS

R.C. PIPES & METAL CULVERTS

R.C. ARCH CULVERTS

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

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

CONSTRUCTION LOADS ON CULVERTS D88

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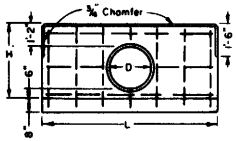
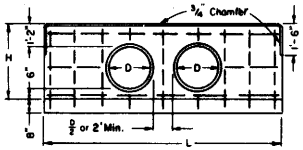
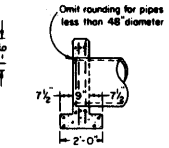


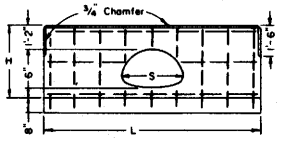
FRONT ELEV. SINGLE HEADWALL



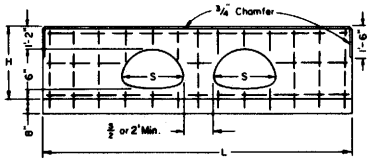
FRONT ELEV. DOUBLE HEADWALL



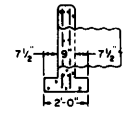
SECTION, SINGLE & DOUBLE HEADWALLS



FRONT ELEV. SINGLE HEADWALL



FRONT ELEV. DOUBLE HEADWALL



SECTION, SINGLE & DOUBLE HEADWALLS

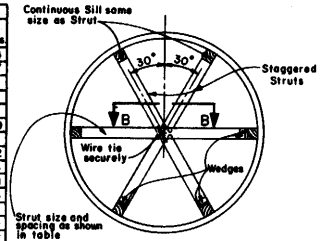
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

Chief, Office of Plumbing and Design
Registered Civil Engineer No. 8623

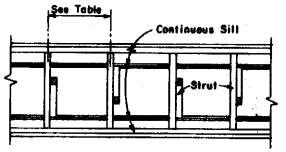
Approved JULY 1, 1980

D in	H ft-in	SINGLE L ft-in	SINGLE Steel Lbs	SINGLE Conc Cu Yds	DOUBLE L ft-in	DOUBLE Steel Lbs	DOUBLE Conc Cu Yds
12	2-8	5-0	35	0.60	8-0	50	0.94
15	2-11	6-0	40	0.75	9-6	60	1.17
18	3-2	7-0	50	0.91	10-6	75	1.35
21	3-5	7-6	60	1.02	11-6	90	1.52
24	3-8	8-6	75	1.20	12-6	100	1.72
27	3-11	9-6	85	1.39	14-0	115	2.00
30	4-2	10-0	85	1.52	15-0	126	2.21
33	4-5	11-0	100	1.73	16-0	150	2.42
36	4-8	12-0	105	1.95	17-0	145	2.65
39	4-11	12-6	130	2.09	18-0	170	2.88
42	5-2	13-6	140	2.34	19-0	185	3.13
45	5-5	14-6	150	2.60	20-0	195	3.38
48	5-8	15-0	160	2.75	21-0	200	3.64
51	5-11	16-0	180	3.03	22-6	225	4.02
54	6-2	17-0	190	3.31	23-6	240	4.30

STRAIGHT HEADWALLS



TYPICAL SECTION



SECTION B-B

C.M.P. ARCH SIZE	SINGLE H	SINGLE L	SINGLE Steel Lbs	SINGLE Conc Cu Yds	DOUBLE L	DOUBLE Steel Lbs	DOUBLE Conc Cu Yds
21"x15"	2'-11"	6'-6"	45	0.80	10'-0"	60	1.22
24"x18"	3'-2"	7'-6"	50	0.96	11'-6"	70	1.45
28"x20"	3'-4"	8'-6"	60	1.12	13'-6"	90	1.76
35"x24"	3'-8"	10'-6"	85	1.47	15'-6"	120	2.16
42"x29"	4'-1"	12'-6"	110	1.76	18'-0"	145	2.57
49"x33"	4'-5"	14'-6"	130	2.26	21'-0"	170	3.13
57"x38"	4'-10"	17'-0"	155	2.81	24'-6"	210	3.86
64"x43"	5'-3"	19'-0"	175	3.31	27'-0"	230	4.42
71"x47"	5'-7"	21'-0"	195	3.81	30'-0"	295	5.09

STRAIGHT HEADWALLS

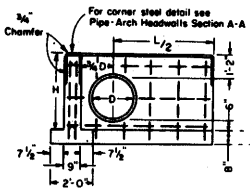
GENERAL NOTES

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

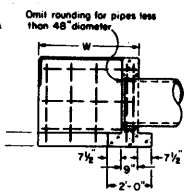
STRUT DETAILS

PIPE DIA	STRUT SIZE	HEIGHT OF FILL IN FEET 0-20	30	40	50	60	70	80	100+
240	8x8	5.0	3.0	3.0	3.0	3.0			
Thru 252	10x10	8.0	4.5	4.5	4.5	4.5			

SPACING IN FEET OF TIMBER STRUTS FOR STRUCTURAL STEEL PLATE PIPE



FRONT ELEV "L" HEADWALL



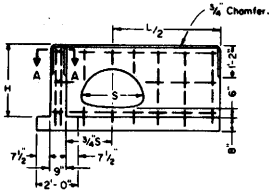
SECTION "L" HEADWALL

D in	H ft-in	L/2 ft-in	3'-4" Steel Lbs	3'-4" Conc Cu Yds	4'-10" Steel Lbs	4'-10" Conc Cu Yds	6'-4" Steel Lbs	6'-4" Conc Cu Yds	7'-10" Steel Lbs	7'-10" Conc Cu Yds	9'-4" Steel Lbs	9'-4" Conc Cu Yds
12	2-8	2-6	50	79	60	.98						
15	2-11	3-0	55	91	65	1.11						
18	3-2	3-6	65	1.04	75	1.25						
21	3-5	3-9	75	1.15	90	1.36						
24	3-8	4-3	85	1.29	100	1.51	110	1.74				
27	3-11	4-9	90	1.44	105	1.67	115	1.91				
30	4-2	5-0	95	1.55	110	1.80	120	2.05	135	2.29		
33	4-5	5-6	105	1.71	120	1.97	135	2.23	150	2.48		
36	4-8	6-0	110	1.88	125	2.15	140	2.41	155	2.66	170	2.95
39	4-11	6-3			150	2.28	170	2.56	185	2.84	200	3.12
42	5-2	6-9			155	2.42	175	2.76	190	3.05	210	3.34
45	5-5	7-3					180	2.97	200	3.27	215	3.57
48	5-8	7-6					190	3.13	216	3.44	230	3.75
51	5-11	8-0							220	3.67	235	3.99
54	6-2	8-6							235	3.91	250	4.24

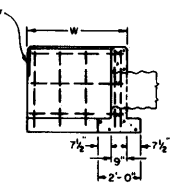
"L" HEADWALLS

FULL CIRCLE PIPE CULVERT HEADWALLS

SECTION A-A



FRONT ELEV. "L" HEADWALL



SECTION "L" HEADWALL

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

"L" HEADWALLS

CORRUGATED METAL PIPE-ARCH CULVERT HEADWALLS

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

PIPE HEADWALLS AND STRUT DETAILS

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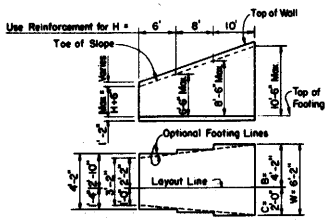
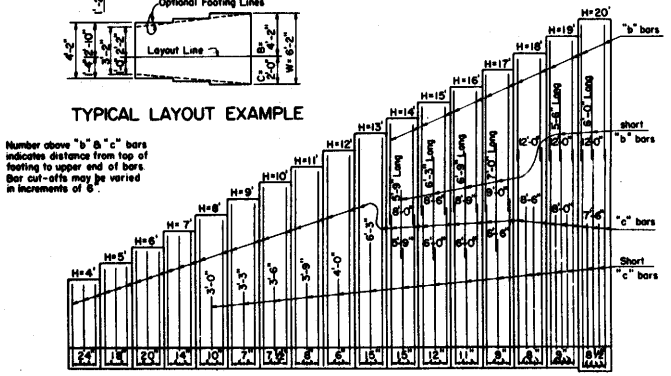
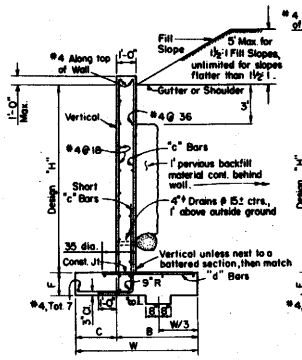
DISTRICT	COUNTY	ROUTE	Post Miles – Total Project	REV.	APPR.

Design Notes:
Unit Stresses: f_s = 24,000 psi, f_c = 1,300 psi, n = 10
Maximum Toe Pressure = 1 ½ Tons/sq.ft.
Elevations, length and angle of flare of wings may be varied by the Engineer to suit conditions encountered in the field.
Walls designed for 2' live load surcharge, 1 ½ : 1 sloping surcharge not to exceed 5' in elevation plus 2' live load surcharge, or unlimited 2:1 surcharge. If 1½ : 1 slope exceeds 5, use Type 2 Retaining Wall.
Wall height may be exceeded by 6" before going to the next greater "H".

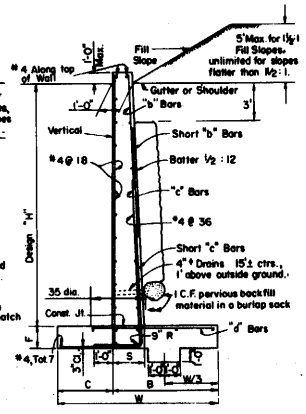


TYPICAL LAYOUT EXAMPLE

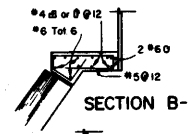




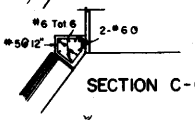
TYPICAL SECTION
H=4' THRU 12'



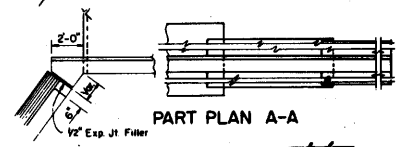
TYPICAL SECTION
H=13' THRU 20'



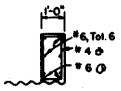
SECTION B-B



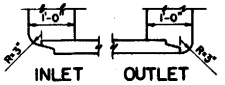
SECTION C-C



PART PLAN A-A

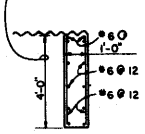


SECTION D-D



INLET OUTLET
R.C. PIPE DETAILS

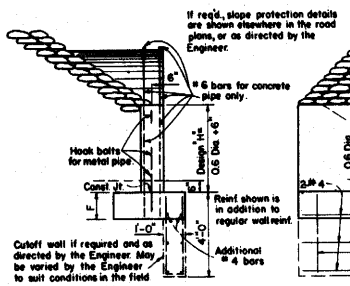
May be varied by the Engineer to suit conditions in the field.



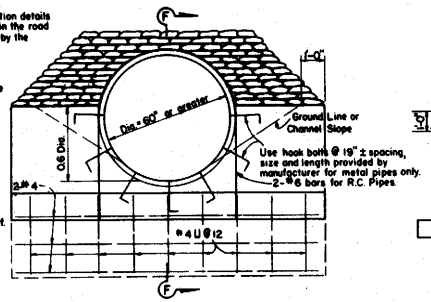
SECTION E-E

REINFORCED CONCRETE WINGWALLS

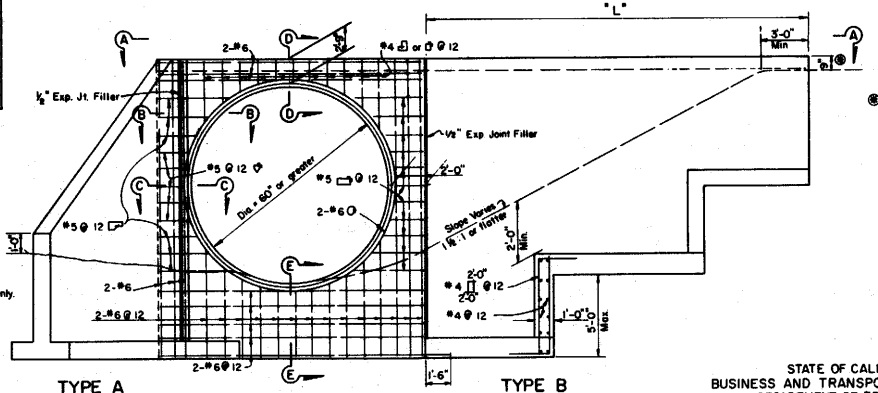
Design "H"	4'	5'	6'	7'	8'	9'	10'	11'	12'	13'	14'	15'	16'	17'	18'	19'	20'
W	3'-2"	3'-8"	4'-2"	4'-8"	5'-2"	5'-8"	6'-2"	6'-8"	7'-2"	7'-8"	8'-0"	8'-8"	9'-4"	10'-0"	10'-8"	11'-4"	12'-0"
C	1'-0"	1'-2"	1'-4"	1'-6"	1'-8"	1'-10"	2'-0"	2'-2"	2'-4"	2'-6"	2'-8"	3'-0"	3'-4"	3'-8"	4'-0"	4'-4"	4'-8"
B	2'-2"	2'-6"	2'-10"	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									½:12							
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	#6@6	#7@6	#8@15	#8@15	#8@12	#8@11	#8@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	#8@15	#8@12	#8@11	#8@9	#9@8	#10@9	#10@8½
Conc. C.Y./L.F.	0.32	0.38	0.44	0.49	0.55	0.61	0.67	0.73	0.79	1.02	1.10	1.18	1.26	1.36	1.45	1.55	1.72
Reinf. Lbs./L.F.	13	16	19	25	30	37	49	62	76	73	90	104	123	141	170	199	206



SECTION F-F



TYPE C WALL



TYPE A

END ELEVATION

TYPE B

STRAIGHT WINGWALLS

* Unless otherwise designated

CHIEF ENGINEER – PLANNING BRANCH
REGISTERED CIVIL ENGINEER NO. 9013
APPROVED JULY 1, 1980

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

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

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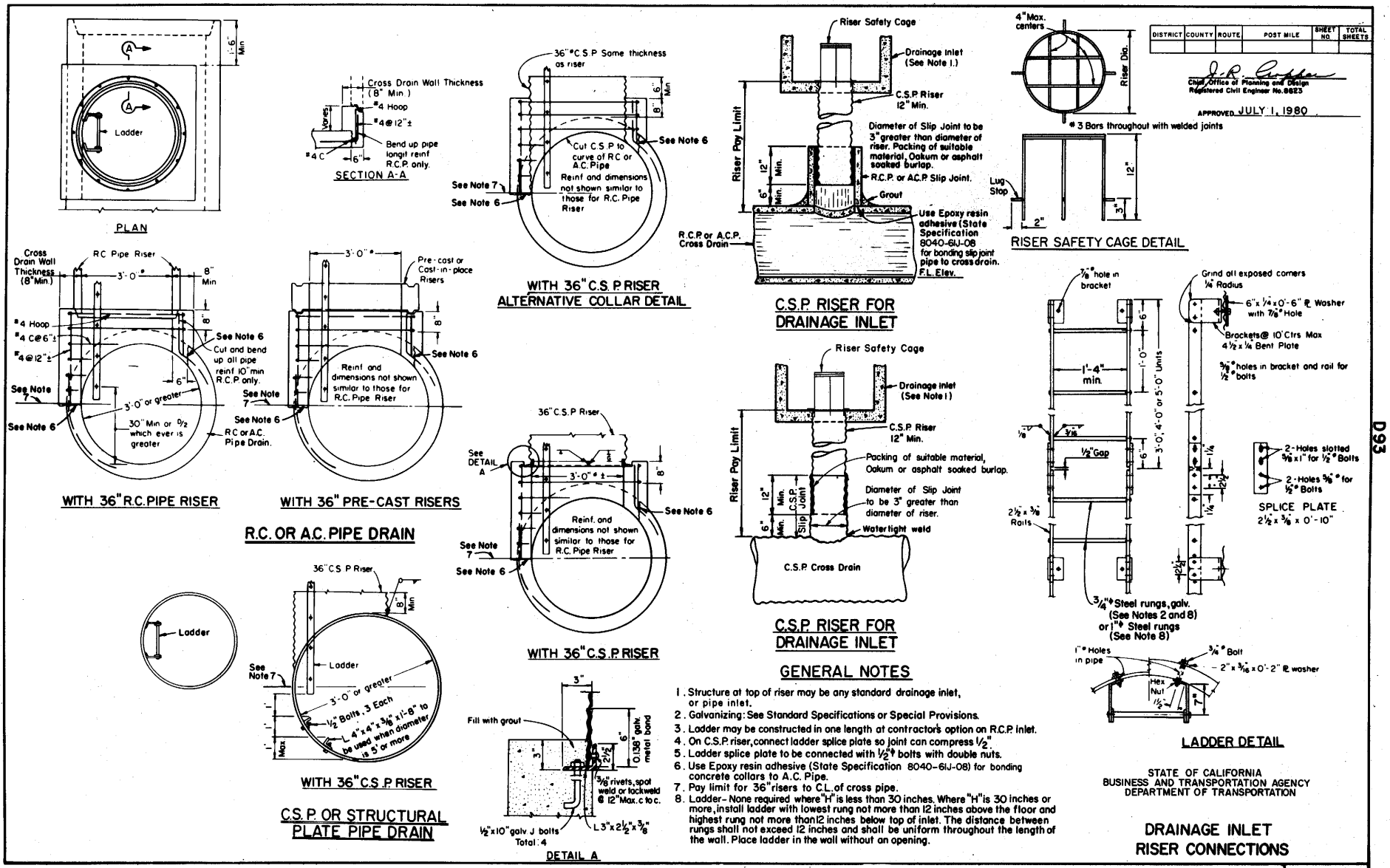

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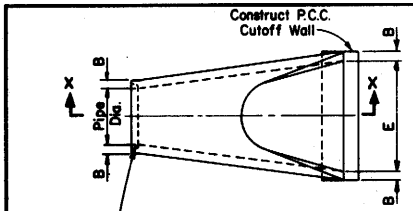
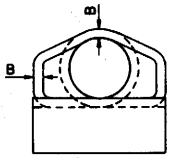


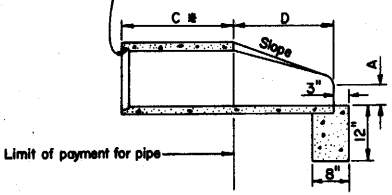
PLAN



END VIEW

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

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

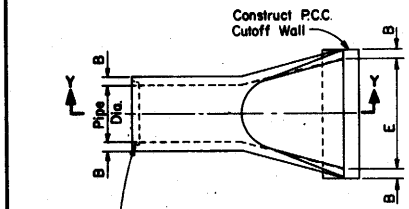


MINIMUM DIMENSIONS						
PIPE DIA.	A	B	C*	D	E	Slope
12"	4"	2"		2'-0"	2'-0"	2:1 or flatter
18"	9"	2½"		2'-3"	3'-0"	
24"	9½"	3"		3'-7½"	4'-0"	
30"	1'-0"	3½"		4'-6"	5'-0"	
36"	1'-3"	4"		5'-3"	6'-0"	
42"	1'-9"	4½"		5'-3"	6'-6"	
48"	2'-0"	5"		6'-0"	7'-0"	
54"	2'-3"	5½"		5'-5"	7'-6"	

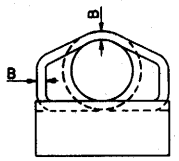
SECTION X-X

PRECAST CONCRETE FLARED END SECTION TYPE A

(See Note 6)



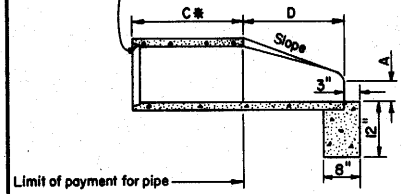
PLAN



END VIEW

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

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

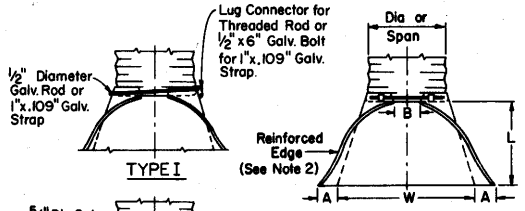


MINIMUM DIMENSIONS						
PIPE DIA.	A	B	C*	D	E	Slope
12"	4"	1¾"		1'-10"	2'-0"	2:1 or flatter
18"	9"	2"		2'-1"	3'-0"	
24"	9½"	2½"		3'-6"	4'-0"	
30"	1'-0"	3"		4'-5"	5'-0"	
36"	1'-3"	3⅜"		5'-2"	6'-0"	
42"	1'-9"	3¾"		5'-3"	6'-6"	
48"	2'-0"	4¼"		6'-0"	7'-0"	
54"	2'-3"	4⅝"		5'-6"	6'-10"	

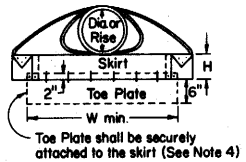
SECTION Y-Y

PRECAST CONCRETE FLARED END SECTION TYPE B

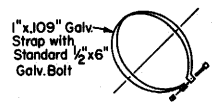
(See Note 6)



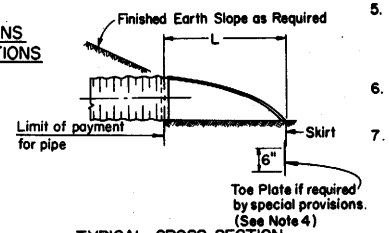
ALTERNATE CONNECTIONS PIPE TO FLARED END SECTIONS



ELEVATION



ALTERNATE END SECTION CONNECTOR STRAP



TYPICAL CROSS-SECTION

CIRCULAR PIPES						
PIPE DIA.	End Section Thick.	DIMENSIONS-INCHES A 1⅛	B Max	H 1⅛	L 11½"	W 2⅛
12"	0.064"	6	6	6	21	24
15"	0.064"	7	8	6	26	30
18"	0.064"	8	10	6	31	36
21"	0.064"	9	12	6	36	42
24"	0.064"	10	13	6	41	48
30"	0.079"	12	16	8	51	60
36"	0.079"	14	19	9	60	72
42"	0.109"	16	22	11	69	84
48"	0.109"	18	27	12	78	90
54"	0.109"	18	30	12	84	102
60"	0.109"	18	33	12	87	114
66"	0.109"	18	36	12	87	120
72"	0.109"	18	39	12	87	126
78"	0.109"	18	42	12	87	132
84"	0.109"	18	45	12	87	138

PIPE-ARCHES								
INCHES Span	Rise	End Section Thick.	DIMENSIONS-INCHES A 1⅛	B Max	H 1⅛	L 11½"	W 2⅛
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 C.M.P. CULVERTS

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

CHIEF OFFICE OF PLANNING AND DESIGN
REGISTERED CIVIL ENGINEER NO. 8825

APPROVED JULY 1, 1980

NOTES

1. All 3pc bodies to have 0.109" thick sides and 0.138" thick center panels. Width of center panels to be greater than 20% of the pipe periphery. Multiple panel bodies to have lap seams which are to be tightly joint by ⅜" ϕ galvanized rivets or bolts.
2. Reinforced edges to be supplemented with galvanized stiffener angles for the 60" thru 84" round, 77"x52" and 83"x57" pipe-arch sizes. The angles will be 2"x2"x¼" for the 60" thru 72" round, 77"x52" and 83"x57" pipe-arch sizes and 2½"x2½"x¼" for 78" and 84" round. The angles to be attached by ⅜" ϕ galvanized nuts and bolts.
3. Angle reinforcement will be placed under the center panel seams on the 77"x52" and 83"x57" pipe-arch sizes.
4. Galvanized toe plate to be available as an accessory when specified.
5. End of pipe to be finished with annular corrugations to conform to flared end section so that no leakage results from the connection. Other designs may be used with approval of the Engineer.
6. Contractor has the option of using either Type A or B "Precast Concrete Flared End Section".
7. For 12" thru 24" helical end section connection, a dimpled coupling band attached to the metal end section by galvanized rivets, bolts or one inch long shop tack welds spaced at same intervals as dimples may be used in place of the 12" stub. See Standard Plan D97-F.

ALTERNATE CONNECTIONS FOR PIPE TO FLARED END SECTIONS

Circular Pipes

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

Pipe-Arches

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

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

FLARED END SECTIONS

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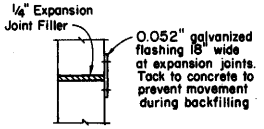
SPAN	Waterway Area Sq. Ft.	HEIGHT	Crown	W_1	W_2	W_3	R_1	R_2	R_3	R_4	A	B	C	D	E	F	G	H	I	J	ⓐ Bars	ⓒ Bars	ⓓ Bars	Footing Dowels	Reinf Steel Lbs/Lin Ft	Concrete Cu Yds Per Lin Ft
6	27	6'-10 5/16"	6"	2'-0"	1'-3 1/2"	11"	6'-0"	6'-2 3/8"	1'-11"	2'-7 1/4"	2 1/4"	2'-7 1/16"	2'-6"	6"	6"	5 1/2"	1 1/2"	2 1/2"	5"	4'-5 1/2"	#6	#6	#5	6	203	0.59
7	37	7-10 7/8	6	2-3	1-5 1/2	11 5/8	7-0	7-1 3/4	2-2 3/4	2-11 1/2	2 3/4	3-0 1/4	2-11	7	6	6 1/2	2	3	5 5/8	5-1 1/4	6	6	5	6	222	0.74
8	48	8-10 3/8	6	2-6	1-7	1'-0 3/8"	8-0	8-1 1/4	2-6 5/8	3-3 5/8	3	3-5 3/8	3-4	8	6	7 1/2	2	3 1/2	6 3/8	5-9 1/8	6	6	5	6	248	0.89
9	61	9-9 11/16	6	2-9	1-8	1-1 1/4	9-0	9-0 5/8	2-10 1/2	3-7 7/8	3 3/8	3-10 9/16	3-9	9	6	8	2	4	7 1/4	6-5 1/8	6	6	5	6	267	1.05
10	74	10-10 1/8	6 3/8	3-0	1-10	1-2	10-0	10-0 3/8	3-2 1/4	4-0 3/8	3 3/4	4-3 3/4	4-2	10	6	10	2	4	8	7-1	7	7	5	7	400	1.27
11	92	11-10 9/16	6 5/8	3-4	2-0	1-3 3/8	11-0	11-0	3-6	4-4 7/8	4 1/4	4-8 15/16	4-7	11	6	10	3	5	8 3/4	7-9 11/16	7	7	5	7	431	1.46
12	110	12-10 3/8	7 1/4	3-8	2-1	1-5	12-0	12-0	3-10	4-9 5/8	4 3/8	5-2 1/8	5-0	1'-0"	6	11	3	5	9 5/8	8-6 1/2	7	7	5	7	457	1.70
13	127	13-11 1/8	7 7/8	4-0	2-3	1-6 1/4	13-0	13-0	4-1 3/4	5-2 1/2	4 7/8	5-7 1/4	5-5	1-1	7	1'-0"	3	5	10 3/8	9-3 1/8	7	7	6	7	504	2.02
14	148	14-10 15/16	8 3/8	4-3	2-4	1-7 3/8	14-0	14-0	4-5 1/2	5-7 1/4	5 3/8	6-0 9/16	5-10	1-2	7	1-0	3	6	11 1/4	9-11 5/16	7	7	6	7	550	2.26
15	169	15-11 5/8	9	4-6	2-6	1-9	15-0	15-0	4-9 3/8	6-0	5 5/8	6-5 5/8	6-3	1-3	7	1-2	3	6	1'-0"	10-7 1/2	7	7	6	7	585	2.59
16	192	17-0 7/16	9 5/8	4-10	2-8	1-10 3/8	16-0	16-0	5-1 1/4	6-4 7/8	6	6-10 13/16	6-8	1-4	7	1-3	3	7	1-0 3/4	11-4 3/16	7	7	6	7	616	2.92
17	217	18-2 3/8	10 1/4	5-2	2-11	2-0	17-0	17-0	5-5	6-9 3/4	6 1/2	7-4	7-1	1-5	8	1-4	4	7	1-1 5/8	12-1	8	8	6	8	796	3.38
18	244	19-3	11	5-5	3-1	2-1 1/4	18-0	18-0	5-8 7/8	7-2 1/2	6 5/8	7-9 1/8	7-6	1-6	8	1-5	4	8	1-2 3/8	12-9 1/8	8	8	6	8	839	3.76
19	272	20-3 13/16	11 3/8	5-8 1/2	3-3	2-2 5/8	19-0	19-0	6-0 3/4	7-7 1/4	7 1/8	8-2 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 5/16	1-0 5/8	6-3 5/8	3-7	2-5 3/8	21-0	21-0	6-8 3/8	8-4 7/8	7 7/8	9-0 11/16	8-9	1-9	9	1-9	4	9	1-4 3/4	14-10 1/2	8	8	6	8	983	5.09
22	363	23-4 1/4	1-1 1/4	6-7	3-7	2-7	22-0	22-0	7-0 1/4	8-9 3/4	8 1/4	9-5 7/8	9-2	1-10	9	1-9	4	9	1-5 5/8	15-7	8	8	6	8	1020	5.47

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

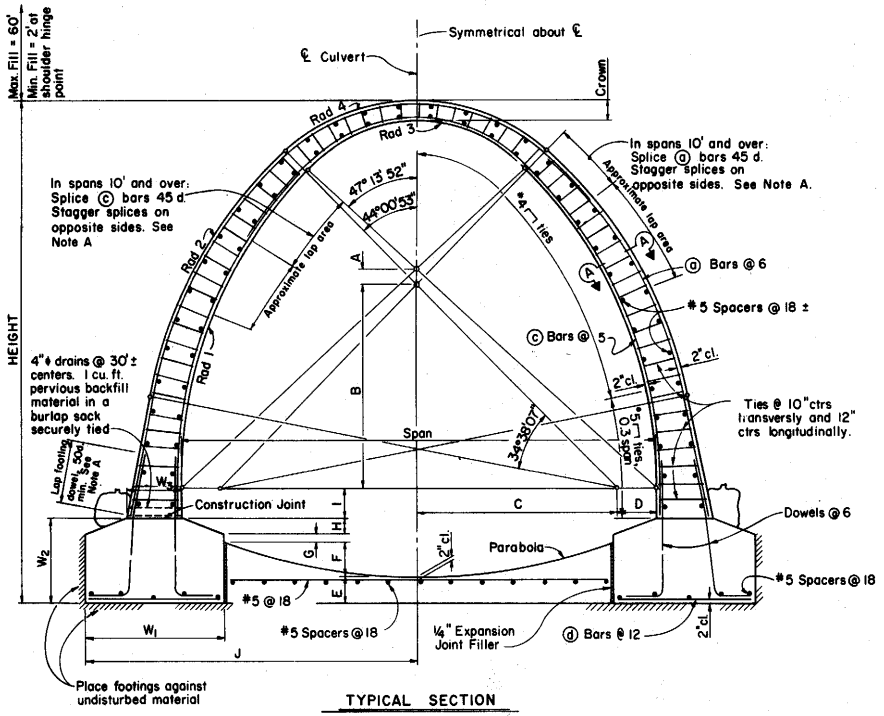
CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

APPROVED JULY 1, 1980



SECTION A-A

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



TYPICAL SECTION

SPAN		FOOTING PRESSURE																
		6'	7'	8'	9'	10'	11'	12'	13'	14'	15'	16'	17'	18'	19'	20'	21'	22'
Footing Pressure Tons psf.	Fill 20'	2.4	2.4	2.5	2.5	2.6	2.7	2.8	2.8	3.0	3.0	3.0	3.1	3.2	3.2	3.3	3.4	3.5
	40'	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.8	5.0	5.0	5.0	5.1	5.2	5.2	5.3	5.4	5.5
	60'	6.0	6.2	6.3	6.5	6.6	6.7	6.8	6.8	7.0	7.0	7.0	7.1	7.2	7.2	7.3	7.4	7.5

GENERAL NOTES

DESIGN: AASHTO dated 1973 with revisions and as supplemented by Bridge Planning and Design Manual.

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

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

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

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

MAXIMUM OVERFILL: 60'

EXCAVATION AND BACKFILL: See Standard Plan A62-E

NOTE A:

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

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

CONCRETE ARCH CULVERTS

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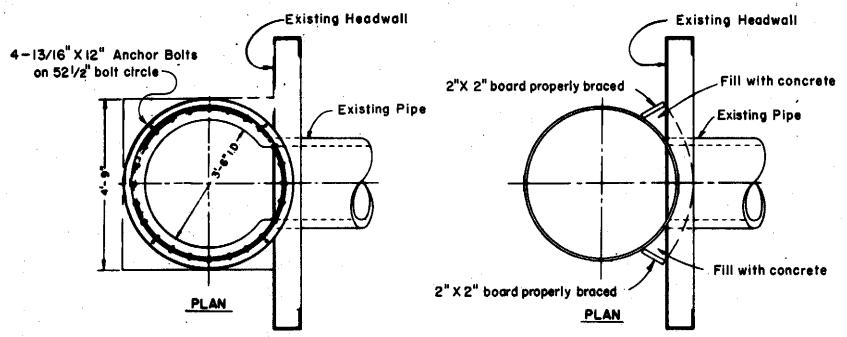
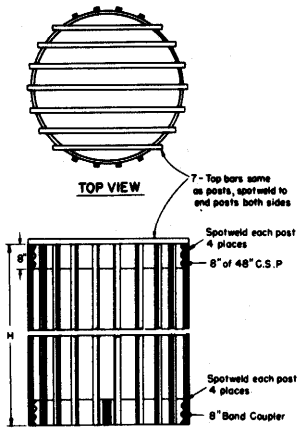
DIST.	COUNTY	ROUTE	POST MILE—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

Chief, Office of Planning and Design
Registered Civil Engineer No. 8623

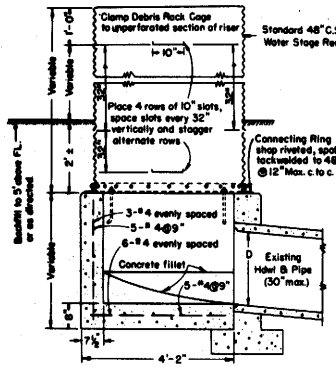
Approved JULY 1, 1980



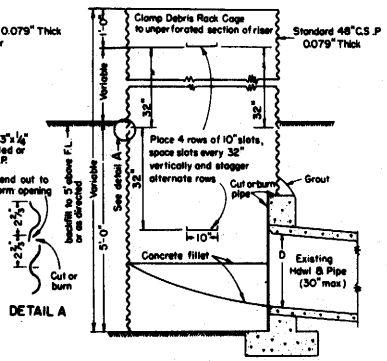


H= 22 Posts- 6' or 8' Lengths use 2" Pipe or L 2"x2"x 3/16" (Galvanized)

DEBRIS RACK CAGE



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



SECTION
C.S.P. RISER
TYPE B

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

PIPE RISER WITH
DEBRIS RACK CAGE D96

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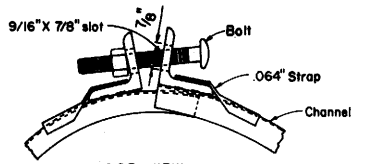
COUPLER TYPE	PIPE CORRUGATION	PIPE SIZE	W OR A	PIPE WALL THICKNESS	BAND THICKNESS	BAR AND STRAP: STRAP THICKNESS	BAR AND STRAP: BAR DIAMETER	ANGLE: DIMENSIONS	ANGLE: BOLTS	ANGLE: RIVETS ANGLE TO BAND	ANGLE: SPOT WELD ANGLE TO BAND
Two Piece Integral Flange	1 1/2" x 1/4"	8"	12"	.064"	.052"				3-3/8"	See Details	
Annular	2 2/3" x 1/2"	Thru 24"	12"	.064"	.064"			2" x 2" x 3/16"	3-1/2"	3-3/8"	3-1/2"
Channel	2 2/3" x 1/2"	Thru 24"	3/4"	.064"	.079"	.079"	7/8"	2" x 2" x 5/16"	1-1/2"		See Details
Wing Channel	2 2/3" x 1/2"	Thru 24"	12"	.064"	.064"	.079"	7/8"	2" x 2" x 3/16"	3-1/2"	3-3/8"	3-1/2"
Hugger	2 2/3" x 1/2"	Thru 24"	10 1/2"	.064"	.064"	.079"	7/8"				
Helical	2 2/3" x 1/2"	Thru 24"	12"	.064"	.064"			2" x 2" x 3/16"	3-1/2"	3-3/8"	3-1/2"

GENERAL NOTES

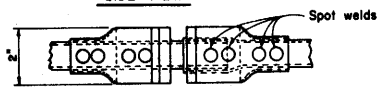
1. All coupling band connection hardware shall be galvanized or electroplated in accordance with the Standard Specifications.
2. Use 1 1/4" gage line dimension on attached angle leg for rivets and spot welds.
3. Dimensions and thicknesses shown are minimum.
4. Spot welds shall develop minimum required strength of strap.
5. Bar yield strength, 32,000 psi minimum.
6. Fillet welds of equivalent strength may be substituted for spot welds or rivets.

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

CHIEF, OFFICE OF PLANNING AND DESIGN
REGISTERED CIVIL ENGINEER NO. 8823
APPROVED JULY 1, 1980

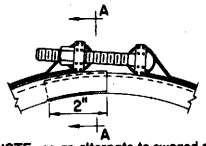


SIDE VIEW

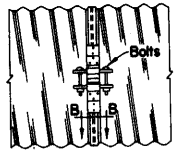


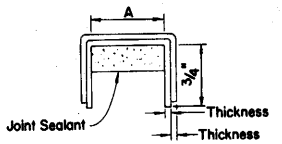
PART PLAN

ANGLE CONNECTOR

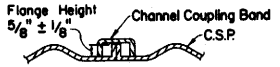


NOTE: as an alternate to swaged end, an oversize bridge clip may be used.





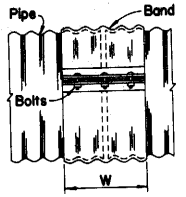
PARTIAL SECTION A-A



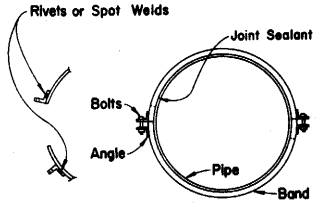
SECTION B-B

BAR & STRAP CONNECTOR

CHANNEL COUPLING BAND FOR FLANGED END C.S.P.

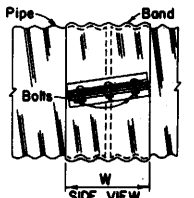


SIDE VIEW



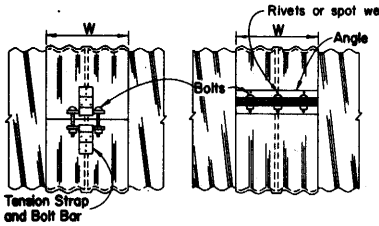
END VIEW

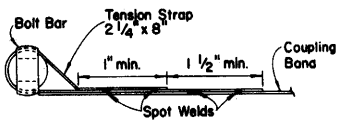
ANNULAR COUPLING BAND



SIDE VIEW

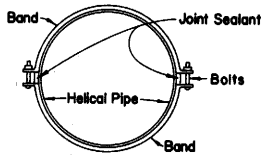
HELICAL COUPLING BAND



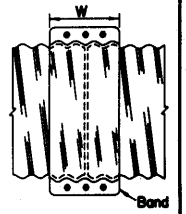


NOTE: minimum of 2 spot welds per connection

STRAP DETAIL

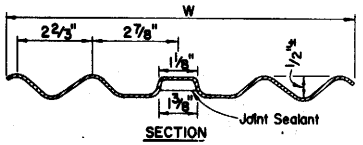


END VIEW



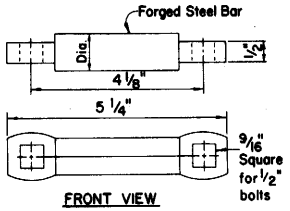
TOP VIEW

TWO PIECE INTEGRAL FLANGE DIE FORMED BAND FOR H.C.S.P.



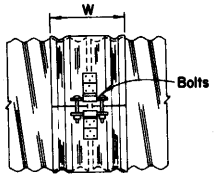
SECTION

WING CHANNEL COUPLING BAND FOR REFORMED END H.C.S.P.

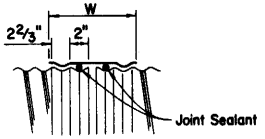


FRONT VIEW

BAR DETAIL



SIDE VIEW



JOINT CROSS SECTION

HUGGER COUPLING BAND FOR REFORMED END H.C.S.P. OR ANNULAR C.S.P.

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

C.S.P. DOWNDRAIN COUPLING DETAILS

D97A

D97-A

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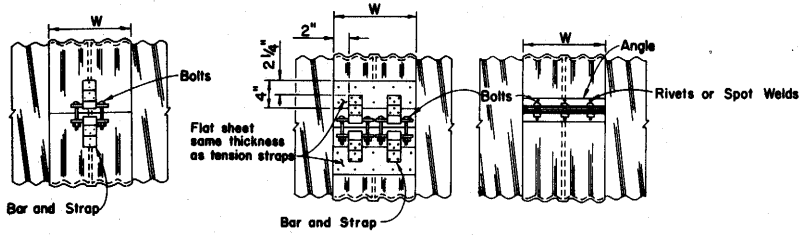
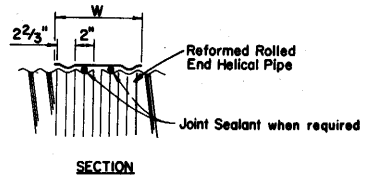
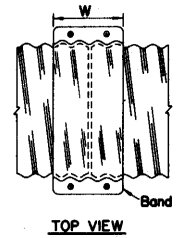
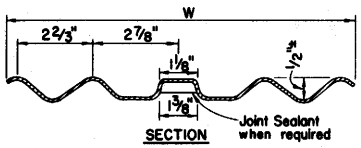
DISTRICT	COUNTY	ROUTE	POST MILE TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF PLANNING AND DESIGN
REGISTERED CIVIL ENGINEER NO. 8823
APPROVED JULY 1, 1980

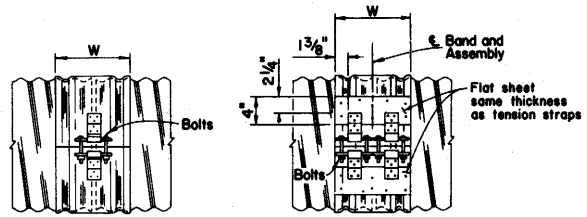




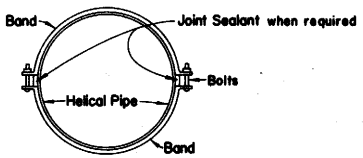




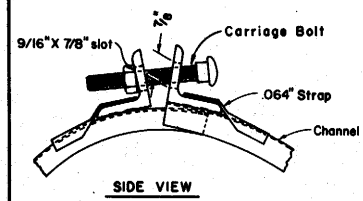
WING CHANNEL COUPLING BAND FOR REFORMED END H.C.S.P.

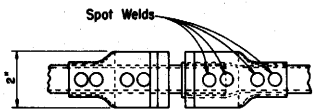


HUGGER COUPLING BAND FOR REFORMED END H.C.S.P. OR ANNULAR C.S.P.

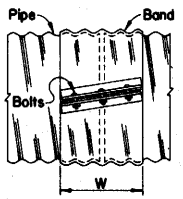


TWO PIECE INTEGRAL FLANGE DIE FORMED BAND FOR H.C.S.P.





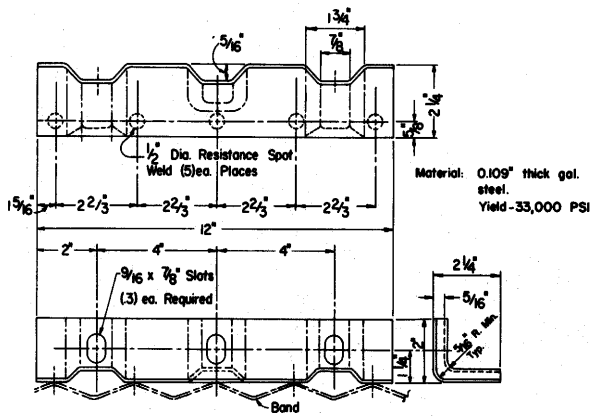
ANGLE CONNECTOR



HELICAL COUPLING BAND

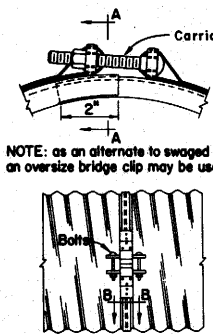
See Standard Plan D97-D for STANDARD JOINT dimensions.

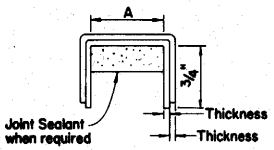
See Standard Plan D97-E for POSITIVE JOINT dimensions.

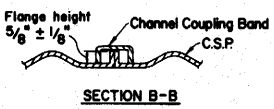


Material: 0.109" thick gal. steel.
Yield-33,000 PSI

DIE-FORMED ANGLE DETAIL
(Alternate to 2" x 2" x 3/16" x 12" angle)

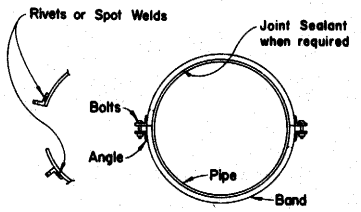




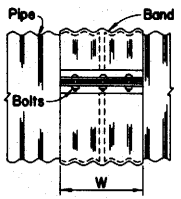


BAR & STRAP CONNECTOR

CHANNEL COUPLING BAND FOR USE ON FLANGED END C.S.P.



HELICAL OR ANNULAR COUPLING BAND



ANNULAR COUPLING BAND

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

C.S.P. COUPLING BAND DETAILS NO. 1
STANDARD AND POSITIVE JOINT

D97-B

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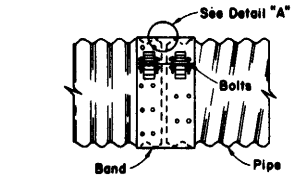
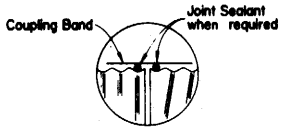
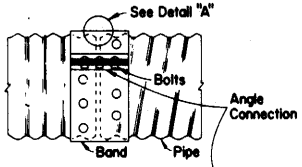
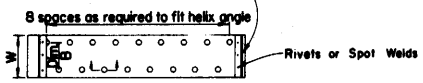




DETAIL "A"

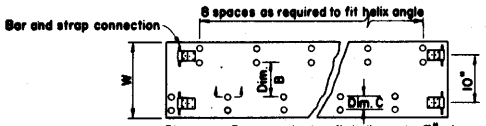




Dimension B: 7" min. between dimples, as required to fit helix angle.

SECTION THRU DIMPLES

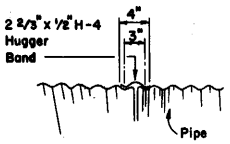
UNIVERSAL COUPLING BAND ANGLE CONNECTION



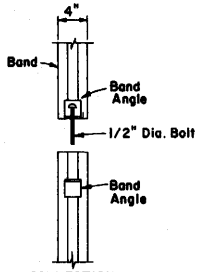
Dimension: B: as required to fit helix angle, 7" min.
Dimension C: as required to fit helix angle, 2 2/3" min.

SECTION THRU DIMPLES

UNIVERSAL COUPLING BAND BAR AND STRAP CONNECTION

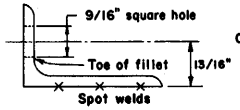


SECTION



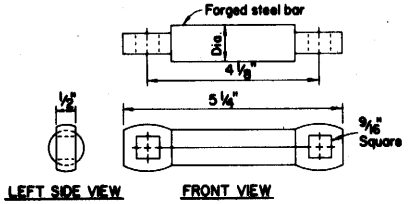
CONNECTION DETAIL

1 1/2" x 2 1/2" x 3/16" rolled angle x 2 1/4" long

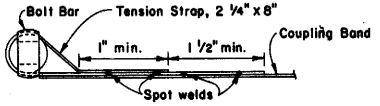


Pipe Size	Pipe Wall Thickness	Band Thickness
12"–54"	.052–.109	.052
60"–66"	.109	.064
36"–48"	.138	.064

H-4 HUGGER BAND FOR STANDARD JOINTS

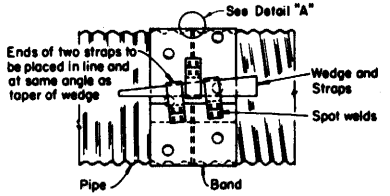


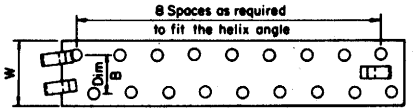
BAR DETAIL



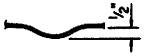
NOTE: minimum of two spot welds per connection.

STRAP DETAIL

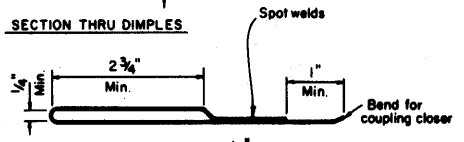




Dimension B: 7" Min. between dimples as req'd. to fit the helix angle

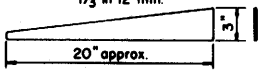


SECTION THRU DIMPLES

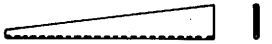


STRAP (3 Reqd.) 2 1/4" WIDE

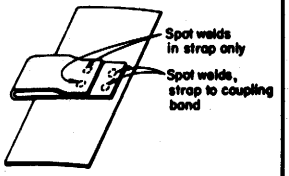
Taper: 1 1/2 in 12 max.
1 1/3 in 12 min.



WEDGE 0.138"



ALTERNATIVE TYPE WEDGE 0.079" FOLDED 180° AND FLATTENED



STRAP DETAIL

UNIVERSAL COUPLING BAND - WEDGE AND STRAP CONNECTION

See Standard Plan D97-D for STANDARD JOINT dimensions.

See Standard Plan D97-E for POSITIVE JOINT dimensions.

DISTRICT	COUNTY	ROUTE	Post Miles—Total Project	SHEET	TOTAL SHEETS

CHIEF, OFFICE OF PLANNING AND DESIGN
REGISTERED CIVIL ENGINEER NO. 0525

APPROVED JULY 1, 1980

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

C.S.P. COUPLING BAND DETAILS NO. 2
STANDARD AND POSITIVE JOINT

D97-C

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Chief, Office of Planning and Design
Registered Civil Engineer No. 26625
Approved JULY 1, 1980

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

COUPLING TYPE	PIPE CORRUGATION	PIPE SIZE	W OR A	THICKNESS PIPE WALL	THICKNESS BAND	BAR & STRAP: THICKNESS STRAP	BAR & STRAP: BOLTS	BAR & STRAP: BAR DIA.	BAR & STRAP: BAR YIELD STRENGTH PSI	ANGLE: DIMENSIONS	ANGLE: BOLTS	ANGLE: RIVETS ANGLE TO BAND	ANGLE: SPOT WELDS ANGLE TO BAND	WEDGE & STRAP: THICKNESS STRAP	WEDGE & STRAP: THICKNESS WEDGE
TWO PIECE INTEGRAL FLANGE	1 1/2" x 1/4"	6" Thru 10"	7"	0.052 - 0.079	0.052						2 - 3/8"				
UNIVERSAL	2 2/3" x 1/2"	Thru 36"	12"	0.052 - 0.138	0.052					2 x 2 x 3/16	3 - 1/2"	3 - 3/8"	3 - 1/2"		
		42" Thru 60"	12"	0.052 - 0.168	0.052					2 x 2 x 3/16	3 - 1/2"	3 - 3/8"	5 - 1/2"		
		Thru 72"	12"	0.052 - 0.168	0.052	0.079	1/2"	7/8"	32,000						
		Thru 72"	12"	0.052 - 0.168	0.052									0.079	0.138
		78" Thru 84"	16 1/4"	0.168	0.079	Double 0.079	1/2"	7/8"	32,000						
ANNULAR	2 2/3" x 1/2"	Thru 36"	7"	0.064 - 0.138	0.052	0.079	1/2"	7/8"	32,000	2 x 2 x 3/16	2 - 1/2"	3 - 3/8"	3 - 1/2"		
		42" Thru 60"	12"	0.064 - 0.168	0.052	0.079	1/2"	7/8"	32,000	2 x 2 x 3/16	3 - 1/2"	3 - 3/8"	5 - 1/2"		
		66" Thru 72"	12"	0.109 - 0.168	0.052	0.079	1/2"	7/8"	32,000	2 x 2 x 1/4	3 - 1/2"	3 - 3/8"	5 - 1/2"		
		78" Thru 84"	12"	0.168	0.079	0.109	1/2"	7/8"	45,000	2 x 2 x 1/4	3 - 1/2"	3 - 3/8"	5 - 1/2"		
	3" x 1"	48" Thru 60"	14"	0.064 - 0.109	0.052	0.079	1/2"	7/8"	32,000	2 x 2 x 3/16	3 - 1/2"	3 - 3/8"	5 - 1/2"		
		66" Thru 84"	14"	0.064 - 0.109	0.052	0.079	1/2"	7/8"	32,000	2 x 2 x 1/4	3 - 1/2"	3 - 3/8"	5 - 1/2"		
		90" Thru 120"	14"	0.079 - 0.109	0.052	0.109	1/2"	7/8"	45,000	2 x 2 x 1/4	3 - 1/2"	4 - 3/8"			
HELICAL	2 2/3" x 1/2"	Thru 36"	12"	0.052 - 0.138	0.052	0.079	1/2"	7/8"	32,000	2 x 2 x 3/16	3 - 1/2"	3 - 3/8"	3 - 1/2"		
		42" Thru 60"	12"	0.052 - 0.168	0.052	0.079	1/2"	7/8"	32,000	2 x 2 x 3/16	3 - 1/2"	3 - 3/8"	5 - 1/2"		
		66" Thru 72"	12"	0.109 - 0.168	0.052	0.079	1/2"	7/8"	32,000	2 x 2 x 1/4	3 - 1/2"	3 - 3/8"	5 - 1/2"		
		78" Thru 84"	12"	0.168	0.079	0.109	1/2"	7/8"	45,000	2 x 2 x 1/4	3 - 1/2"	3 - 3/8"	5 - 1/2"		
	3" x 1"	48" Thru 60"	14"	0.064 - 0.109	0.052	0.079	1/2"	7/8"	32,000	2 x 2 x 3/16	3 - 1/2"	3 - 3/8"	5 - 1/2"		
		66" Thru 84"	14"	0.064 - 0.109	0.052	0.079	1/2"	7/8"	32,000	2 x 2 x 1/4	3 - 1/2"	3 - 3/8"	5 - 1/2"		
		90" Thru 120"	14"	0.079 - 0.109	0.052	0.109	1/2"	7/8"	45,000	2 x 2 x 1/4	3 - 1/2"	4 - 3/8"			
WING CHANNEL	2 2/3" x 1/2"	Thru 72"	12"	0.052 - 0.168	0.052	0.079	1/2"	7/8"	32,000	2 x 2 x 1/4	3 - 1/2"	3 - 3/8"	5 - 1/2"		
		78" Thru 84"	12"	0.168	0.079	0.109	1/2"	7/8"	45,000	2 x 2 x 1/4	3 - 1/2"	3 - 3/8"	5 - 1/2"		
		Thru 60"	12"	0.052 - 0.168	0.052					2 x 2 x 3/16	3 - 1/2"	3 - 3/8"	5 - 1/2"		
	3" x 1"	48" Thru 84"	12"	0.064 - 0.109	0.052	0.079	1/2"	7/8"	32,000	2 x 2 x 1/4	3 - 1/2"	3 - 3/8"	5 - 1/2"		
		90" Thru 120"	12"	0.079 - 0.109	0.052	0.109	1/2"	7/8"	45,000	2 x 2 x 1/4	3 - 1/2"	4 - 3/8"			
		Thru 60"	12"	0.064 - 0.109	0.052					2 x 2 x 3/16	3 - 1/2"	3 - 3/8"	5 - 1/2"		
CHANNEL	2 2/3" x 1/2"	Thru 42"	3/4"	0.052 - 0.109	0.079					2 x 2 x 5/16	1 - 1/2"	See Note 9			
		48" Thru 54"	3/4"	0.064 - 0.079	0.079					2 x 2 x 5/16	1 - 1/2"	See Note 9			
		Thru 54"	3/4"	0.052 - 0.138	0.079	0.079	1/2"	7/8"	32,000						
		60" Thru 66"	3/4"	0.109	0.079	0.079	1/2"	7/8"	32,000						
		60" Thru 72"	1"	0.138 - 0.168	0.109	0.079	1/2"	7/8"	32,000						
HUGGER	2 2/3" x 1/2"	Thru 72"	10 1/2"	0.052 - 0.168	0.052	0.079	1/2"	7/8"	32,000						
		78" Thru 84"	10 1/2"	0.168	0.079	0.109	1/2"	7/8"	45,000						
	3" x 1"	48" Thru 84"	10 1/2"	0.064 - 0.109	0.052	0.079	1/2"	7/8"	32,000						
		90" Thru 120"	10 1/2"	0.079 - 0.109	0.052	0.109	1/2"	7/8"	45,000						

GENERAL NOTES

1. All 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. For pipe arches use same width band as for round pipe of equal periphery.
4. Two piece band required for pipe greater than 42" diameter.
5. Tension strap may be connected to band with either spot welds or fillet welds that develop minimum required strength of strap.
6. Use 1 1/4" gage line dimension on attached angle leg for rivets and spot welds.
7. Band thickness shall not be less than 3 standard thicknesses lighter than the thickness of the pipe.
8. Dimensions and thickness shown are minimum.
9. Angle 2" long with 0.064 x 2" strap.
10. Fillet welds of equivalent strength may be substituted for spot welds or rivets.
11. These dimensions, thicknesses and strengths apply to Standard Plan Sheets D97-B and D97-C.

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

C.S.P. COUPLING DETAILS NO.3
STANDARD JOINT

D97-D

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D97-D

Chief, Office of Planning and Design
Registered Civil Engineer No. 8623

Approved JULY 1, 1980

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

COUPLING TYPE	CORRUGATION	PIPE SIZE	W OR A	THICKNESS PIPE WALL	THICKNESS BAND	BAR & STRAP: THICKNESS STRAP	BAR & STRAP: BOLTS	BAR & STRAP: BAR DIA.	BAR & STRAP: BAR YIELD STRENGTH P.S.I.	ANGLE: DIMENSIONS	ANGLE: BOLTS	ANGLE: RIVETS ANGLE TO BAND	ANGLE: SPOT WELDS ANGLE TO BAND	WEDGE & STRAP: THICKNESS STRAP	WEDGE & STRAP: THICKNESS WEDGE
TWO PIECE INTEGRAL FLANGE	1½" x ¼"	6" Thru 10"	7"	0.064 - 0.079	0.064						2 - ⅜"				
UNIVERSAL	2⅔" x ½"	Thru 36"	12"	0.064 - 0.138	0.064									0.079	0.138
		Thru 36"	12"	0.064 - 0.138	0.064	0.079	½"	⅞"	32,000	2 x 2 x 3/16	3 - ½"	3 - ⅜"	5 - ½"		
		42" Thru 60"	16¼"	0.064 - 0.168	0.064	Double 0.079	½"	⅞"	32,000						
ANNULAR	2⅔" x ½"	Thru 36"	12"	0.064 - 0.138	0.064					2 x 2 x 3/16	3 - ½"	3 - ⅜"	5 - ½"		
		42" Thru 60"	12"	0.064 - 0.079	0.064					2 x 2 x 3/16	3 - ½"	3 - ⅜"	5 - ½"		
		42" Thru 60"	12"	0.064 - 0.168	0.064					2 x 2 x 5/16	3 - ½"	5 - ⅜"			
		66" Thru 84"	24"	0.109 - 0.168	0.064					2 x 2 x 5/16	5 - ½"	7 - ⅜"			
	3" x 1"	48" Thru 60"	14"	0.064 - 0.079	0.064					2 x 2 x 3/16	3 - ½"	3 - ⅜"	5 - ½"		
		48" Thru 60"	14"	0.109	0.064					2 x 2 x 5/16	3 - ½"	5 - ⅜"			
		66" Thru 120"	25"	0.064 - 0.109	0.064					2 x 2 x 5/16	5 - ½"	9 - ⅜"			
HELICAL	2⅔" x ½"	Thru 36"	12"	0.064 - 0.138	0.064					2 x 2 x 3/16	3 - ½"	3 - ⅜"	5 - ½"		
		42" Thru 60"	12"	0.064 - 0.079	0.064					2 x 2 x 3/16	3 - ½"	3 - ⅜"	5 - ½"		
		42" Thru 60"	12"	0.064 - 0.168	0.064					2 x 2 x 5/16	3 - ½"	5 - ⅜"			
		66" Thru 84"	24"	0.109 - 0.168	0.064					2 x 2 x 5/16	5 - ½"	7 - ⅜"			
	3" x 1"	48" Thru 60"	14"	0.064 - 0.079	0.064					2 x 2 x 3/16	3 - ½"	3 - ⅜"	5 - ½"		
		48" Thru 60"	14"	0.109	0.064					2 x 2 x 5/16	3 - ½"	5 - ⅜"			
		66" Thru 120"	25"	0.064 - 0.109	0.064					2 x 2 x 5/16	5 - ½"	9 - ⅜"			
WING CHANNEL	2⅔" x ½"	Thru 48"	12"	0.064 - 0.109	0.064	0.079	½"	⅞"	32,000						
		42" Thru 48"	12"	0.138 - 0.168	0.064	0.109	½"	⅞"	45,000						
		54" Thru 60"	12"	0.079 - 0.168	0.064	Double 0.079	½"	⅞"	32,000						
		66" Thru 84"	12"	0.109 - 0.168	0.109	Double 0.109	½"	⅞"	45,000						
		Thru 60"	12"	0.064 - 0.168	0.064					2 x 2 x 5/16	3 - ½"	5 - ⅜"			
	3" x 1"	48" Thru 78"	12"	0.064 - 0.109	0.064	Double 0.079	½"	⅞"	32,000						
		84" Thru 96"	12"	0.109	0.079	Double 0.079	½"	⅞"	32,000						
		102" Thru 120"	12"	0.109	0.109	Double 0.109	½"	⅞"	45,000						
CHANNEL	2⅔" x ½"	Thru 24"	¾"	0.064 - 0.079	0.079	0.079	½"	⅞"	32,000	2 x 2 x 5/16	1 - ½"	See Note 9			
		30" Thru 42"	¾"	0.064 - 0.079	0.079	0.079	½"	⅞"	32,000						
		30" Thru 42"	1"	0.109	0.109	0.079	½"	⅞"	32,000						
		48" Thru 54"	1"	0.064 - 0.079	0.109	0.079	½"	⅞"	32,000						
HUGGER	2⅔" x ½"	Thru 48"	10½"	0.064 - 0.109	0.064	0.079	½"	⅞"	32,000						
		42" Thru 48"	10½"	0.138 - 0.168	0.064	0.109	½"	⅞"	45,000						
		54" Thru 60"	10½"	0.079 - 0.168	0.064	Double 0.079	½"	⅞"	32,000						
		66" Thru 84"	10½"	0.109 - 0.168	0.109	Double 0.109	½"	⅞"	45,000						
	3" x 1"	48" Thru 66"	10½"	0.064 - 0.109	0.064	Double 0.079	½"	⅞"	32,000						
		72" Thru 84"	10½"	0.109	0.079	Double 0.079	½"	⅞"	32,000						
		90" Thru 120"	10½"	0.109	0.109	Double 0.109	½"	⅞"	45,000						

NOTE: For H-4 Hugger Band, See Sheet D97-C

GENERAL NOTES

1. All coupling band connection hardware shall be galvanized or electroplated in accordance with 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. For pipe arches use same width band as for round pipe of equal periphery.
4. Two piece band required for pipe greater than 42" diameter.
5. Tension strap may be connected to band or sheet with either spot welds or fillet welds that develop minimum required strength of strap.
6. Use 1¼" gage line dimension on attached angle leg for rivets and spot welds.
7. Band thickness shall not be less than 3 standard thicknesses lighter than the thickness of the pipe.
8. Dimensions and thickness shown are minimum.
9. Angle 2" long with 0.064" x 2" strap.
10. Fillet welds of equivalent strength may be substituted for spot welds or rivets.
11. These dimensions, thicknesses and strengths apply to Standard Plan Sheets D97-B and D97-C

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

C.S.P. COUPLING DETAILS NO.4
POSITIVE JOINT

D97-E

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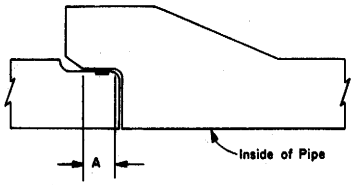
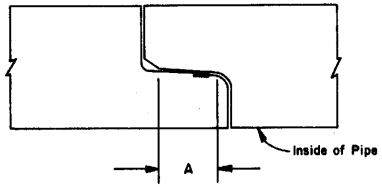
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

Chief, Office of Planning and Design
Registered Civil Engineer No. 26823

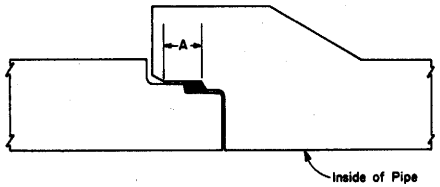
APPROVED JULY 1, 1980



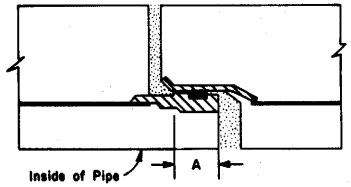
CONCRETE JOINT-FLARED BELL DESIGN



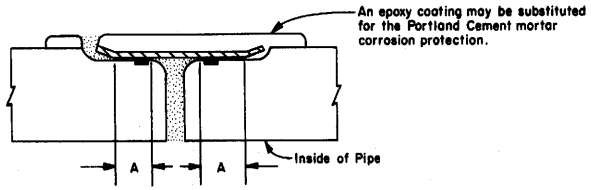
CONCRETE JOINT-FLUSH BELL DESIGN



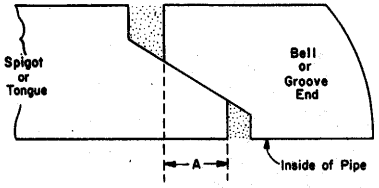
CONCRETE JOINT-FLARED BELL DESIGN
(TYPE R-3)



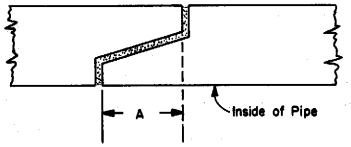
STEEL JOINT-FLUSH BELL DESIGN



CONCRETE JOINT-DOUBLE GASKET DESIGN



SELF-CENTERING TONGUE & GROOVE



T & G DESIGN

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

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

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

D97-F

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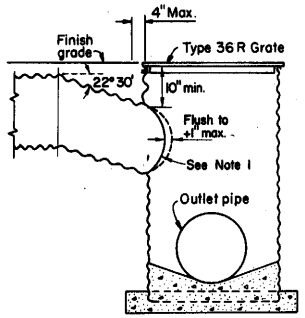
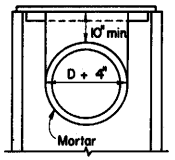
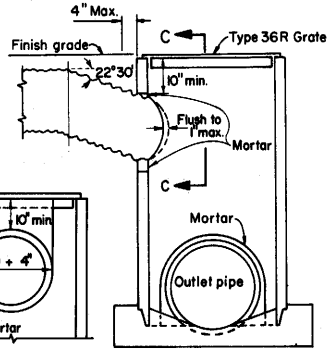


SAME AS TYPE GMP
WITH TYPE 36R GRATE

See Standard Plans D75-A & D77-A

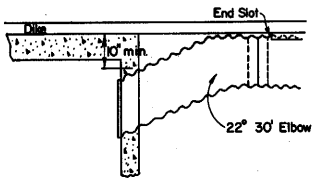


SECTION C-C

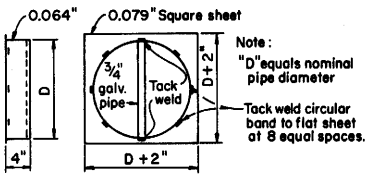


SAME AS TYPE GCP
WITH TYPE 36R GRATE

See Standard Plans D75-A & D77-A



DETAILS OF SLOTTED DRAIN CONNECTIONS TO STANDARD INLET STRUCTURES

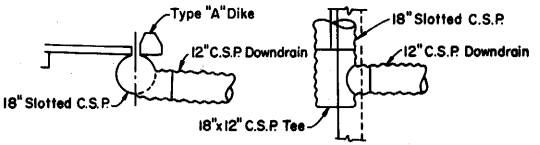


METAL CAP DETAIL

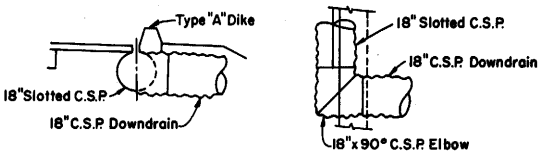
DISTRICT	COUNTY	ROUTE	P.M. Miles - Total Project	SHEET NO.	TOTAL SHEETS

Chief, Office of Planning and Design
Registered Civil Engineer No. 8823

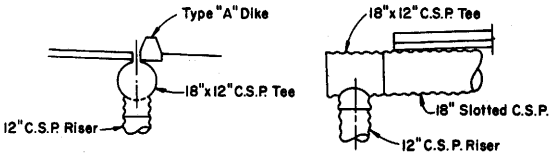
Approved JULY 1, 1980



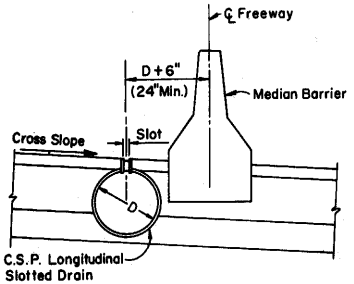
SHOULDER INSTALLATION 18" SLOTTED C.S.P. TO 12" C.S.P. DOWNDRAIN



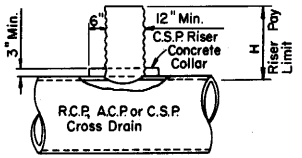
SHOULDER INSTALLATION 18" SLOTTED C.S.P. TO 18" C.S.P. DOWNDRAIN



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



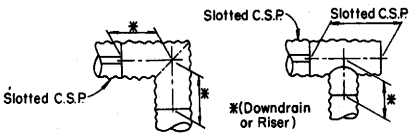
TYPICAL CROSS SECTION



RISER CONNECTION DETAIL

GENERAL NOTES

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



MEASUREMENT OF CORRUGATED PIPES, ELBOWS AND TEES

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

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

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

D98-A

D98-A

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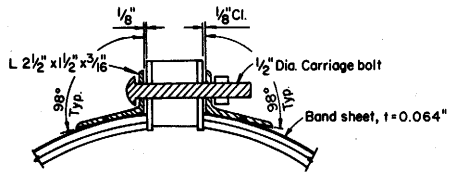
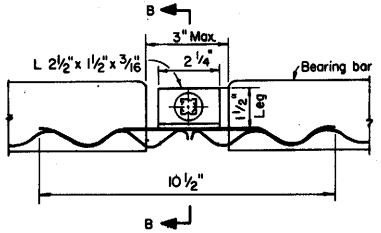
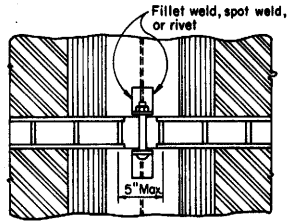


SECTION B-B

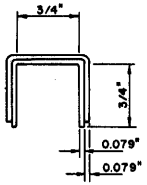


ELEVATION

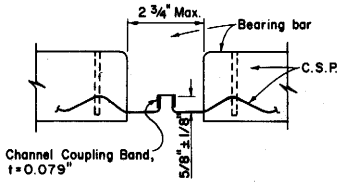


PART PLAN

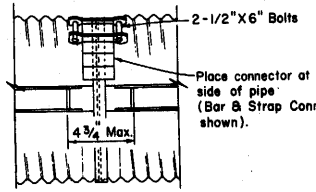
MODIFIED HUGGER BAND



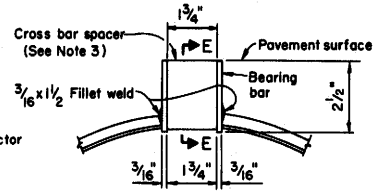
PARTIAL SECTION A-A



ELEVATION

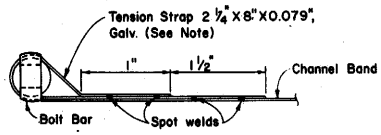


PART PLAN



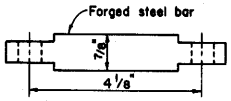
SECTION D-D

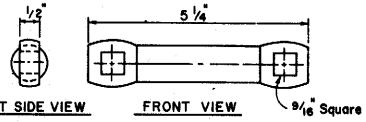
GRATE SLOT DETAIL



Note: Minimum of two spot welds per connection.

STRAP DETAIL

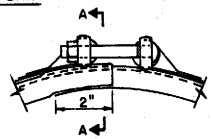




LEFT SIDE VIEW FRONT VIEW

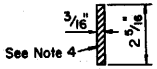
BAR DETAIL

BAR & STRAP CONNECTOR

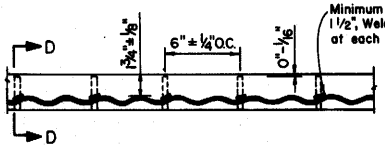


Note: As an alternate to swaged end an oversize bridge clip may be used.

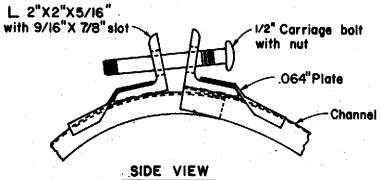
SIDE VIEW



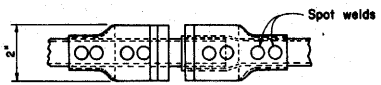
SECTION E-E



GRATE SLOT WELDING DETAIL



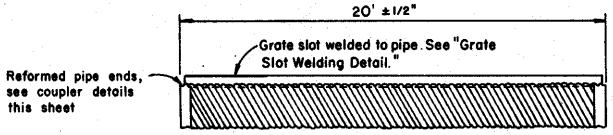
SIDE VIEW



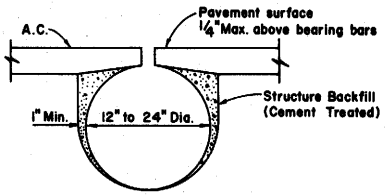
PART PLAN

ANGLE CONNECTOR

CHANNEL COUPLING BAND



GRATE SLOT DRAIN



BACKFILL

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

Chief, Office of Planning and Design
Registered Civil Engineer No. 8625

Approved JULY 1, 1980

GENERAL 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.

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

12" Thru 24" SLOTTED C.S.P.
DRAIN DETAILS

D98-B

D98-B

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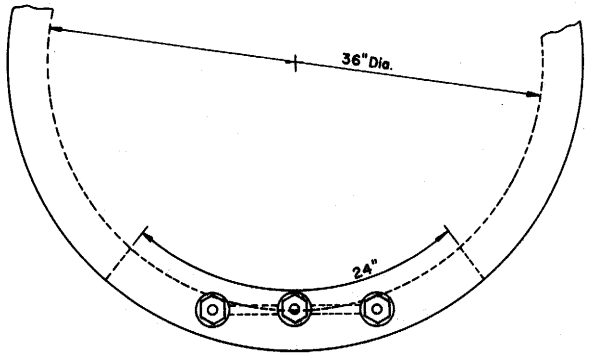
DISTRICT	COUNTY	ROUTE	Post Mileage - Total Project	Sheet No.	Total Sheets

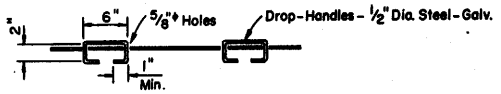
Chief, Project Development Engineer
Registered Civil Engineer No. 8625
Approved JULY 1, 1980

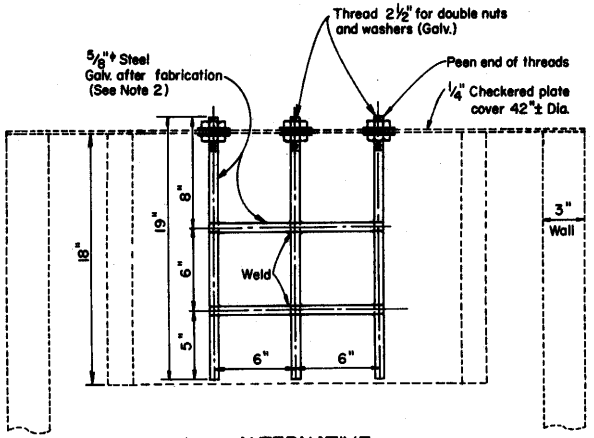


PLAN VIEW ⚠

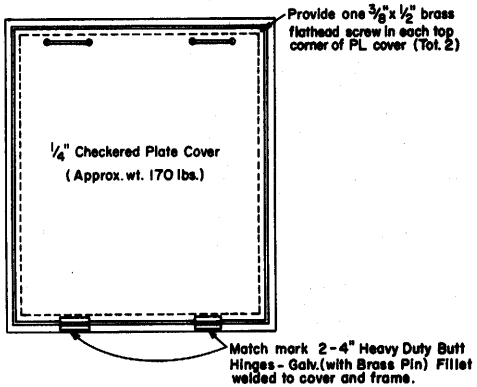
GENERAL NOTES

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





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



HINGED COVER FOR
TYPE OL & OS INLETS

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

D98-C

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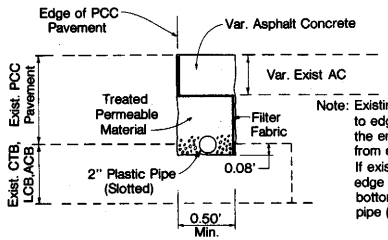
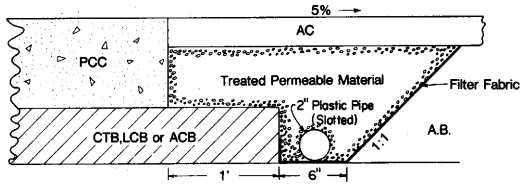


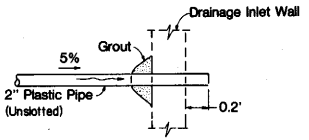
Note: Existing edge of CTB may be coincident to edge of PCC pavement or even under the entire width of shoulder or one-foot from edge of PCC pavement as shown. If existing edge of CTB is coincident to edge of PCC Pavement, excavate to bottom of CTB and place 2" plastic pipe (slotted).

Note: See Typical Cross Section for pavement thicknesses.

TYPE 1 SUBGRADE DRAIN FOR EXISTING HWY. FACILITY



TYPE 2 SUBGRADE DRAIN (NEW CONSTRUCTION)

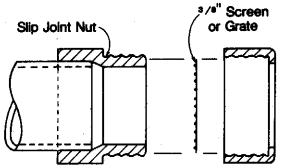


SUBGRADE DRAIN OUTLET CONNECTION TO EXISTING D.I.

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

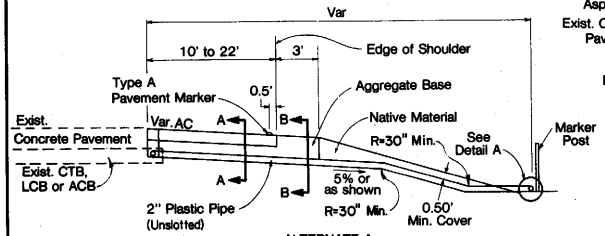
CHIEF, OFFICE OF PLANNING AND DESIGN
REGISTERED CIVIL ENGINEER NO. 8625

APPROVED JULY 1, 1980

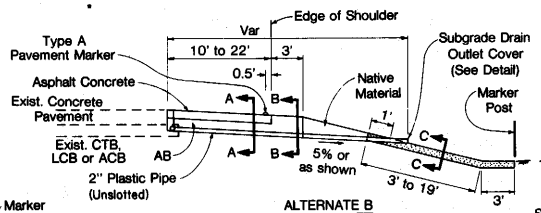


Note: Place Cover on 2" Plastic Pipe Subgrade Drain Outlet

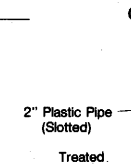
SUBGRADE DRAIN OUTLET COVER



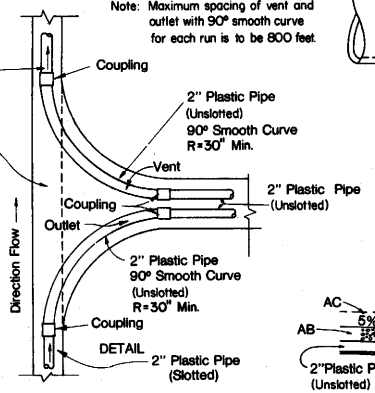
ALTERNATE A

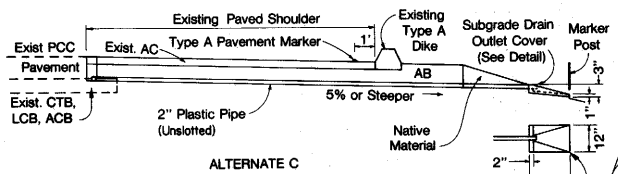


ALTERNATE B



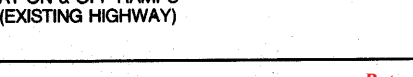
SECTION C C

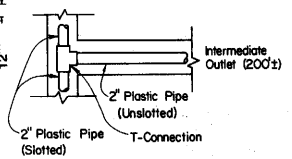




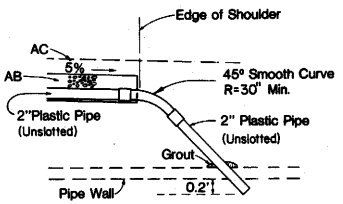
ALTERNATE C

OUTLET IN EMBANKMENT FOR SUBGRADE DRAINS



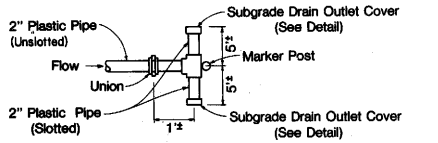


OUTLET CONNECTION PLAN VIEW

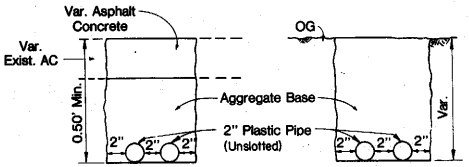


ELEVATION

SUBGRADE DRAIN OUTLET CONNECTION TO DRAINAGE PIPES



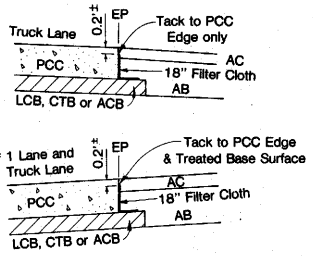
DETAIL A



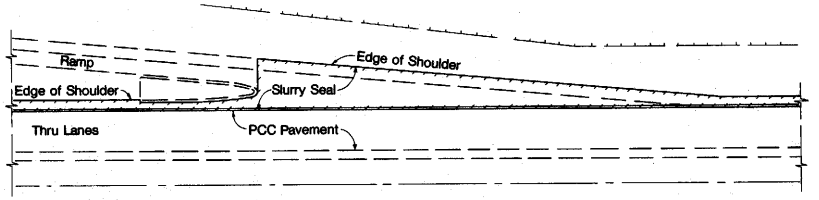
PAVED AREAS SECTION AA

UNPAVED AREAS SECTION BB

OUTLET FOR SUBGRADE DRAINS



USE OF FILTER CLOTH WITHOUT EDGE DRAINS



TYPICAL SLURRY SEAL PLACEMENT AT ON & OFF RAMPS (EXISTING HIGHWAY)

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

SUBGRADE DRAIN DETAIL

D98-D

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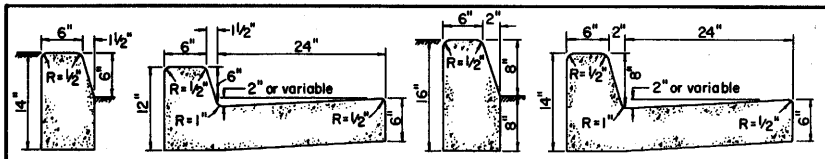
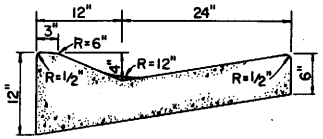
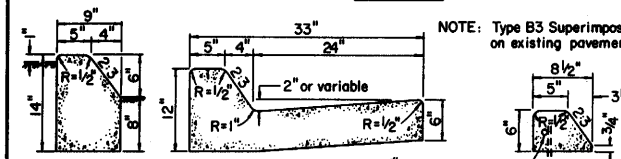


A1-6 A2-6 A1-8 A2-8

TYPE A



TYPE E

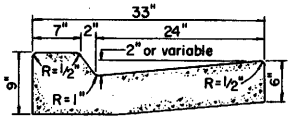


B1 B2

NOTE: Type B3 Superimposed on existing pavement.

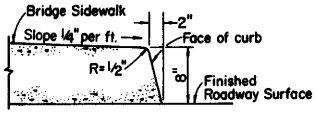
#4 Longitudinal bar
#4 Dowel spaced 4', min. length 8"

B3



B4

TYPE B



TYPE H
(ON BRIDGES)

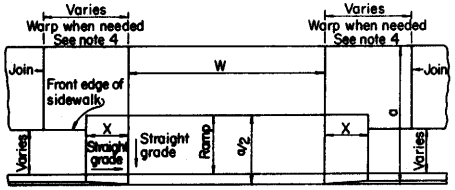
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF PLANNING AND DESIGN
REGISTERED CIVIL ENGINEER NO. 8625

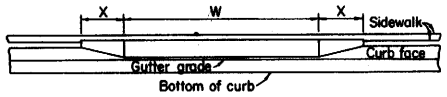
APPROVED July 1, 1980

CURB QUANTITIES

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

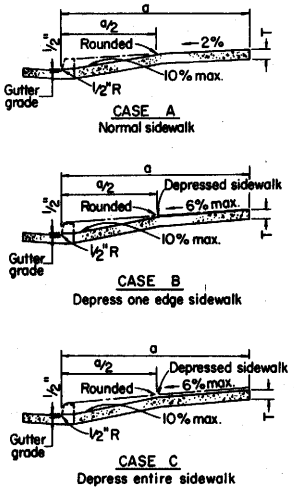


PLAN



ELEVATION

DRIVEWAYS



CASE A
Normal sidewalk

CASE B
Depress one edge sidewalk

CASE C
Depress entire sidewalk

SECTIONS

NOTES:

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

STATE OF CALIFORNIA
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CURBS AND DRIVEWAYS | N8-A

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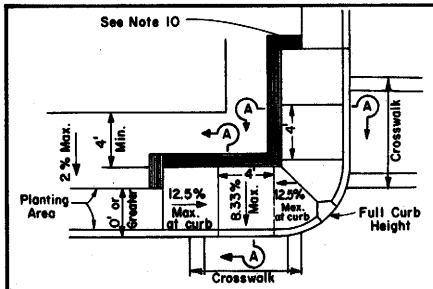
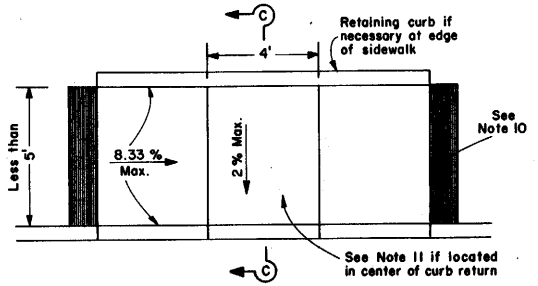
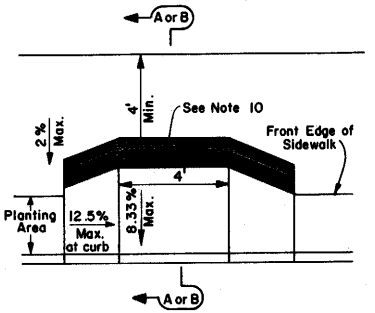


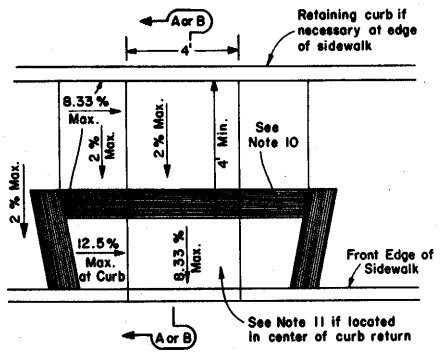
CASE A



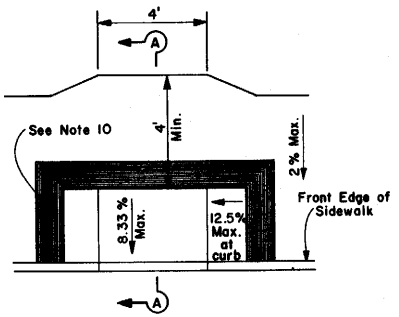
CASE C
(Sidewalk less than 5' wide)



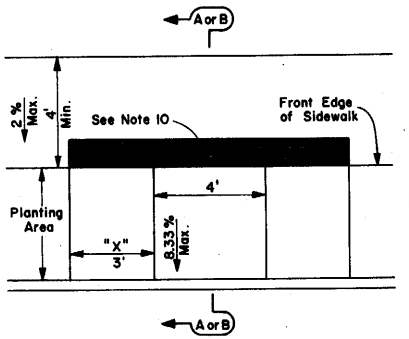
CASE F
See Note 6



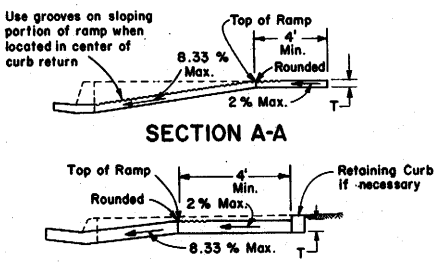
CASE B



CASE D

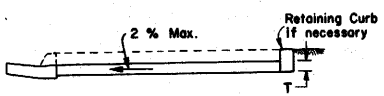


CASE G
See Note 6

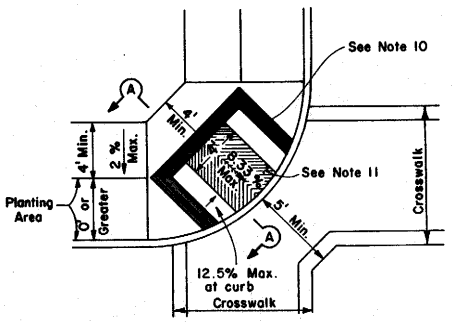


SECTION A-A

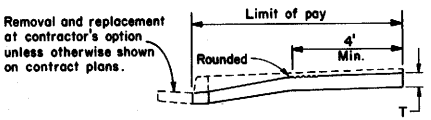
SECTION B-B
Depress entire sidewalk as required



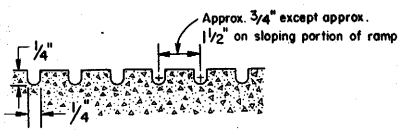
SECTION C-C



CASE E



DETAIL H
Existing curb and sidewalk



GROOVING DETAIL

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

CHIEF, OFFICE OF PLANNING AND RESEARCH
REGISTERED CIVIL ENGINEER NO 9825
APPROVED July 1, 1980

NOTES

1. If distance from curb to back of sidewalk is too short to accommodate ramp and 4' platform as in Case A, the sidewalk may be depressed longitudinally as in Case B or C or may be widened as in Case D.
2. If sidewalk is less than 5' wide, the full width of the sidewalk shall be depressed as shown in Case C.
3. As an alternate to Case A, one ramp may be placed in the center of the curb return as in Case E.
4. When ramp is located in center of curb return, crosswalk configuration must be similar to that shown on the plan to accommodate wheelchairs.
5. If planting area width is equal to or greater than ramp length, ramp side slope "X" distance = 3' (See Case G)
6. For Cases F and G, the longitudinal portion of the sidewalk may need to be depressed as shown in Case B.
7. If located on a curve the sides of the ramp need not be parallel, but the minimum width of the ramp shall be 4'.
8. The bottom of the ramp shall be flush with the gutter. No lip shall be used.
9. Sidewalk and ramp thickness, "T", shall be 3 1/2'.
10. The ramp shall have a 12" wide border with 1/4" grooves approximately 3/4" o.c. See grooving detail. The surface of ramp shall have a transverse broomed surface texture rougher than the surrounding sidewalk except when located in center of curb return.
11. When ramp is located in center of curb return, it shall be grooved in a herring-bone pattern with 1/4" grooves approximately 1 1/2" o.c. See grooving detail. Grooves should be aligned parallel to crosswalk stripes to direct blind pedestrians into appropriate crosswalk.
12. Ramp side slope varies uniformly from a maximum of up to 12.5 % at curb to conform with longitudinal sidewalk slope adjacent to top of the ramp, except in Cases C & G.
13. RETROFITS - When a wheelchair ramp is added to an existing facility, the following changes are permitted:
    (A) Ramp grade in Case C may be increased to 4 %.
    (B) Other ramp grades may be increased to a maximum of 11.1 %. (Nevertheless, they should be as flat as feasible.)
    (C) Where the 4' platform is not feasible, the width may be decreased to 3'.
    (D) The platform may be eliminated if the grade does not exceed 8.33 %.

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

WHEELCHAIR RAMP DETAIL NO.1

N8-B

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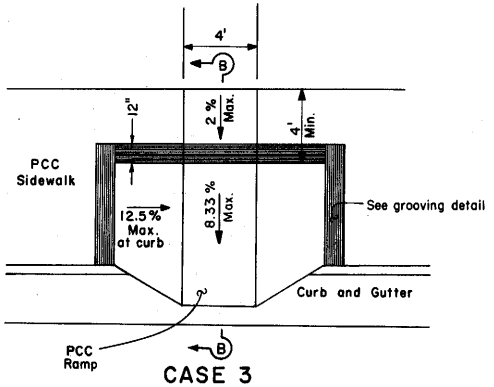
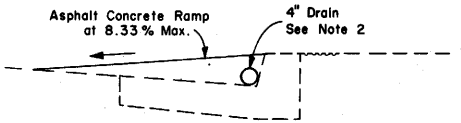
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF PLANNING AND DESIGN
REGISTERED CIVIL ENGINEER NO. 9625

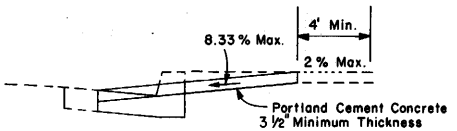
APPROVED July 1, 1980



CASE 3



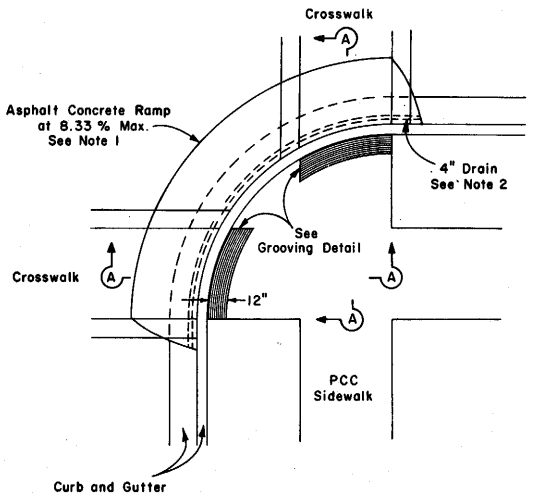
SECTION A-A



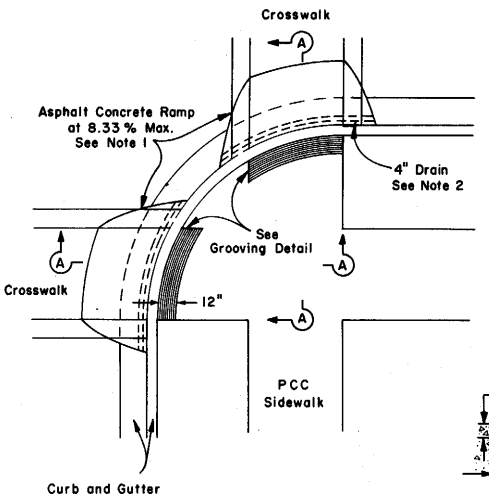
SECTION B-B

NOTES

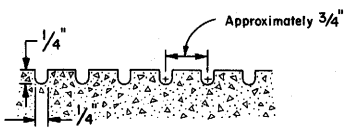
1. Asphalt Concrete Ramp side slopes shall be a maximum of 3:1.
2. 4" drain shall be 0.139" min. thickness steel pipe. Pipe shall conform to radius of curb and be beveled to conform to side slope.
3. Concrete finish for Case 3 shall have a transverse broomed surface texture rougher than the surrounding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



CASE 1



CASE 2



GROOVING DETAIL

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

WHEELCHAIR RAMP DETAIL NO. 2

N8-C

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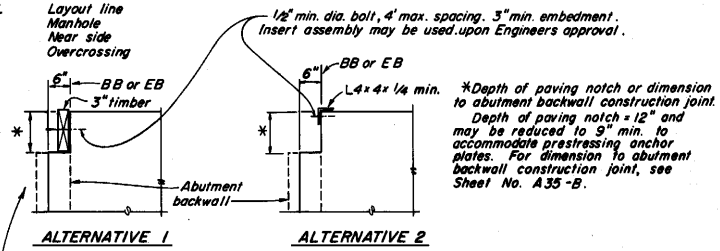
BRIDGE PLAN ABBREVIATIONS

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

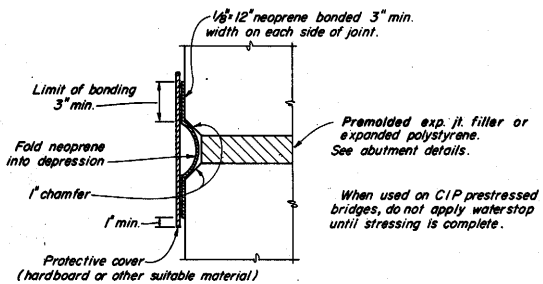


*Depth of paving notch or dimension to abutment backwall construction joint. Depth of paving notch = 12" and may be reduced to 9" min. to accommodate prestressing anchor plates. For dimension to abutment backwall construction joint, see Sheet No. A35-B.

ALTERNATIVE 1 — ALTERNATIVE 2

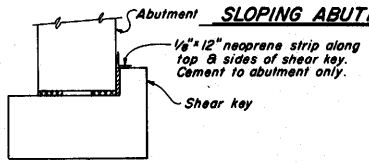
TEMPORARY BUMPERS
BRIDGE DETAIL 1-2

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.

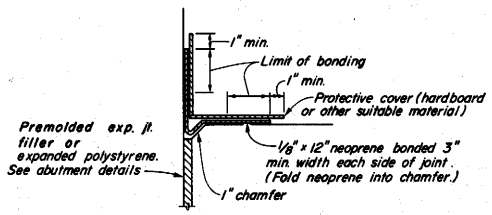


When used on CIP prestressed bridges, do not apply waterstop until stressing is complete.

STRIP WATERSTOP DETAIL
BRIDGE DETAIL 1-3

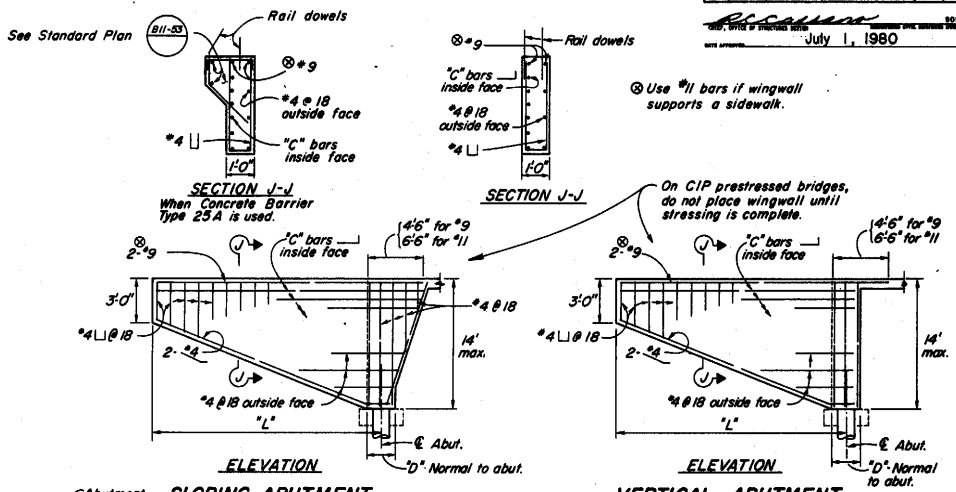


SHEAR KEY JOINT PROTECTION
BRIDGE DETAIL 1-6



STRIP WATERSTOP CORNER DETAIL
BRIDGE DETAIL 1-4

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



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

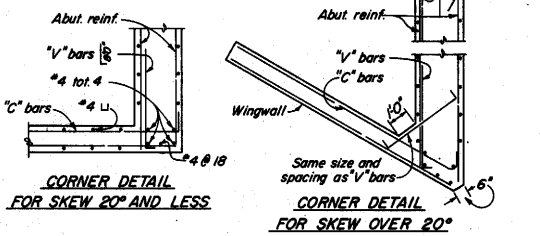
SECTION J-J

ELEVATION — SLOPING ABUTMENT

ELEVATION — VERTICAL ABUTMENT

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

1



CORNER DETAIL FOR SKEW 20° AND LESS

CORNER DETAIL FOR SKEW OVER 20°

WINGWALLS FOR DIAPHRAGM ABUTMENT
BRIDGE DETAIL 1-5

STANDARD DRAWING			
FILE No. XS-22-10	DESIGN By W.E.&H.S.	Checked David Pharis	Approved Recommended By Bruce H. Maurer, Bridge Engineer 8/98
DRAWING DATE 1/80	DETAILS By [illegible]	Checked David Pharis	
	SUBMITTED BY [illegible]		

1 REV BAR REINFORCING

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER

BRIDGE No.

POST MILE

BRIDGE DETAILS

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU WO

Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY)

BO-1

DH-09-D 147

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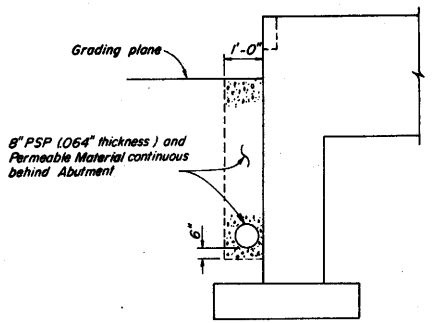
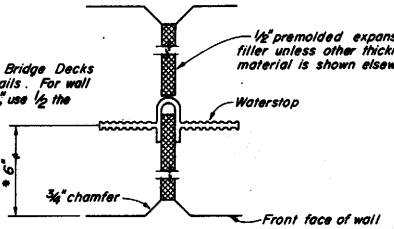


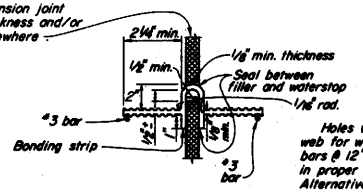
8" PSP AND PERMEABLE MATERIAL
BRIDGE DETAIL 3-5



1 * For placement in Bridge Decks see Joint Seal Details. For wall thickness less than 12", use ½ the wall thickness.

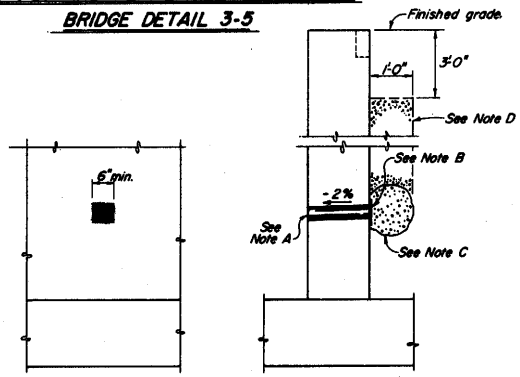
WALL EXPANSION JOINT
BRIDGE DETAIL 3-4

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



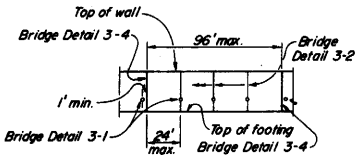
Holes will be permitted in the outer ½" of the web for wire, rings, etc.. Tie web to #3 reinforcing bars @ 12" max. intervals to support the waterstop in proper position during concrete placement. Alternative detail may be submitted for approval of the Engineer.

WATERSTOP
BRIDGE DETAIL 3-6

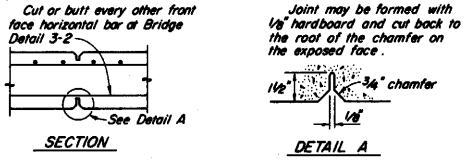


ELEVATION SECTION

WEEP HOLE AND PERVIOUS BACKFILL
BRIDGE DETAIL 3-1



WALL EXPANSION JOINTS AND WEAKENED PLANES
BRIDGE DETAIL 3-3



SECTION DETAIL A

WEAKENED PLANES
BRIDGE DETAIL 3-2

Notes:

A. 4"ϕ drains @ 25' max. center to center (9' c-c for Type 3 and 9'-3" c c for Type 4 Retaining Walls) For walls adjacent to sidewalks or curbs, provide 4" cast iron or asbestos cement pipe under the sidewalk to discharge thru curb face. Exposed wall drains shall be located 3"± above finished grade.

B. 6" square aluminum or galvanized steel wire 4 mesh hardware cloth. (Min wire diameter 0.03") Anchor firmly to backface.

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

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

STANDARD DRAWING

FILE No. XS-3-53 | DESIGN By David Marsh | Checked V.E. Gills | Approved Recommended by Donald Maresh
DRAWING DATE 1/80 | DETAILS By [illegible] | Checked David Marsh | Registered Civil Engineer 8/28
SUBMITTED BY [illegible]

1 ADDED NOTE

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN
PROJECT ENGINEER

BRIDGE No.
POST MILE

BRIDGE DETAILS

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU
WO

Disregard prints bearing earlier revision dates

REVISION DATES (YEAR/MONTH/DAY)

BO-3

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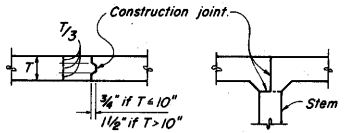
DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

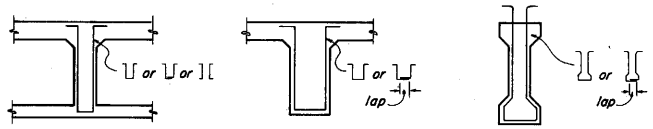
R. C. Lorenzen — 8013
CHIEF, OFFICE OF STRUCTURE DETAIL — REGISTERED CIVIL ENGINEER NUMBER
DATE APPROVED JULY 1, 1980



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.

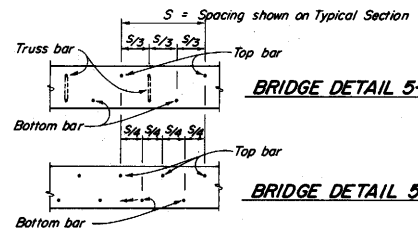
PRECAST GIRDER

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

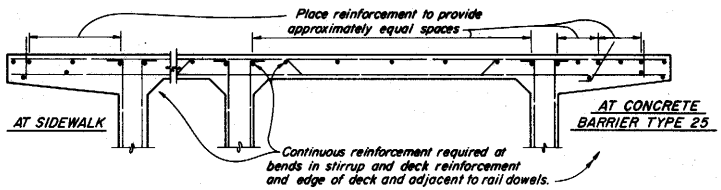
BRIDGE DETAIL 5-5



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.

BO-5

83

STANDARD DRAWING

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

Approval Recommended By — DESIGN ENGINEER — REGISTERED CIVIL ENGINEER NUMBER 29883

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN — PROJECT ENGINEER

BRIDGE No. — POST MILE

BRIDGE DETAILS

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU WO

Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY)

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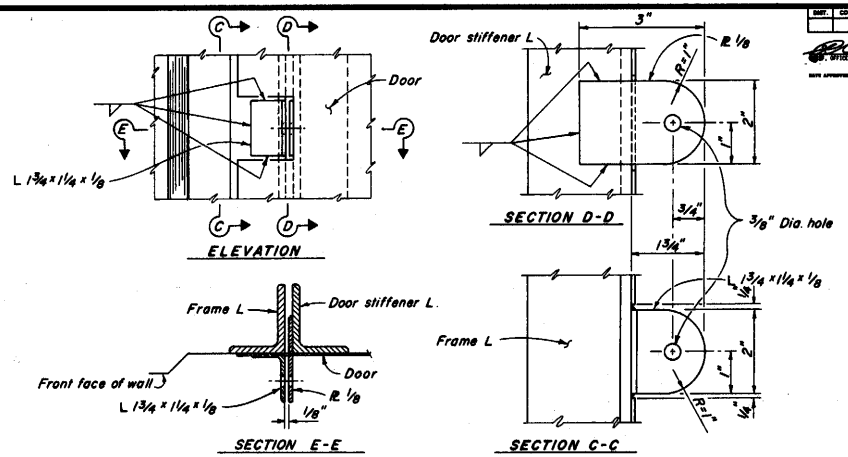
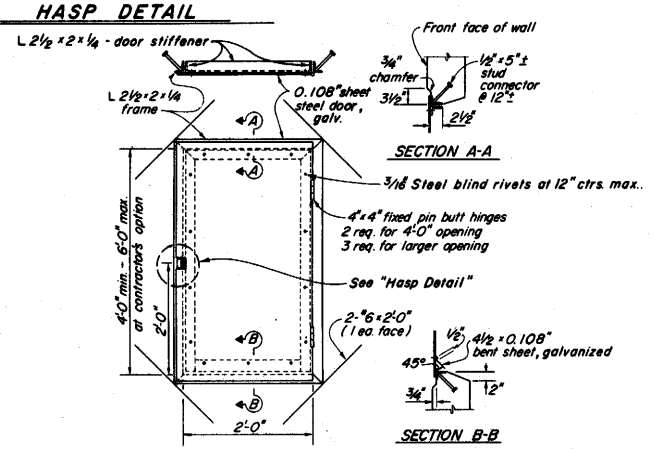


HASP DETAIL



ACCESS DOOR

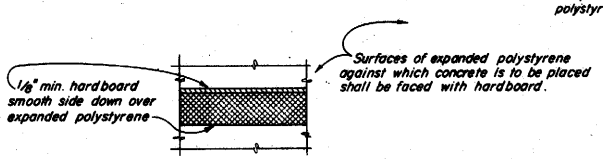
Note: Galvanize frame assemblies and door stiffener angles after welding and fabrication.

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

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

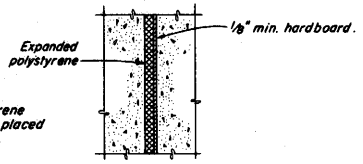
BRIDGE DETAIL 13-3

Scale: 1" = 1'-0"



PROTECTION OF HORIZONTAL POLYSTYRENE

BRIDGE DETAIL 13-1



PROTECTION OF VERTICAL POLYSTYRENE

BRIDGE DETAIL 13-2

STANDARD DRAWING

FILE No. XS-16-65	DESIGN	Checked	Approved Recommended By
DRAWING DATE 1/80	DETAILS	Checked	
	SUBMITTED BY		1989

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER

BRIDGE No.

POST MILE

BRIDGE DETAILS

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU WO

Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY)

BO-13

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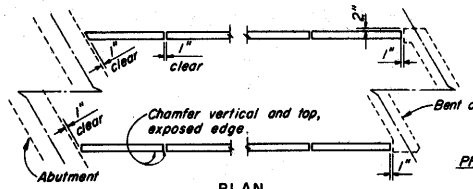


PLAN

Skew not to scale

PRESTRESSING NOTES:

Post-tensioned prestressing will not be permitted.

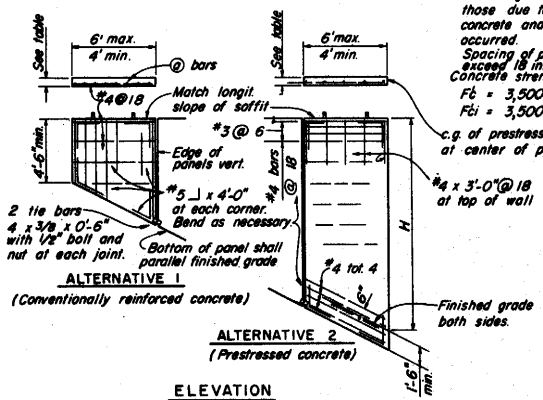
Pf = the force, per foot of panel width, remaining after all losses, including those due to creep and shrinkage of concrete and creep of steel have occurred.

Spacing of prestressing tendons shall not exceed 18 in.

Concrete strength:

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

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



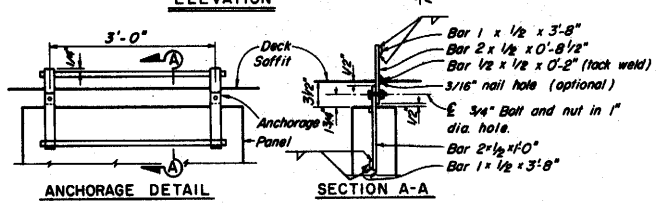
ALTERNATIVE 1

(Conventionally reinforced concrete)

ALTERNATIVE 2

(Prestressed concrete)

ELEVATION



ANCHORAGE DETAIL

Use with Alternative 1 or 2

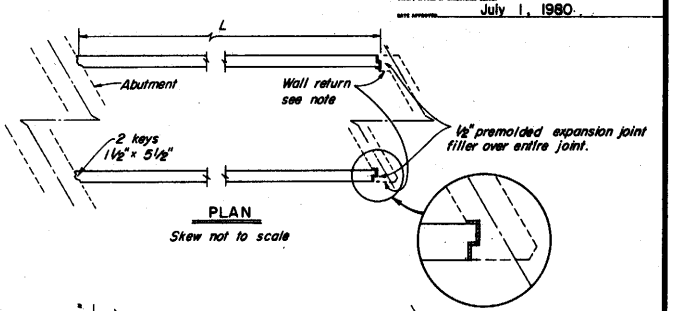
SECTION A-A

PRECAST PANELS, ALTERNATIVE 1 OR 2

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

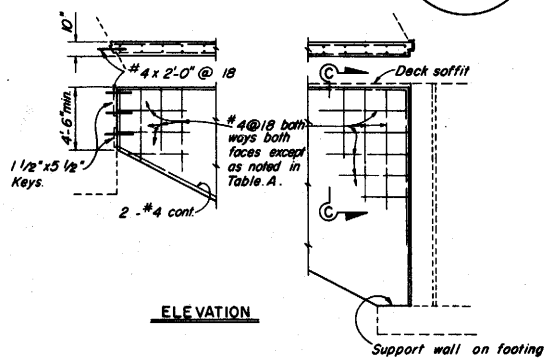
NOTES:

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

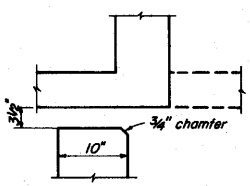


PLAN

Skew not to scale



ELEVATION



SECTION C-C

TABLE A

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

CAST-IN-PLACE, ALTERNATIVE 3

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

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

R C Lawand
CHIEF, OFFICE OF STRUCTURES DESIGN
DATE APPROVED July 1, 1980

STANDARD DRAWING

FILE No. XS-22-6	DESIGN By W.E. Gillis	Checked David Nestorik	Approval Recommended By Kenneth Mancarti
DRAWING DATE 1/80	DETAILS By	Checked David Nestorik	DATE OF APPROVAL 8/78
	SUBMITTED BY		CHIEF, OFFICE OF STRUCTURES DESIGN

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER

BRIDGE NO.

POST MILE

CLOSURE WALL DETAILS - BOX GIRDER

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU WO

Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY)

B 1-11

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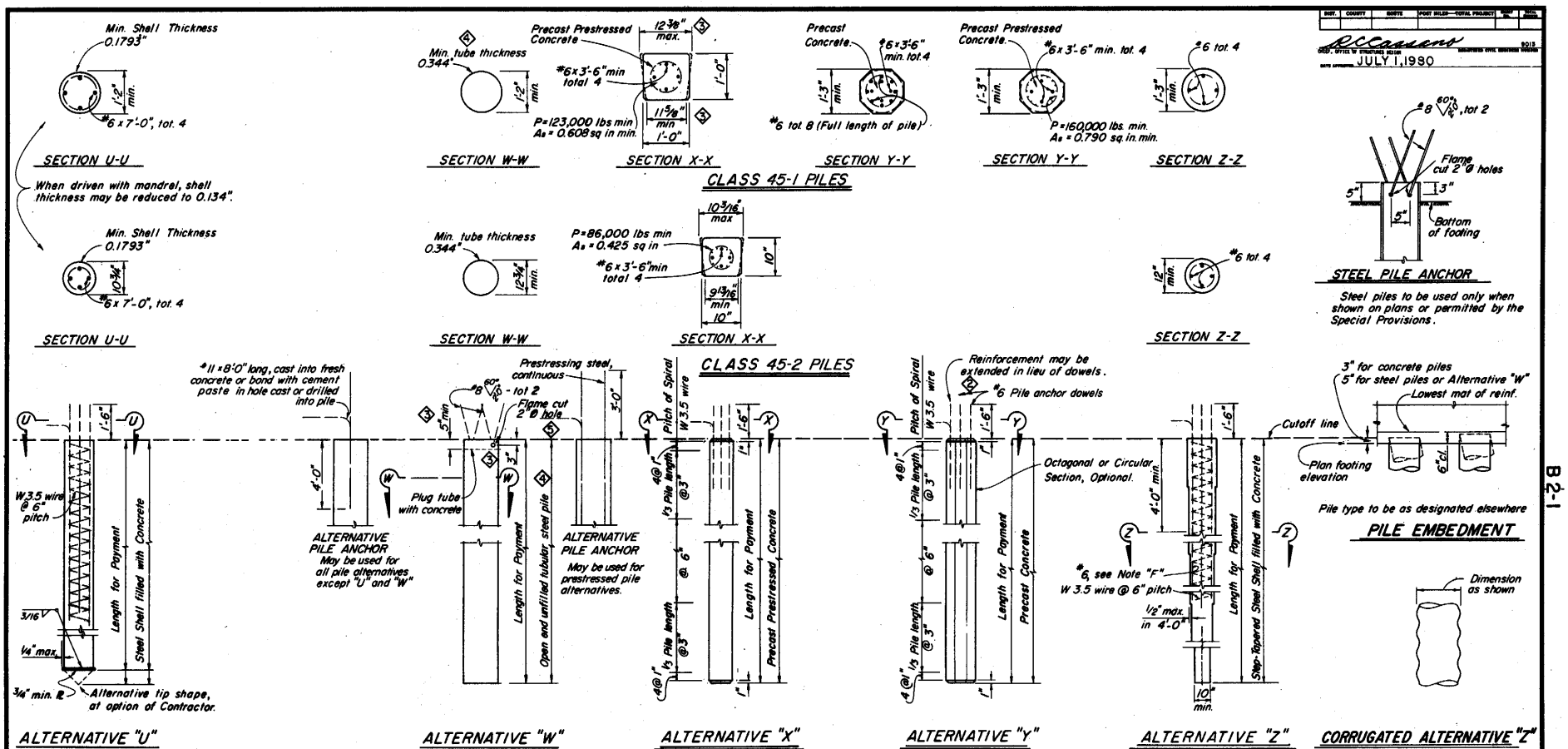

PRECAST PRESTRESSED PILES:

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

As = Minimum Area of prestressing steel required.

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

DESIGN LOADING = 45 TONS

NOTE F: In Alternative "Z", two #6 bars shall extend to the pile tip and the other two #6 bars and the spiral wrap shall extend, at least, to a point halfway between the pile tip and the lowest of the following:

a. Bottom of footing
b. Top of final ground surface.
c. Top of original ground surface when holes are drilled through embankment constructed by Contractor.
d. Bottom of pre-drilled holes greater than pile diameter.

NOTES: Class 45-1 piles may be substituted for Class 45-2. A 10" minimum diameter pipe extension (thickness = 0.1793" min.) may be used at the tip of Alternative "Z" when taper is 30' or more in length.

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

5 gauge wire may be substituted for W 3.5 wire.

Piles may not be extended except in accordance with details shown in the Project Plans.

1 For Pile Welding Detail - Butt Joints see Standard Plan B2-5

STANDARD DRAWING

FILE No. XS-10-17 | DRAWING DATE 1/80 | DESIGN | DETAILS | SUBMITTED BY | Approved Recommended by | JULY 1, 1980

1 ADDED NOTE
2 BAR CALL OUT
3 REV VALUES
4 REV WORDING
5 DIMEN. CALL OUT

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PILE DETAILS - CLASS 45-1 & CLASS 45-2

B 2-1

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

Disregard prints bearing earlier revision dates

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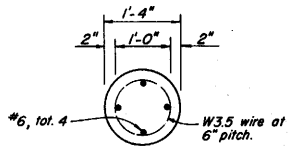
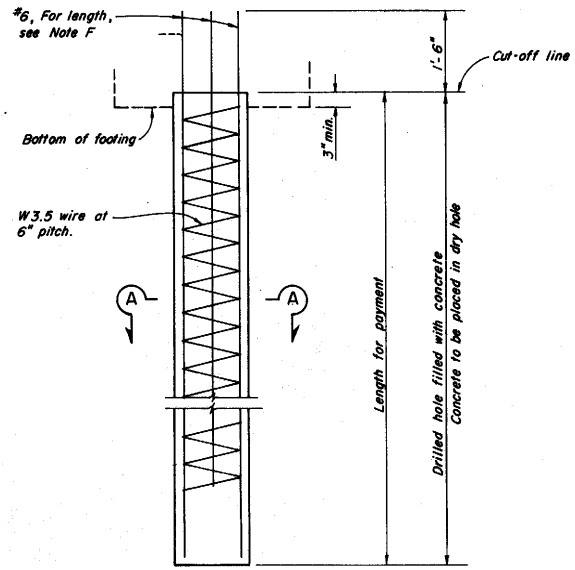
DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

July 1, 1980



SECTION A-A



ELEVATION

NOTE F: Two #6 bars shall extend to the pile tip and the other two #6 bars and spiral wrap shall extend, at least, to a point halfway between the pile tip and the lowest of the following:

a. Bottom of footing
b. Top of final ground surface
c. Top of original ground surface when holes are drilled through embankment constructed by Contractor.

NOTES:

All bars extended into a footing having a depth less than 2'-0" shall be hooked.

5 gauge wire may be substituted for W3.5 wire.

Piles may not be extended except in accordance with details shown in the Project Plans.

STANDARD DRAWING

FILE No. X8-10-25	DESIGN	Checked
DRAWING DATE 1/80	DETAILS	Checked
	SUBMITTED BY	

Approval Recommended by: Bridge Engineer, Structures Design; Registered Civil Engineer Number 8198

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER

BRIDGE No.

POST MILE

16" CAST-IN-DRILLED HOLE CONCRETE PILE

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

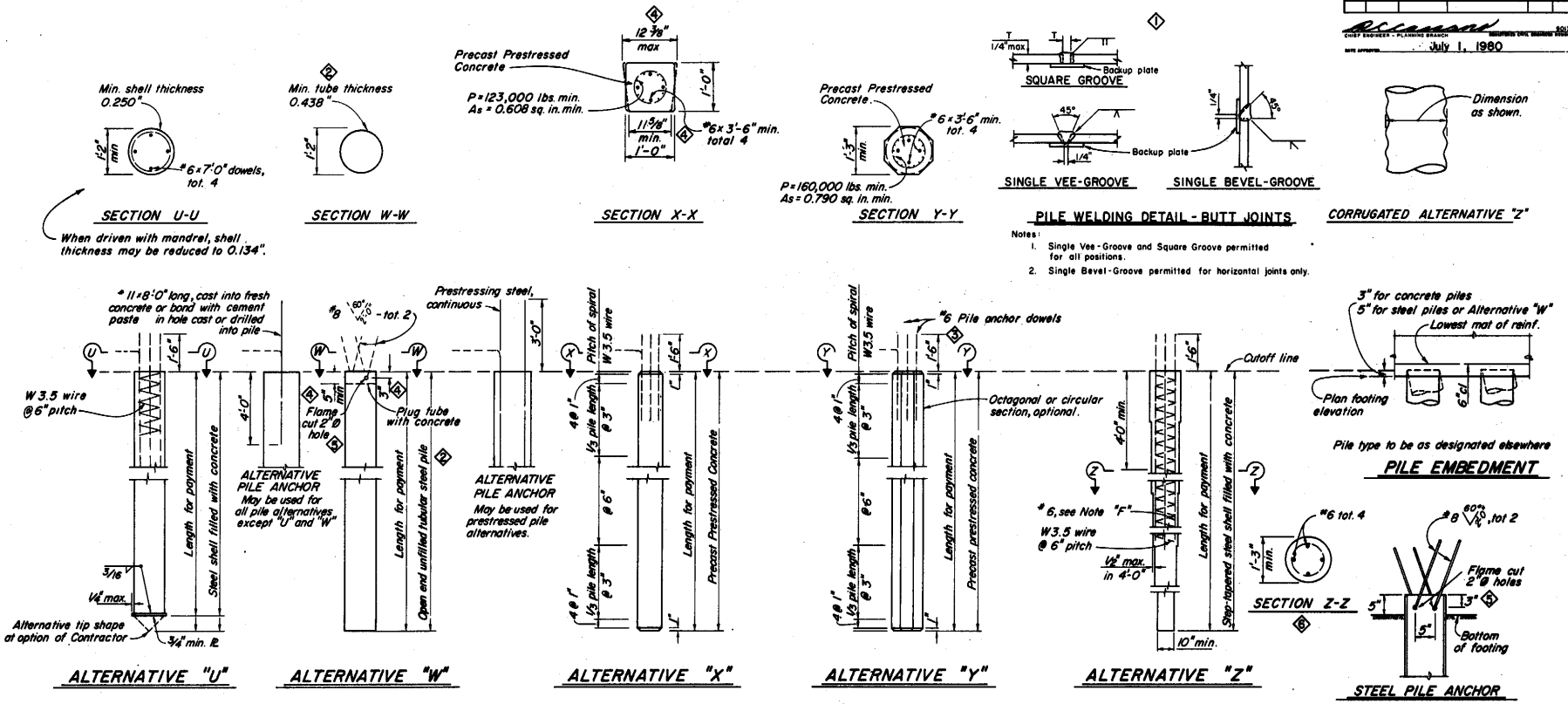
CU
WO

Disregard prints bearing earlier revision dates

REVISION DATES (ENGINEERING STAGE ONLY)

B 2-3

Return to Table of Contents



Notes:

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

Notes:

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

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

5 gauge wire may be substituted for W3.5 wire.

Piles may not be extended except in accordance with details shown in the Project Plans.

PRECAST PRESTRESSED PILES:

P = Prestressing Force @ anchorage

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

A_s = Minimum Area of prestressing steel required.

Concrete Strength: f'_c @ 28 days = 6,000 p.s.i (Alternative "X")
5,000 p.s.i (Alternative "Y")
f'_{ci} @ transfer = 4,000 p.s.i

DESIGN LOADING = 70 TONS

NOTE F

In Alternative "Z", two #6 bars shall extend to the pile tip and the other two #6 bars and the spiral wrap shall extend, at least, to a point halfway between the pile tip and the lowest of the following:

a. Bottom of footing.
b. Top of final ground surface.
c. Top of original ground surface when holes are drilled through embankment constructed by Contractor.
d. Bottom of pre-drilled holes greater than pile diameter.

Steel piles to be used only when shown on plans or permitted by the Special Provisions.

STANDARD DRAWING	1 ADDED DETAIL	4 REV VALUE	State of CALIFORNIA DEPARTMENT OF TRANSPORTATION
FILE No. XS-10-26	2 REV WORDING	5 DIMENSION CALL OUT	STRUCTURES-DESIGN
DRAWING 1/80	3 BAR CALL OUT	6 RELOCATED DETAIL	PILE DETAILS - CLASS 70
DATE			

Approved Recommended By: 8/28

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

Disregard prints bearing earlier revision dates

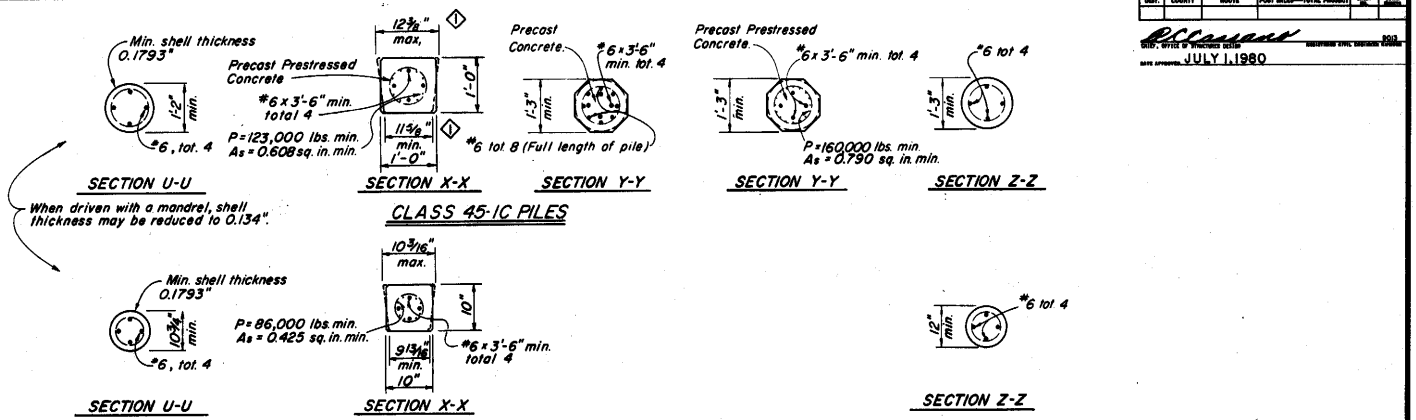
B 2-5

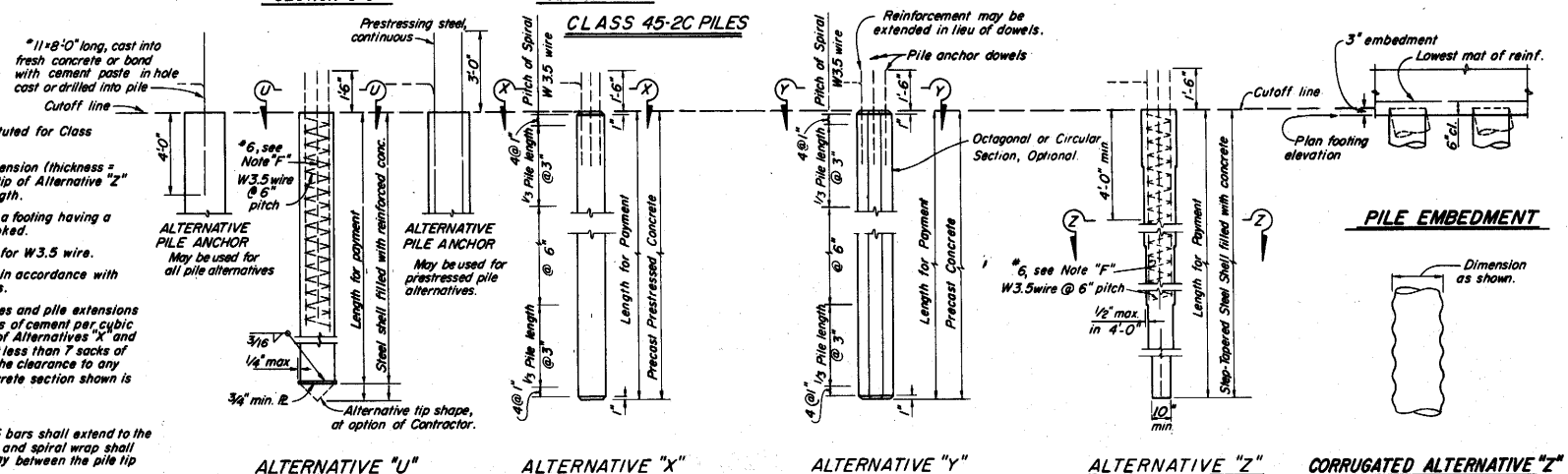
Return to Table of Contents

DIST. | COUNTY | ROUTE | POST MILES—TOTAL PROJECT | PROJ. NO. | PROJ. NO.

CHIEF, OFFICE OF STRUCTURES DESIGN — REGISTERED CIVIL ENGINEER

DATE APPROVED JULY 1, 1980





NOTES:

Class 45-1C piles may be substituted for Class 45-2C piles.

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

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

5 gauge wire may be substituted for W3.5 wire.

Piles may not be extended except in accordance with details shown in the Project Plans.

Except as noted, all concrete in piles and pile extensions shall contain not less than 8 sacks of cement per cubic yard. In the prestressed options of Alternatives "X" and "Y", the concrete shall contain not less than 7 sacks of cement per cubic yard, provided the clearance to any steel from the surface of the concrete section shown is increased to 3".

NOTE F:

In Alternatives "U" & "Z", two #6 bars shall extend to the pile tip and the other two #6 bars and spiral wrap shall extend, at least, to a point halfway between the pile tip and the lowest of the following:

a. Bottom of footing

b. Top of final ground surface

c. Top of original ground surface when holes are drilled through embankment constructed by Contractor.

d. Bottom of pre-drilled holes greater than pile diameter.

PRECAST PRESTRESSED PILES:

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

A_s = Minimum Area of prestressing steel required.

Concrete Strength: f'_c @ 28 days = 6,000 p.s.i. (Alternative "X")
5,000 p.s.i. (Alternative "Y")

f'_{ci} @ transfer = 4,000 p.s.i.

DESIGN LOADING = 45 TONS

STANDARD DRAWING

FILE No. XS-10-27 | DESIGN | Checked | Approval Recommended By

DRAWING DATE 1/80 | DETAILS | Checked | DESIGN ENGINEER | REGISTERED CIVIL ENGINEER NUMBER

SUBMITTED BY

REVISED VALUES

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER

BRIDGE No. | POST MILE

PILE DETAILS - CLASS 45-1C & CLASS 45-2C

DH-09-D 147

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

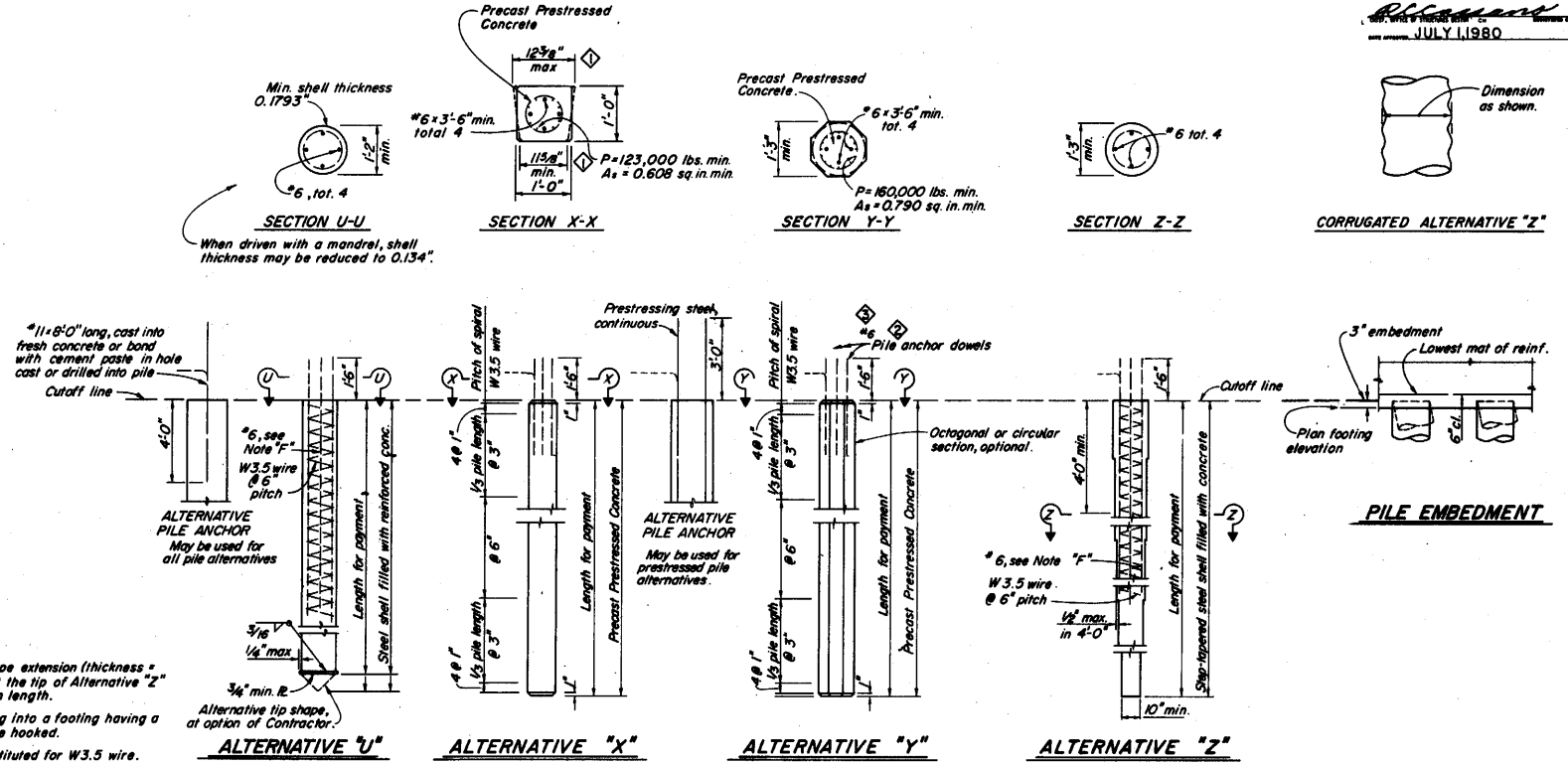
CU WO

Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY)

B 2-6

Return to Table of Contents



NOTES:

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

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

5 gauge wire may be substituted for W3.5 wire.

Piles may not be extended except in accordance with details shown in the Project Plans.

Except as noted, all concrete in piles and pile extensions shall contain not less than 8 sacks of cement per cubic yard. In the prestressed options of Alternatives "X" and "Y", the concrete shall contain not less than 7 sacks of cement per cubic yard, provided the clearance to any steel from the surface of the concrete section shown is increased to 3".

PRECAST PRESTRESSED PILES:

P = Prestressing Force @ anchorage

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

As = Minimum Area of prestressing steel required.

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

f'_{ci} transfer = 4,000 psi

DESIGN LOADING = 70 TONS

NOTE F:

In Alternatives "U" & "Z", two #6 bars shall extend to the pile tip and the other two #6 bars and spiral wrap shall extend, at least, to a point halfway between the pile tip and the lowest of the following:

a. Bottom of footing.
b. Top of final ground surface.
c. Top of original ground surface when holes are drilled through embankment constructed by Contractor.
d. Bottom of pre-drilled holes greater than pile diameter.

STANDARD DRAWING

FILE No. XS-10-28
DRAWING 1/80
DATE
DESIGN
DETAILS
SUBMITTED BY
Approved Recommended by

1. REV. VALUES
2. BAR CALL OUT
3. DELETED NOTE

State of CALIFORNIA
DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PILE DETAILS - CLASS 70 C

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU
WO

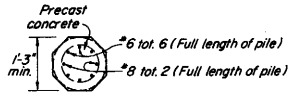
Disregard prints bearing earlier revision dates

B 2-8

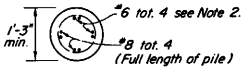
Return to Table of Contents

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

R. C. Sassaman
CHIEF, OFFICE OF STRUCTURES DESIGN, 1, BRIDGE ENGINEER, CIVIL BRANCH STANDARD
DATE APPROVED July 1, 1980

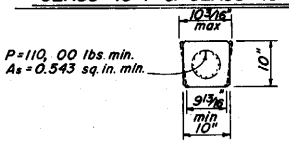


SECTION Y-Y

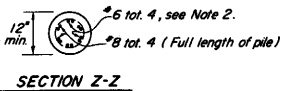


SECTION Z-Z

CLASS 45-1 & CLASS 45-1C PILES

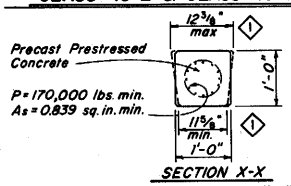


SECTION X-X



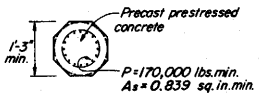
SECTION Z-Z

CLASS 45-2 & CLASS 45-2C PILES



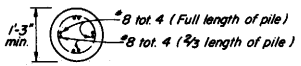
SECTION X-X

ALTERNATIVE "X"



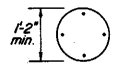
SECTION Y-Y

ALTERNATIVE "Y"



SECTION Z-Z

ALTERNATIVE "Z"

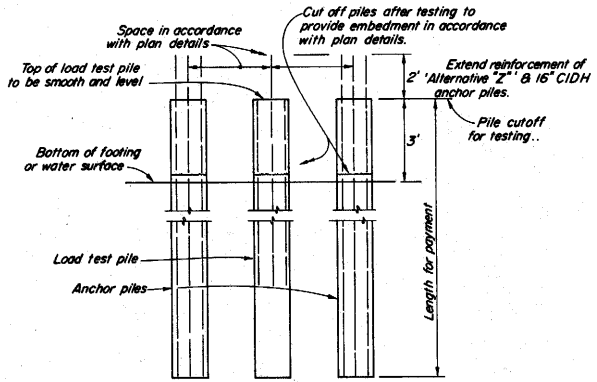


SECTION U-U

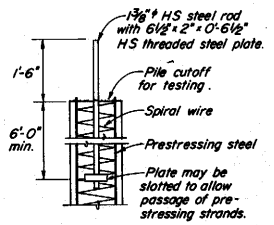
ALTERNATIVE "U"

When driven with a mandrel, shell thickness may be reduced to 0.164"

CLASS 70 & CLASS 70C PILES



LOAD TEST PILE GROUP



ALTERNATIVE "X" & "Y"
ANCHOR PILE CONNECTION
CLASS 70 & CLASS 70C PILES

Notes:

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

STANDARD DRAWING

FILE No. XS-10-31	DESIGN	By Wayne D. Thorpe	Checked F. Yeh	Approved Recommended By Bruce H. Mancuso
DRAWING DATE 1/80	DETAILS	By R. L. Mercy	Checked J. Thorpe	BRUCE H. MANCUSO REGISTERED CIVIL ENGINEER NUMBER 8178
	SUBMITTED BY	Marvin D. Mertz		

1 Rev Values

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN
PROJECT ENGINEER

BRIDGE No.
POST MILE

LOAD TEST ANCHOR PILE DETAILS

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU
WO

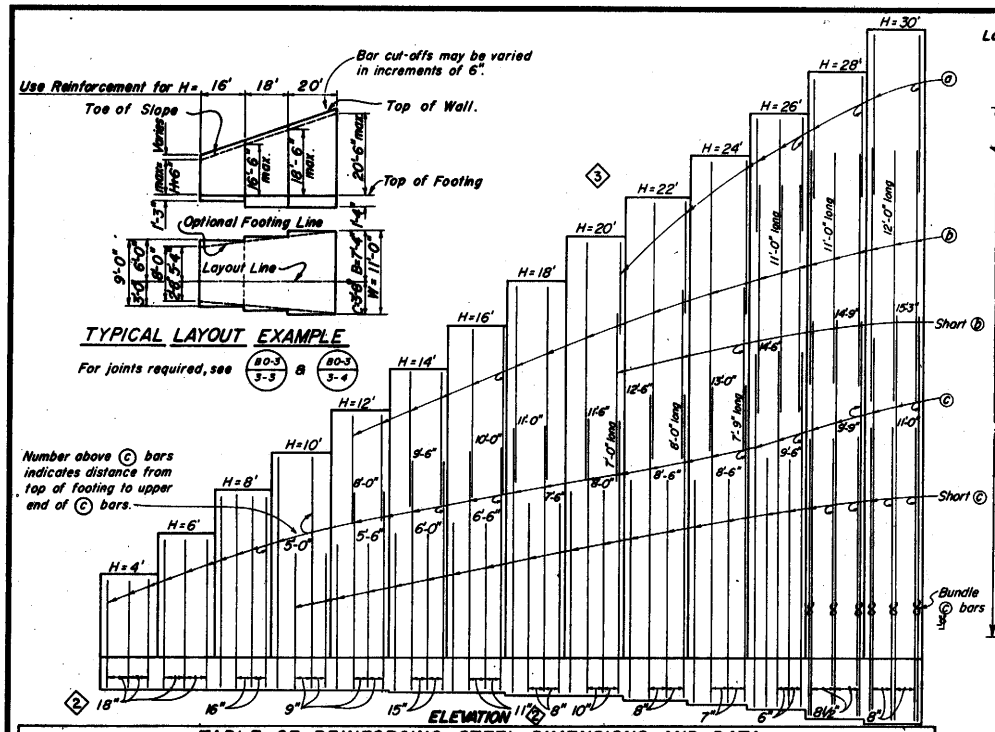
Disregard prints bearing earlier revision dates

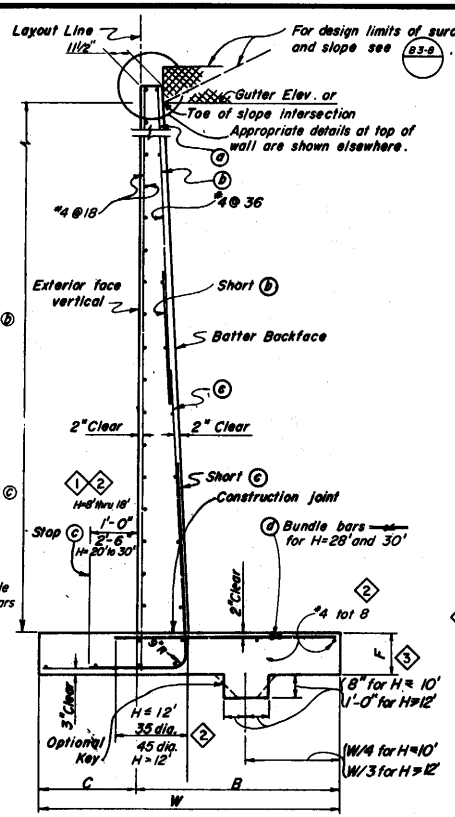
REVISION DATES (PRELIMINARY STAGE ONLY)

B 2-9

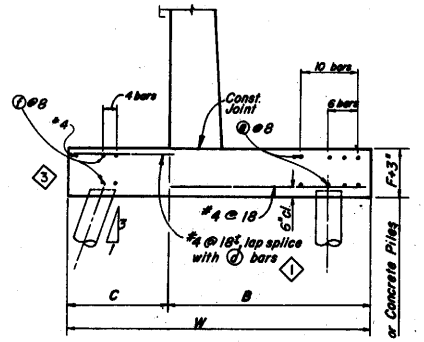
OH-08-D 147

Return to Table of Contents



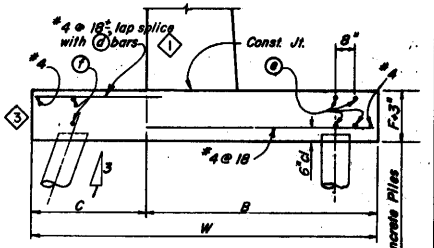


SPREAD FOOTING SECTION



45T PILE FOOTING SECTION

H= 4' Thru H= 22'



45T PILE FOOTING SECTION

H= 24' Thru H=30'

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
ⓐ	bars									#5@20	#5@32	#5@28	#5@12	#6@17	#6@16
ⓑ	bars					#4@18	#6@30	#6@22	#6@16	#8@20	#8@16	#8@14	#8@12	#8@8½	#8@8
ⓒ	bars	#5@18	#5@18	#5@16	#5@9	#6@9	#9@15	#9@11	#9@8	#10@10	#10@8	#10@7	#10@6	#10@8½	#10@8½
ⓓ	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@8½
Total ⓐ	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 ⓕ	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	80	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	113	140	179	217	273	326	429	469	528
	Conc cf/ft.	10.2	12.7	16.7	20.8	25.2	30.1	34.8	40.6	45.7	53.1	64.7	78.6	89.9	107.0

NOTES:

For details not shown and drainage notes see B3-9.

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'.

JULY 1, 1980

STANDARD DRAWING

FILE No. XS-3-46 | DRAWING DATE 1/80 | DESIGN | DETAILS | SUBMITTED BY | Checked | Checked | Approved | Recommended by

1 REV WORDING
2 REV VALUES
3 REV DETAILS

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER

DRAWING No. B 3-1

RETAINING WALL TYPE I H= 4'- 30'

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

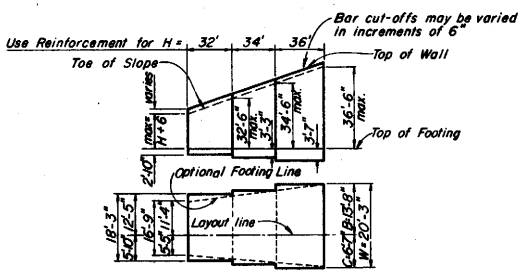
CU WO

Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY)

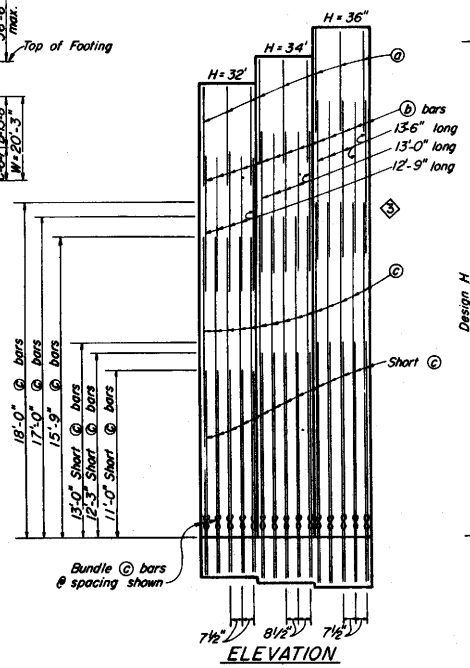
B 3-1

Return to Table of Contents

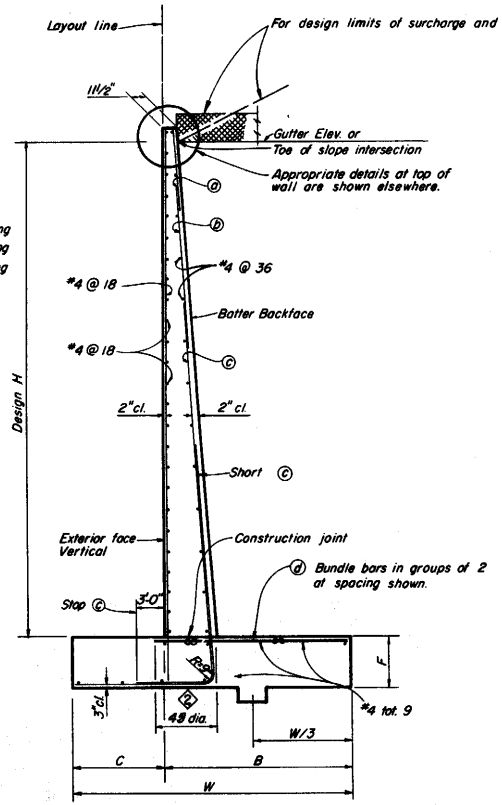


TYPICAL LAYOUT EXAMPLE

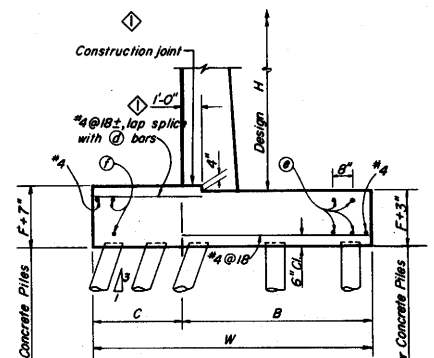
For joints required, see 80-3/3-3 & 80-3/3-4



ELEVATION



SPREAD FOOTING SECTION



45T PILE FOOTING SECTION

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

TABLE OF REINFORCING STEEL DIMENSIONS AND DATA				
Design H		32'	34'	36'
W		18'-3"	19'-3"	20'-3"
C		5'-10"	6'-3"	6'-7"
B		12'-5"	13'-0"	13'-8"
F Spread Ftg.		2'-10"	3'-3"	3'-7"
Batter		1:12	1:12	1:12
ⓐ	bars	#6 @ 15	#7 @ 17	#7 @ 15
ⓑ	bars	#8 @ 7½	#9 @ 8½	#9 @ 7½
ⓒ	bars	#10 @ 7½ ¥	#11 @ 8½ ¥	#11 @ 7½ ¥
ⓓ	bars	#9 @ 7½ ¥	#10 @ 8½ ¥	#9 @ 7½ ¥
Total ⓐ	bars	4-#7	4-#7	4-#7
Total ⓕ	bars	2-#7	2-#7	2-#7
2' level surcharge	H Comp k	24.3	27.7	31.0
	V Comp k	59.2	66.5	74.4
	Toe Pr. k/sf	6.3	6.8	7.3
2:1 unlimited slope	H Comp. k	36.6	41.7	46.9
	V Comp k	81.5	91.7	102.6
	Toe Pr. k/sf	7.7	8.4	9.1
1½:1 limited slope	H Comp k	29.3	32.8	36.3
	V Comp k	66.6	74.5	82.9
	Toe Pr. k/sf	7.9	8.4	8.9
Spread Footing	Steel lbs./ft.	563.2	665.7	751.0
	Conc. c.f./ft	129.4	147.8	165.7
Pile Footing	Steel lbs/ft.	590.3	694.3	779.0
	Conc. c.f./ft	134.2	153.0	171.3

¥ Denotes a bundle of 2 bars.

NOTES:

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

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

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

CHIEF, OFFICE OF STRUCTURES DESIGN — REGISTERED CIVIL ENGINEER, STRUCTURE DESIGN
DATE APPROVED July 1, 1980

STANDARD DRAWING

FILE NO. XS-3-47	DESIGN By David Masaki	Checked W.C.B. Hsiao
DRAWING DATE 1/80	DETAILS By [illegible]	Checked David Masaki
	SUBMITTED BY [illegible]	Approved Recommended By [illegible] CHIEF, OFFICE OF STRUCTURES DESIGN; REGISTERED CIVIL ENGINEER NUMBER 8198

1 REV WORDING
2 REV VALUE
3 REV DETAIL

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN
PROJECT ENGINEER

BRIDGE No.
POST MILE

RETAINING WALL TYPE I H=32'-36'

B 3-2

DH-05-B 147

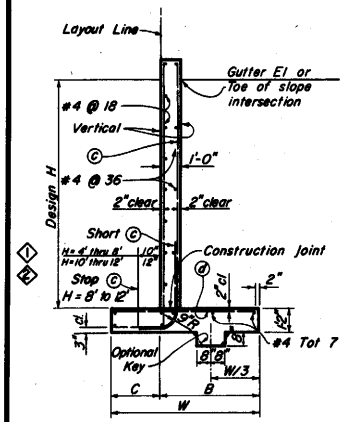
ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU
WO

Disregard prints bearing earlier revision dates

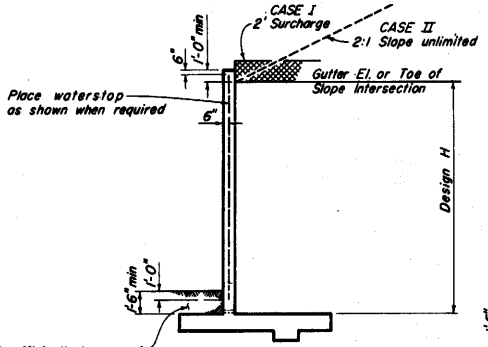
REVISION DATES (PRELIMINARY STAGE ONLY)

Return to Table of Contents



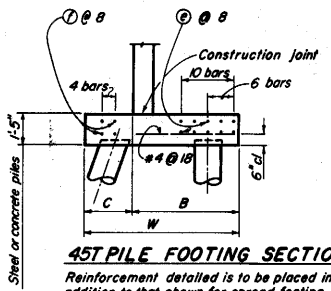
SPREAD FOOTING SECTION

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



DESIGN

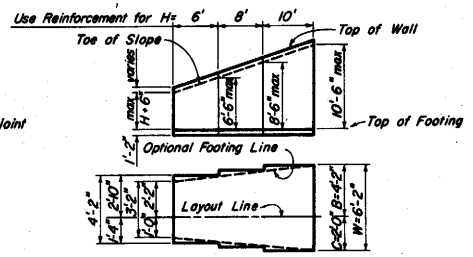
For drainage notes and other details, see (B3-8)



45T PILE FOOTING SECTION

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

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



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

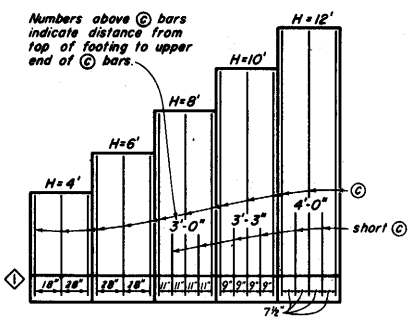
TYPICAL LAYOUT EXAMPLE

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

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

TABLE OF REINFORCING STEEL DIMENSIONS AND DATA

Design H		4'	6'	8'	10'	12'
W		3'-2"	4'-2"	5'-2"	6'-2"	7'-2"
C		1'-0"	1'-4"	1'-8"	2'-0"	2'-4"
B		2'-2"	2'-10"	3'-6"	4'-2"	4'-10"
ⓒ bars		#5 @ 18	#5 @ 18	#5 @ 11	#6 @ 9	#7 @ 7½
ⓓ bars		#5 @ 18	#5 @ 18	#5 @ 22	#7 @ 18	#8 @ 15
Total ⓔ bars		6 - #6	6 - #6	6 - #6	10 - #7	10 - #7
Total ⓕ bars					4 - #7	4 - #7
CASE I - Toe Press. psf		1590	1930	2240	2550	2840
CASE II - Toe Press. psf		1060	1460	1860	2280	2700
Spread Footing	Steel lbs/ft	17	23	27	46	70
	Conc CF/ft	8.6	11.8	14.9	18.1	21.3
Pile Ftg	Steel lbs/ft	27	34	38	75	101
	Conc CF/ft	9.9	11.9	15.3	18.8	22.2



ELEVATION

NOTES

Design Conditions

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

Design Data

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'.

STANDARD DRAWING

FILE No. XS-3-48 | DRAWING DATE 1/80 | DESIGN | DETAILS | SUBMITTED BY | Checked W.E. Ellis | Checked David Mahab | Approved Recommended By | JULY 1, 1980

1 Rev. Values
2 Added Note

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

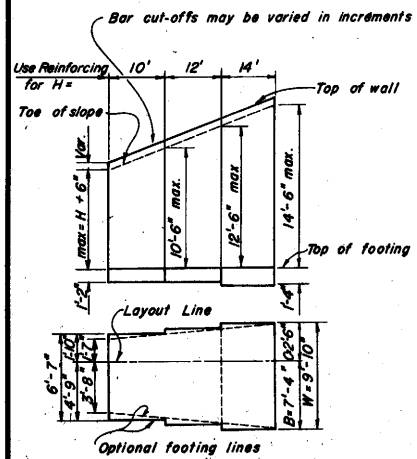
STRUCTURES-DESIGN | PROJECT ENGINEER | BRIDGE No. | POST MILE

RETAINING WALL TYPE IA

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

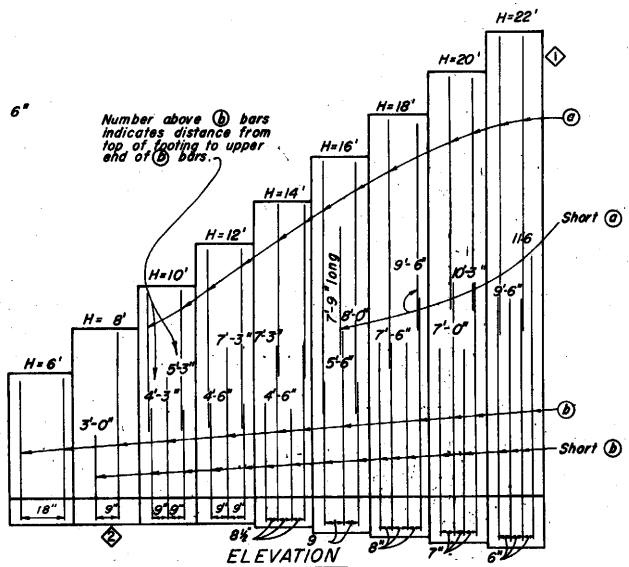
B 3-3

Return to Table of Contents



TYPICAL LAYOUT EXAMPLE

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



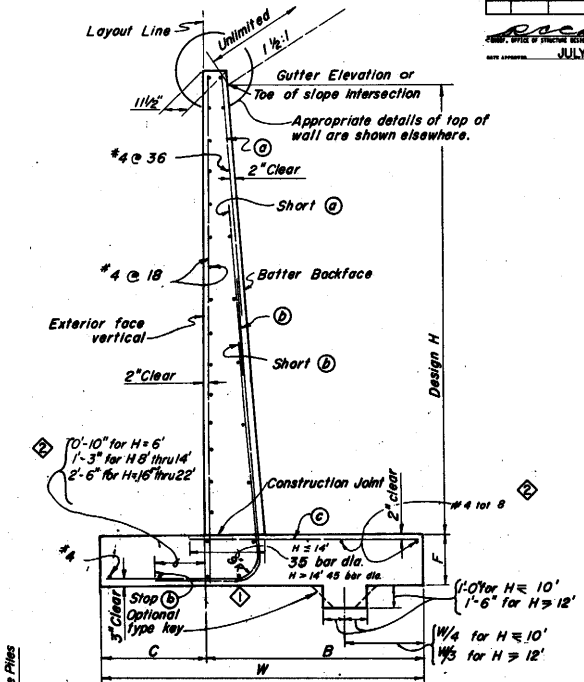
ELEVATION

TABLE OF REINFORCING STEEL DIMENSIONS AND DATA									
Design H	6'	8'	10'	12'	14'	16'	18'	20'	22'
W	3'-10"	5'-3"	6'-7"	8'-1"	9'-10"	11'-4"	13'-0"	14'-10"	17'-6"
C	1'-4"	1'-7"	1'-10"	2'-1"	2'-6"	2'-10"	3'-1"	3'-8"	4'-4"
B	2'-6"	3'-8"	4'-9"	6'-0"	7'-4"	8'-6"	9'-11"	11'-2"	13'-2"
F	1'-2"	1'-2"	1'-2"	1'-2"	1'-4"	1'-7"	1'-10"	2'-1"	2'-4"
Batter	½:12	½:12	½:12	½:12	½:12	½:12	⅝:12	¾:12	⅞:12
(a) bars			#5@18	#5@18	#6@17	#6@9	#8@16	#8@14	#8@12
(b) bars	#5@18"	#5@9	#6@9	#8@9	#9@8½	#11@9	#11@8	#11@7	#11@6
(c) bars	#5@18"	#5@18	#6@18	#6@9	#6@8½	#8@9	#8@8	#8@7	#8@6
Tot. (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. c.f./ft.	13.2	17.5	21.8	29.0	35.7	43.7	54.9	68.2	85.7
Spread footing Steel lbs/ft.	21	30	44	69	89	140	184	250	325
Pile Footing Conc. c.f./ft.	12.2	16.8	21.4	26.5	33.6	42.1	53.7	67.5	85.5
Pile Footing Steel lbs/ft.	32	42	80	106	126	177	214	280	357

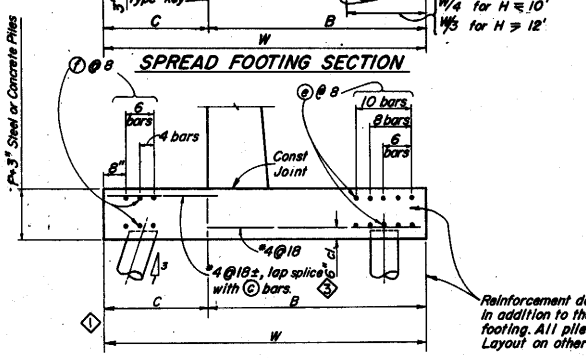
NOTES:

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.



SPREAD FOOTING SECTION



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.

STANDARD DRAWING			
FILE No. XS-3-42	DESIGN By David Marsh Checked H.E. Ellis	Approval Recommended By Joseph Mancarti	1 Rev Detail
DRAWING 1/80 DATE	DETAILS By H. Liang Checked David Marsh	DATE APPROVED 8/79	2 Rev Values
	SUBMITTED BY Kenneth Chang	REGISTERED CIVIL ENGINEER NUMBER	3 Rev Wording

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER

BRIDGE No.

POST MILE

RETAINING WALL TYPE 2

B3-4

DH-05-D 147

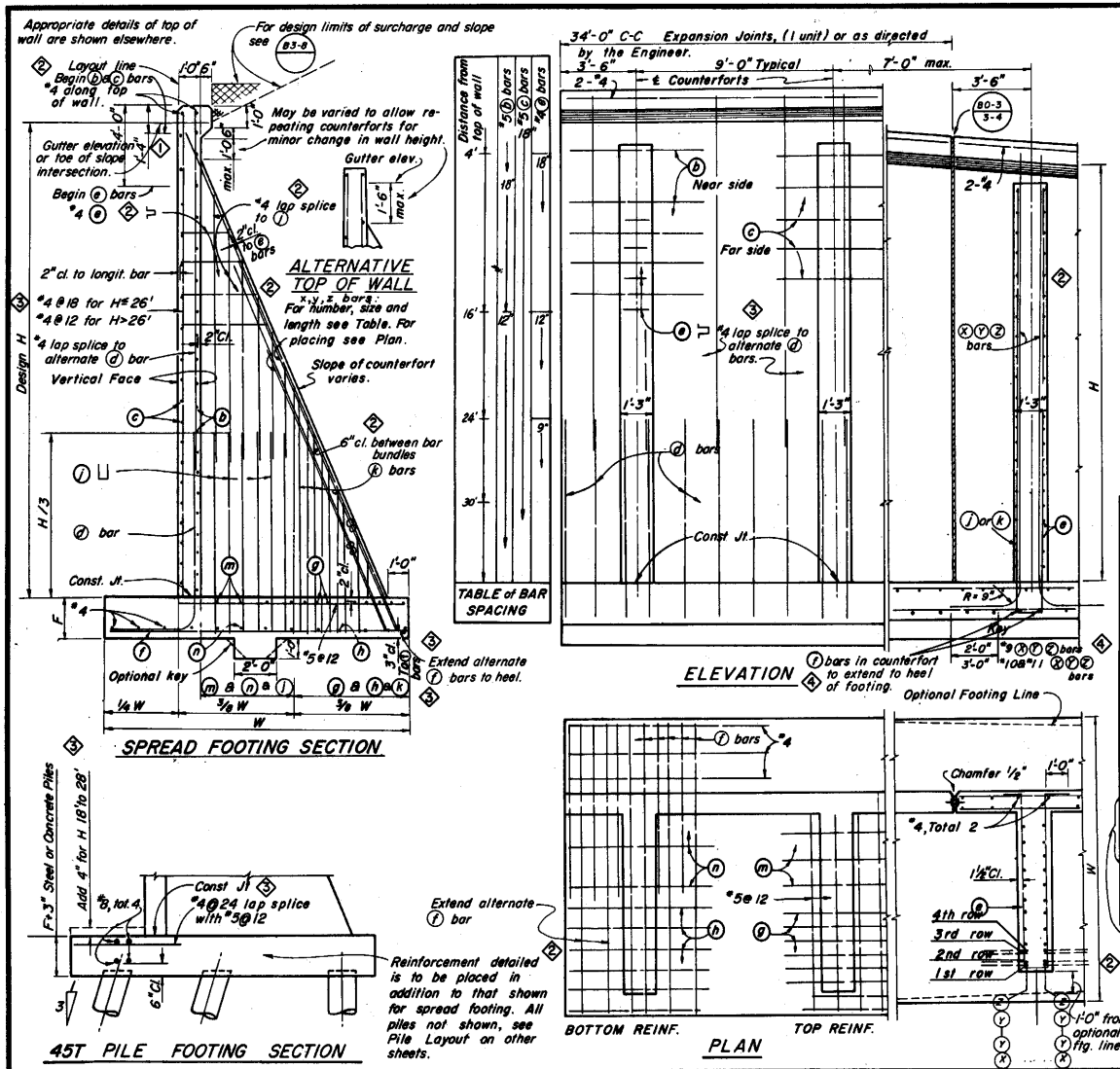
ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU WO

Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY)

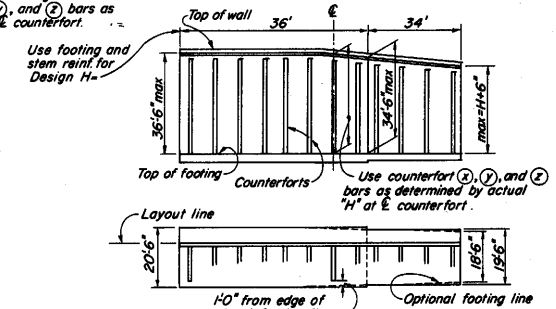
Return to Table of Contents



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 Alt.	5'-6"	6'-0"	6'-9"	7'-8"	8'-0"	8'-3"	8'-6"	9'-0"	9'-9"	10'-0"
ⓕ bars, length	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
1 1/2:1 Limited	4160	4690	5290	5850	6450	6900	7340	7740	8130	8640

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

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

NOTES:

For Design and Drainage notes and other details see B3-9

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.

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

R. C. Cassano
DIST., OFFICE & STRUCTURES EngINEER — REGISTERED CIVIL ENGINEER
DATE APPROVED JULY 1, 1980

STANDARD DRAWING

FILE No. XS-3-43	DESIGN	By David Olerich	Checked W.E.E.III
DRAWING DATE 1/80	DETAILS	By R. J. Lacey	Checked David Olerich
	SUBMITTED BY	Roger H. Nunn	Approved Recommended By Dwight Mancarch, Chief Bridge Design Section; Approved Dwight Mancarch, Chief Bridge Design Section; REGISTERED CIVIL ENGINEER NUMBER 8178

1 Rev Values
2 Rev Details
3 Rev Wording
4 Added Note

State of CALIFORNIA
DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN
PROJECT ENGINEER

BRIDGE No.
POST MILE

COUNTERFORT RETAINING WALL TYPE 3

B 3-5

DH-04-D 147

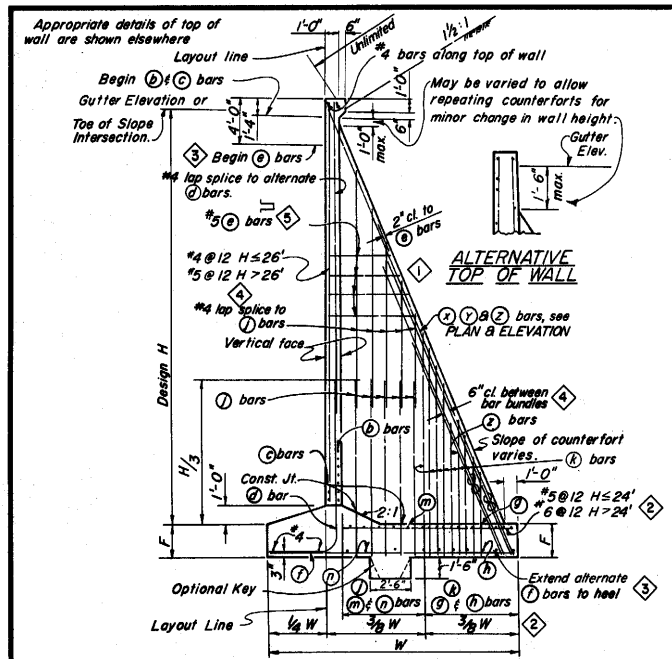
ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU
WO

Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY)

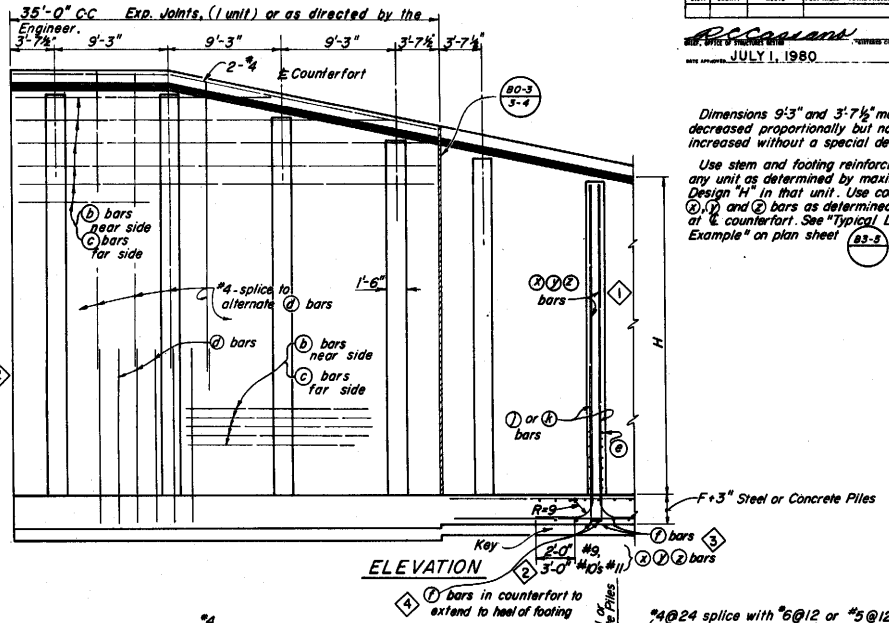
Return to Table of Contents



SPREAD FOOTING SECTION

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

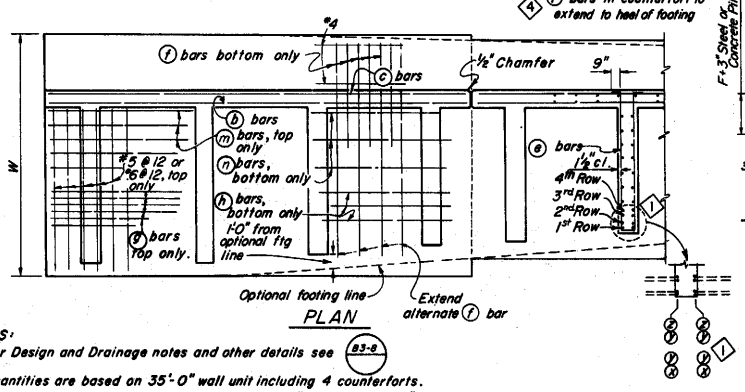
TABLE OF SPACING FOR ⓑ, ⓒ & ⓔ BARS
Distance below top of wall



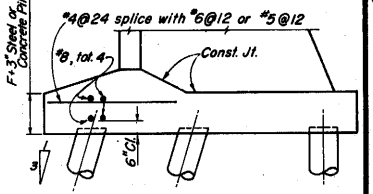
ELEVATION

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 plan sheet B3-5



PLAN



45T PILE FOOTING SECTION

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

TABLE OF REINFORCING STEEL DIMENSIONS AND DATA

	Design H	18'	20'	22'	24'	26'	28'	30'
	W	12'-10"	14'-1"	15'-6"	16'-10"	18'-3"	19'-6"	21'-0"
	F	1'-9"	2'-0"	2'-0"	2'-0"	2'-3"	2'-3"	2'-6"
	ⓧ bars, edge counterfort	2-#9	2-#9	2-#9	2-#10	2-#10	2-#11	2-#11
	ⓧ bars, length	20'-8"	22'-6"	24'-9"	26'-10"	29'-0"	31'-3"	33'-6"
	ⓨ bars, edge counterfort	4-#9	4-#9	4-#9	4-#10	4-#10	4-#11	4-#11
	ⓨ bars, length	13'-0"	15'-6"	17'-9"	21'-0"	22'-0"	22'-6"	25'-9"
	ⓩ bars, edge counterfort			2-#9	2-#10	2-#10	2-#11	2-#11
	ⓩ bars, length			10'-6"	12'-0"	13'-3"	13'-5"	16'-4"
	ⓑ bars, back face wall	#5	See Table for spacing					
	ⓒ bars, front face wall	#5	See Table for spacing					
	ⓖ bars, wall face	#6 @ 12	#6 @ 10	#6 @ 9	#8 @ 12	#8 @ 11	#9 @ 12	#9 @ 11
	ⓔ Stirrups counterfort	#5	See Table for spacing					
	ⓕ bars, toe	#4 @ 12	#4 @ 10	#4 @ 9	#5 @ 12	#6 @ 11	#7 @ 12	#7 @ 11
	ⓕ bars, length	6'-0"	7'-0"	7'-9"	8'-5"	9'-2"	9'-9"	10'-6"
	ⓙ bars, counterfort heel	#5 @ 15	#5 @ 13	#5 @ 11	#6 @ 15	#6 @ 13	#6 @ 12	#6 @ 11
	ⓚ bars, counterfort heel	#5 @ 7½	#5 @ 6½	#5 @ 5½	#6 @ 7½	#6 @ 6½	#6 @ 6	#6 @ 5½
	ⓜ bars, top of heel	#6 @ 16	#6 @ 16	#6 @ 16	#6 @ 16	#6 @ 16	#6 @ 16	#6 @ 16
	ⓖ bars, top of heel	#6 @ 8	#6 @ 8	#6 @ 8	#6 @ 8	#6 @ 8	#6 @ 8	#6 @ 8
	ⓝ bars, bottom of heel	#5 @ 18	#5 @ 18	#5 @ 18	#5 @ 18	#5 @ 18	#5 @ 18	#5 @ 18
	ⓗ bars, bottom of heel	#5 @ 9	#5 @ 9	#5 @ 9	#5 @ 9	#5 @ 9	#5 @ 9	#5 @ 9
Spread Footing	Concrete cu.ft./lin.ft.	58.7	69.2	77.7	86.3	99.9	109.1	125.1
	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

NOTES:

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

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

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

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

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

R.S. Cassidy — CHIEF, OFFICE OF STRUCTURE DETAIL — REGISTERED CIVIL ENGINEER
DATE APPROVED: JULY 1, 1980

STANDARD DRAWING

FILE NO. XS-3-44	DESIGN By David Sharaki	Checked W.E. Ellis	Approval Recommended By Dwight Mancarti — DESIGN ENGINEER
DRAWING DATE 1/80	DETAILS By [illegible]	Checked David Sharaki	REGISTERED CIVIL ENGINEER NUMBER 8198
	SUBMITTED BY [illegible]		

1 REV DETAIL
2 REV VALUES
3 REV NOTES
4 ADDED NOTE
5 REV WORDING

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN
PROJECT ENGINEER

BRIDGE NO.
POST MILE

COUNTERFORT RETAINING WALL TYPE 4

B 3-6

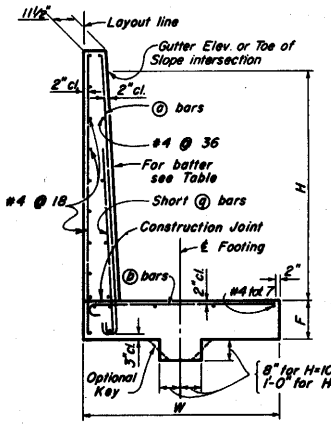
DH-05-D 147

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

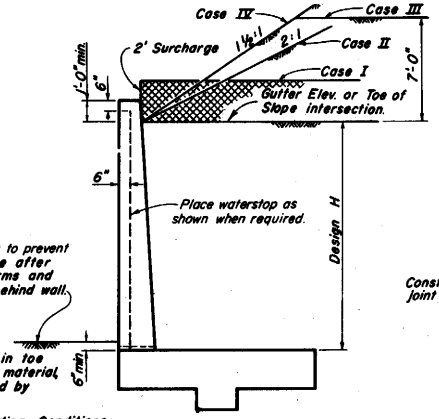
CU
WO

Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY)



SPREAD FOOTING SECTION



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

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

Loading Conditions:

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

DESIGN

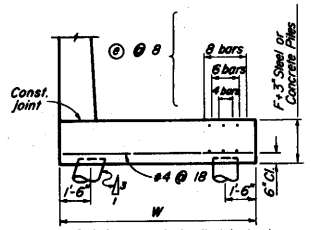
For drainage notes and other details, see B3-8

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.

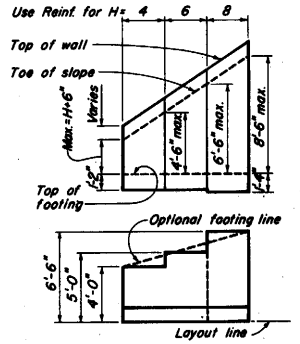
Pile layout does not apply to Case IV conditions.



Reinforcement detailed is to be placed in addition to that shown for spread footings. ⟨2⟩

◎ For Design H=4' use W=5'-0". All others from table.

45T PILE FOOTING SECTION

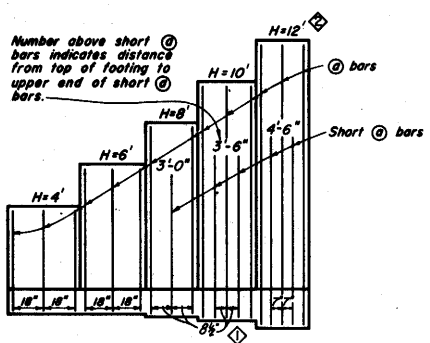


TYPICAL LAYOUT EXAMPLE

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' ⟨2⟩
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	⅛:12	¼:12
	ⓐ 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 ⟨1⟩
Total	ⓐ bars	6-#7	6-#7	8-#7	6-#7	4-#7
Soil Pressure	Case I k/sf	1.6	2.2	2.5	3.0	3.5
	Case II k/sf	1.5	2.1	2.7	3.4	4.1
	Case III k/sf	1.6	2.3	2.9	3.8	4.4
	Case IV k/sf	2.0	3.2	4.2	5.3	6.5
Spread Ftg.	Steel lbs	16	22	35	55	73
	Conc. c.y.	9.4	12.5	17.2	24.4	36.1
Pile Footing	Steel lbs	31	36	54	70	85
	Conc. c.y.	10.9	12.9	17.9	25.5	36.5

Number above short ⓐ bars indicates distance from top of footing to upper end of short ⓐ bars.



ELEVATION

NOTES

Design Conditions:

Design H may be exceeded by 6" before going to the next size. ⟨3⟩

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.

July 1, 1980

STANDARD DRAWING

FILE No. XS-3-49 | DRAWING DATE 1/80 | DESIGN | DETAILS | SUBMITTED BY | Approved Recommended by | 8/98

⟨1⟩ Rev Value
⟨2⟩ Rev Note
⟨3⟩ Deleted Note

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

BRIDGE No. | POST MILE

RETAINING WALL TYPE 5

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU WO

Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY)

B3-7

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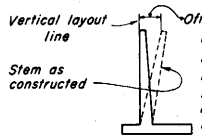


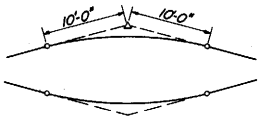
APPROX. WALL OFFSET VALUES

Not required for wall types 3 and 4

Values for offsetting forms to be determined by the Engineer.

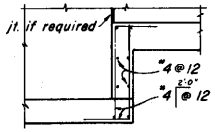
PLAN OF WALL WITH BR. DETAIL 3-4 (see B0-3 3-4)

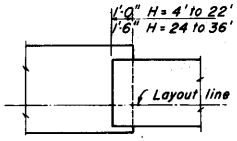
PLAN OF WALL WITH EXPANSION JOINT ONLY



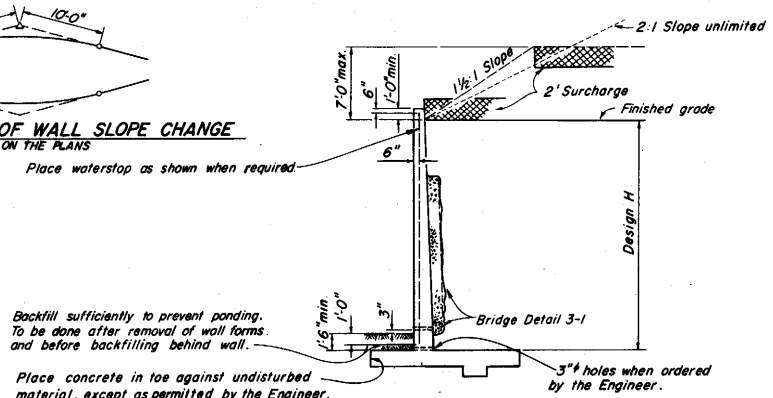
20' VC AT TOP OF WALL SLOPE CHANGE

WHERE SHOWN ON THE PLANS



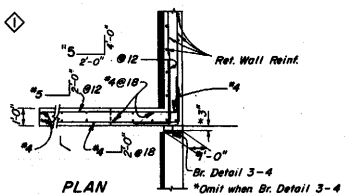


FOOTING STEP



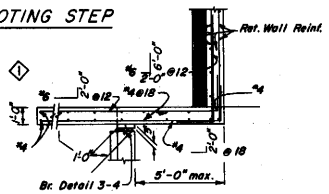
DESIGN AND DRAINAGE

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



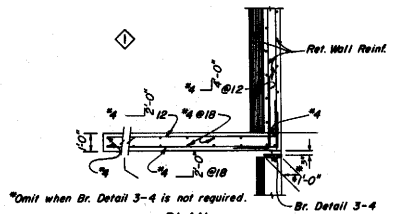
PLAN

(For Return Wall Type "A")



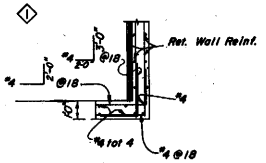
PLAN

(For Return Wall Type "B")



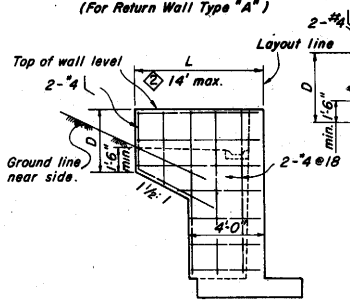
PLAN

(For Return Wall Type "C")



PLAN

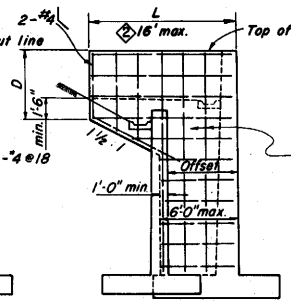
(For Return Wall Type "D")



ELEVATION

RETURN WALL TYPE "A"

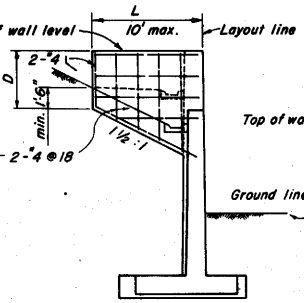
Use where H = 8' or less



ELEVATION

RETURN WALL TYPE "B"

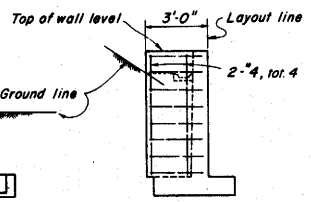
Use where H = 10' or more on offset walls



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: 3

Design H may be exceeded by 6" before going to the next size.
Special footing design is required where foundation material is incapable of supporting toe pressure loads listed in table.
Return wall not required unless shown elsewhere.

Design Data:

fc = 1300 psi f'c = 3250 psi fs = 24,000 psi n = 10 earth = 120 pcf
2' Surcharge:
Equivalent fluid pressure = 36 pcf max. for determination of toe pressure.
27 pcf min. for determination of heel pressure.

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

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

R. Cusano — CHIEF, OFFICE OF STRUCTURES DESIGN — REGISTERED CIVIL ENGINEER RECORDED 5013
DATE APPROVED July 1, 1980

STANDARD DRAWING

FILE No. XS-3-45	DESIGN	By David Marsh	Checked W.E. Ellis	Approval Recommended by
DRAWING DATE 1/80	DETAILS	By B.J. Lacy	Checked David Marsh	
	SUBMITTED BY	Ken Bonney		REGISTERED CIVIL ENGINEER NUMBER 7-1-82

1 Rev Details
2 Rev Values
3 Rev Note

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN
PROJECT ENGINEER

BRIDGE No.
POST MILE

RETAINING WALL DETAILS NO. 1

DH-03-0 147

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

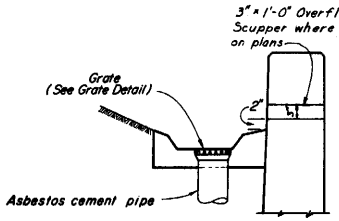
CU
WO

Disregard prints bearing earlier revision dates →

REVISION DATES (PRELIMINARY STAGE ONLY)

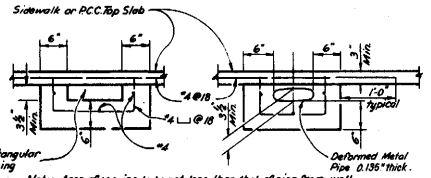
B3-8

Return to Table of Contents



WALL DRAIN DETAIL

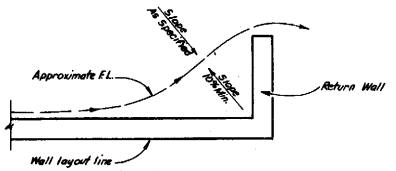
Scale: 1"=1'-0"



Note: Area of opening to be not less than that of pipe from wall gutter. Make opening transition in wall. Edge opening in curb face to 3/8" Min. Radius.

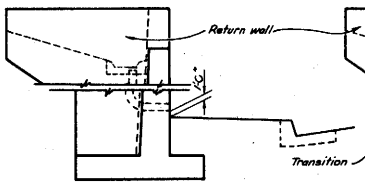
OUTLET DETAIL - SECTION B-B

Scale: 1"=1'-0"



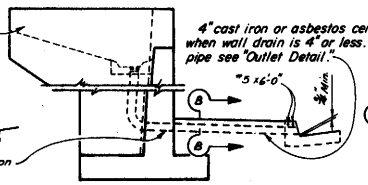
WALL DRAINAGE WHERE GUTTER NOT REQUIRED

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



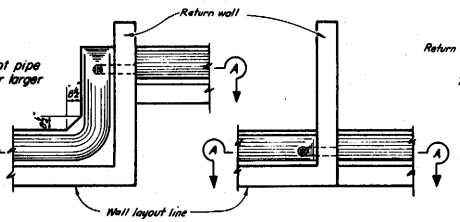
RETAINING WALL, FACE OF WALL OUTLET

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

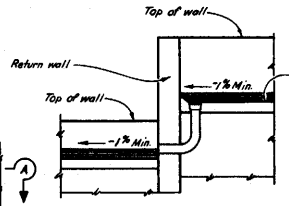


RETAINING WALL, GUTTER OUTLET

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



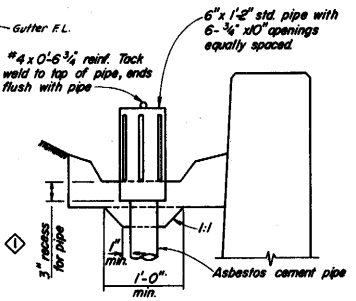
PLAN-OFFSET WALL PLAN-CONTINUOUS WALL



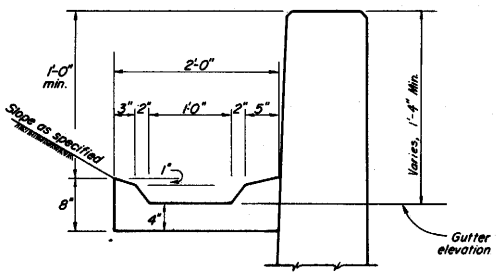
SECTION A-A

DRAIN THROUGH RETURN WALL

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



WALL DRAIN WITH PIPE DOME

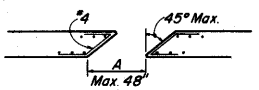


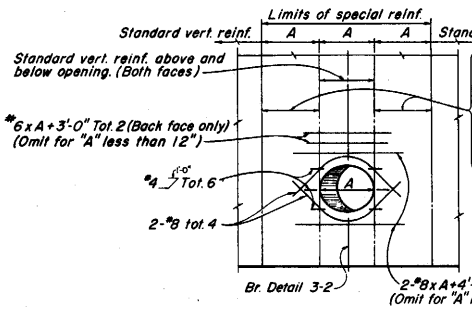
TYPICAL GUTTER DETAIL

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

GRATE DETAIL

Sizes to fit Standard Hubs





Standard vert. reinf. plus additional bars corresponding in size and number to bars cut by the opening. Place half on each side. Extend the additional bars into the footing the same as other wall reinforcement and to a minimum of 60 bar dia. above the top of Utility opening if wall height permits. Bundle bars as required.

Horiz. reinf. to be standard except as shown.

All reinf. to clear opening by 2" min.

Expansion joints shall not be located within the limits of special reinforcing.

RETAINING WALL UTILITY OPENING

Max. size of Opening (A) = 48"

To be used in conjunction with sheet B3-8

STANDARD DRAWING					
FILE No. XS-3-29	DESIGN	By Donald Marsh	Checked W.E. Gillis	Approved for Standard by	
DRAWING DATE 1/80	DETAILS	By [illegible]	Checked David Marsh	[illegible]	
	SUBMITTED BY	Roger Bittner		REGISTERED CIVIL ENGINEER NUMBER 22,649	

① ADDED DETAIL

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER

BRIDGE No.

POST MILE

RETAINING WALL DETAILS NO. 2

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU WO

Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY)

B3-9

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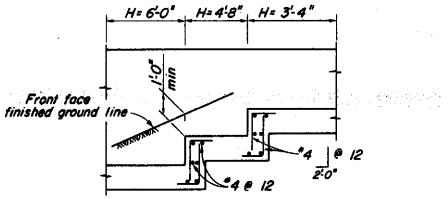
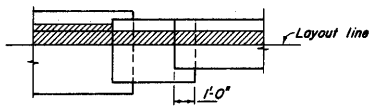
DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

R. L. Cassano — CHIEF, OFFICE OF STRUCTURES DESIGN — REGISTERED CIVIL ENGINEER NUMBER 9013

DATE APPROVED JULY 1, 1980

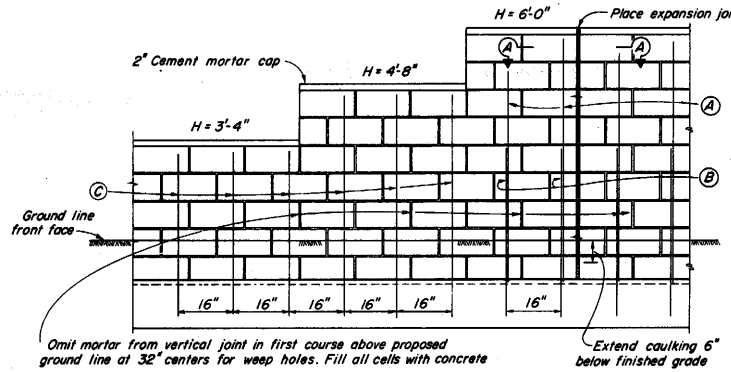


ELEVATION



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

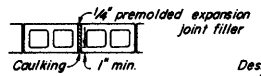
Reinf Conc: f_c = 1300 psi f'_c = 3250 psi f_s = 24,000 psi n = 10

Earth = 120 pcf.

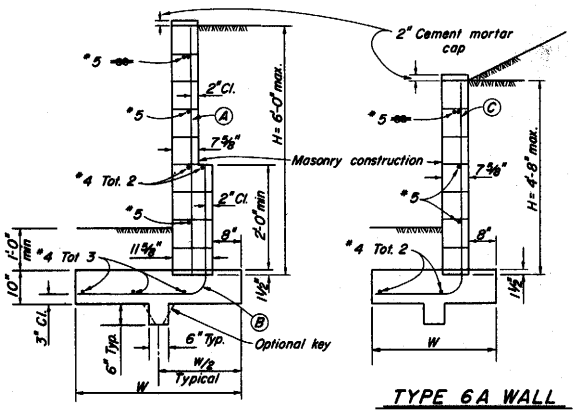
2' Level Surcharge:
Equivalent fluid pressure = 36 pcf for determination of toe pressure.
27 pcf for determination of heel pressure.

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

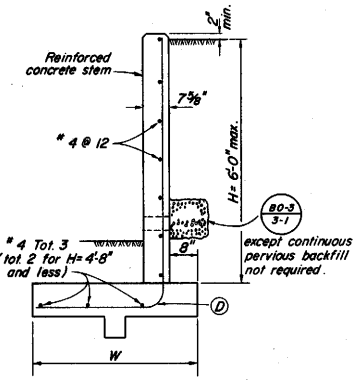
Minimum allowable soil bearing capacity of foundation material = 1 TSF.

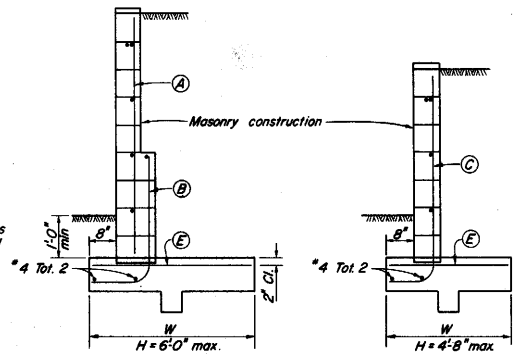


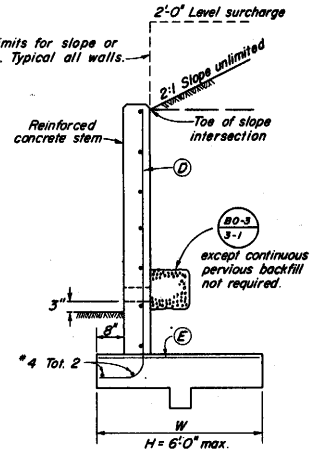
SECTION A-A



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		8.5	8.9	11.6	12.8	15.0
Reinf. Conc. Stem		6.6	7.7	9.8	13.7	16.7

NOTES

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

Type	Design H	3'-4"	4'-0"	4'-8"	5'-4"	6'-0"
6B	W	2'-8"	3'-0"	3'-4"	3'-8"	4'-0"
6B	A				#4@16	#4@16
6B	B				#4@16	#5@16
6B	C	#4@16	#4@16	#5@16		
6B	D	#4@16	#4@16	#5@16	#5@16	#4@8
6B	E	#4@16	#4@16	#4@16	#4@16	#5@16
Footing conc. Cu. Ft. / L.F.		2.5	2.8	3.0	3.3	3.6
Reinf. Lbs./L.F. Masonry		9.1	9.6	11.8	12.9	15.4
Reinf. Conc. Stem		6.6	7.7	9.8	13.7	16.7

For reinforced concrete stem joints required see 80-3 3-3 & 80-3 3-4

STANDARD DRAWING

FILE NO. XS-3-50	DESIGN By David Okasaki	Checked W.E.E. Ellis	Approval Recommended By
DRAWING DATE 1/80	DETAILS By R. Lewis	Checked David Okasaki	
	SUBMITTED BY Roger Blom		DATE 7-1-80

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER

BRIDGE No.

POST MILE

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

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU WO

Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY)

B3-11

DH-DS-D 147

101

B3-11

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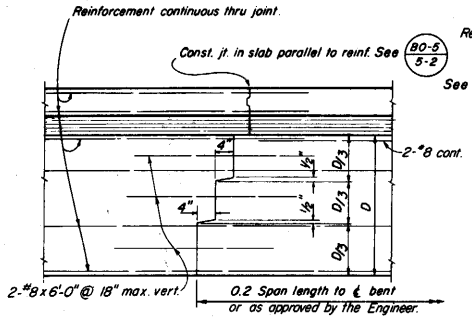
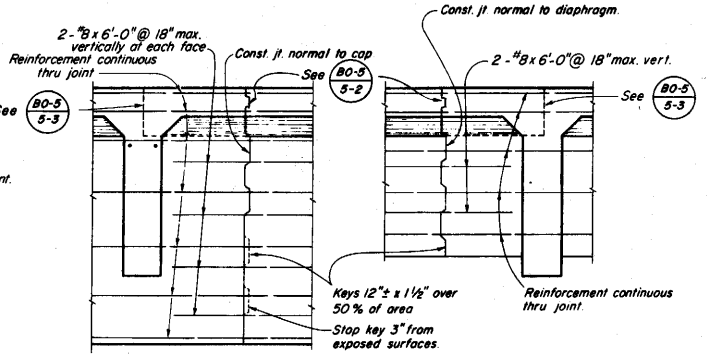
DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

DIR., OFFICE OF STRUCTURE DESIGN — 3013 — STANDARD CIVIL ENGINEER DRAWING

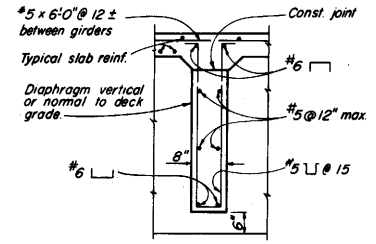
DATE APPROVED: JULY 1, 1980



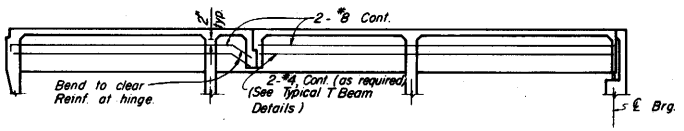
TRANSVERSE GIRDER CONSTRUCTION JOINTS
DETAIL J-3



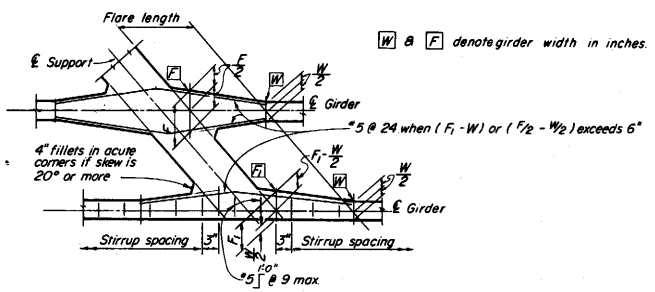
BENT CAP DIAPHRAGMS
LONGITUDINAL CONSTRUCTION JOINTS
DETAIL J-4



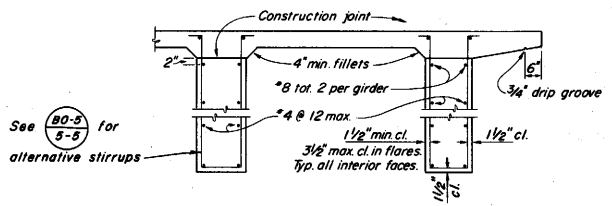
INTERMEDIATE DIAPHRAGM SECTION
DETAIL D-1



GIRDER WEB REINFORCEMENT
DETAIL J-1



TYPICAL GIRDER FLARE AND STIRRUP SPACING DIAGRAM
DETAIL S-3



TYPICAL T BEAM DETAILS
DETAIL T-1

B6-1

STANDARD DRAWING							
FILE No. XS-16-21	DESIGN By	Checked	Approval Recommended By	State of CALIFORNIA DEPARTMENT OF TRANSPORTATION	STRUCTURES-DESIGN	BRIDGE No.	T-BEAM DETAILS
DRAWING DATE 1/80	DETAILS By	Checked			PROJECT ENGINEER	POST MILE	
	SUBMITTED BY						

DH-09-D 147

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU WO

Disregard prints bearing earlier revision dates →

REVISION DATES (PRELIMINARY STAGE ONLY)

B6-1

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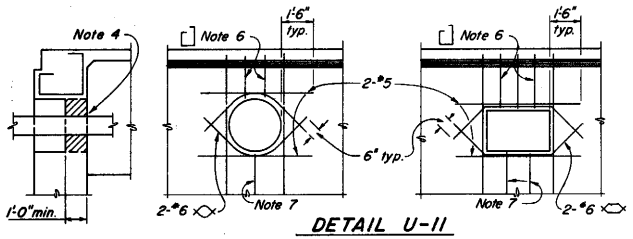
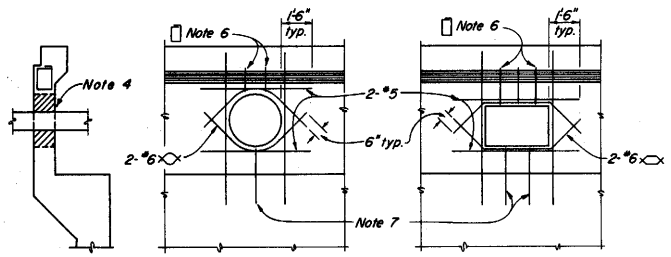
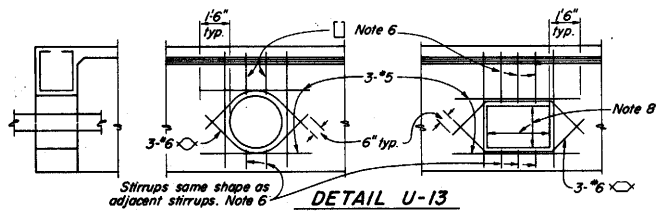
ABUTMENT DIAPHRAGMS



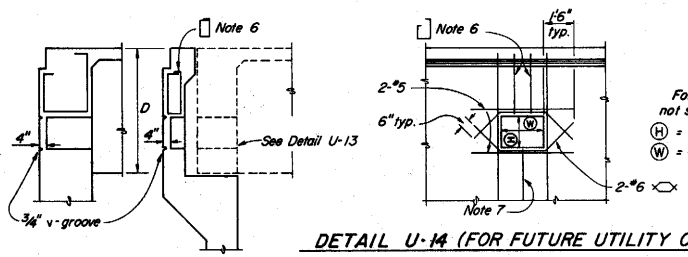
DETAIL U-11



DETAIL U-12



DETAIL U-13



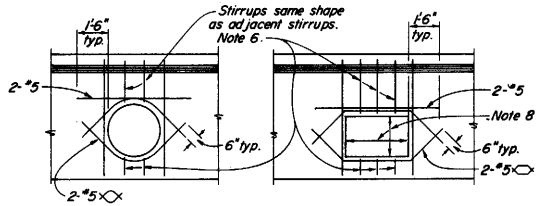
DETAIL U-14 (FOR FUTURE UTILITY OPENING)

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

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

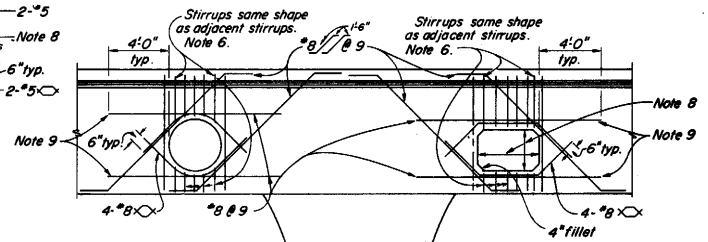
(W) = 1/3 D or 1'-3" min., whichever is greater.

INTERMEDIATE DIAPHRAGMS

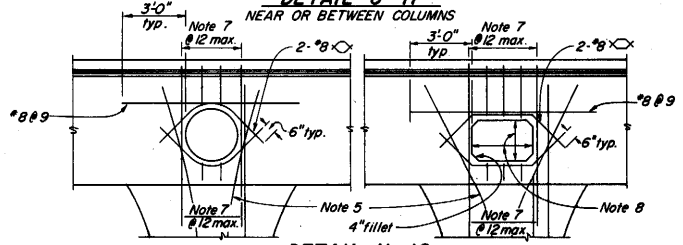


DETAIL U-15

BENT CAPS



DETAIL U 17
NEAR OR BETWEEN COLUMNS



DETAIL U-18
AT COLUMN

NOTES:

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

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

DIST. OFFICE OF STRUCTURES DESIGN — REGISTERED CIVIL ENGINEER

DATE APPROVED JULY 1, 1980

STANDARD DRAWING

FILE No. XS-16-51	DESIGN By S.D. Matusic	Checked	Approval Recommended By
DRAWING DATE 1/80	DETAILS By K.C. Bleichinger	Checked	REVIEW ENGINEER
	SUBMITTED BY		REGISTERED CIVIL ENGINEER NUMBER 7949

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER

BRIDGE No.

POST MILE

UTILITY OPENINGS - T-BEAM

ORIG. 'A' IN INCHES FOR R. 'TRACE' PURPOSES 0 1 2 3

CU WO

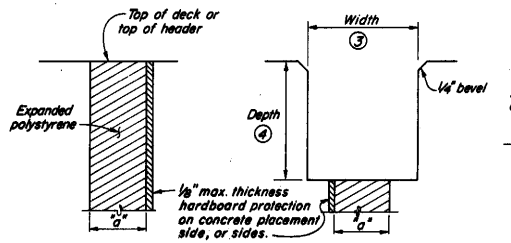
Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY)

B 6-10

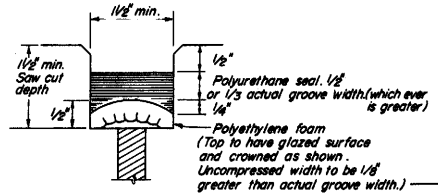
B6-10

Return to Table of Contents



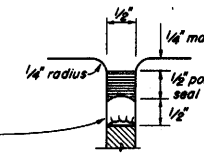
FORMING DETAIL

SAWCUT DETAIL



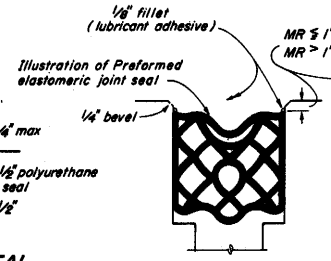
TYPE A SEAL

Movement Rating = 1/2" max.



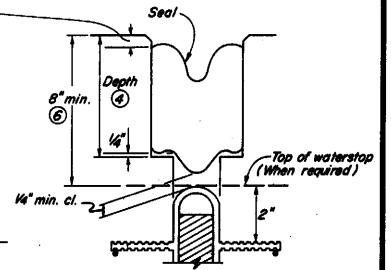
TYPE A L SEAL

Longitudinal Joints Only



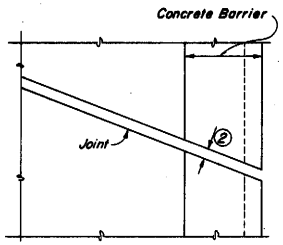
TYPE B SEAL

Movement Rating > 1/2"

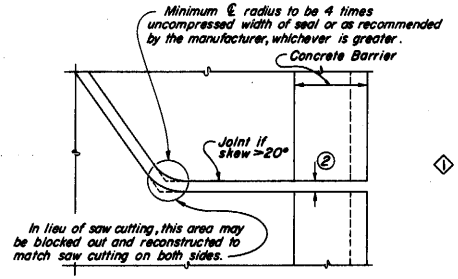


TYPE B JOINT SEAL

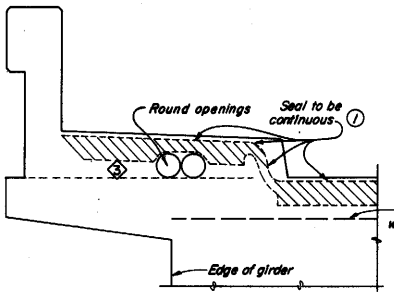
IN MINIMUM WIDTH POSITION (W_2)

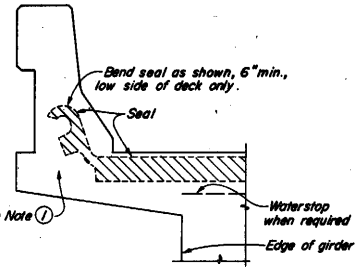


PLAN OF JOINT



PLAN OF ANGLED JOINT





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

CONCRETE BARRIER & SIDEWALK

CONCRETE BARRIER

JOINT SEAL DETAILS

DIMENSIONS "a" OF JOINT REQUIRED

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

NOTES :

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

July 1, 1980

STANDARD DRAWING

FILE No. XS-12-45 | DRAWING DATE 1/80 | DESIGN | DETAILS | SUBMITTED BY | Checked | Approved: Recommended By

1. Delete Sequence of Construction
2. Add 8Rev Notes
3. Add Round Openings

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER

BRIDGE No. | POST MILE

JOINT SEALS (MAXIMUM MOVEMENT RATING = 2")

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU WO

Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY, STAGE, FINAL)

B6-21

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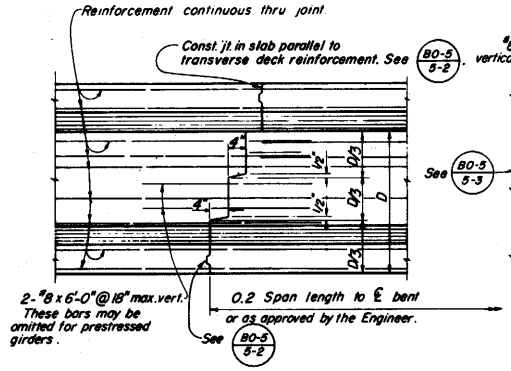
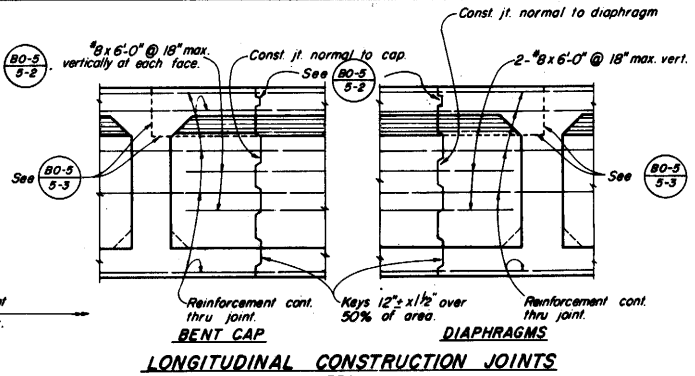
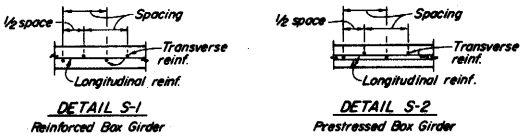


TRANSVERSE GIRDER CONSTRUCTION JOINTS
DETAIL J-3



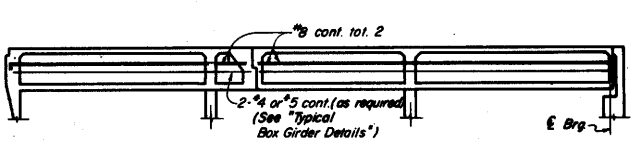
LONGITUDINAL CONSTRUCTION JOINTS
DETAIL J-4



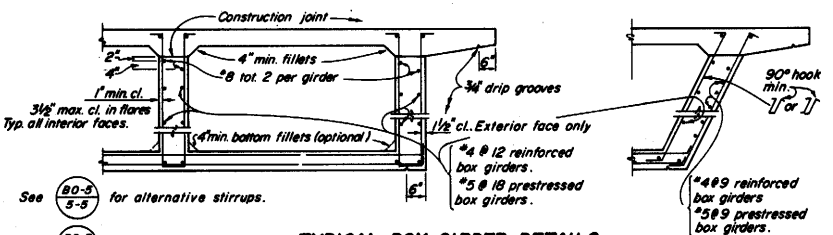
DETAIL S-1
Reinforced Box Girder

DETAIL S-2
Prestressed Box Girder

BOTTOM SLAB TRANSVERSE REINFORCEMENT SPACING DIAGRAMS



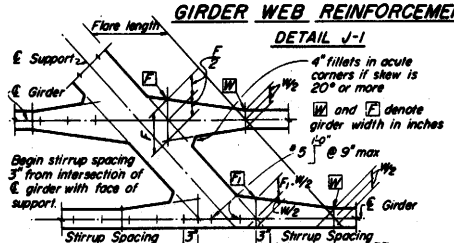
GIRDER WEB REINFORCEMENT
DETAIL J-1



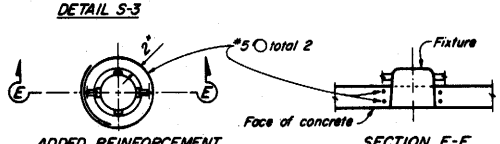
See 80-5 5-5 for alternative stirrups.

See 88-5 for stirrup details and clearances for prestressed box girders.

TYPICAL BOX GIRDER DETAILS
DETAIL B-1

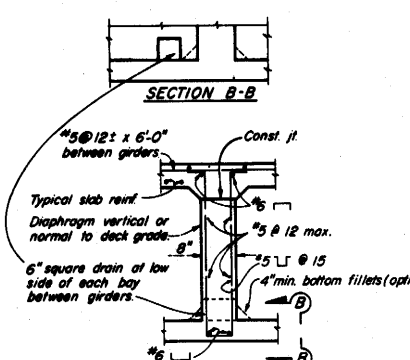


TYPICAL GIRDER FLARE AND STIRRUP SPACING DIAGRAM
DETAIL S-3

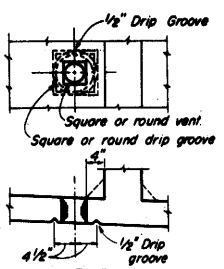


ADDED REINFORCEMENT
SECTION E-E

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.

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

CHIEF, OFFICE OF STRUCTURES DESIGN — REGISTERED CIVIL ENGINEER
DATE APPROVED JULY 1, 1980

STANDARD DRAWING

FILE No. XS-16-22	DESIGN	By	Checked
DRAWING DATE 1/80	DETAILS	By	Checked
	SUBMITTED BY		Approved Recommended By

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER

BRIDGE No. | POST MILE

BOX GIRDER DETAILS

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU
WO

Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY PLANS ONLY)

B7-1

105

B7-1

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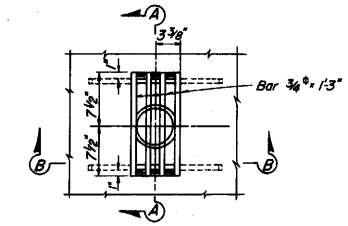
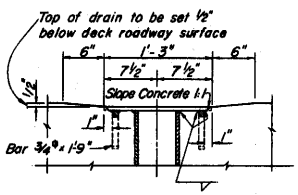
DIST.	COUNTY	ROUTE	POST MILES	TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

R. Cleaver — CHIEF, OFFICE OF STRUCTURES DESIGN — REGISTERED CIVIL ENGINEER 8013

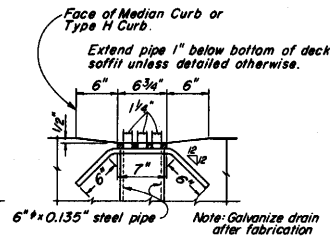
DATE APPROVED JULY 1, 1980



PLAN

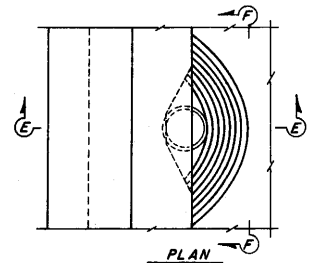


SECTION A-A

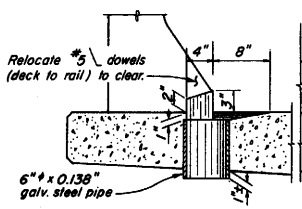


SECTION B-B

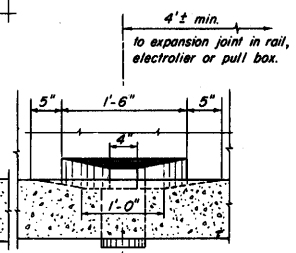
DRAIN - TYPE "A" DETAIL 7-1



PLAN



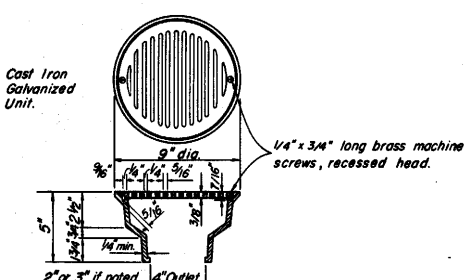
SECTION E-E



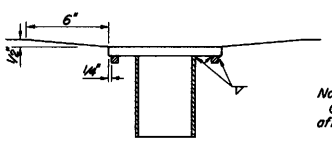
SECTION F-F

DRAIN - TYPE "B" DETAIL 7-3

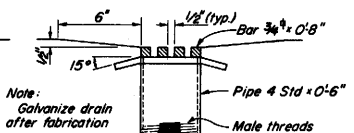
For Type 25 Barrier Railing



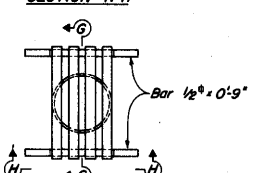
AREA DRAIN DETAIL 7-4



SECTION G-G

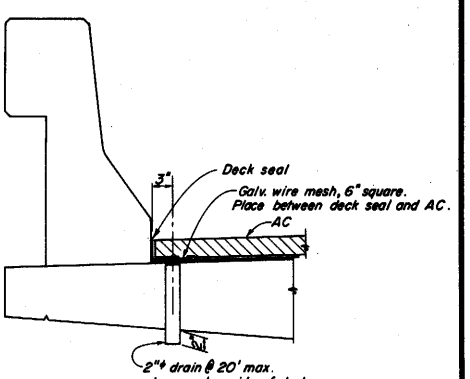


SECTION H-H



PLAN

PEDESTRIAN STRUCTURE DRAIN DETAIL 7-5



DECK BLEEDER DRAIN DETAIL 7-6

STANDARD DRAWING

FILE No. XS-16-60	DESIGN	By E. H. Pomeroy	Checked E. H. Pomeroy	Approval Recommended By
DRAWING 1/80	DETAILS	By E. H. Pomeroy	Checked E. H. Pomeroy	Hengi A. Hendy Jr.
DATE	SUBMITTED BY	E. H. Pomeroy		REGISTERED CIVIL ENGINEER NUMBER 7989

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER

BRIDGE No.

POST MILE

DECK DRAINS

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU WO

Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY)

B7-5

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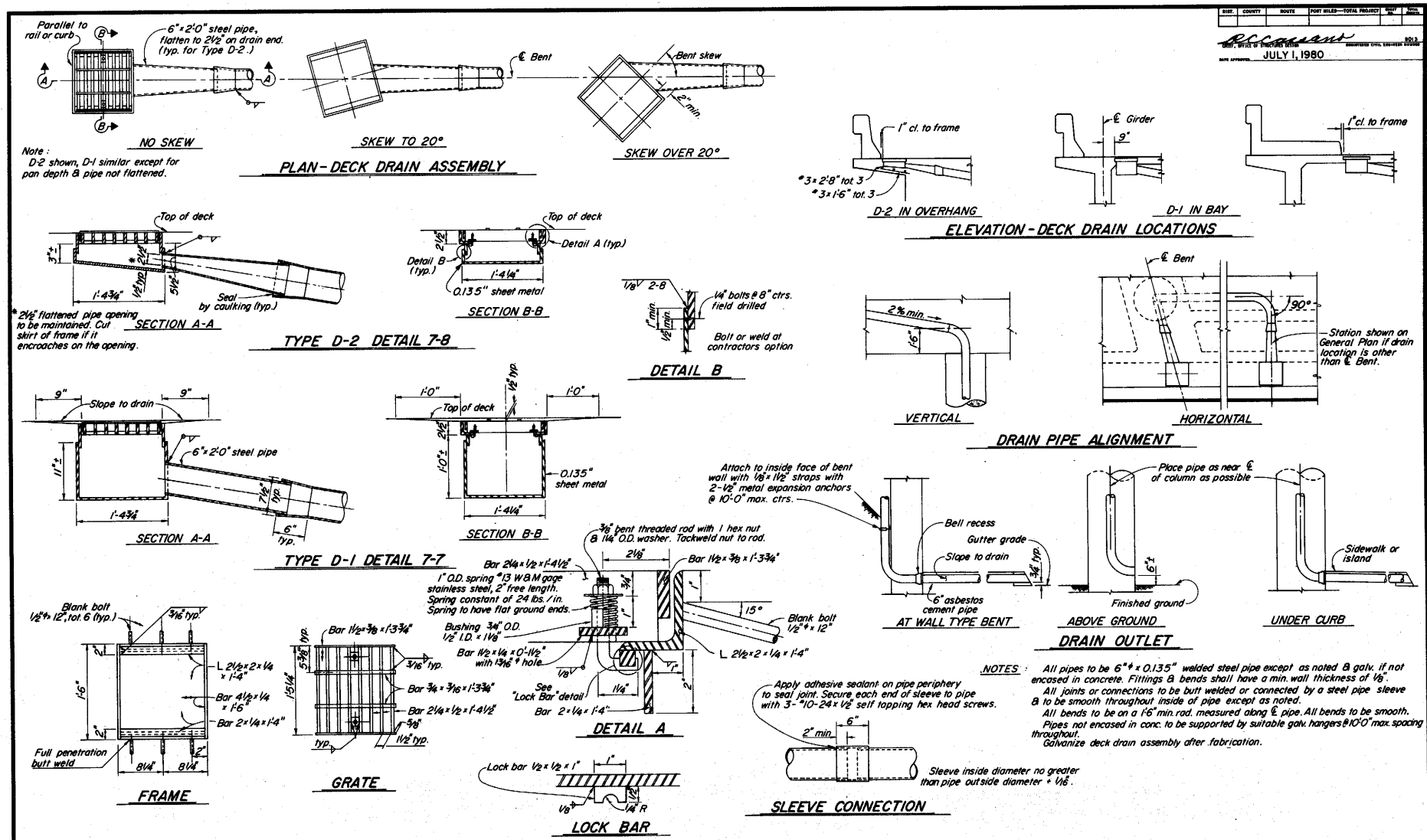
DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

DIRECTOR, OFFICE OF ENGINEERING SERVICES — BRIDGE ENGINEER CIVIL ENGINEER DIVISION
DATE APPROVED JULY 1, 1980



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.

STANDARD DRAWING

FILE No. XS-20-22	DESIGN By E. Pinnery Checked E. W. Parkin	Approval Recommended By Bernard A. Hood
DRAWING 1/80	DETAILS By E. Pinnery Checked E. A. Pinnery	REGISTERED CIVIL ENGINEER NUMBER 13383
DATE	SUBMITTED BY E. W. Parkin	

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN
PROJECT ENGINEER
BRIDGE NO.
POST MILE

DECK DRAINS - TYPES D-1 & D-2

B7-6

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU
WO

Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY)

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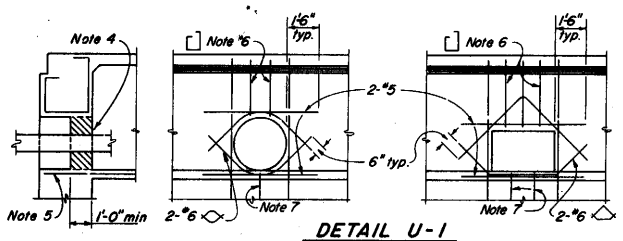
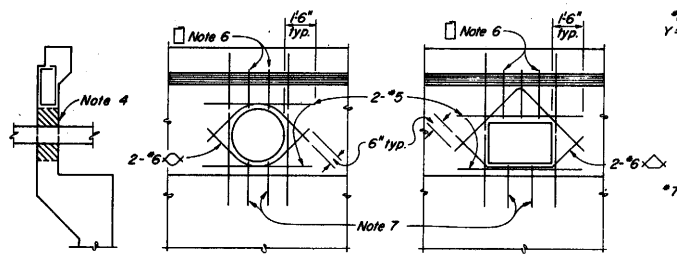
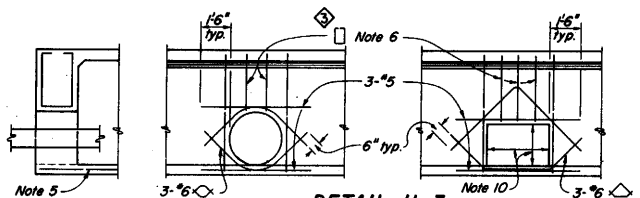
ABUTMENT DIAPHRAGMS



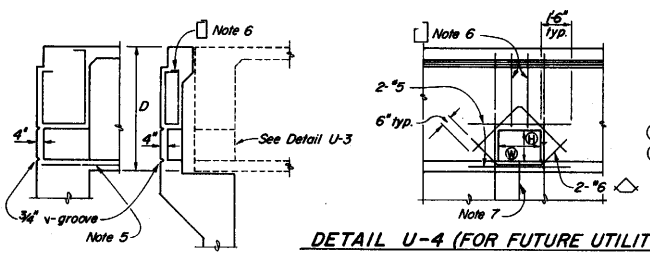
DETAIL U-1



DETAIL U-2



DETAIL U-3



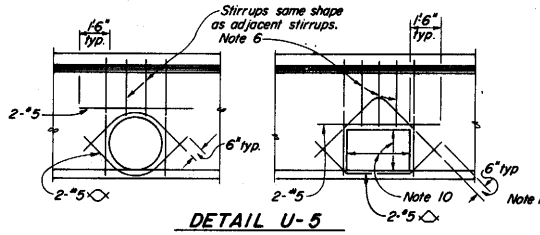
DETAIL U-4 (FOR FUTURE UTILITY OPENING)

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

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

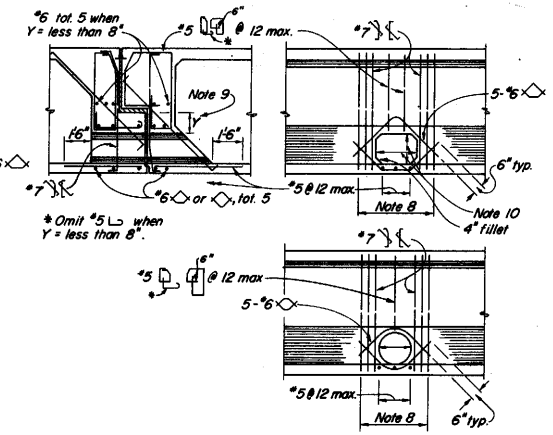
(W) = 1/3 D or 2'-0" min., whichever is greater.

INTERMEDIATE DIAPHRAGMS AND HINGES



DETAIL U-5

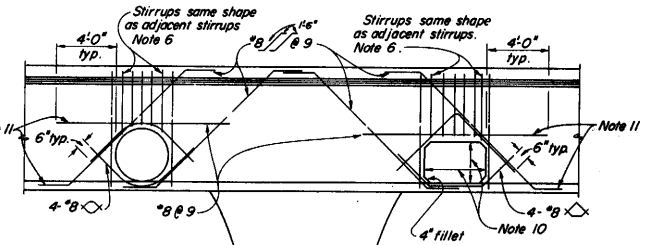
AT INTERMEDIATE DIAPHRAGM



DETAIL U-6

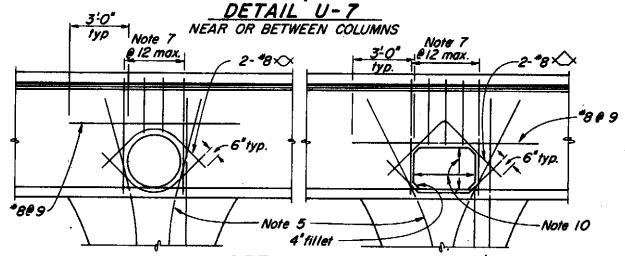
AT HINGE

BENT CAPS



DETAIL U-7

NEAR OR BETWEEN COLUMNS



DETAIL U-8

AT COLUMN

NOTES:

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

SHT.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHT. NO.	TOTAL SHTS.

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

DATE APPROVED: JULY 1, 1980

STANDARD DRAWING

FILE No. XS-16-49	DESIGN By S.D. Mantowski	Checked
DRAWING DATE 1/80	DETAILS By K.C. Blechinger	Checked S.D. Mantowski
	SUBMITTED BY	Approved and Recommended By — REGISTERED CIVIL ENGINEER NUMBER 1981

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER

BRIDGE NO.

POST MILE

UTILITY OPENING - BOX GIRDER

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU WO

Disregard prints bearing earlier revision dates

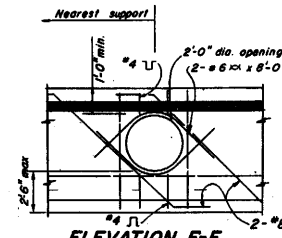
REVISION DATES (PRELIMINARY STAGE ONLY)

B 7-10

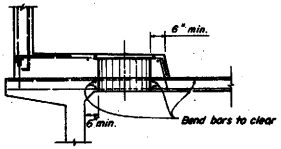
Return to Table of Contents

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

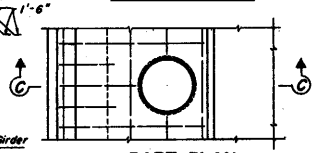
R. Cassano
CHIEF, OFFICE OF STRUCTURES DESIGN — REGISTERED CIVIL ENGINEER NUMBER 8013
DATE APPROVED JULY 1, 1980



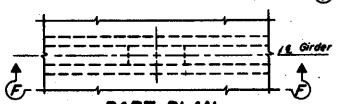
ELEVATION F-F



SECTION C-C



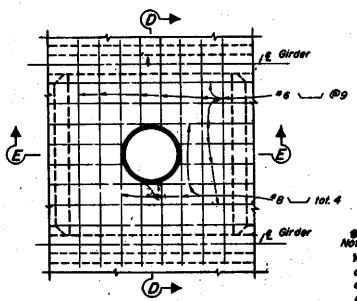
PART PLAN
SIDEWALK ACCESS OPENING
DETAIL U42



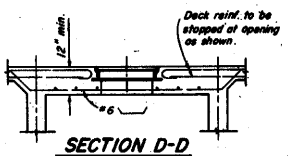
PART PLAN
GIRDER STEM ACCESS OPENING
DETAIL U41

NOTES

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



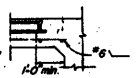
PART PLAN



SECTION D-D

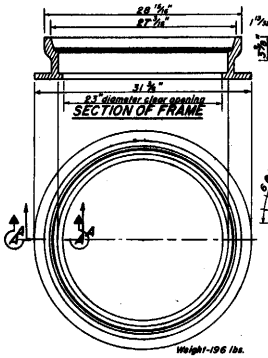
SECTION E-E

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



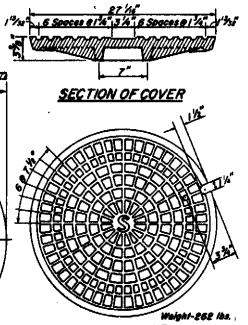
HALF SECTION E'-E'

DECK ACCESS OPENING
DETAIL U43



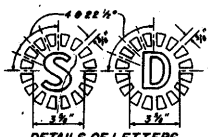
SECTION OF FRAME

PLAN OF FRAME

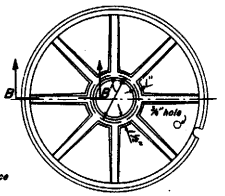


SECTION OF COVER

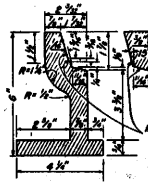
TOP PLAN OF COVER



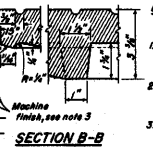
DETAILS OF LETTERS
Surface of letter shall be flush with finished surface



BOTTOM PLAN OF COVER



SECTION A-A

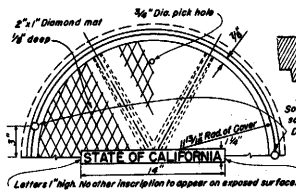


SECTION B-B

NOTES—

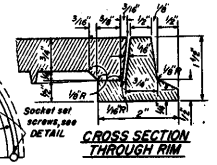
1. The manhole frame and cover shall be made of gray cast iron.
2. All parts of the manhole frame and cover except machined surfaces shall be coated with asphaltum paint.
3. The manhole frame and cover shall be tested for accuracy of fit and shall be marked in sets before delivery. The cover shall fit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

NON-ROCKING MANHOLE FRAME AND COVER FOR DECKS
DETAIL U45

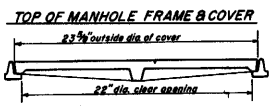


Letters 1" high. No other inscription to appear on exposed surfaces.

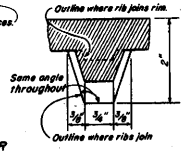
TOP OF MANHOLE FRAME & COVER



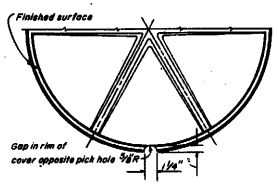
CROSS SECTION THROUGH RIM



CROSS SECTION THROUGH FRAME & COVER

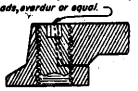


CROSS SECTION THROUGH RIB AT MID RADIUS



BOTTOM OF MANHOLE COVER

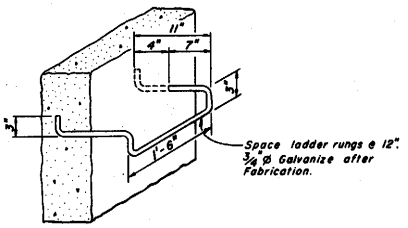
Drill and tap hole and install 3/4"x1 1/4" socket set screw, hexagonal hole, U.S.S threads, everdur or equal.



MANHOLE COVER LOCKING DEVICE DETAIL

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

MANHOLE FRAME AND COVER FOR SIDEWALKS
DETAIL U46



LADDER RUNG DETAIL
DETAIL U44

B7-11

STANDARD DRAWING				
FILE No. XS-16-50	DESIGN	Checked	Approval Recommended By:	
DRAWING 1/80	DETAILS	Checked		
DATE	SUBMITTED BY			

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER

BRIDGE No.

POST MILE

UTILITIES DETAILS

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU
WO

Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY)

B 7-11

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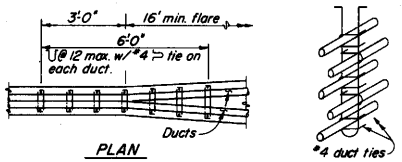
DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

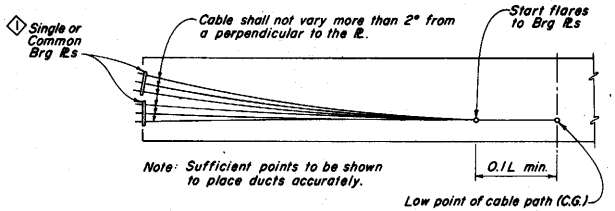
R.C. Lawson — CHIEF, OFFICE OF STRUCTURES DESIGN — REGISTERED CIVIL ENGINEER 9013
DATE APPROVED July 1, 1980



PLAN

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

STIRRUP REINFORCEMENT AT FLARE OF GIRDER STEM



1 BEARING PLATE PRESTRESSING PATH

Distribution of prestressing force:

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

Stressing sequence:

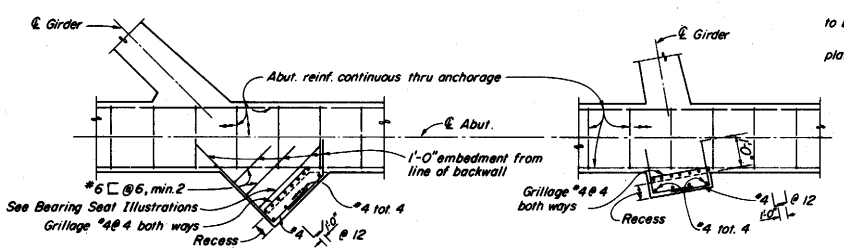
No more than 1/2 of the prestressing force in any girder may be stressed before an equal force is stressed in the adjacent girders. At no time during the stressing operations will more than 1/6 of the total prestressing force be applied eccentrically about the centerline of the structure.

Girder stem shall be flared near anchorage to provide a minimum of 1 1/2" concrete covering the ducts, flare may be on one side of girder only.

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

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

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

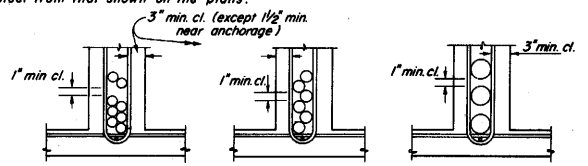


SKEW OVER 20° PLAN

SKEW 20° & UNDER PLAN

Notes:
Recess for anchorage to be filled with concrete.
Edge distance of bearing plates shall be 1 1/2" min.

BEARING SEAT FOR PRESTRESSED ANCHORAGE AT DIAPHRAGM TYPE ABUTMENTS



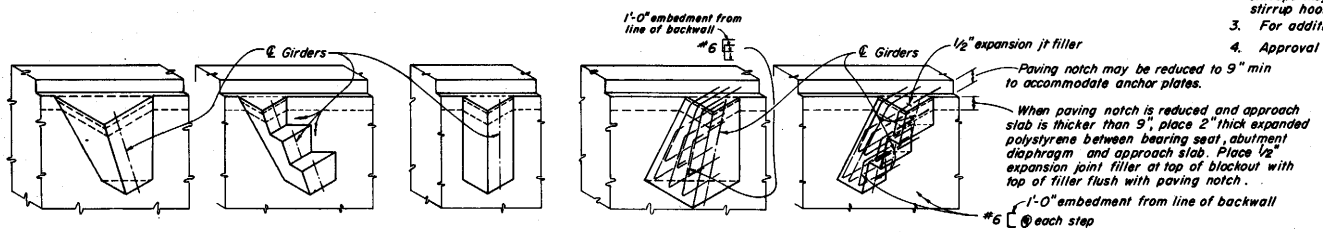
DUCTS 3" O.D. & LESS

DUCTS OVER 3" O.D. to 4 1/2" O.D.

DUCTS OVER 4 1/2" 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 ⊻ or ⊔ stirrups may be used. A reinforcing bar must be placed inside of each stirrup hook or 90° bend.
3. For additional reinforcing details see B7-1
4. Approval of the Engineer is required for deviations.



EXT. SLOPING GIRDER

VERTICAL GIRDER

EXT. SLOPING GIRDER (Reinf Typical)

BEARING SEAT ILLUSTRATIONS

Contractor to submit working drawings to the Engineer for approval.

STANDARD DRAWING				
FILE No. XS-12-46	DESIGN By Z.H. Gunduz	Checked	Approval Recommended By	1 Rev Description
DRAWING DATE 1/80	DETAILS By K.C. Blechinger	Checked		
	SUBMITTED BY			

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER

BRIDGE No.

POST MILE

CAST-IN-PLACE PRESTRESSED GIRDER DETAILS

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

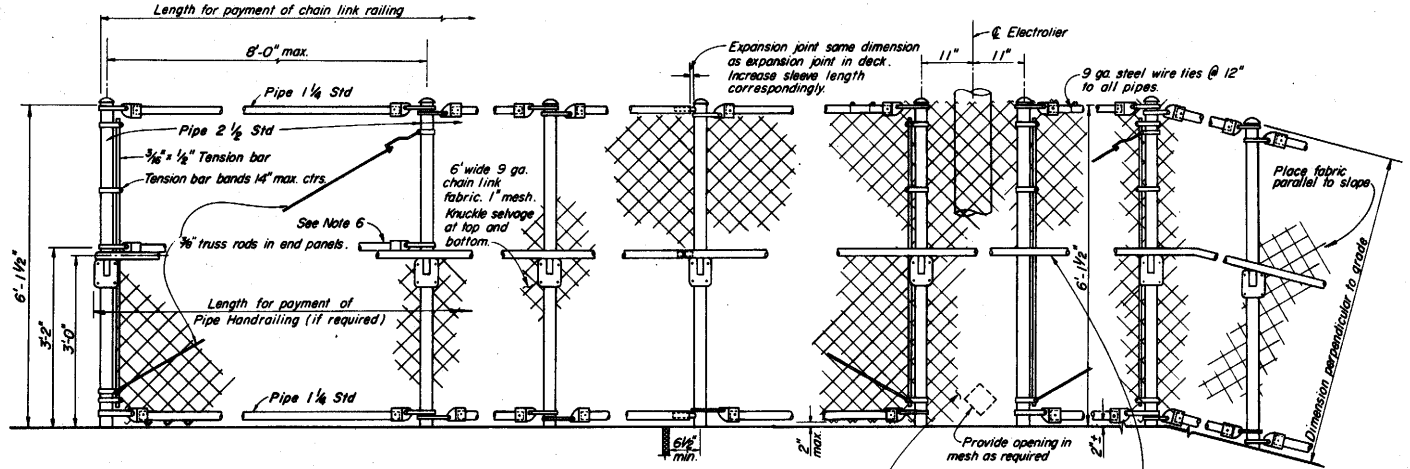
CU WO

Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY)

B8-5

Return to Table of Contents



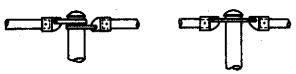
END POST

INTERMEDIATE POSTS

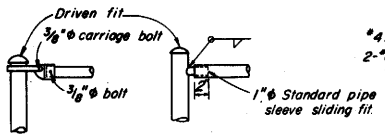
AT DECK EXPANSION JOINTS

AT ELECTROLIER

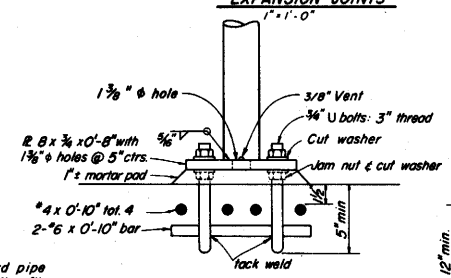
ON SLOPES



ALTERNATIVE DETAILS

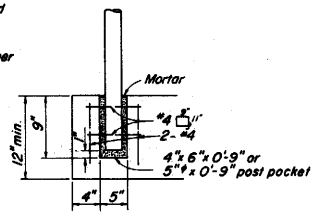


TYPICAL CONNECTION DETAILS



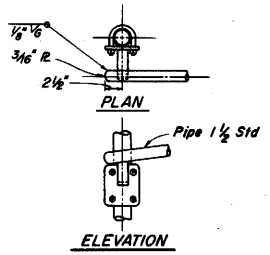
ANCHORAGE DETAIL

3" = 1'-0"

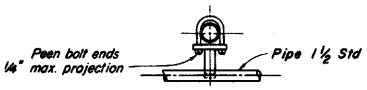


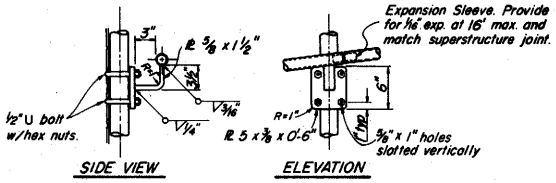
ALTERNATIVE ANCHORAGE DETAIL

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



PIPE HANDRAILING AT END





PIPE HANDRAILING BRACKET

NOTES :

1. Railing assembly except chain link fabric to be galvanized after fabrication.
2. Peen all 3/8" ϕ bolts.
3. Railing shall conform to horizontal and vertical alignment. Posts shall be vertical. Top and bottom pipes shall be bent if radius is 150' or less -- may be on 8' chords if radius is over 150'.
4. When railing is on slope, 6' chain link fabric shall be placed parallel to slope.
5. Alternative details may be submitted by Contractor for Engineer's approval.
6. Additional pipe 1¼ std required when radius is less than 150'.

JULY 1, 1980

STANDARD DRAWING

FILE No. XS-9-73 | DRAWING DATE 1/80 | DESIGN By RPH | DETAILS By | SUBMITTED BY | Checked RWB & HOP | Checked RW Bishop | Approved Recommended by | REGISTERED CIVIL ENGINEER NUMBER 8178

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER

BRIDGE No.

POST MILE

CHAIN LINK RAILING

CU WO

Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

BII-7

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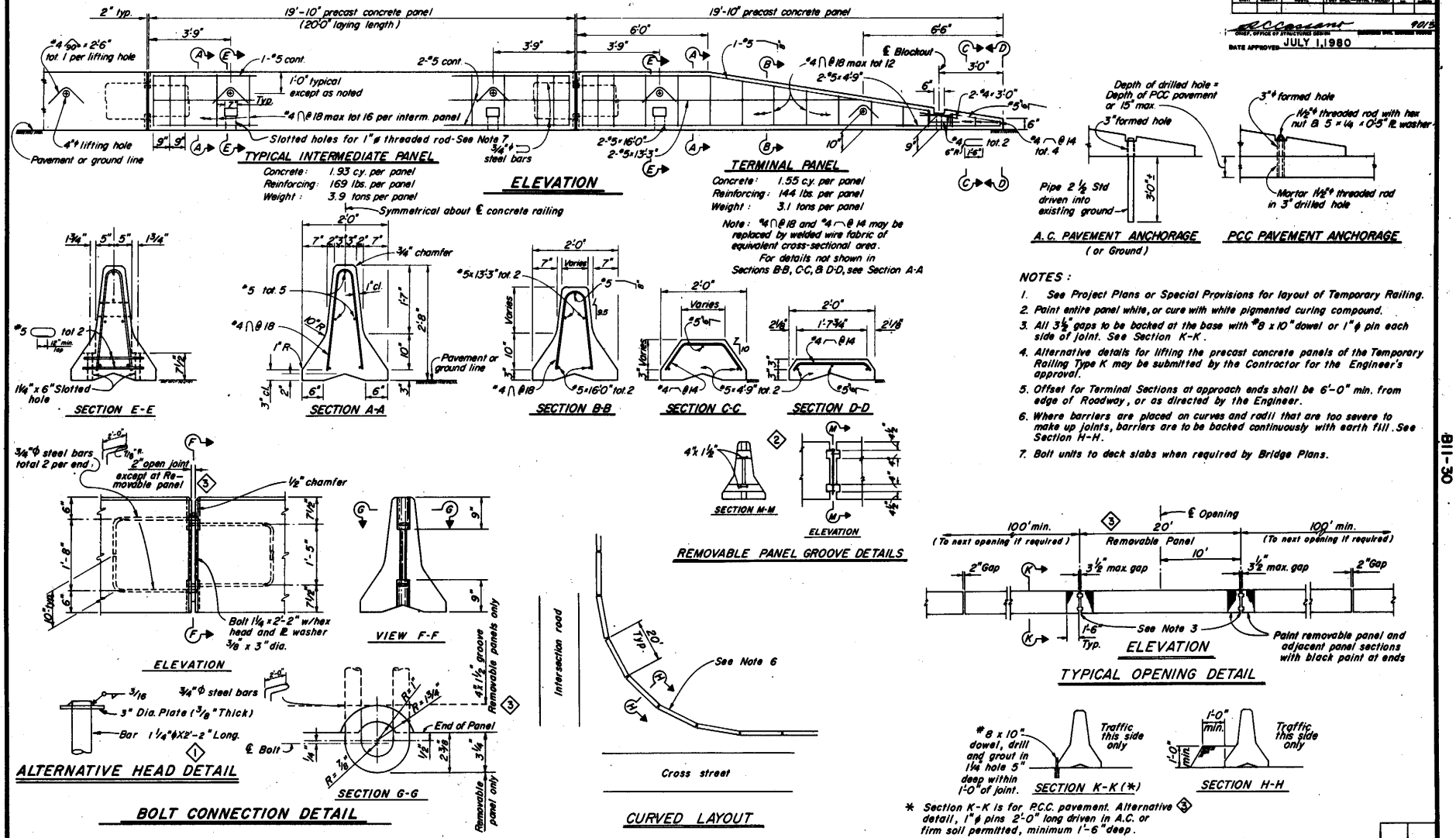

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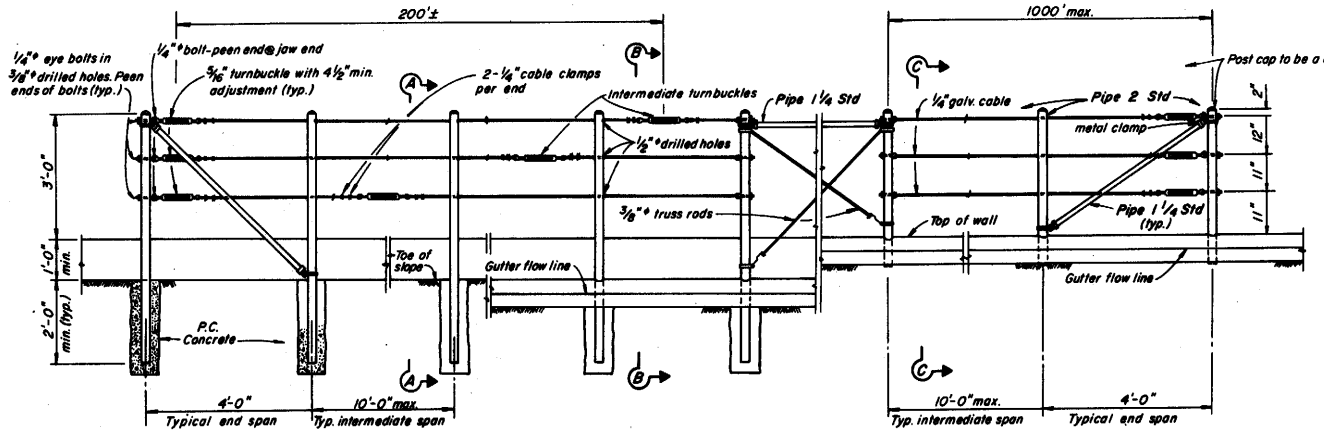
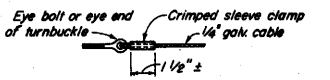


RETAINING WALL (Without Gutter)
EXISTING

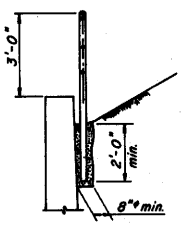
RETAINING WALL (With Gutter)
EXISTING

RETAINING WALL (With Gutter)
NEW CONSTRUCTION

ELEVATION

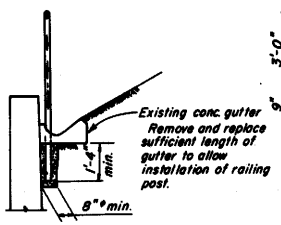


ALTERNATIVE CABLE CONNECTION



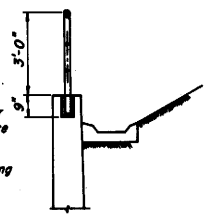
EXISTING

SECTION A-A



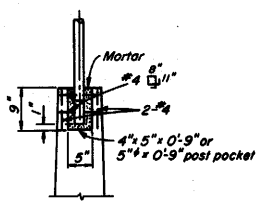
EXISTING

SECTION B-B

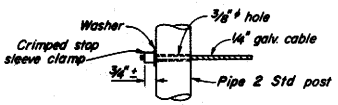


NEW CONSTRUCTION

SECTION C-C



POST POCKET



ALTERNATIVE DEAD END ANCHORAGE

NOTES:

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

JULY 1, 1980

STANDARD DRAWING

FILE No. XS-9-97 | DESIGN By RDH | Checked RW Bishop
DRAWING DATE 1/80 | DETAILS By | Checked RW Bishop
SUBMITTED BY | Approved Recommended by | 7-8-80

State of CALIFORNIA
DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN
PROJECT ENGINEER

BRIDGE No.
POST MILE

CABLE RAILING

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

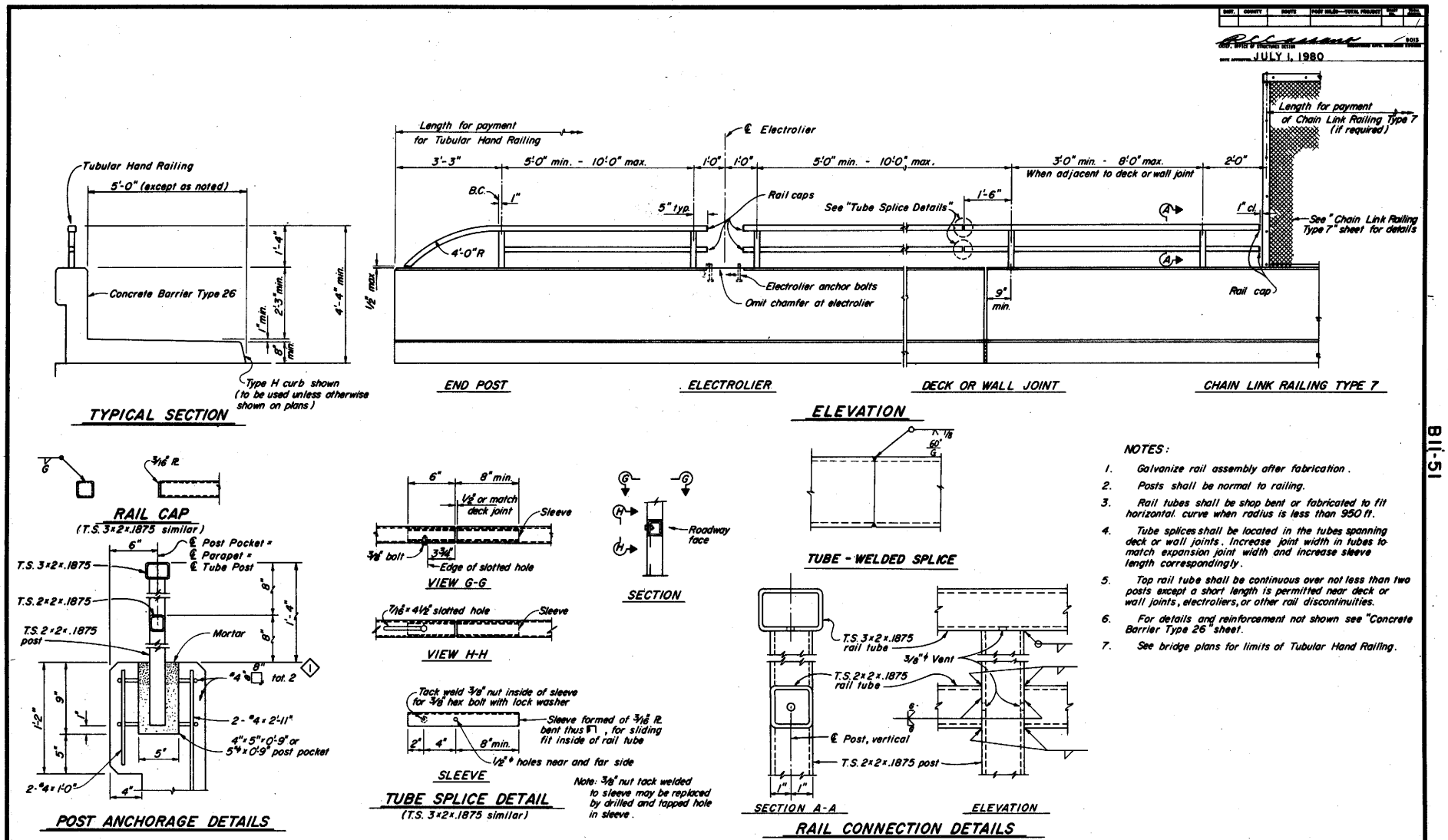
CU
WO

Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY DRAWN ONLY)

B11-47

Return to Table of Contents



NOTES:

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

STANDARD DRAWING

FILE No. XS-9-101 | DRAWING 1/80 | DATE | DESIGN By R.P.U. | DETAILS By | SUBMITTED BY | Checked R.W. Bishop | Checked R.W. Bishop | Approved by | REGISTERED CIVIL ENGINEER NUMBER 8198

1 REV. REINF.

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER

BRIDGE No.

POST MILE

TUBULAR HAND RAILING

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

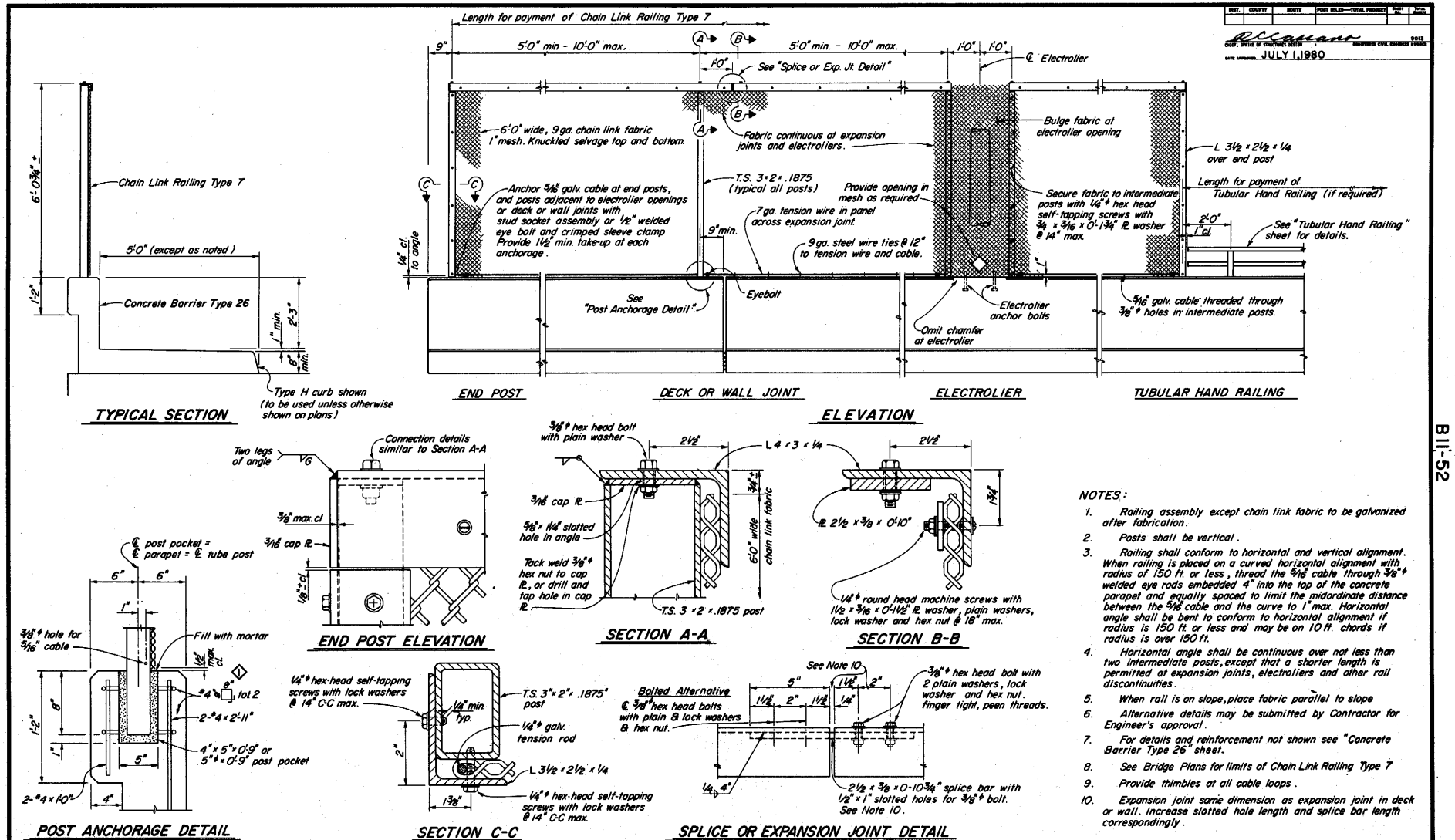
CU WO

Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY)

B11-51

Return to Table of Contents



NOTES:

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

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

R. C. Sullivan — CHIEF, OFFICE OF STRUCTURES DESIGN — REGISTERED CIVIL ENGINEER 9013
DATE APPROVED: JULY 1, 1980

STANDARD DRAWING

FILE No. XS-9-102	DESIGN By R O H	Checked R W Bishop	Approval Recommended By
DRAWING 1/80 DATE	DETAILS By	Checked R W Bishop	REGISTERED CIVIL ENGINEER NUMBER 7881
	SUBMITTED BY		

◇ REV REINF.

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN
PROJECT ENGINEER

BRIDGE No.
POST MILE

CHAIN LINK RAILING TYPE 7

DH-09-D 147

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

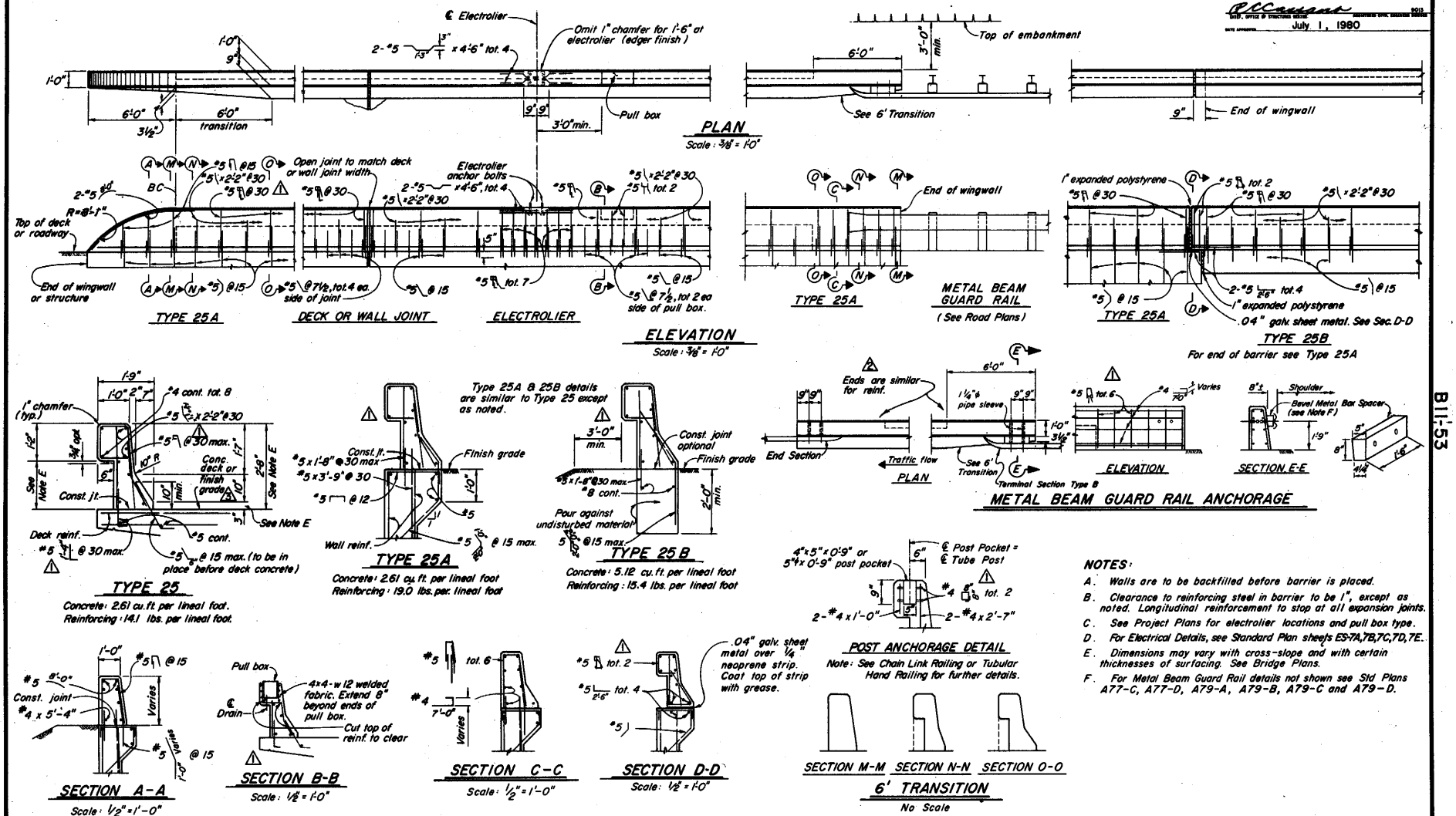
CU
WO

Disregard prints bearing earlier revision dates →

REVISION DATES (PRELIMINARY STAGE ONLY)

BII-52

Return to Table of Contents



NOTES:

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

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

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

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

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

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

STANDARD DRAWING

FILE No. XS-9-103	DESIGN By R O H	Checked R W Bishop	Approved Recommended by Harold Marcenaro
DRAWING DATE 1/80	DETAILS By	Checked R W Bishop	REGISTERED CIVIL ENGINEER NUMBER 8198
	SUBMITTED BY		

1. Revised Reinf.
2. Added Notes & Dimensions
3. Added Finish Grade

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER

BRIDGE No.

POST MILE

CONCRETE BARRIER TYPE 25

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

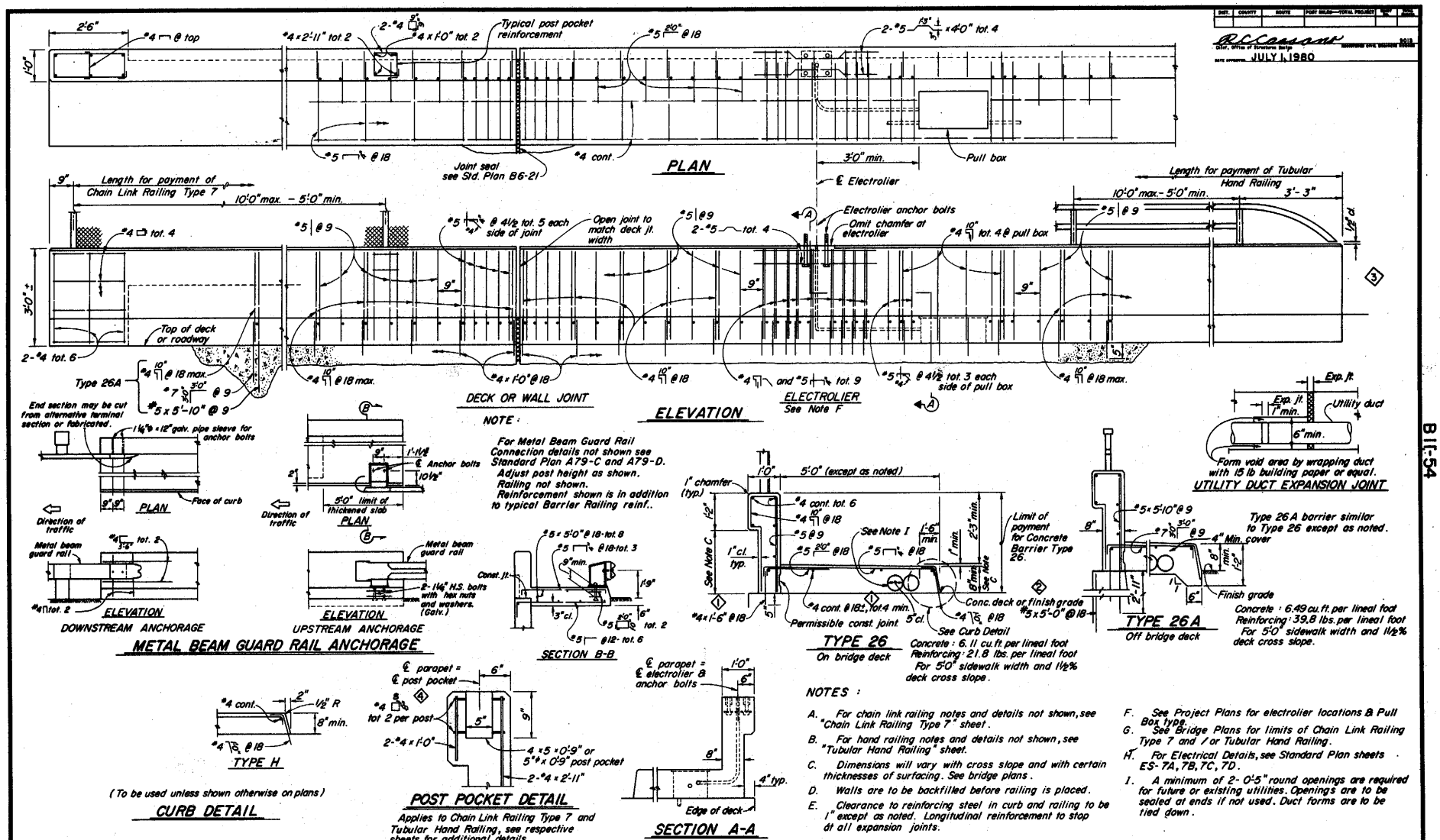
CU WO

Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY)

B11-53

Return to Table of Contents



NOTES:

A. For chain link railing notes and details not shown, see "Chain Link Railing Type 7" sheet.

B. For hand railing notes and details not shown, see "Tubular Hand Railing" sheet.

C. Dimensions will vary with cross slope and with certain thicknesses of surfacing. See bridge 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 Bridge Plans for limits of Chain Link Railing Type 7 and / or Tubular Hand Railing.

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

I. A minimum of 2-0'-5" round openings are required for future or existing utilities. Openings are to be sealed at ends if not used. Duct forms are to be tied down.

STANDARD DRAWING

FILE No. XS-9-104	DESIGN By RPH	Checked RW Bishop	Approved Recommended By Lloyd Manwiek
DRAWING DATE 1/80	DETAILS By	Checked RW Bishop	8/98
	SUBMITTED BY		

1. INCREASED REINF.
2. REVISED REFERENCE SURFACE DESCRIPTION
3. REMOVE APPROACH RAIL
4. REVISED REINF.

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER

BRIDGE No.

POST MILE

CONCRETE BARRIER TYPE 26

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU WO

Disregard prints bearing earlier revision dates

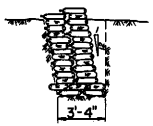
REVISION DATES (PRELIMINARY STAGE ONLY)

B11-54

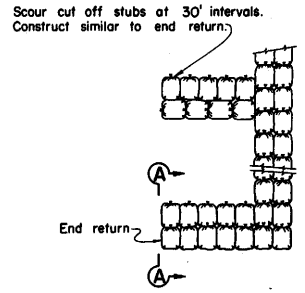
Return to Table of Contents

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

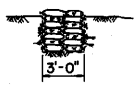
R.C. Cassano
DIRF. OFFICE OF STRUCTURES DESIGN — REGISTERED CIVIL ENGINEER 8013
DATE APPROVED JULY 1, 1980



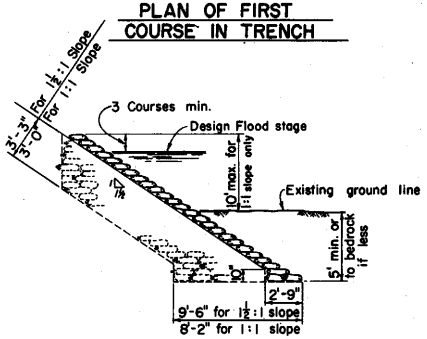
SECTION A-A



PLAN OF FIRST COURSE IN TRENCH

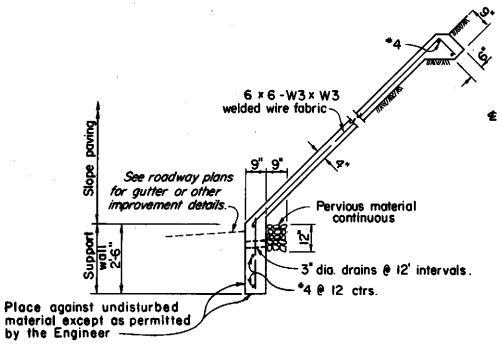


SECTION OF SCOUR CUT-OFF STUBS

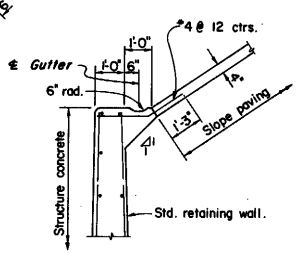


TYPICAL SECTION

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

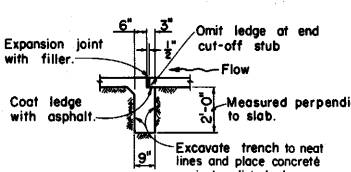


TYPICAL SECTION "C"

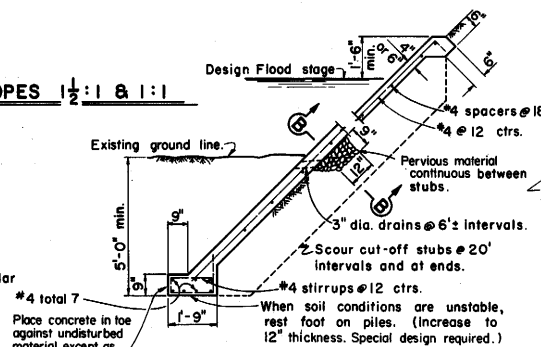


TYPICAL SECTION "D"

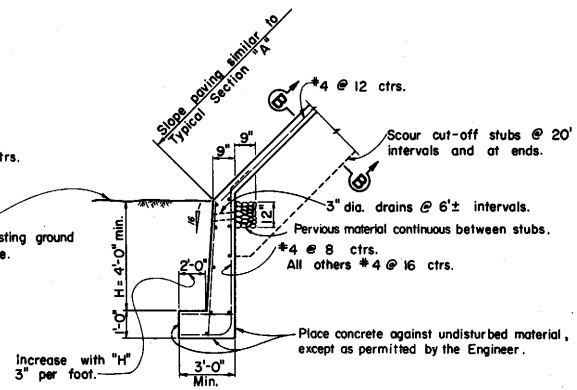
Note: Typical Section "C" and "D" not to be used adjacent to waterways.



SECTION B-B
Scale: ½" = 1'-0"



TYPICAL SECTION "A"



TYPICAL SECTION "B"

CONCRETE SLOPE PROTECTION
Scale: ½" = 1'-0"

STANDARD DRAWING				
FILE No. XS-19-1	DESIGN By W.T. Eliff	Checked	Approval Recommended By Sumil Mancent	
DRAWING DATE 1/80	DETAILS By	Checked W.T. Eliff	DESIGN ENGINEER	REGISTERED CIVIL ENGINEER NUMBER 8198
	SUBMITTED BY W.T. Eliff			

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER

BRIDGE No.

POST MILE

SLOPE PROTECTION DETAIL NO. 1

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU
WO

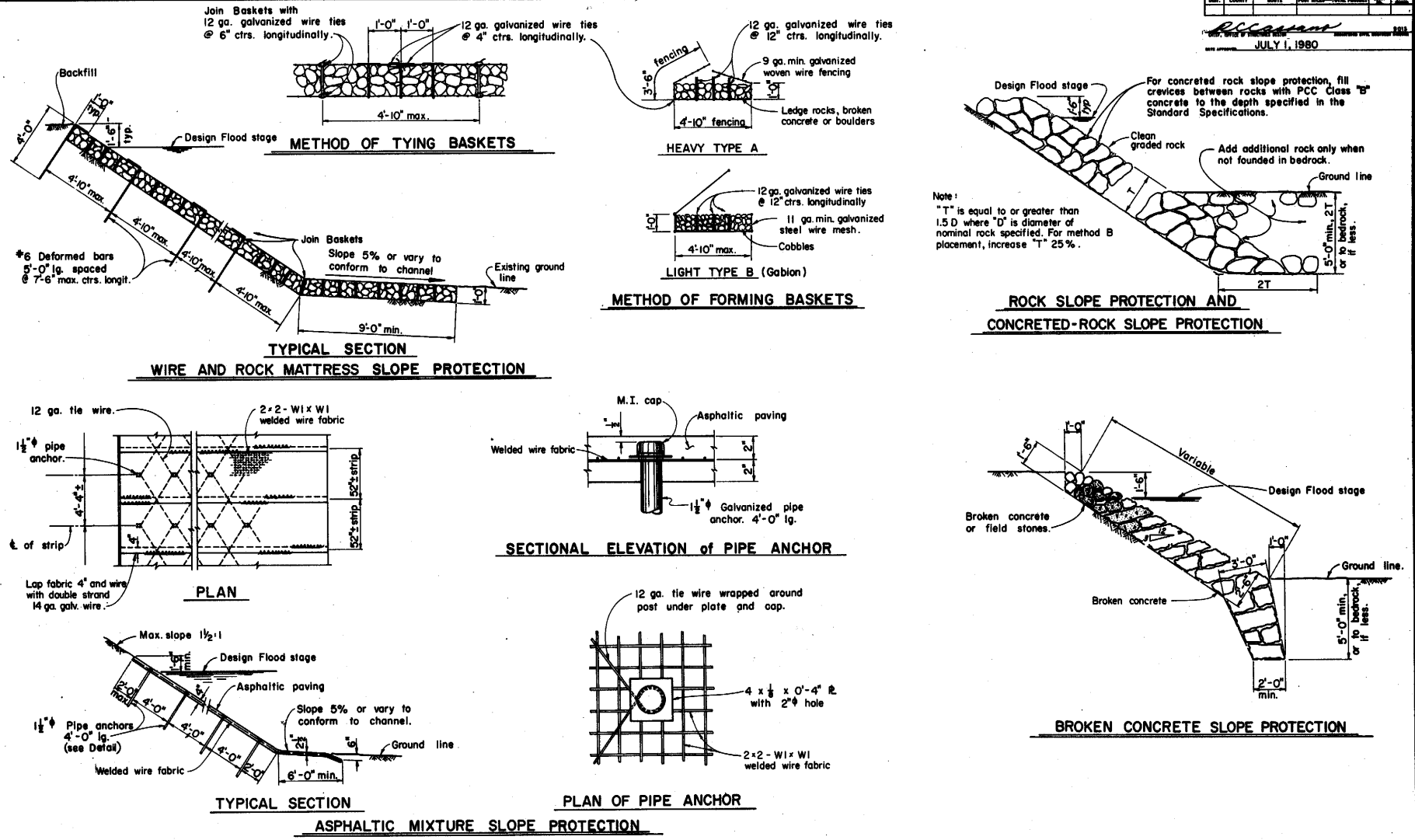
Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY)

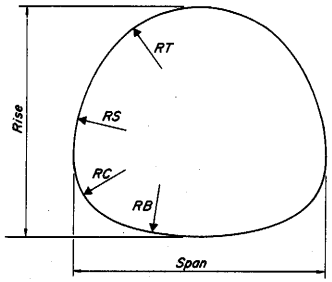
B13-1

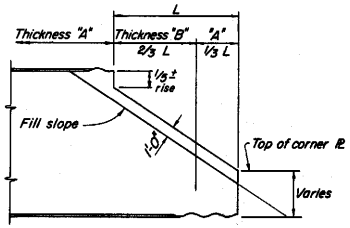
B13-1

Return to Table of Contents



Return to Table of Contents

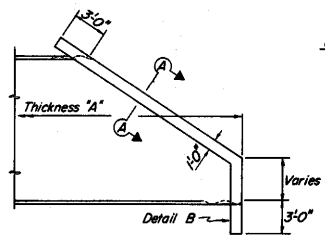




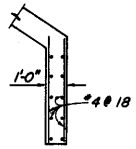
SIDE ELEVATION

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

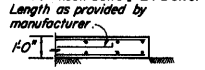
ALTERNATIVE 1



SIDE ELEVATION

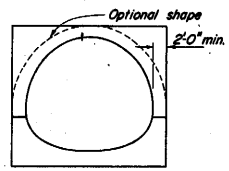


DETAIL B



SECTION A-A

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



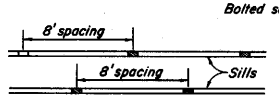
END ELEVATION

ALTERNATIVE 2

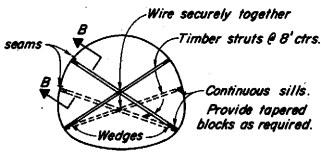
MAXIMUM HEIGHT OF FILL (Feet)																	
		Thickness (Inches)												LAYOUT DATA (inches)			
		0.109	0.138	0.168	0.188	0.109	0.138	0.168	0.188	0.218	0.249	0.280					
		Soil Pressure 1.5 Tons/s.f.				For soil pressures, see Table A below											
SPAN	RISE													RT	RS	RC	RB
12'-2"	11'-0"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

Structures require strutting for fill heights below heavy lines.

END BEVELS



SECTION B-B



TYPICAL SECTION

NOTES:

A. Struts shown are minimum required and are for earth loads only.
B. Tabular data based on 6"x2" corrugations, (Structural steel plate)
C. Minimum cover from crown to shoulder hinge point = 5.0'.
D. Backfill shall be brought up uniformly on both sides of the structure.
E. Minimum cover for construction loading, see D-88 of Standard Plans.

STRUTTING DETAILS

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

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

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

B14-1

STANDARD DRAWING
FILE No. XS-2-41
DRAWING 1/80
DATE
DESIGN By R. L. Becker Checked Albert Banke
DETAILS By R. L. Becker Checked Albert Banke
SUBMITTED BY R. L. Becker
Approval Recommended by W. O. Gerhardt
REGISTERED CIVIL ENGINEER NUMBER 22889

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN
PROJECT ENGINEER

BRIDGE No.
POST MILE

STRUCTURAL STEEL PLATE VEHICULAR UNDERCOSSING

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

B14-1

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TABLE OF FOOTING WIDTHS IN FEET

RISE / SPAN RATIO = 0.50

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

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

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

TABLE OF FOOTING WIDTHS IN FEET

RISE / SPAN RATIO = 0.30

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

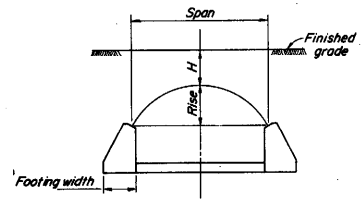
INVERT QUANTITIES PER LINEAL FOOT

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

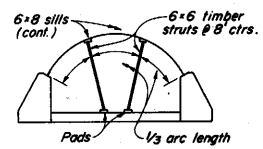
FOOTING QUANTITIES PER LINEAL FOOT (one footing)

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

QUANTITIES SHOWN ARE FOR DESIGN PURPOSES ONLY



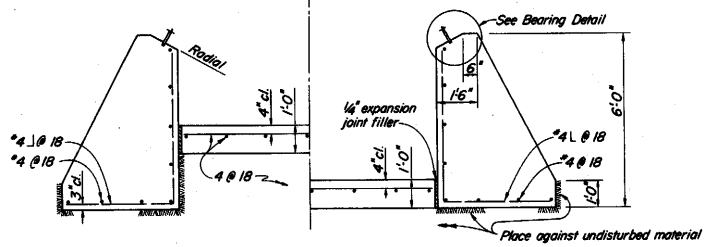
TYPICAL SECTION



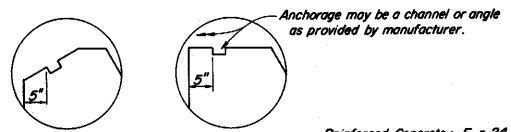
*STRUTTING DETAILS

Pad size as directed by Engineer

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



FOOTING AND INVERT DETAILS



SLOPED SEAT
Rise / Span = 0.30

LEVEL SEAT
Rise / Span = 0.50

BEARING DETAIL

Reinforced Concrete: F_s = 24,000 P.S.I.
N = 10
F_c = 1,300 P.S.I.

NOTES:

A. Structural steel plate, 6"x 2" corrugations. Minimum depth of cover = 5'-0".

B. Footing widths not to be extrapolated or interpolated. Special designs required for loadings not covered.

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

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

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

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

R. Sullivan
CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER
DATE APPROVED JULY 1, 1980

STANDARD DRAWING

FILE NO. XS-2-42 | DESIGN By G. S. Parker | Checked Albert Barker | Approval Recommended By W. C. Ambrosini
DRAWING 1/80 | DETAILS By E. J. Dwyer | Checked Albert Barker | ASSISTANT CHIEF ENGINEER
DATE | SUBMITTED BY G. S. Parker | REGISTERED CIVIL ENGINEER NUMBER 7489

State of CALIFORNIA
DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN
PROJECT ENGINEER
BRIDGE No.
POST MILE

STRUCTURAL STEEL PLATE ARCHES

B14-2

DS-DD-D 147

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 1 0 1 2 3

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WO

Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY)

B14-2

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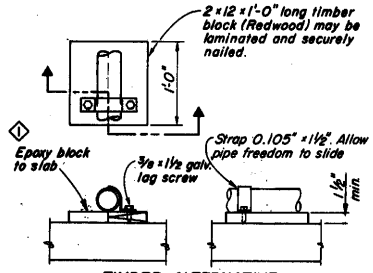
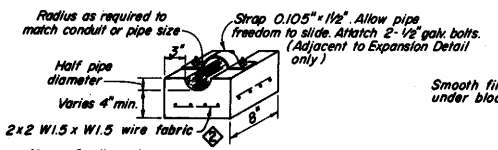
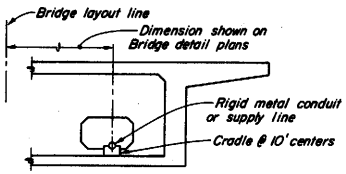


TIMBER ALTERNATIVE

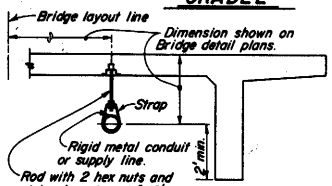


Note: Cradle to be precast concrete. Secure to bottom slab with epoxy adhesive.

CONCRETE ALTERNATIVE



BOX GIRDER CRADLE

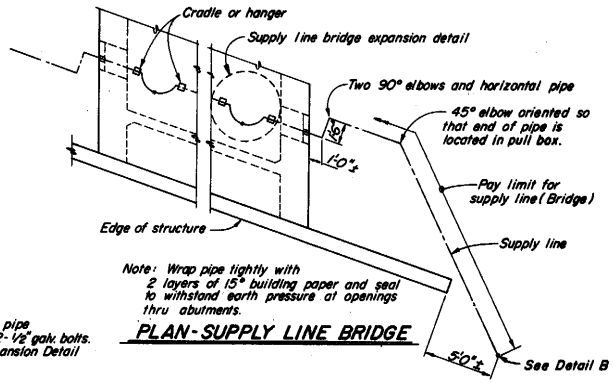


Conduit or pipe	2"	3"	4"
Rod	3/8"	1/2"	5/8"
Strap	0.090 x 1"	0.090 x 1"	0.105 x 1 1/2"

OTHER THAN BOX GIRDER HANGER

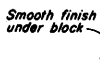
Note: Cradle straps, hanger rods, and hanger straps to be galvanized after fabrication.

SUPPORT DETAILS

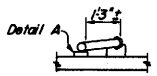


Note: Wrap pipe tightly with 2 layers of 15# building paper and seal to withstand earth pressure at openings thru abutments.

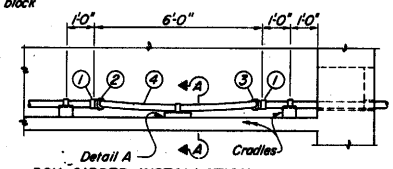
PLAN-SUPPLY LINE BRIDGE



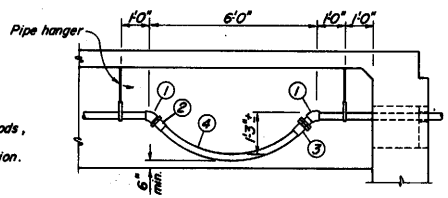
DETAIL A



SECTION A-A



BOX GIRDER INSTALLATION

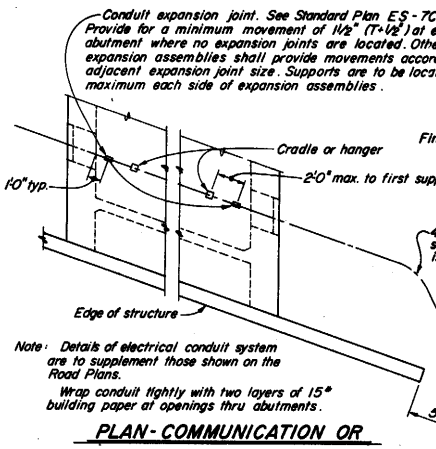


INSTALLATION FOR OTHER STRUCTURE TYPES

1. 45° pipe elbow
2. Hose fitting, male spud
3. Hose fitting, female spud with swivel nut.
4. Hose 6'-3"± length (I.D. shall be nominal size of pipe).

1. Use expansion assembly at one abutment or as shown elsewhere on the plans.
2. Openings through diaphragms and bent caps to be twice the diameter of the pipe unless otherwise detailed on the plans.

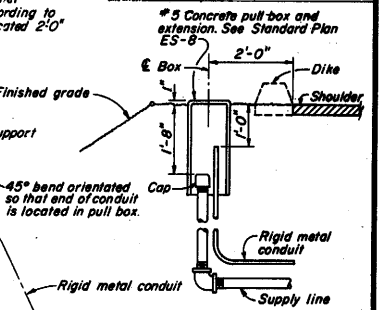
SUPPLY LINE BRIDGE EXPANSION DETAILS



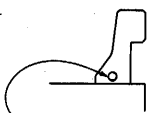
Note: Details of electrical conduit system are to supplement those shown on the Road Plans.

Wrap conduit tightly with two layers of 15# building paper at openings thru abutments.

PLAN-COMMUNICATION OR SPRINKLER CONTROL CONDUITS

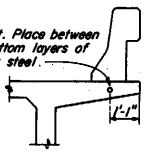


DETAIL B

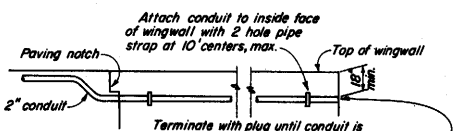


3" max conduit in rail. See Standard Plan ES-7B & 7C.

CONDUIT IN BRIDGE RAIL



CONDUIT IN OVERHANG

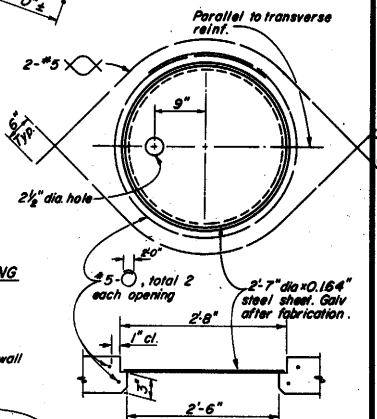


CONDUIT IN OVERHANG - WINGWALL DETAIL

CONDUIT LOCATIONS

(For 2" conduit only except as noted)

For location see Bridge Detail plans.



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

ACCESS OPENING

1. Changed hold down from bolt to epoxy
2. Changed "wire mesh" to "wire fabric"

STANDARD DRAWING

FILE No. XS-20-45 | DESIGN by G.H. Imbsen | Checked C.W. PURKISS
DRAWING DATE 1/80 | DETAILS by H.C. Blechinger | Checked C.W. PURKISS
SUBMITTED BY Charles W. Purkiss | Approved Recommended by Gene A. Hood Jr. 7/1/80

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER

BRIDGE No.

PORT MUX

SUPPLY LINE AND COMMUNICATION & SPRINKLER CONTROL CONDUITS (MAXIMUM PIPE OR CONDUIT SIZE = 4")

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

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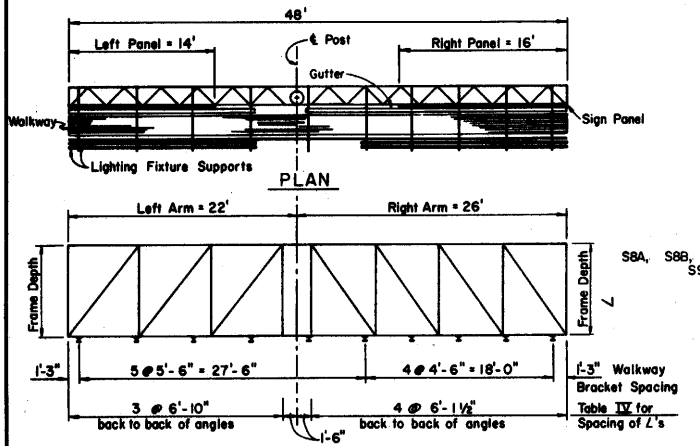
WO

Disregard prints bearing earlier revision dates

B 14-3



UNBALANCED SINGLE POST TYPE

EXAMPLE NO. 1

INSTRUCTIONS TO FABRICATOR

PROJECT PLANS SHOW:

1. Sign structure location.
2. Length of structure frame.
3. Panel size and locations on structure.
4. Walkway length for 2-post signs.
5. Post type and height to bottom of frame.
6. Base plate elevation.
7. Footing elevation or location of pile foundation.
8. Photoelectric cell location if required.

REFER TO THE FOLLOWING STANDARD PLANS FOR DETAILS NOT SHOWN ON PROJECT PLANS:

S1-12. Instructions and examples.
S2-11. Post types II thru VIII.
S3-11. Post types I-S thru VIII-S.
S4-6. Structural frame members
S5-6. Structural frame members.
S6-8. Structural frame details.
S7-8. Frame juncture details.
S8A, S8B, S8C, S8D Sign panel mounting details.
S9-12 & S10-9. Walkway details no. 1 & no. 2.
S11-10. Walkway safety railing details.
S13-10. Pile foundation.
ES31. Fluorescent Sign Lighting Equipment (72").
ES32A. Fluorescent 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.

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

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

DATE APPROVED July 1, 1980

GENERAL NOTES

SPECIFICATIONS:

DESIGN: A.A.S.H.O. Specifications for the Design and Construction of Structural Supports for Highway Signs, dated 1968.

CONSTRUCTION: Standard Specifications, and the Special Provisions.

LOADING:

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

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

UNIT STRESSES:

STRUCTURAL STEEL: Fs = 20,000 P.S.I.

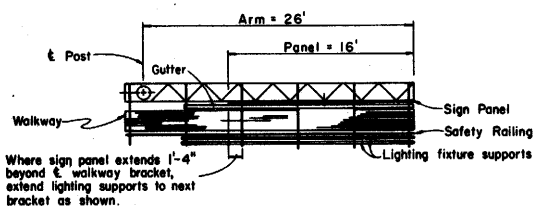
REINFORCED CONCRETE: Fs = 20,000 P.S.I.; Fc = 1,200 P.S.I.

FOOTING SOIL PRESSURE: 1¼ tons/sq. ft.

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

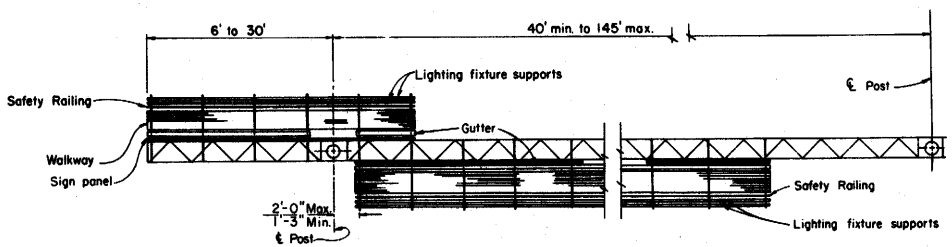
WELDING: All welding continuous unless otherwise noted on the plans. All welding to be done in accordance with the Standard Specifications.

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
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
TRUSS
INSTRUCTIONS AND EXAMPLES

S1-12

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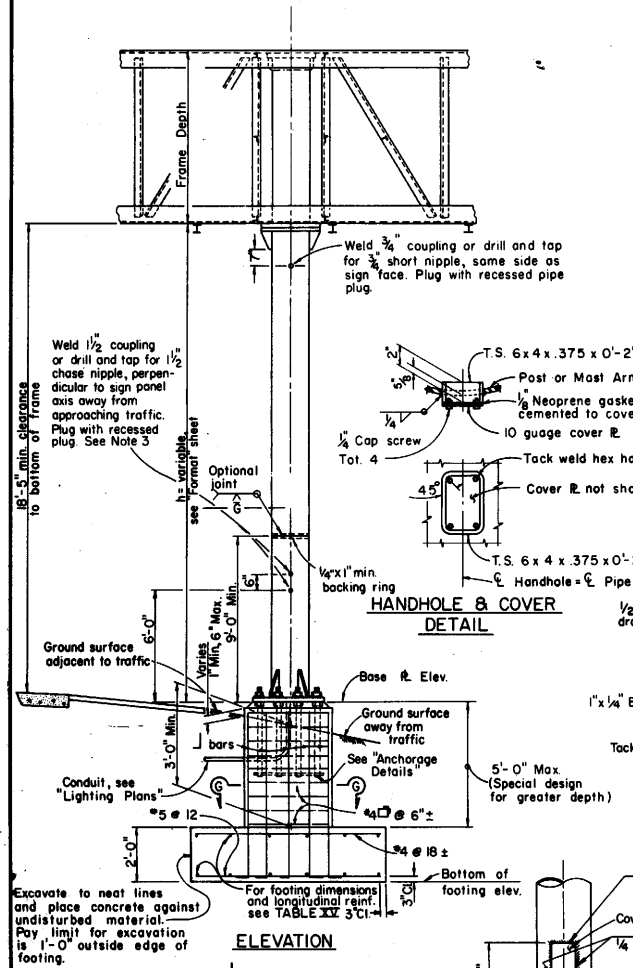
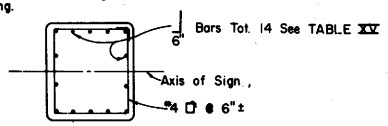
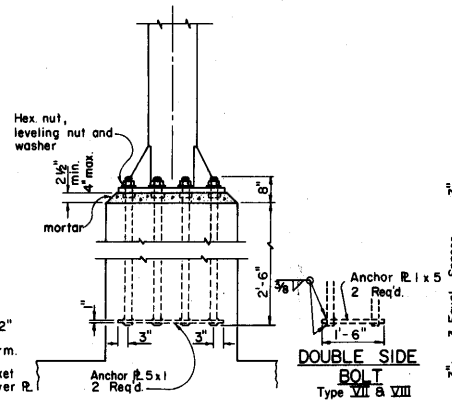


ELEVATION



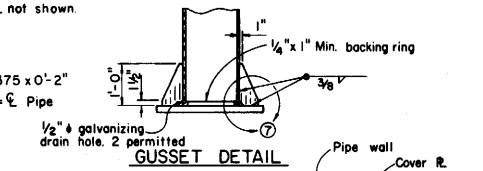
SECTION G-G

HANDHOLE & COVER DETAIL

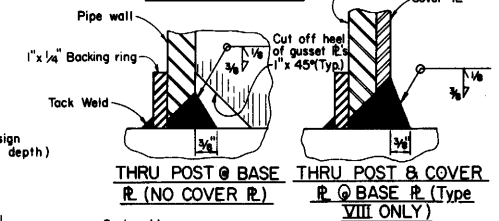


ANCHORAGE DETAILS

DOUBLE SIDE BOLT
Type VII & VIII



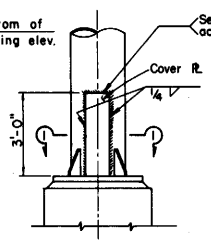
GUSSET DETAIL



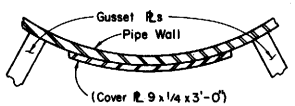
THRU POST @ BASE PL (NO COVER PL)

THRU POST & COVER PL @ BASE PL (Type VIII ONLY)

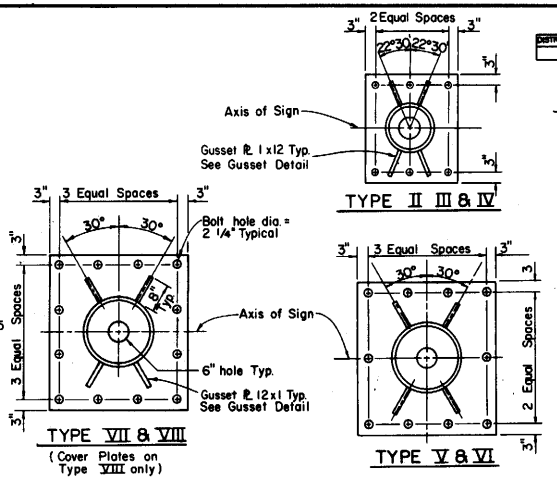
DETAIL 7



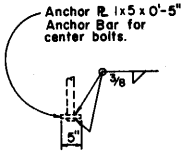
PARTIAL ELEVATION TYPE VIII POST
(Anchor bolts not shown)



SECTION 1-1



TYPICAL BASE PLATES



SINGLE SIDE BOLT
Type V & VI

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	J Bars
II	12" Std. @ 49.56	1'-7"x 1'-7"x 7/8"	2'-4"x 2'-1"x 2"	6	2'-11"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"x 12'-0"	6-#5 bars	8-#7 bars	#6
IV	16" O.D. @ 82.77	1'-10"x 1'-10"x 7/8"	3'-1"x 2'-9"x 2"	6	3'-8"x 3'-4"	8'-0"x 14'-0"	6-#5 bars	9-#8 bars	#6
V	18" O.D. @ 93.45	2'-0"x 2'-0"x 7/8"	3'-3"x 3'-0"x 2"	10	3'-10"x 3'-7"	9'-0"x 15'-0"	6-#5 bars	9-#9 bars	#7
VI	20" O.D. @ 104.13	2'-2"x 2'-2"x 1"	3'-3"x 3'-0"x 2"	10	3'-10"x 3'-7"	9'-0"x 16'-0"	6-#6 bars	8-#10 bars	#8
VII	24" O.D. @ 125.49	2'-6"x 2'-6"x 1"	3'-7"x 3'-3"x 2"	12	4'-3"x 3'-11"	10'-0"x 17'-0"	7-#6 bars	10-#10 bars	#10
VIII	24" O.D. @ 125.49 with cover PL	2'-6"x 2'-6"x 1"	3'-9"x 3'-3"x 2"	12	4'-5"x 3'-11"	10'-0"x 18'-0"	10-#6 bars	11-#10 bars	#10

NOTES:
1. For "General Notes" see "Instructions and Examples" sheet, S1-12.
2. Longer sides of Base Plates, Pedestals & Footing shall be normal to axis of sign.
3. Backfill shall be in place prior to erection of post.
4. Thread upper 8" of anchor bolts and galvanize upper 1'-0".
5. Spread footing shown, use Pile Foundation when shown on the Project Plans
6. Anchor PLs may be retained with hex. nut or formed head as alternatives to details shown.
7. On single post sign structures, the post shall be raked out of plumb, with the use of the leveling nuts to make the bottom of the sign frame level.
8. At final position of post all top and bottom nuts shall be tightened against base plate.
9. When foundation is located on a steep slope with exposed face of concrete adjacent to traffic, see detail on "Pile Foundation" sheet, S13-10.
10. Slope protection required when indicated on the Project Plans.

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

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

DATE APPROVED July 1, 1980

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
TRUSS
SINGLE POST TYPE
POST TYPES II THRU VIII

S2-11

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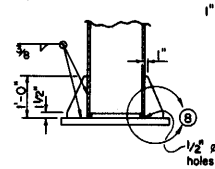
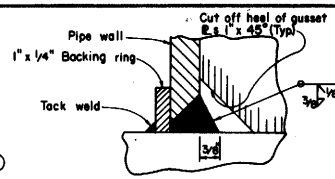


SECTION S-S

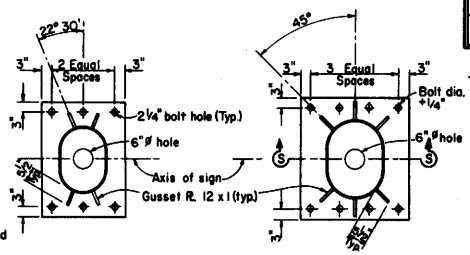


DETAIL 8

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:

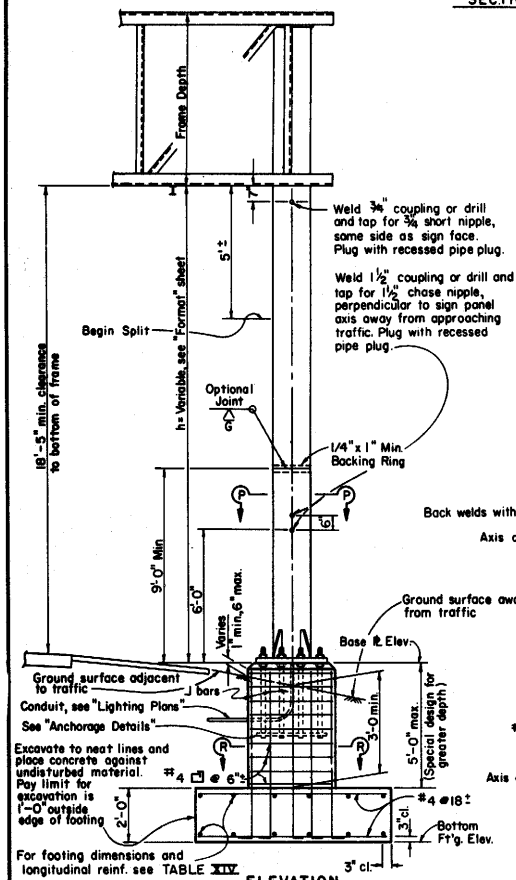
1. For "General Notes" see "Instructions & Examples" sheet, S1-12.
2. Longer sides of Base Plates, Pedestals & Footings; shall be normal to axis of sign.
3. Backfill shall be in place prior to erection of post.
4. Thread upper 8" of anchor bolts and galvanize upper 1'-0".
5. Spread footing shown, use Pile Foundation when shown on the Project Plans
6. Anchor ℞s may be retained with hex. nut or formed head as an alternative to details shown.



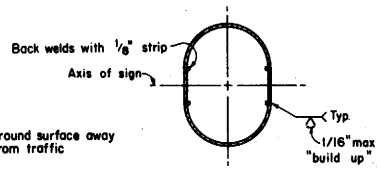
6 BOLT TYPE

8 BOLT TYPE

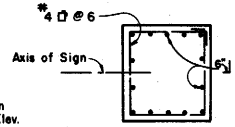
TYPICAL BASE PLATES



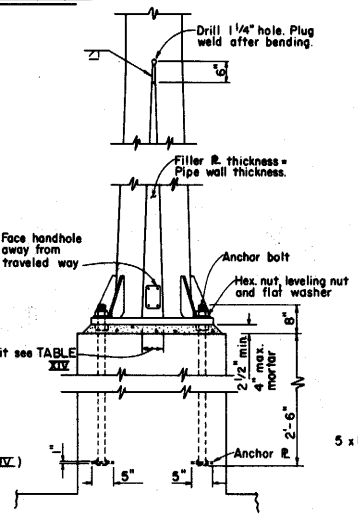
ELEVATION



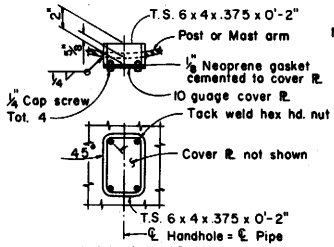
SECTION P-P



SECTION R-R



ANCHORAGE DETAILS

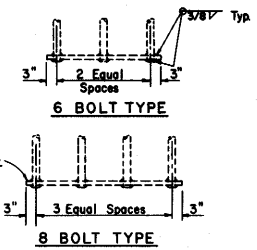


HANDHOLE & COVER DETAILS

Notes:

When foundation is located on a steep slope with exposed face of concrete adjacent to traffic, see detail on "Pile Foundation" sheet, S13-10.

Slope protection required when indicated on Project Plans.



6 BOLT TYPE

8 BOLT TYPE

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

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

DATE APPROVED July 1, 1980

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

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

S3-11

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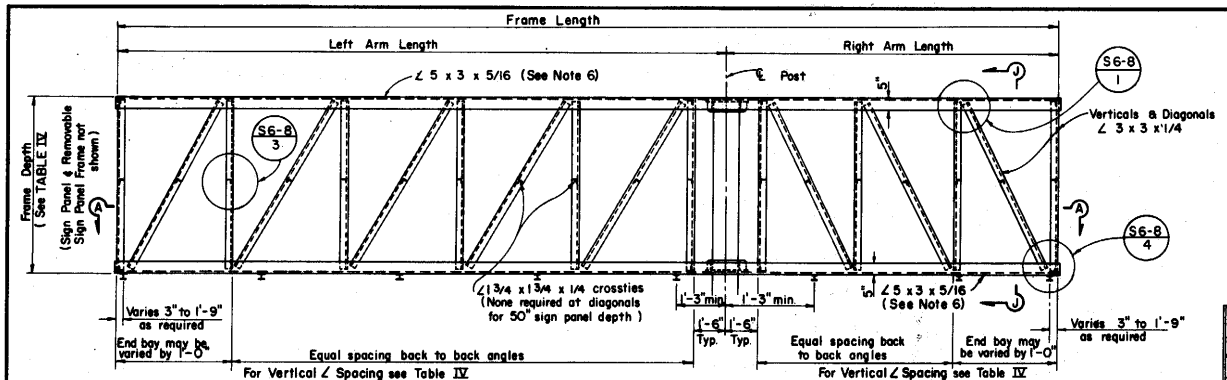
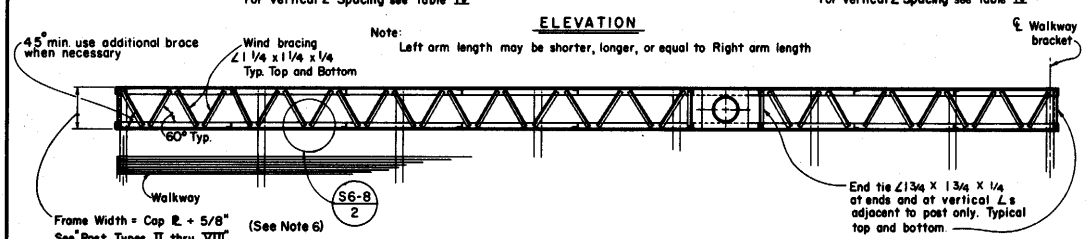


ELEVATION

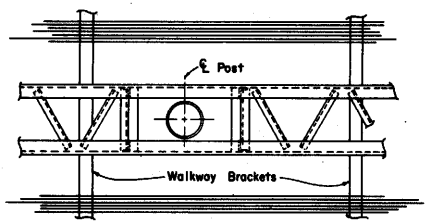
Note:
Left arm length may be shorter, longer, or equal to Right arm length



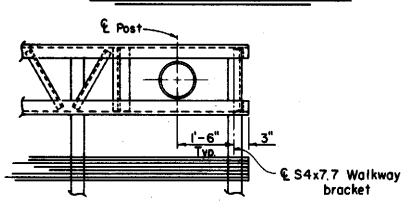
SECTION A-A

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

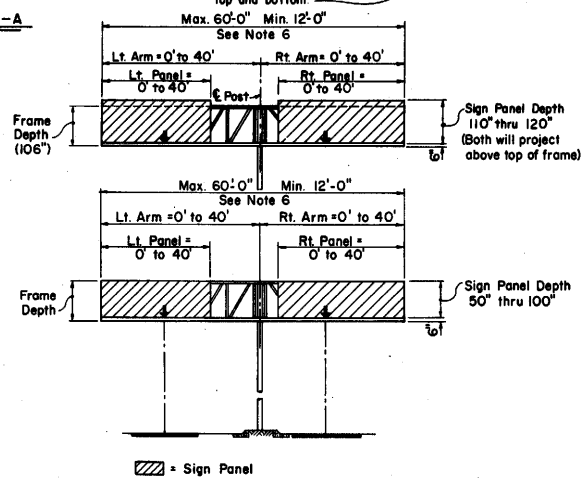
TABLE IV



PART PLAN OF DOUBLE FACED TYPE AT POST



PART PLAN OF CANTILEVER TYPE AT POST



RANGE OF STRUCTURE SIZES

NOTES:

1. For connection of frame to post see S7-8
2. For walkway see S9-12 & S10-9
3. For walkway length see S1-12
4. Minimum length of frame = 12'-0"
5. Maximum length of frame = 60'-0"
6. For arm lengths 35' to 40' and sign depths 80" thru 120":
   a. Use 5 x 3 x 7/16 chord ∠'s.
   b. Frame width = Cap ℄ + 7/8".
7. Diagonal not required if arm length is equal to or less than shown in this column.

Standard Plan Sheet No.
Detail No.

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

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

DATE APPROVED July 1, 1980

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS TRUSS SINGLE POST TYPE STRUCTURAL FRAME MEMBERS

S4-6

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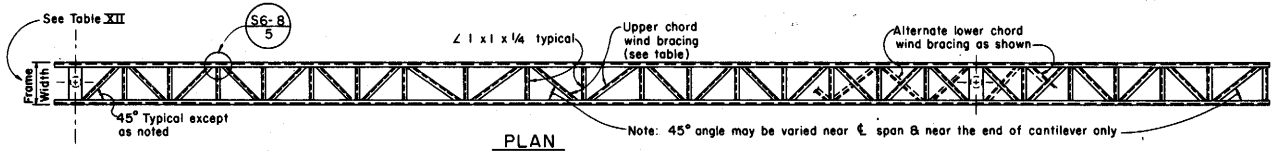
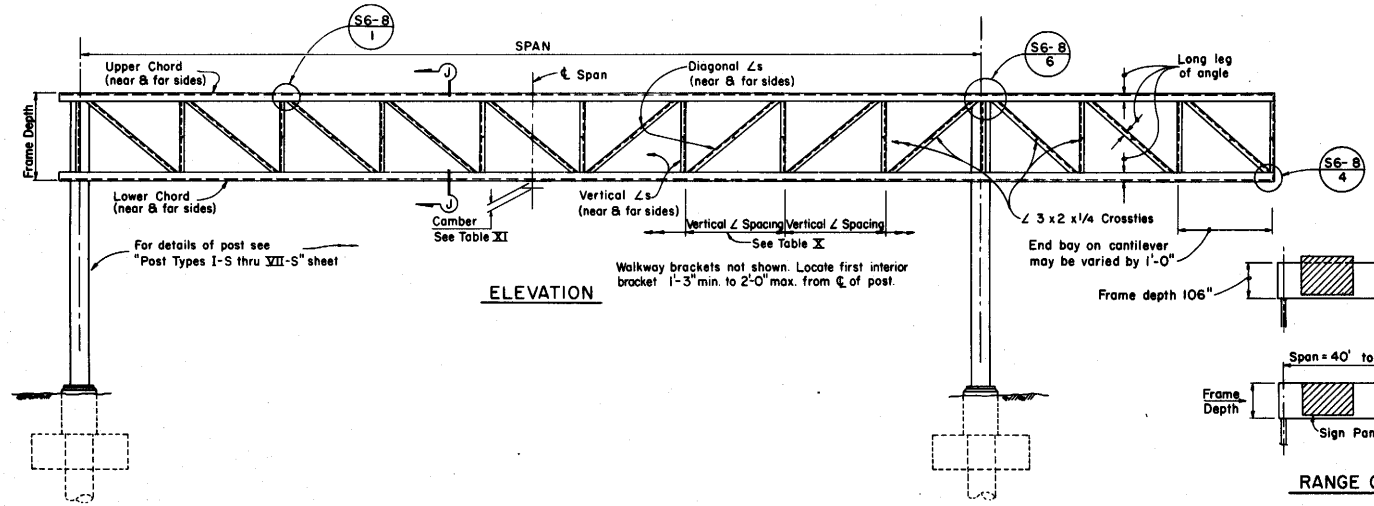
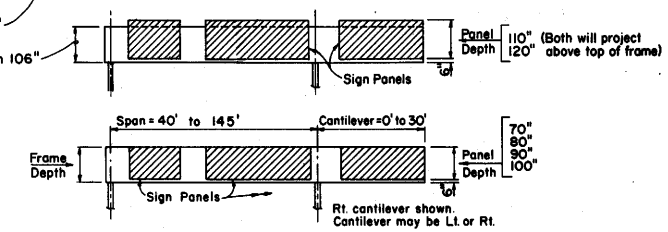


PLAN



ELEVATION



RANGE OF STRUCTURE SIZES

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

TABLE XII

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

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

TABLE XI

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

TABLE X

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

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

NOTE:

Frame widths shown are nominal. These widths may be varied by 1/4" to standardize fabrication methods.

* Add 6" to frame width for Post Types V-S & VI-S; Add 1'-0" for Post Type VII-S

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

DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET	TOTAL SHEETS

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

DATE APPROVED July 1, 1980

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
TRUSS
TWO POST TYPE
STRUCTURAL FRAME MEMBERS

S5-6

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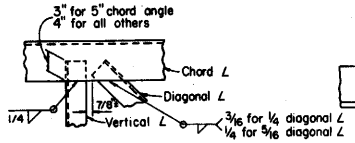
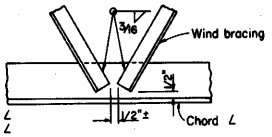


DETAIL ①



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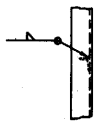

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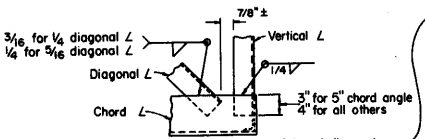
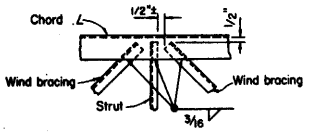
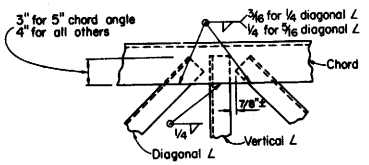


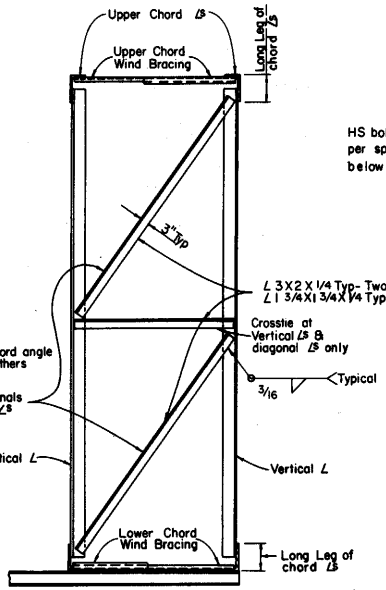
DETAIL ④



DETAIL ⑤

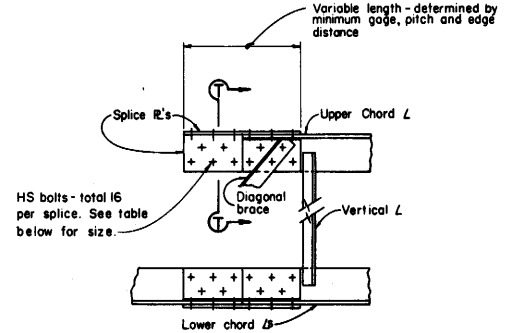


DETAIL ⑥

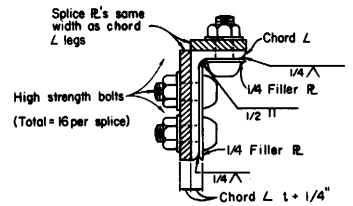


TYPICAL SECTION J-J

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



BOLTED CHORD SPLICE



SECTION T-T

SPLICE NOTES

Specifications:
The bolted splice shall conform to current "Specifications for Structural Joints Using ASTM A325 Bolts", approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation. except all material shall be galvanized before assembly.

Location of Splices:
The splice shall be located so as not to interfere with mounting the walkway brackets or the clip angles for the removable sign panel frame. The wind bracing in the area of the bolted chord splice shall be bolted to the chord angles with a 3/8" bolt, nut, 2 cut washers and lock washer.

Filler PL:
The plates welded to the angle legs on the inside shall be welded before punching the bolt holes. They shall be the same length as the cover plates. The plates are not necessary on the single post signs if the splice is located over 1/3 of the cantilever length from the post. Alternative splice details may be used if approved by the Engineer.

BOLTED CHORD SPLICE	
TWO POST SIGNS	
Chord L	Nominal Bolt Diam.
5X3 1/2X5/16	3/4"
6X4 X 3/8	7/8"
7X4 X 7/16	1"
8X4 X 1/2	1-1/8"
8X4 X 5/8	1-1/4"
9X4 X 5/8	1-1/4"
SINGLE POST SIGNS	
Chord L	Nominal Bolt Diam.
5X3X5/16	3/4"
5X3X 7/16	3/4"

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

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

DATE APPROVED July 1, 1980

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
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OVERHEAD SIGNS
TRUSS
STRUCTURAL FRAME DETAILS

S6-8

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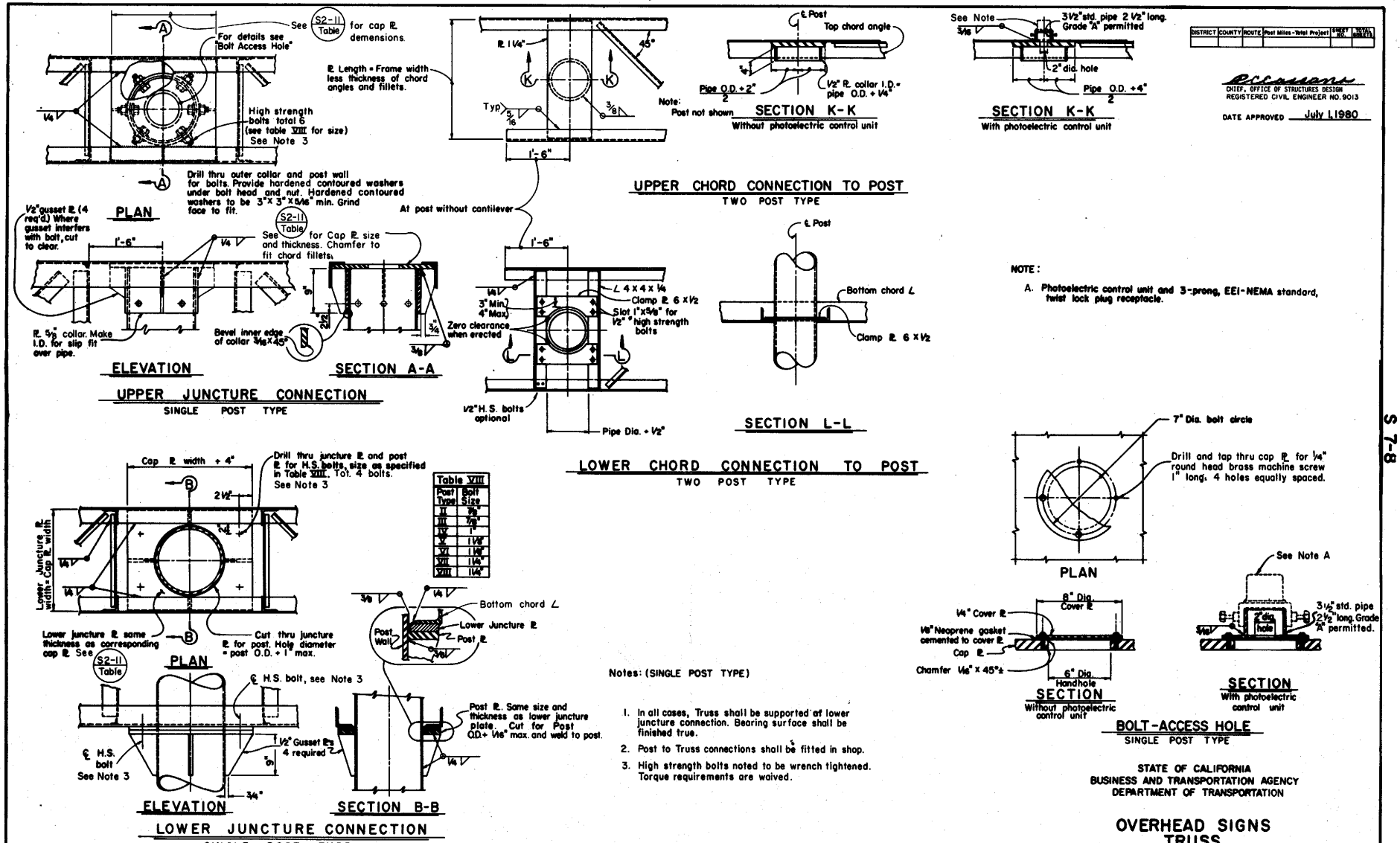

Table VIII	
Post Type	Bolt Size
II	7/8"
III	7/8"
IV	1"
V	1 1/8"
VI	1 1/8"
VII	1 1/4"
VIII	1 1/4"

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.

NOTE:

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

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

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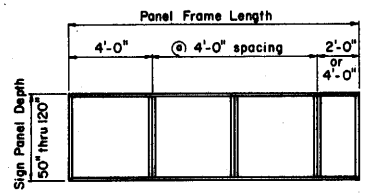
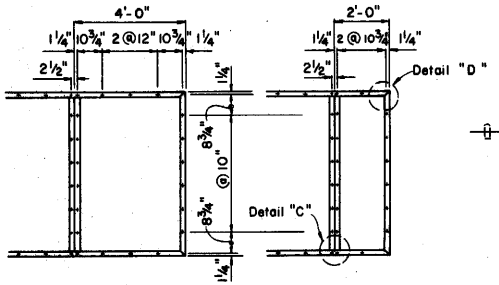


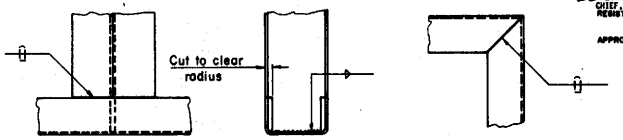
REMOVABLE FRAME
(4'-0" THRU 20'-0")



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

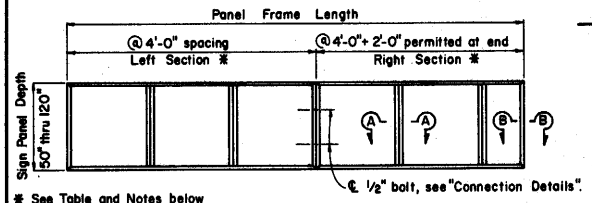
PANEL MOUNTING HOLE SPACING

(Panel mounting holes to be ½"ø max.)
Hole spacing is for single sheet sign panel.
For Overhead Formed Panels refer to "Overhead Formed Panel" Sheet.



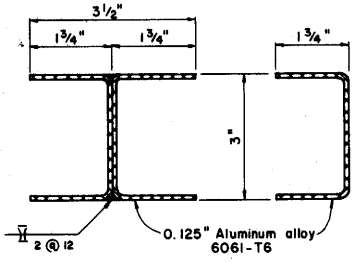
DETAIL "C" SIDE VIEW DETAIL "D"

FRAME JOINT DETAILS



* See Table and Notes below

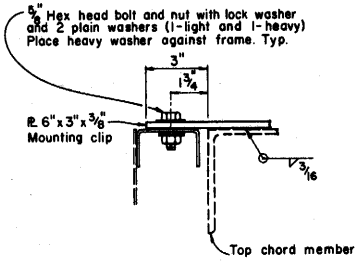
REMOVABLE FRAME
(GREATER THAN 20'-0")

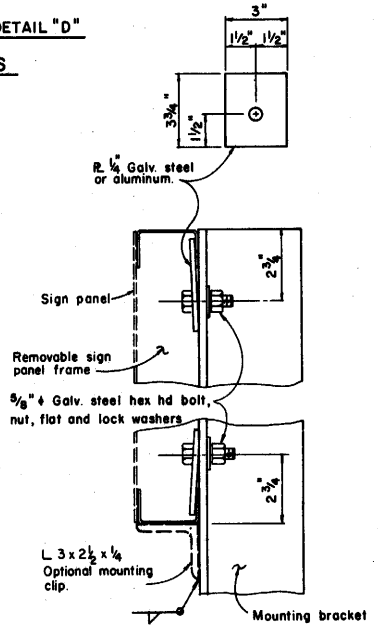


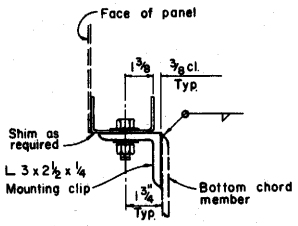
SECTION A-A SECTION B-B

FRAME MEMBERS

Note: Fabricated members shown, similar extruded members may be substituted.





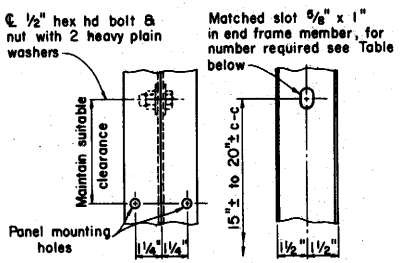


TRUSS MOUNT *

* Truss mounting details apply for panel frames ≤ 100" deep. Mounting for deeper panels shown on S 8D.

BRIDGE MOUNT

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'



FRONT VIEW SIDE VIEW

CONNECTION DETAILS

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. Mounting clips shall be located such as to allow the removable sign panel frame to lie on a straight line.
4. Maximum spacing of RSPF support is 5'-6"

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. Hoisting two assembled sections will not be permitted. The sections shall be bolted together in place as per "Connection Details" prior to tightening of mounting clip bolts.

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

STATE OF CALIFORNIA
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DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
ALUMINUM FRAME
REMOVABLE SIGN PANEL FRAMES

S8A

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

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

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

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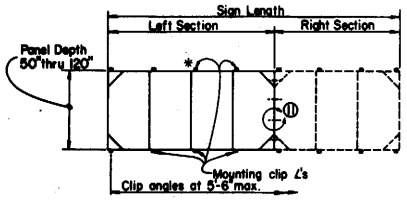
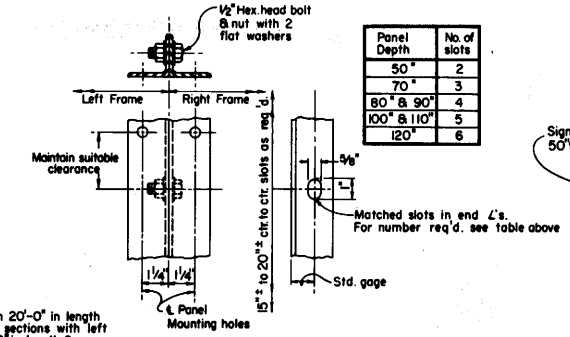


REMOVABLE FRAME GREATER THAN 20'-0"

* 110" & 120" sign panel frame will project above the top chord of the truss. In these cases the top clips shall be bolted to vertical frame members. See S 8D for details.

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

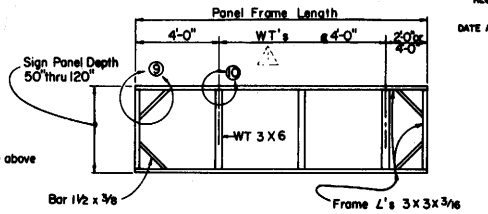
NOTES:
Frames for signs greater than 20'-0" in length shall be fabricated in two sections with left section a multiple of 4'-0" in length. See table above.
Sections shall be hoisted into place individually and bolted together as per detail ⑪ prior to tightening of mounting clip bolts.
Bolting two sections together and hoisting simultaneously will not be permitted.



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

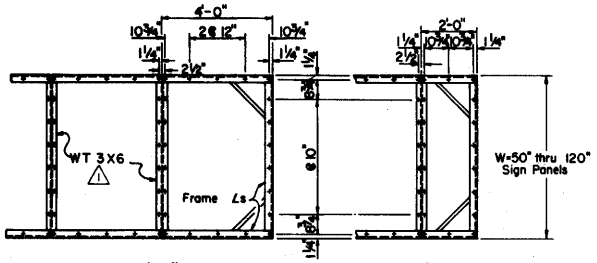
DETAIL ⑪

No Scale



TYPICAL REMOVABLE FRAME

(4'-0" thru 20'-0")



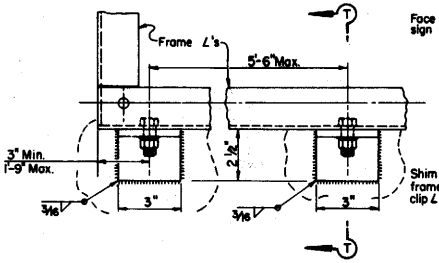
TYPICAL 4'-0" PANEL

TYPICAL 2'-0" PANEL

Note: All holes ½" diameter maximum.

MOUNTING HOLE SPACING FOR SIGN PANEL & FRAME

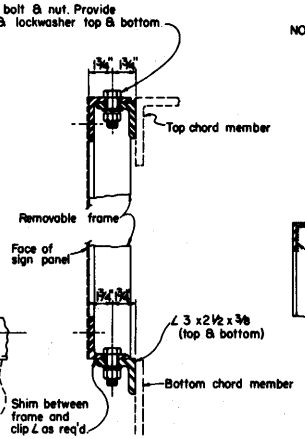
Scale: ½" = 1'-0"
Hole spacing is for single sheet sign panels.
For Overhead Formed Panels refer to "Overhead Formed Panel" Sheet.



FRAME MOUNTING DETAILS

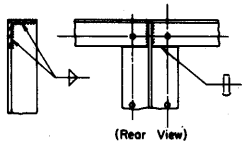
No Scale

Details shown apply for sign panel frames ≤ 100" deep. Mounting details for deeper panels shown on S 8D.

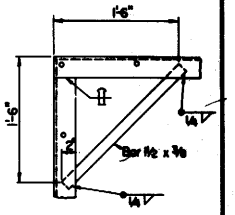


SECTION T-T

NOTES:
1. Frames shall be all-welded construction.
2. Panel mounting holes shall be drilled by template. Sign panel may be considered a template.
3. Drilled and tapped holes (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
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

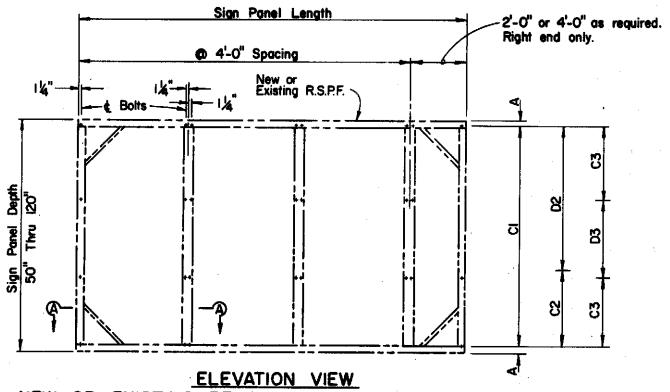
OVERHEAD SIGNS
STEEL FRAME
REMOVABLE SIGN PANEL FRAMES

S8B

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

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

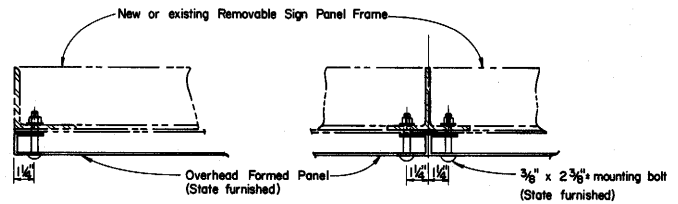
APPROVED July 1, 1980



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

PANEL DEPTH	MOUNTING BOLT SPACING						
	A	1 Space	2 Space		3 Space		
		C1	C2	D2	C3	D3	C3
50"	1¼"	47½"					
60"			28¾"	28¾"			
70"			48¾"	18¾"			
80"			38¾"	38¾"			
90"			38¾"	48¾"			
100"			48¾"	48¾"			
110"					38¾"	30"	38¾"
120"	1¼"				48¾"	20"	48¾"

TABLE I



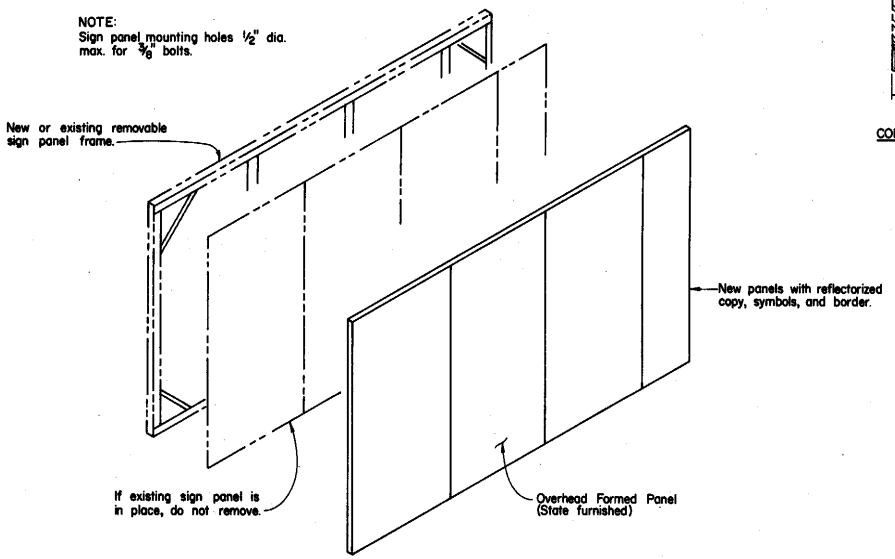
CORNER DETAIL

PANEL CONNECTION

SECTION A-A

NOTES:
When constructing a new frame:
(1) refer to standard plan sheets S8A and S8B for structural details,
(2) sign panels shall be considered as a template for drilling holes for mounting bolts.

NOTE:
Sign panel mounting holes ½" dia. max. for ⅜" bolts.



NOTE:
THE CONTRACTOR SHALL VERIFY ALL DEPENDENT DIMENSIONS IN THE FIELD BEFORE ORDERING OR FABRICATING ANY MATERIAL.

STATE OF CALIFORNIA
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DEPARTMENT OF TRANSPORTATION

OVERHEAD FORMED PANEL DETAILS FOR MOUNTING ON REMOVABLE SIGN PANEL FRAMES

S8-BA

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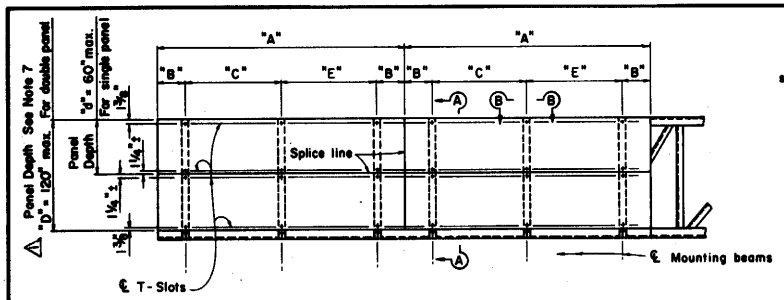
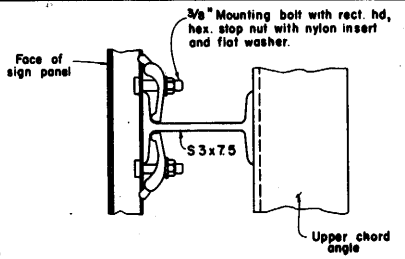
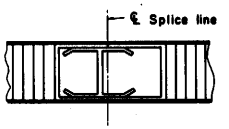


SIGN-ELEVATION



VIEW B-B

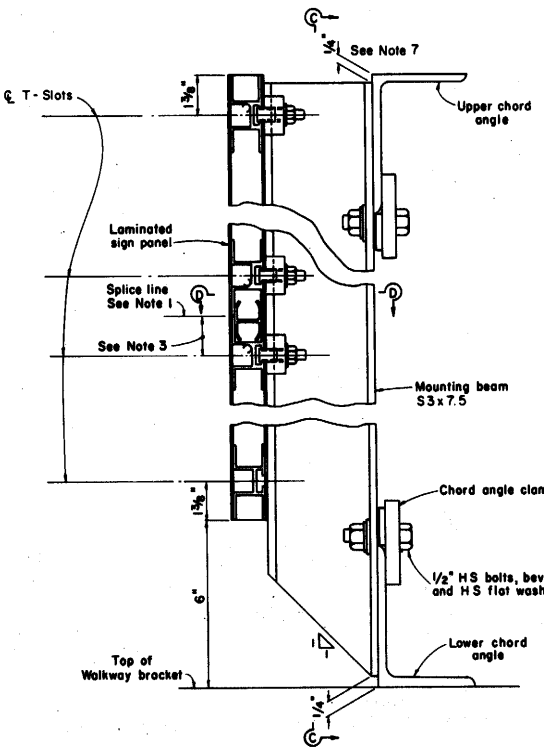


SECTION D-D

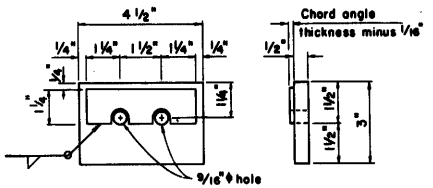
Sign Panel Length *	Number Mounting Beams	Sign Panel Overhang	Mounting Beam Spacing	
"A"		"B"	"C"	"E"
5'-0"	2	9"	3'-6"	
6'-0"	2	12"	4'-0"	
7'-0"	2	15"	4'-6"	
8'-0"	2	18"	5'-0"	
9'-0"	2	22"	5'-4"	
10'-0"	2	24"	6'-0"	
11'-0"	2	24"	7'-0"	
12'-0"	2	30"	7'-0"	
13'-0"	2	30"	8'-0"	
14'-0"	2	30"	9'-0"	
15'-0"	3	36"	9'-0"	
16'-0"	3	6"	7'-6"	7'-6"
17'-0"	3	12"	7'-6"	7'-6"
18'-0"	3	12"	8'-0"	8'-0"
19'-0"	3	12"	8'-6"	8'-6"
20'-0"	3	18"	8'-6"	8'-6"
21'-0"	3	18"	9'-0"	9'-0"
22'-0"	3	24"	9'-0"	9'-0"
23'-0"	3	30"	9'-0"	9'-0"
24'-0"	3	36"	9'-0"	9'-0"

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

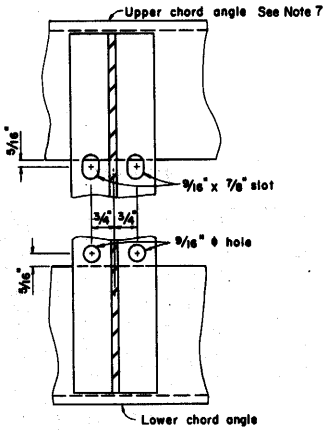
MOUNTING BEAM SPACING TABLE



SECTION A-A



CHORD ANGLE CLAMP



SECTION C-C

NOTES:

1. The size and number of individual sign panel plus the location of splice line is dependent on the sign panel manufacturer.
2. Mounting bolts are required on each side of the horizontal splice lines.
3. Dimension varies from panel to panel. Average value approximate 1 1/4".
4. Torque aluminum sign panel mounting bolts to 100 in.-lbs.
5. Chord angle clamp to be galvanized after fabrication.
6. The Contractor shall verify all dependent dimensions in the field before ordering or fabricating any material.
7. 110" & 120" sign panels along with the mounting beams will project above the top chord truss member 10" & 20" respectively. Attachment details shall be the same.

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
TRUSS
SIGN PANEL MOUNTING DETAILS
LAMINATED PANEL, TYPE A

DISTRICT	COUNTY	ROUTE	Post Mile	Total Project	Sheet	Total Sheets

CHIEF, OFFICE OF STRUCTURES DESIGN
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S8C

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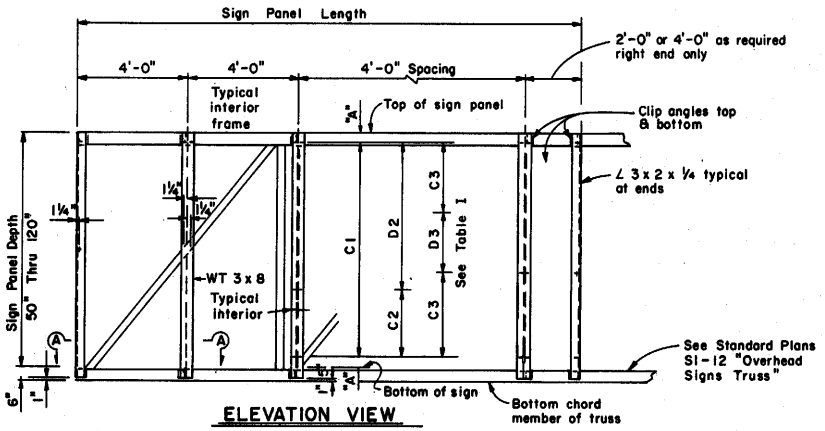


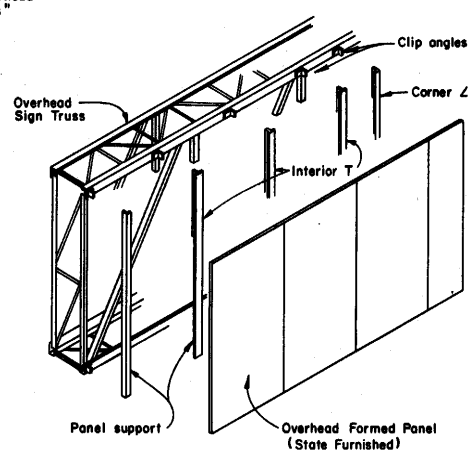
ELEVATION VIEW

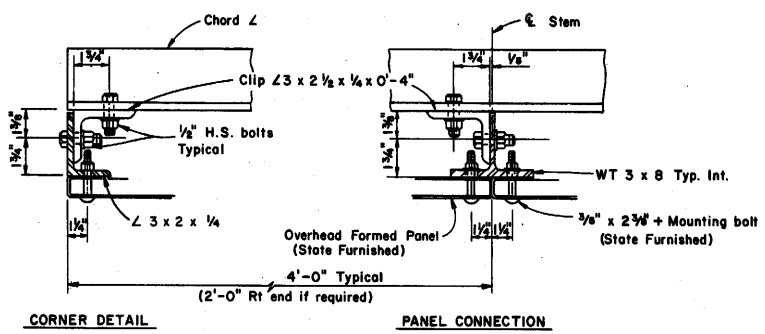
SIGN PANEL FRAME AND MOUNTING HOLE SPACING FOR OVERHEAD FORMED PANELS

NOTE: Sign panel mounting holes ½" diameter maximum for ⅜" bolts

PANEL DEPTH	MOUNTING HOLE SPACING						
	A	1 SPACE	2 SPACE		3 SPACE		
		C1	C2	D2	C3	D3	C3
50"	1¼"	47½"					
60"			28¾"	28¾"			
70"			48¾"	18¾"			
80"			38¾"	38¾"			
90"			38¾"	48¾"			
100"			48¾"	48¾"			
110"	↓				38¾"	30"	38¾"
120"	1¼"				48¾"	20"	48¾"

TABLE I





CORNER DETAIL

PANEL CONNECTION

SECTION A-A

NOTE:
1. All hardware shall be galvanized after fabrication
2. Panel mounting holes shall be drilled by template. Sign panel shall be considered a template.
3. Clip angles may have slotted holes for aligning panels maximum slot ⅝" x 1¼".
4. Panel support members will protrude above top of truss for 110" and 120" sign panel depths.

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

Chief, Office of Structures Design
Registered Civil Engineer No. 5013

APPROVED July 1, 1980

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

OVERHEAD FORMED PANEL DETAILS FOR MOUNTING ON OVERHEAD SIGN TRUSS (NEW)

S8-CA

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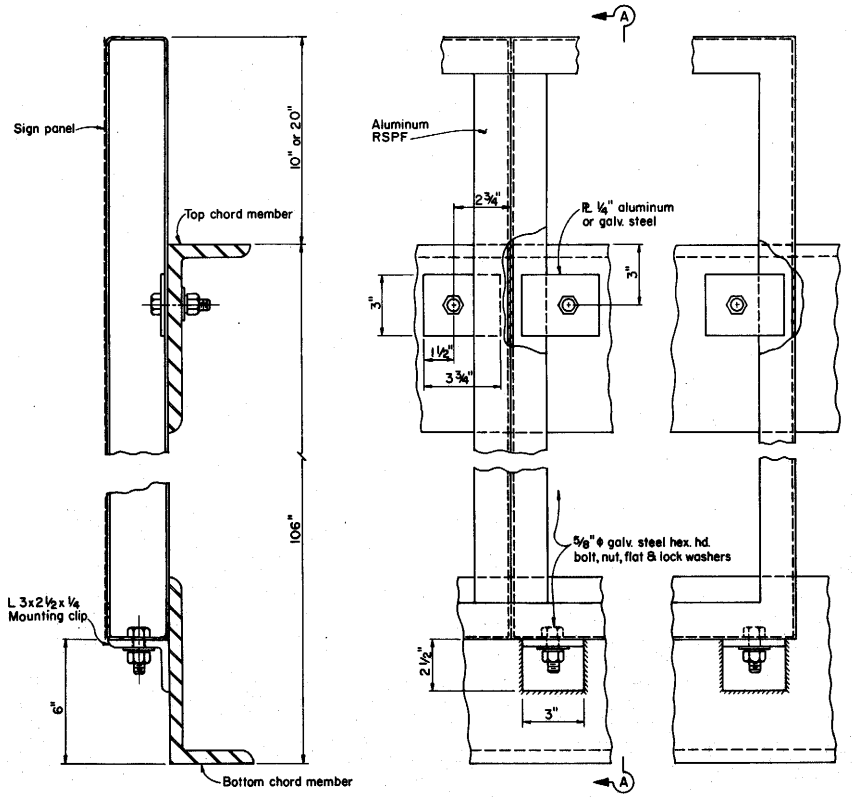
Dist.	County	Route	Post Mile Total Project	Sheet No.	Total Sheets

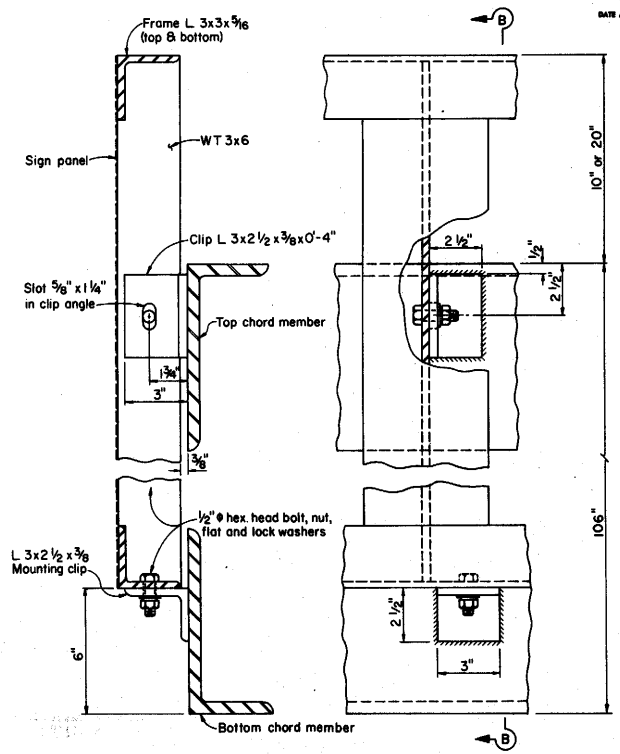
CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 8013
DATE APPROVED July 1, 1980



SECTION A-A

ELEVATION VIEW

ALUMINUM REMOVABLE SIGN PANEL FRAMES



SECTION B-B

ELEVATION VIEW

STEEL REMOVABLE SIGN PANEL FRAMES

NOTES:

1. For aluminum RSPF details see sheet S 8A.
2. For steel RSPF details see sheet S 8B.
3. Minimum fillet weld is 1/4" for clip angles welded to chord member of truss.
4. Maximum spacing of bottom clip angle is 5'-6".
5. Top clips required for each vertical member of RSPF

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
TRUSS
REMOVABLE SIGN PANEL FRAMES
110" & 120" SIGN PANELS

S 8D

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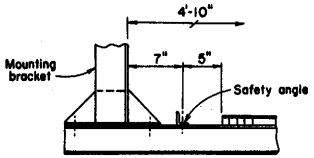
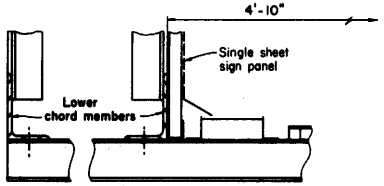
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	Sheet No.	Total Sheets

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

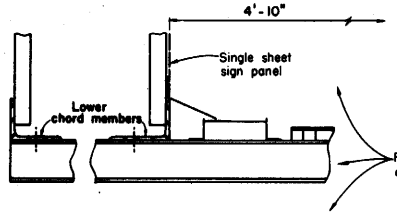
APPROVED July 1, 1980



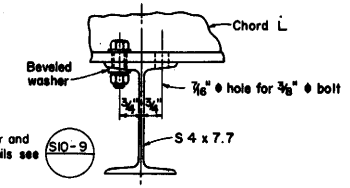
BRIDGE MOUNTED

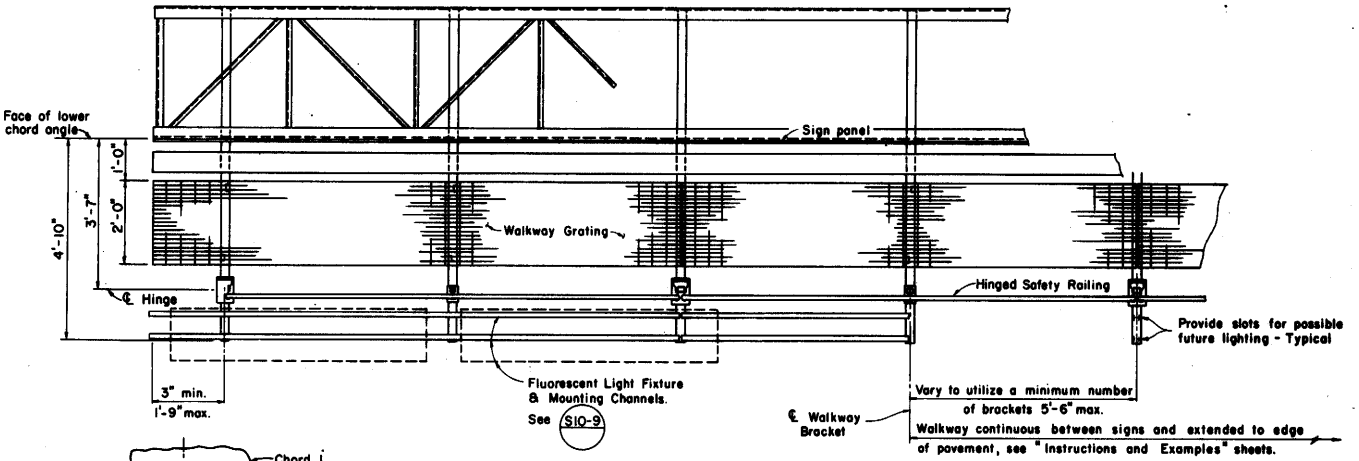


BOX BEAM
CLOSED TRUSS ALTERNATIVE

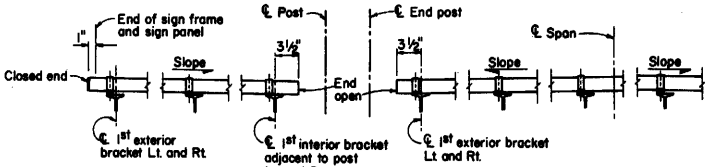


BOX BEAM





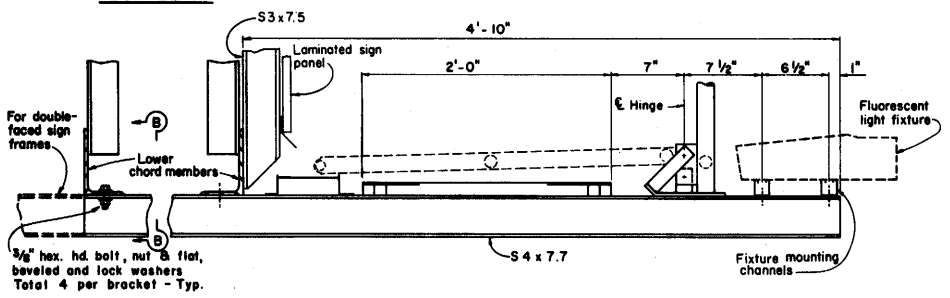
WALKWAY PLAN



SINGLE POST TYPE

GUTTER DETAILS

TWO POST TYPE



TRUSS

TYPICAL WALKWAY SECTION

Notes:
1. For spacing of lighting fixtures, see "Fluorescent Sign Lighting Equipment - Integral Ballast" sheet.
2. On sign bridges having panels facing two directions, end gutters 1"± past edge of panels nearest to ℄ span.

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
WALKWAY DETAILS NO. 1

S 9-12

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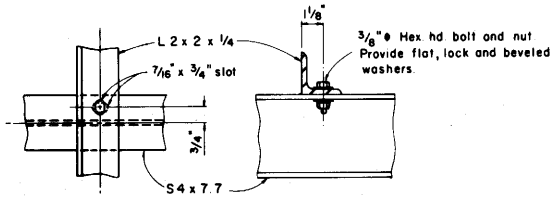
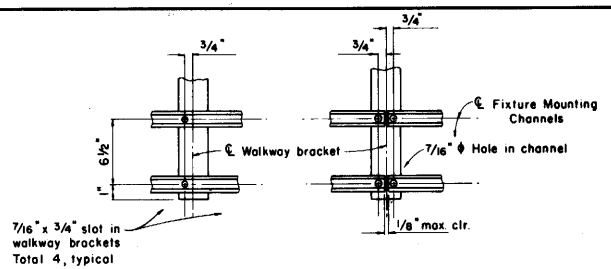
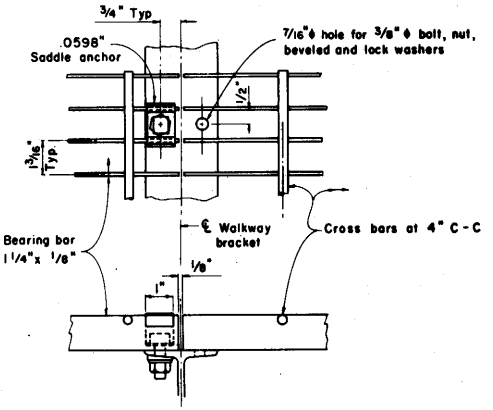


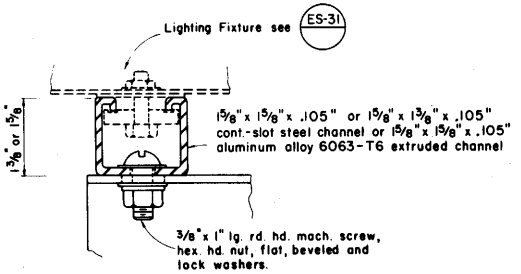
SAFETY ANGLE DETAILS
FOR BRIDGE MOUNTED SIGNS



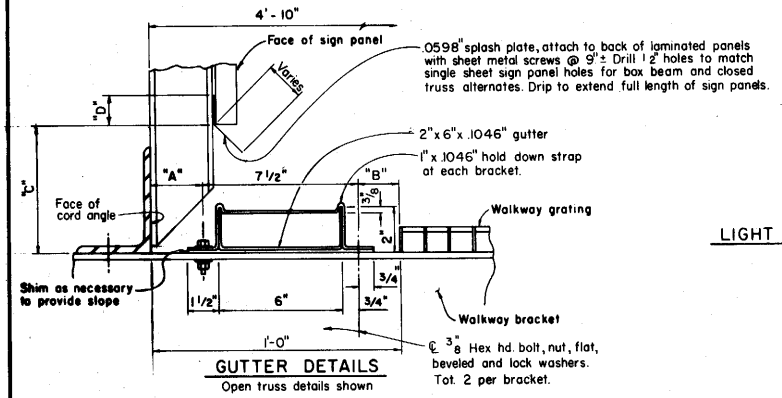
TYPICAL CONNECTION CONNECTION AT SPLICE



WALKWAY DETAILS



LIGHT FIXTURE MOUNTING CHANNEL DETAILS



GUTTER DETAILS
Open truss details shown

Dimension	A	B	C	D
Truss	2 3/4"	1 3/4"	6"	1"
Box Beam	1 1/4"	3 1/4"	4 1/4"	2"
Closed Truss Alternative	2 3/4"	1 3/4"	4"	2"

NOTES:

1. Welded type grating shall have 1 1/4" x 1/8" bearing bars at 1 3/16" centers with 1/4" diameter (or equal) cross bars at 4" centers. If mechanical lock grating is used, it shall be equal in strength to the welded type. Alternate hold-down clips may be submitted for approval.
2. Walkway grating and light fixture mounting channels to be continuous (no splices) over as many walkway brackets as practicable consistent with fabrication, ease of handling and assembly.
3. Gutter section to be made in convenient length and welded or brazed together in the field.

DISTRICT	COUNTY	ROUTE	Post Mile	Total Project	Sheet	Total Sheets

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9015

APPROVED July 1, 1980

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
WALKWAY DETAILS NO. 2

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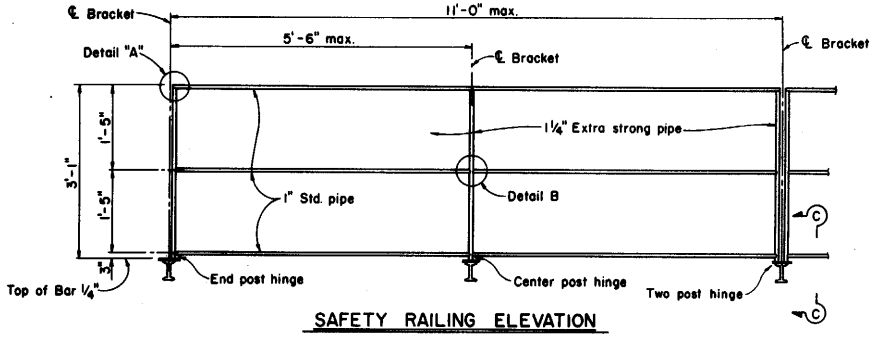
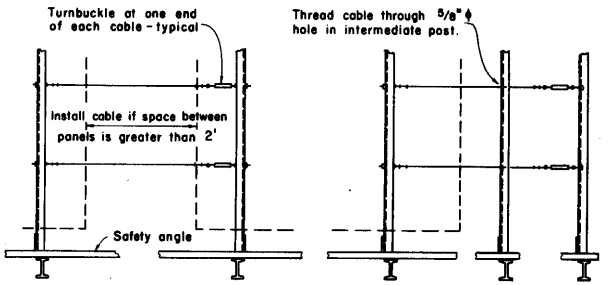


SAFETY RAILING ELEVATION



BETWEEN PANELS

BEYOND PANEL

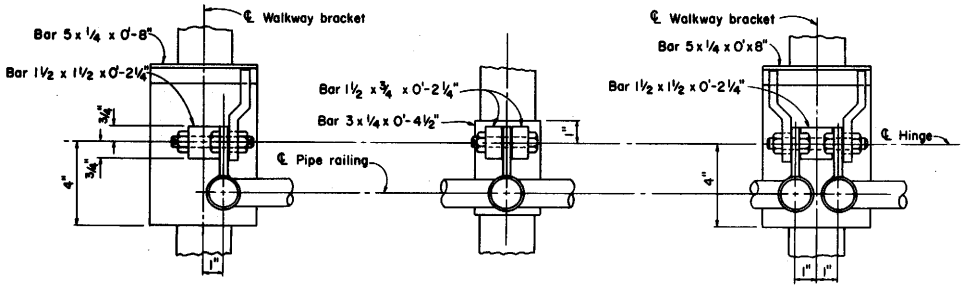
SAFETY CABLE ELEVATION

FOR BRIDGE MOUNTED SIGNS

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

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

APPROVED July 1, 1980

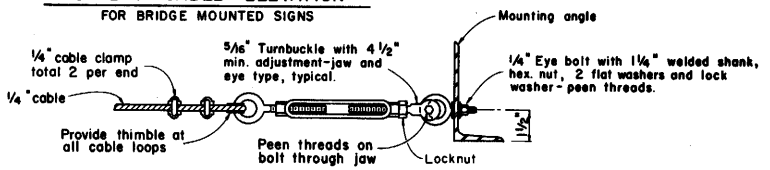


END POST

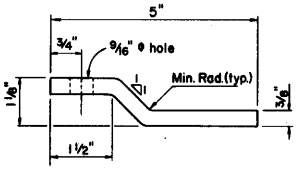
CENTER POST

TWO POST

HINGE - PLAN



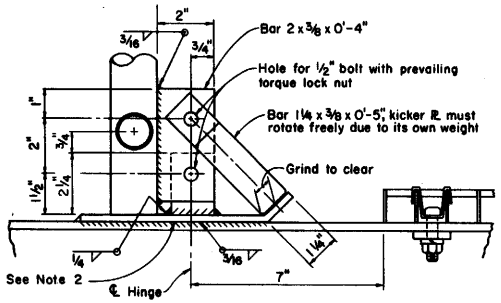
TURNBUCKLE DETAILS



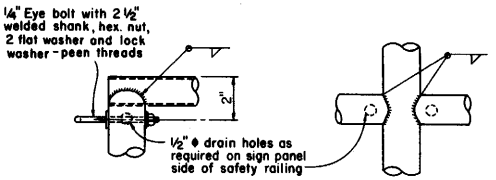
PLAN - KICKER BAR

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.



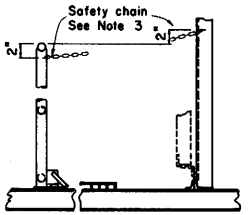
SECTION C-C



DETAIL A

DETAIL B

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



CHAIN ASSEMBLY

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATIONS

OVERHEAD SIGNS
WALKWAY SAFETY RAILING DETAILS

S 11-10

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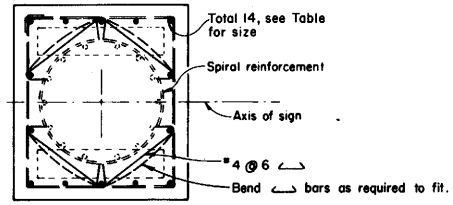
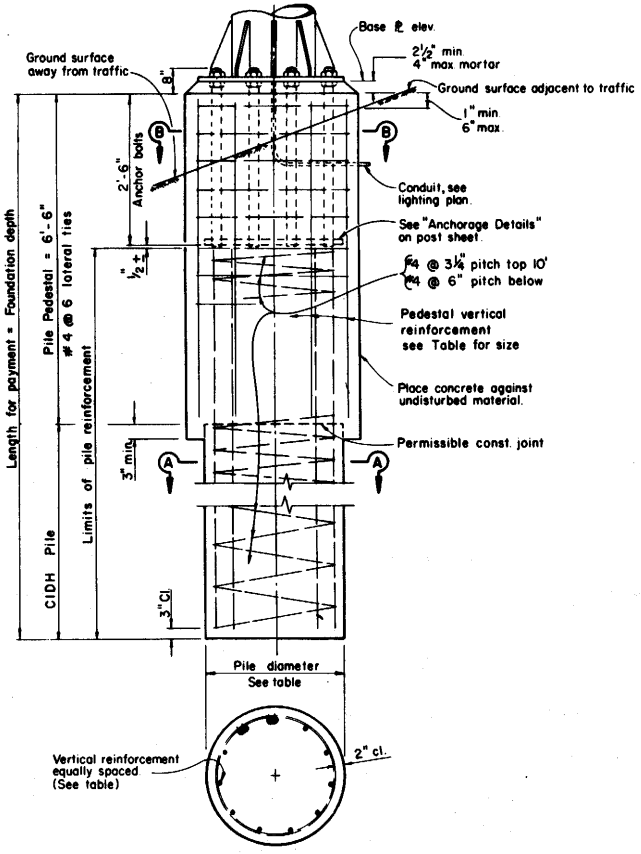


SECTION B-B



SECTION A-A

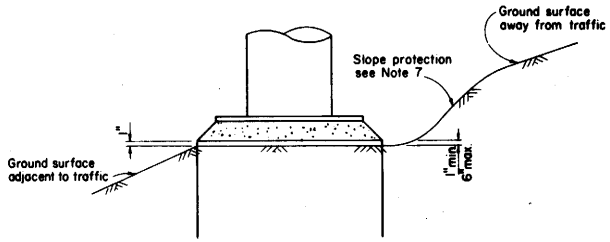
Post Type	Anchor Bolts	Pedestal Size	Reinforcing Steel Vertical	Pile Diameter	Foundation Depth**
II	6 - 2"	2'-11" x 2'-10"	14 - #7	30"	14'
III	6 - 2"	3'-2" x 2'-10"	14 - #8	30"	14'
IV	6 - 2"	3'-8" x 3'-4"	16 - #8	36"	14'
V	10 - 2"	3'-10" x 3'-7"	16 - #9	36"	17'
VI	10 - 2"	3'-10" x 3'-7"	16 - #10	36"	18'
VII	12 - 2"	4'-3" x 3'-11"	16 - #11	36"	21'
VIII	12 - 2"	4'-5" x 3'-11"	24* - #11	36"	22'
I-S	6 - 2"	2'-10" x 2'-10"	14 - #7	30"	14'
II-S	6 - 2"	3'-1" x 2'-10"	14 - #8	30"	16'
III-S	6 - 2"	3'-4" x 2'-10"	14 - #10	30"	18'
IV-S	8 - 2"	3'-6" x 3'-4"	16 - #10	36"	19'
V-S	8 - 2"	3'-9" x 3'-4"	16 - #11	36"	22'
VI-S	8 - 2"	4'-1" x 3'-4"	16 - #11	36"	23'
VII-S	8 - 2¼"	4'-5" x 3'-11"	24* - #11	36"	25'

** Use Foundation Depth shown in table unless otherwise shown on the Project Plans.

* Bundled bars

NOTES:

1. For anchor bolt layout see post sheet.
2. For "Base ℄ Elev." see Project Plans.
3. Pedestal and pile shall be Class "A" P.C.C.
4. Pedestals & Base Plates, longer sides shall be normal to axis of sign.
5. Prior to erection of the post, backfill which is equivalent to the surrounding material shall be in place.
6. Pedestal shall be formed 6" min. below ground surface. Remainder to be placed against undisturbed material.
7. Slope protection required when indicated on the Project Plans.



DETAIL C

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

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

DATE APPROVED July 1, 1980

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS TRUSS PILE FOUNDATION

S 13-10

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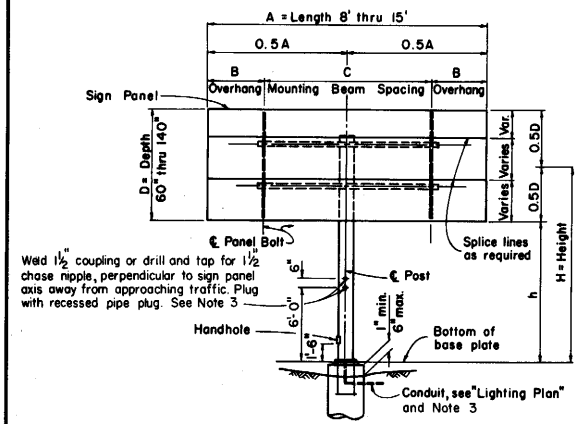
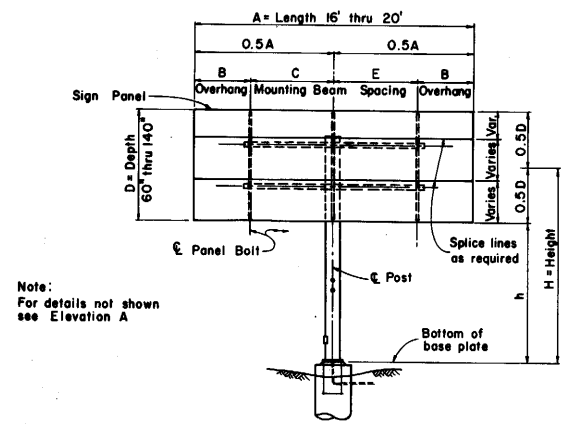
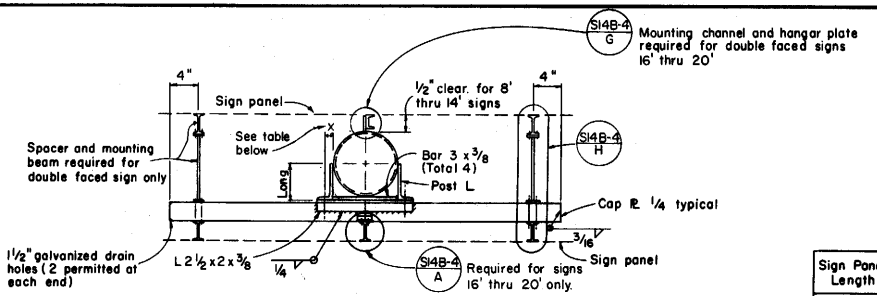


ELEVATION A

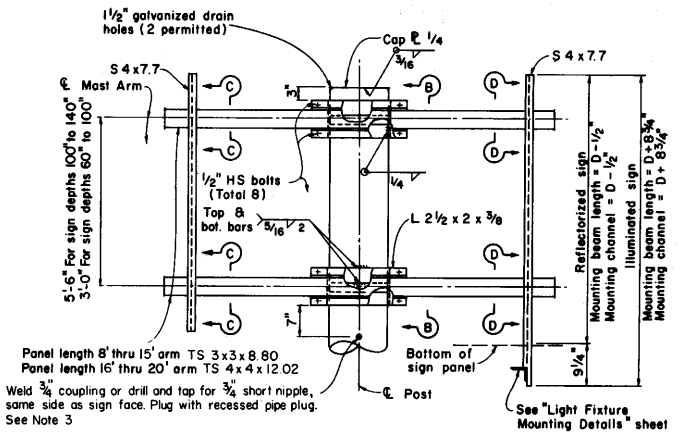


Note:
For details not shown see Elevation A

ELEVATION B



PLAN



PART ELEVATION

POST SIZE (Pipe)	POST ANGLES		
	ANGLE	X	WELD
6 @ 18.97	L 4 x 3 x ½	1¾"	¼
6 @ 28.57	L 4 x 3 x ½	1¾"	¼
8 @ 28.55	L 5 x 3 x ½	1¾"	¼
8 @ 43.39	L 5 x 3 x ½	1¾"	¼
10 @ 54.74	L 6 x 4 x ⅝	2½"	¼
12 @ 65.42	L 7 x 4 x ⅝	2½"	5/16
14 @ 72.09	L 8 x 4 x ¾	2½"	5/16
14 @ 89.30	L 8 x 4 x ¾	2½"	5/16

Sign Panel Length	Number Mounting Beams	Sign Panel Overhang	Mounting Beam Spacing	
A		B	C	E
5' - 0"	2	9"	3' - 6"	
6' - 0"	2	12"	4' - 0"	
7' - 0"	2	15"	4' - 6"	
8' - 0"	2	18"	5' - 0"	
9' - 0"	2	22"	5' - 4"	
10' - 0"	2	24"	6' - 0"	
11' - 0"	2	24"	7' - 0"	
12' - 0"	2	30"	7' - 0"	
13' - 0"	2	30"	8' - 0"	
14' - 0"	2	30"	9' - 0"	
15' - 0"	2	36"	9' - 0"	
16' - 0"	3	6"	7' - 6"	7' - 6"
17' - 0"	3	12"	7' - 6"	7' - 6"
18' - 0"	3	12"	8' - 0"	8' - 0"
19' - 0"	3	12"	8' - 6"	8' - 6"
20' - 0"	3	18"	8' - 6"	8' - 6"

MOUNTING BEAM SPACING

Note:

1. For sections and detail not shown see S14B-4
2. For post and foundation details see "Overhead Signs, Lightweight, Post Details & Foundation" sheets.
3. Drilled holes, plugs, conduit and handhole required on illuminated signs only.

DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET	TOTAL SHEETS

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

DATE APPROVED July 1, 1980

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS LIGHTWEIGHT BALANCED-SINGLE STEEL POST CONNECTION AND MOUNTING DETAILS

S 14A-5

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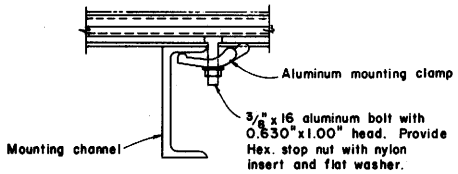
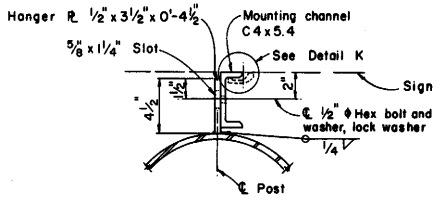
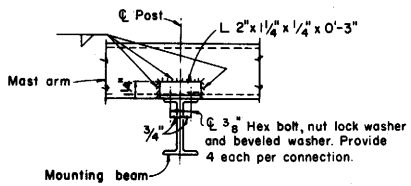


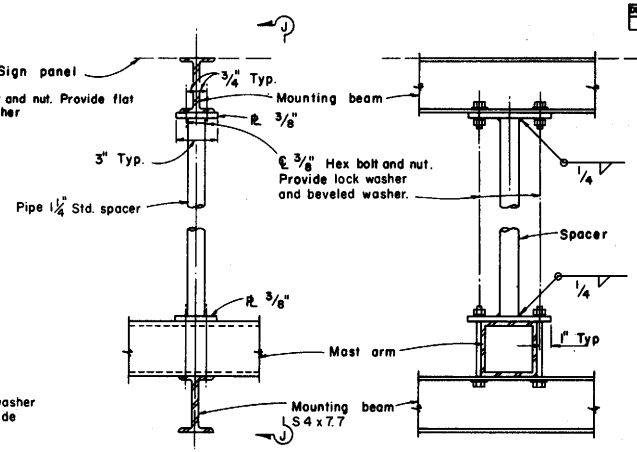
DETAIL K



DETAIL G
3" = 1'-0"



DETAIL A

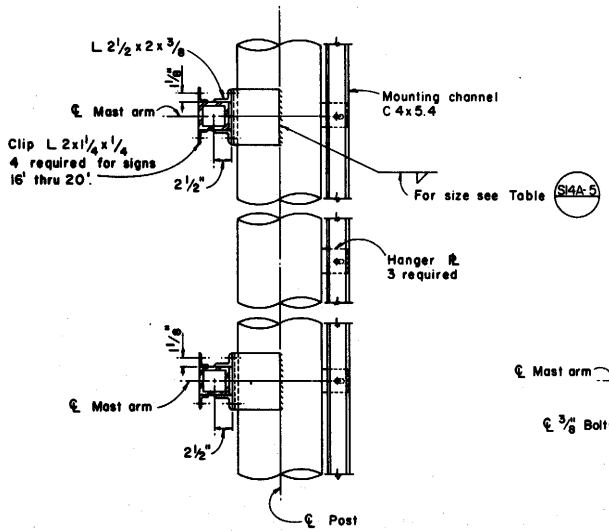


DETAIL H

VIEW J-J

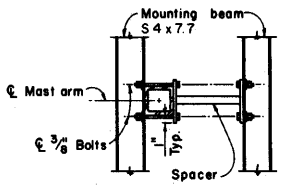
Note: Spacer required for double faced sign only.

Note: For sections and details not shown see S14A-5



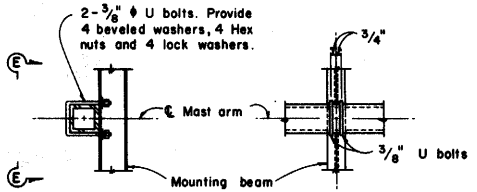
SECTION B-B

Note: Mounting channel and Hanger PL required for double faced signs 16' thru 20' only.



SECTION C-C

Note: Typical end mount for double faced signs.



SECTION D-D

VIEW E-E

Note: Typical connection to single faced signs.

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
LIGHTWEIGHT
BALANCED-SINGLE STEEL POST
DETAILS

S14B-4

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

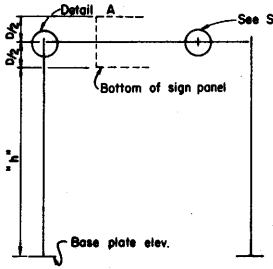
CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

DATE APPROVED July 1, 1980

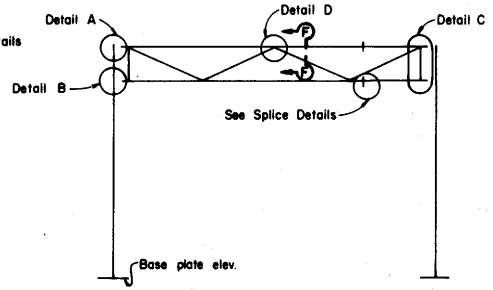
S14B-4

Return to Table of Contents

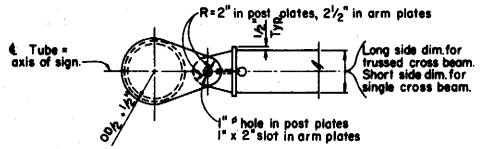
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET	TOTAL SHEETS



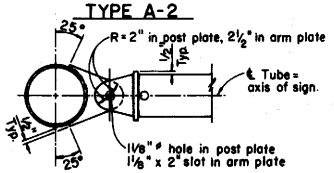
SINGLE CROSS BEAM SERIES
TYPE A-1



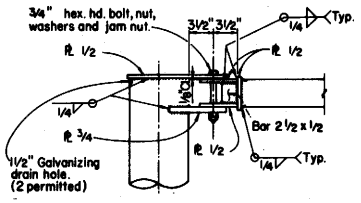
TRUSSED CROSS BEAM SERIES
TYPE A-2



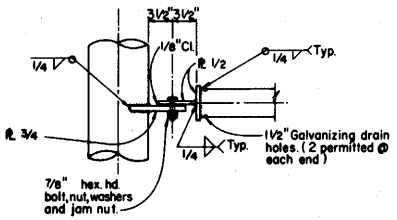
PLAN



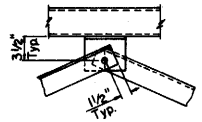
PLAN



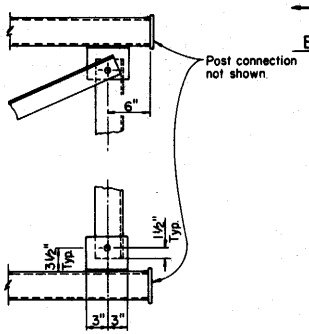
DETAIL A



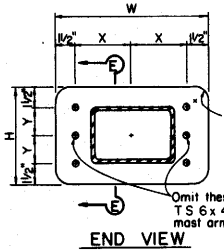
DETAIL B



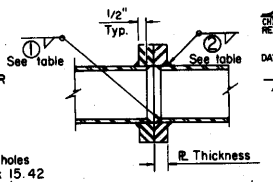
DETAIL D



DETAIL C

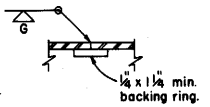


END VIEW



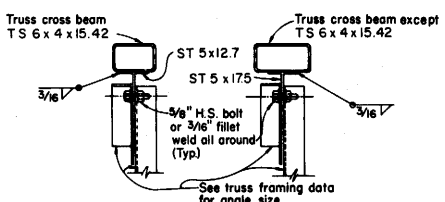
SECTION E-E

SPLICE DETAILS

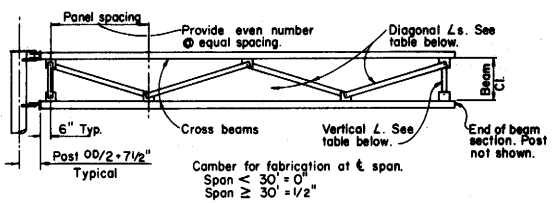


OPTIONAL WELDED SPLICE

SPLICE DATA									
TUBULAR CROSS BEAM SIZE	HIGH STRENGTH BOLTS				A-36 PLATES			WELDING	
	NO.	SIZE	X	Y	W	H	THICKNESS	①	②
TS 6 x 4 x 15.42	4	⅝"	4¼"	2"	11½"	7"	1"	3/16	5/16
TS 8 x 4 x 18.82	6	⅝"	5¼"	2"	1'-1½"	7"	1"	3/16	5/16
TS 8 x 6 x 22.04	6	⅝"	5¼"	2½"	1'-1½"	8"	1⅛"	3/16	⅜
TS 8 x 6 x 31.73	6	⅝"	4¼"	3½"	11½"	10"	1⅛"	¼	5/16
TS 10 x 6 x 25.44	6	⅝"	6½"	2½"	1'-4"	8"	1⅜"	3/16	⅜
TS 10 x 6 x 36.83	6	¾"	6½"	3"	1'-4"	9"	1⅝"	5/16	½



SECTION F-F



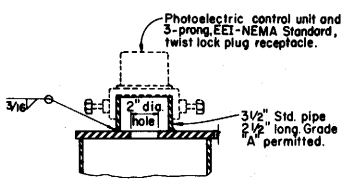
SIGN DEPTH	BEAM CLEARANCE	MAX. PANEL SPACING	VERTICAL ANGLE	DIAGONAL ANGLE
40" - 70"	2' - 0"	5' - 6"	∠3½ x 2½ x ¼*	∠3½ x 2½ x ¼*
80" - 100"	4' - 6"	6' - 6"	∠3½ x 2½ x ¼*	∠3½ x 2½ x ¼*

* Short leg outstanding.

TRUSS FRAMING DATA

Note:
For post connection to base ℄ see S20A-7 / A
For cross beam to sign panel connections see S18A-8

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



PHOTOELECTRIC CONTROL UNIT

For General Notes see "Foundation" sheet, S20B-9.

STATE OF CALIFORNIA
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CHIEF, OFFICE OF STRUCTURES DESIGN
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OVERHEAD SIGNS LIGHTWEIGHT TYPE A CONNECTION DETAILS

S 15-8

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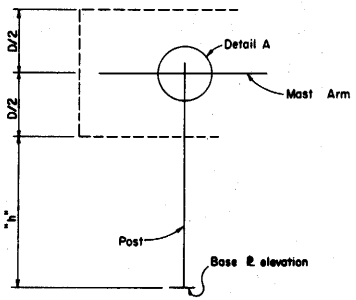
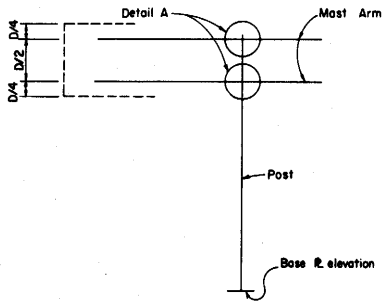
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET	TOTAL SHEETS

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

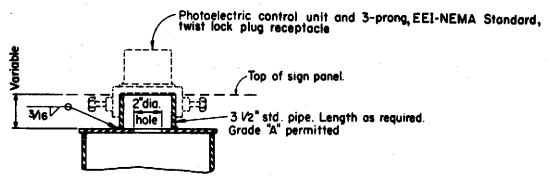
DATE APPROVED July 1, 1980



SINGLE ARM SERIES
TYPE B-1



DOUBLE ARM SERIES
TYPE B-2

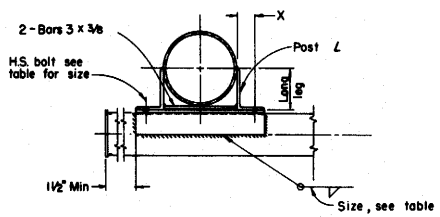


PHOTOELECTRIC CONTROL UNIT

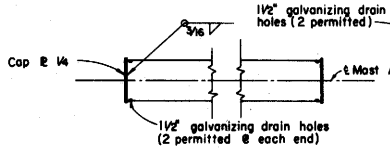
POST ANGLES			
POST SIZE	ANGLE	X	WELD
6	∠ 4 x 3 x 1/2	1 3/4"	1/4
8	∠ 5 x 3 x 1/2	1 3/4"	1/4
10	∠ 6 x 4 x 5/8	2 1/2"	1/4
12	∠ 7 x 4 x 5/8	2 1/2"	5/16
14	∠ 8 x 4 x 3/4	2 1/2"	5/16

MAST ARM ANGLES				
ARM SIZE	ANGLE	H.S. BOLT	Y	WELD
TS 3x3x8.80	∠ 2 x 2 x 3/8	1/2	1 1/8"	1/4
TS 4x4x12.02	∠ 2 1/2 x 2 x 3/8	1/2	1 1/8"	1/4
TS 5x5x15.42	∠ 3 x 2 1/2 x 3/8	5/8	1 3/8"	1/4
TS 6x6x18.82	∠ 3 1/2 x 2 1/2 x 3/8	5/8	1 3/8"	1/4
TS 7x7x22.04	∠ 4 x 3 x 1/2	3/4	1 3/4"	5/16
TS 8x8x25.44	∠ 5 x 3 x 1/2	7/8	1 3/4"	5/16
TS 10x10x32.23	∠ 6 x 4 x 5/8	7/8	2 1/2"	5/16

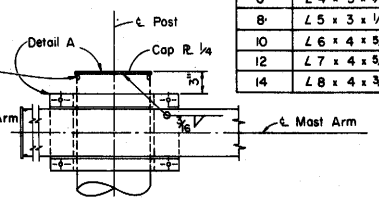
POST TO ARM FRAMING DATA



SECTION D-D



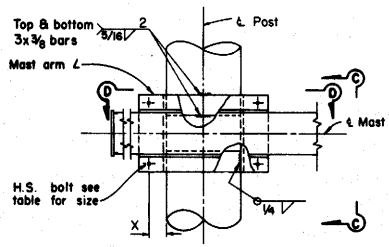
MAST ARM



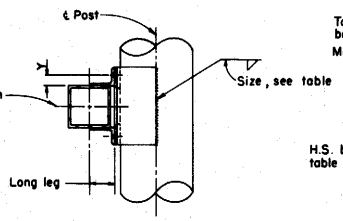
POST CAP

END DETAIL

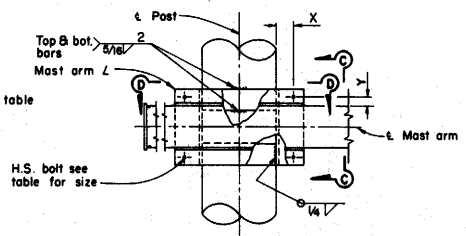
SEE PROJECT PLANS FOR:
1. Sign type and location.
2. Panel type and location on structure.
3. Post size and dimension "h".
4. Mast arm size.
5. Foundation type.
6. Illumination if required.



DETAIL A



VIEW C-C



DETAIL B

NOTE:
For post connection to base plate see S20A-7
For mast arm length and mast-arm-to-sign panel connections see S18A-8

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OVERHEAD SIGNS
LIGHTWEIGHT
TYPE B
CONNECTION DETAILS

S16-7

For General Notes See S20A-7

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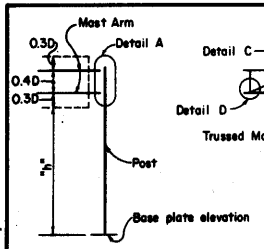
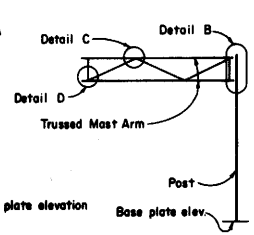
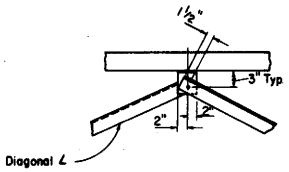


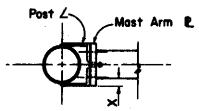
DOUBLE MAST ARM SERIES
TYPE C-1



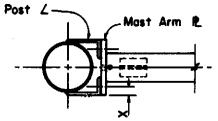
TRUSSED MAST ARM SERIES
TYPE C-2



DETAIL C

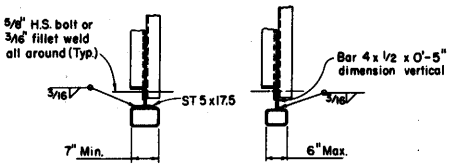


SECTION F-F

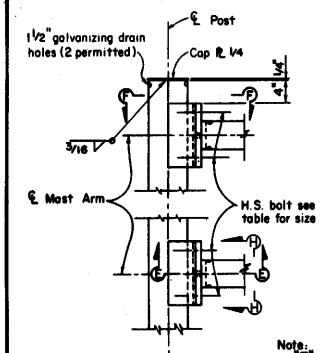


SECTION G-G

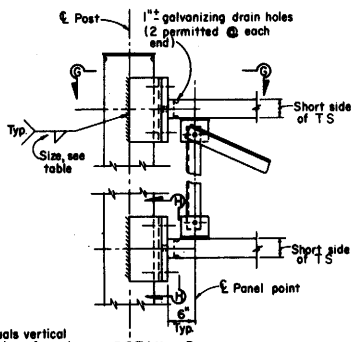
DETAIL D



VIEW J-J

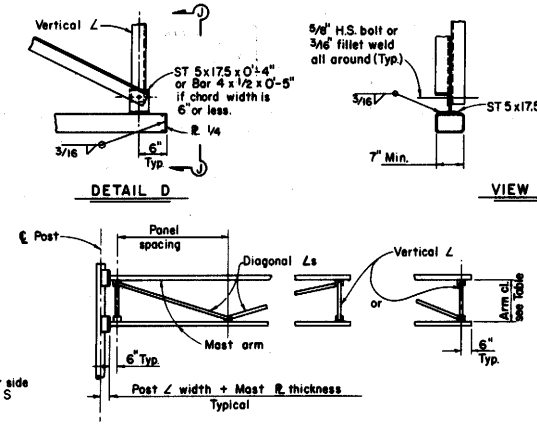


DETAIL A



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

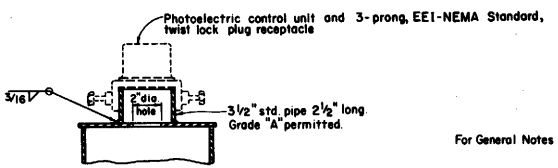
DETAIL B



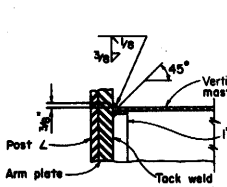
SIGN DEPTH INCHES	ARM CLEARANCE	MAX. PANEL SPACING	VERTICAL ANGLE	DIAGONAL ANGLE
D = 40"-70"	2'-0"	4'-4"	∠2 x 2 x ¼	∠2 x 2 x ¼
D = 80"-100"	3'-0"	6'-6"	∠3½ x 2½ x ¼*	∠3½ x 2½ x ¼*

* Short leg outstanding

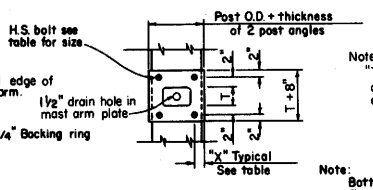
TRUSS FRAMING DATA



PHOTOELECTRIC CONTROL UNIT



SECTION E-E



SECTION H-H

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

Note:
Bottom connection shown. Top similar.

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

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

POST TO ARM FRAMING DATA

Note:
For post connection to base ℄ see S20A-7

For mast arm length and mast-arm-to sign panel connections see S18A-8

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

For General Notes see S20A-7

DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET	ADDED

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO 9013

DATE APPROVED July 1, 1980

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OVERHEAD SIGNS LIGHTWEIGHT TYPE C CONNECTION DETAILS

S17-8

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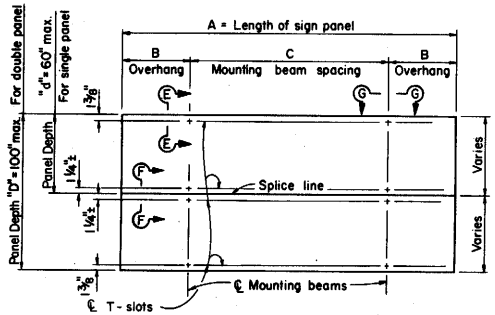
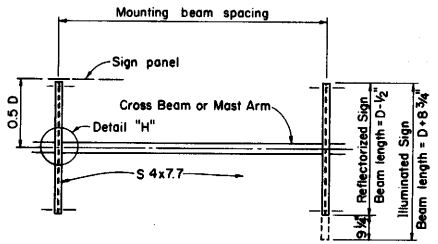
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET	TOTAL SHEETS

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9015

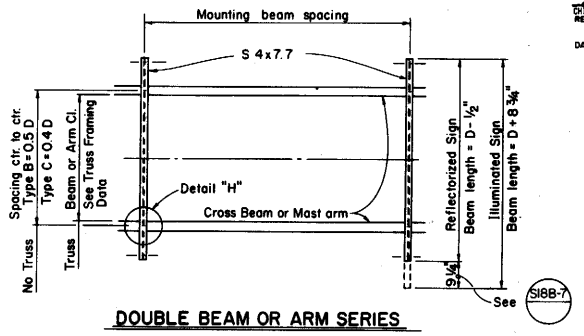
DATE APPROVED July 1, 1980



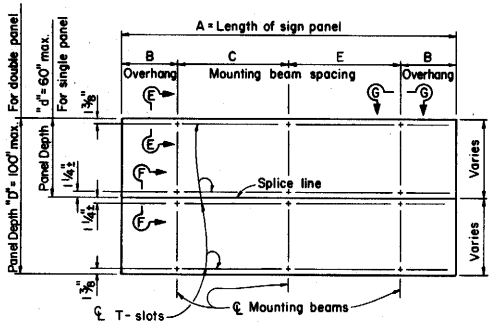
SIGN PANEL LENGTH 5'-0" TO 15'-0"



SINGLE BEAM OR ARM SERIES

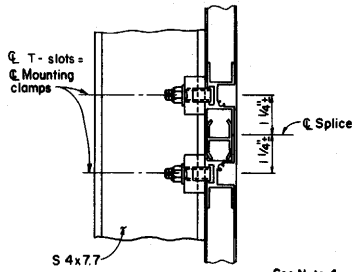


DOUBLE BEAM OR ARM SERIES

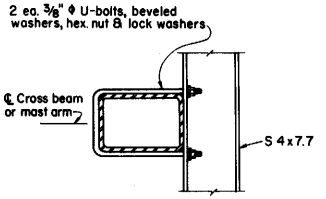


SIGN PANEL LENGTH 16'-0" TO 24'-0"*

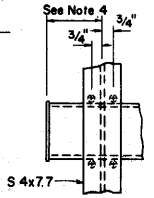
ELEVATION



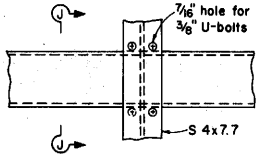
SECTION F-F



SECTION J-J



END ARM DETAIL
SINGLE POST SIGNS

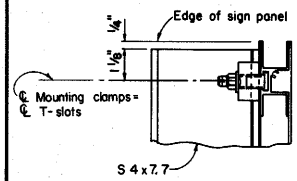


DETAIL H

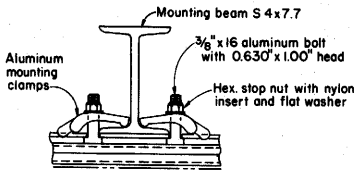
Sign Panel Length*	Number Mounting Beams	Sign Panel Overhang	Mounting Beam Spacing	
A		B	C	E
5'-0"	2	9"	3'-6"	
6'-0"	2	12"	4'-0"	
7'-0"	2	15"	4'-6"	
8'-0"	2	18"	5'-0"	
9'-0"	2	22"	5'-4"	
10'-0"	2	24"	6'-0"	
11'-0"	2	24"	7'-0"	
12'-0"	2	30"	7'-0"	
13'-0"	2	30"	8'-0"	
14'-0"	2	30"	9'-0"	
15'-0"	3	36"	9'-0"	
16'-0"	3	6"	7'-6"	7'-6"
17'-0"	3	12"	7'-6"	7'-6"
18'-0"	3	12"	8'-0"	8'-0"
19'-0"	3	12"	8'-6"	8'-6"
20'-0"	3	18"	8'-6"	8'-6"
21'-0"	3	18"	9'-0"	9'-0"
22'-0"	3	24"	9'-0"	9'-0"
23'-0"	3	30"	9'-0"	9'-0"
24'-0"	3	36"	9'-0"	9'-0"

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

MOUNTING BEAM SPACING



SECTION E-E



VIEW G-G

NOTES:

1. Laminated panel sign depths more than 60" requires additional mounting clamps located 1 1/4"± each side of panel splice line. Exact location is dependent on sign panel manufacturer.
2. Position sign panel so that mounting beams will clear truss connections and arm to post joints. Where interference cannot be avoided, 1/2" ϕ holes to pass the 3/8" ϕ U-bolts may be drilled through mast arm angles or truss connection members as necessary.
3. Torque aluminum sign panel mounting bolt to 100 in.-lbs.
4. 11" for Type C-1 and C-2. Others 4"

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
LIGHTWEIGHT
SIGN PANEL MOUNTING DETAILS
LAMINATED PANEL, TYPE A

S18A-8

S18A-8

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DIST	COUNTY	ROUTE	Post Miles - Total Project	SHEET	TOTAL SHEETS

CHIEF, OFFICE OF STRUCTURES DESIGN
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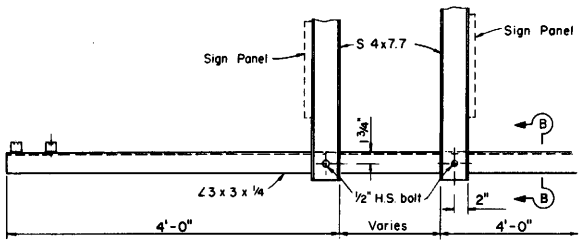
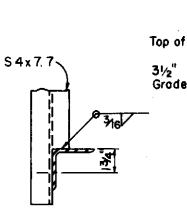
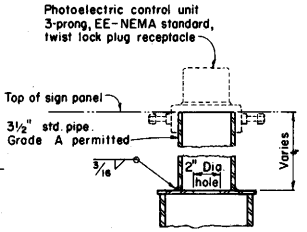


SIDE VIEW - DOUBLE FACED SIGN - END MOUNT

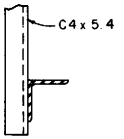
Note:
For details not shown see "Side View - Single Faced Sign Types A, B & C" details.



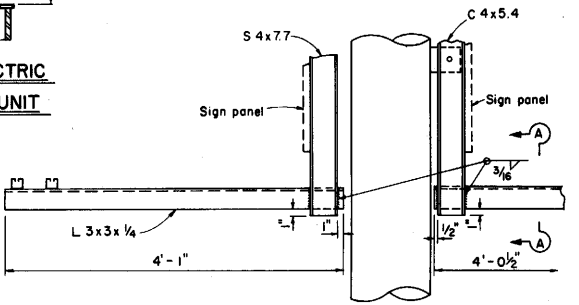
PART SEC. B-B



PHOTOELECTRIC CONTROL UNIT

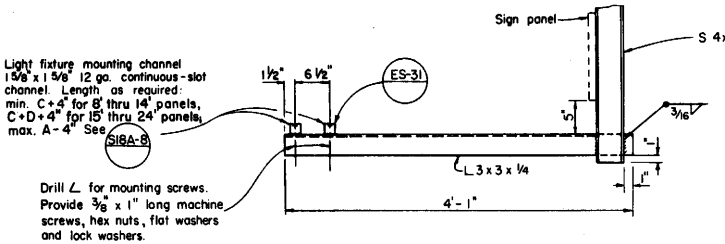


PART SEC. A-A



SIDE VIEW - DOUBLE FACED SIGN - CENTER MOUNT

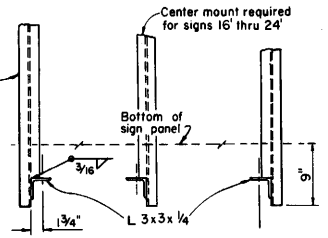
(Required only on balanced single post signs 16' thru 20')



SIDE VIEW - SINGLE FACED SIGN TYPES A, B & C

LIGHT FIXTURE MOUNTING DETAIL
SIGNS GREATER THAN 5'-6" IN LENGTH

For signs 5'-6" (66") or less in length see sheet for "Fluorescent Sign Lighting Equipment (36 inch)."



FRONT VIEW

STATE OF CALIFORNIA
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DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
LIGHTWEIGHT

LIGHT FIXTURE MOUNTING DETAILS S 18 B-7

S 18B-7

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

CHIEF, OFFICE OF STRUCTURES DESIGN
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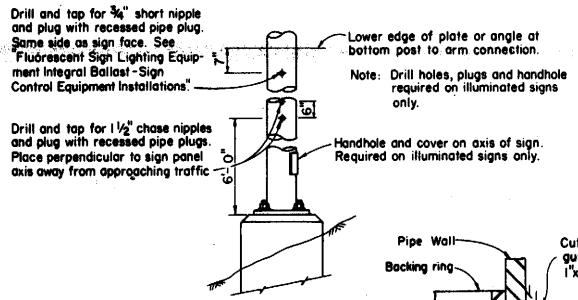
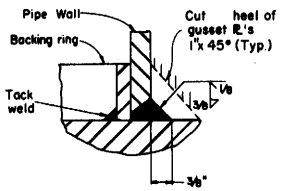
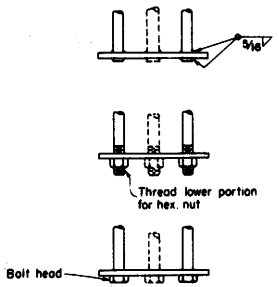


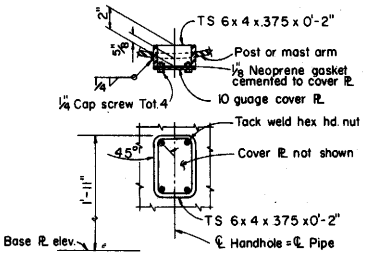
ELEVATION



DETAIL A



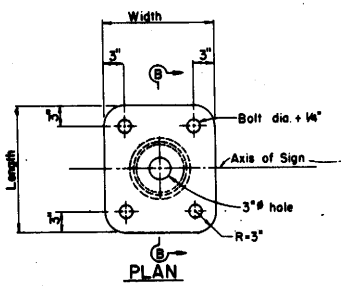
ALTERNATIVE BAR CONNECTIONS



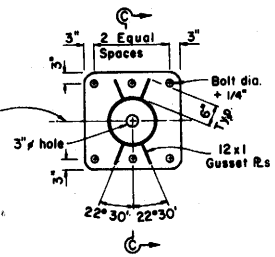
HANDHOLE & COVER DETAILS

POST SIZE	BASE PLATE	ANCHOR BOLTS (Min.)
6 @ 18.97	1½"x1'-2"x 1'-2"	4-1 ¼"
6 @ 28.57	1½"x1'-2"x 1'-2"	4-1 ½"
8 @ 28.55	1½"x1'-6"x 1'-6"	4-1¾"
8 @ 43.39	2"x1'-6"x 1'-6"	4-2"
10 @ 54.74	2"x1'-8"x 1'-8"	4-2 ¼"
12 @ 65.42	2"x1'-8 x 1'-8"	4-2 ½"
14 @ 72.09	2"x2'-4"x 2'-4"	6-2"
14 @ 89.30	2"x2'-4"x 2'-4"	6-2 ¼"

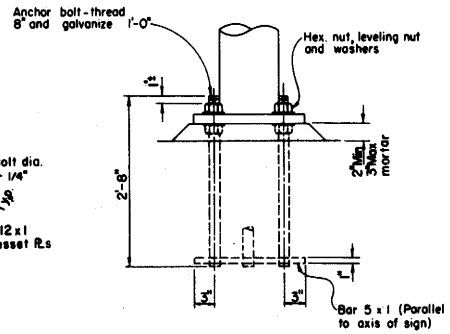
NOTES:
1. Footings shall be placed with long dimensions normal to axis of sign.
2. On single post signs the post shall be raked out of plumb with the use of the leveling nuts to make the bottom of the sign frame level.
3. 2"ϕ anchor bolts may be substituted for 1¾" ϕ bolts.
   2½"ϕ anchor bolts may be substituted for 2¼" ϕ bolts.



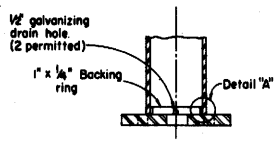
PLAN



PLAN

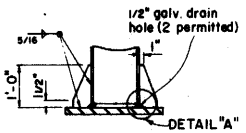


ANCHOR BOLT



SECTION B-B

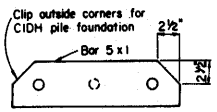
6" THRU 12" POSTS



SECTION C-C

14" POST

BASE PLATE DETAILS



BAR PLAN

ANCHORAGE DETAILS

GENERAL NOTES

DESIGN: A.A.S.H.O Specifications for the Design and Construction of Structural Supports for Highway Signs, dated 1968.

CONSTRUCTION: Standard Specifications and the special provision.

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

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OVERHEAD SIGNS
LIGHTWEIGHT
POST DETAILS

S20A-7

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CHIEF, OFFICE OF STRUCTURES DESIGN
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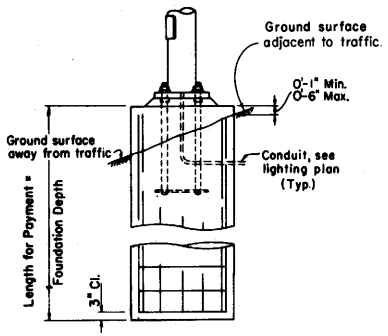
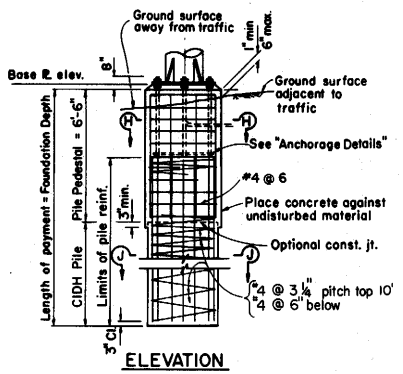
DATE APPROVED July 1, 1980

POST SIZE	PILE FOUNDATION				SPREAD FOOTING				
	Pedestal	Pile Dia.	Found. Depth	Reinf. Size	Pedestal	Footing	Reinf. Top	Reinf. Bot.	Reinf. L Bar
6 ¢ 18.97		24"	8'	#5	1'-10" x 1'-10"	4'-0" x 6'-0"	#4	#4	#5
6 ¢ 28.57		24"	9'	#5	1'-10" x 1'-10"	4'-0" x 7'-0"	#4	#4	#5
8 ¢ 28.55		30"	9'	#6	2'-2" x 2'-2"	5'-0" x 8'-0"	#4	#4	#5
8 ¢ 43.39		30"	11'	#7	2'-2" x 2'-2"	6'-0" x 9'-0"	#4	#5	#5
10 ¢ 54.74	2'-10" x 2'-10"	30"	13'	#8	2'-4" x 2'-4"	7'-0" x 10'-0"	#5	#7	#7
12 ¢ 65.42	2'-10" x 2'-10"	30"	15'	#10	2'-4" x 2'-4"	7'-0" x 12'-0"	#6	#8	#8
14 ¢ 72.09	3'-4" x 3'-4"	36"	15'	#10	2'-11" x 2'-11"	7'-0" x 13'-0"	#7	#9	#8
14 ¢ 89.30	3'-4" x 3'-4"	36"	16'	#10	2'-11" x 2'-11"	8'-0" x 14'-0"	#7	#9	#8



ELEVATION



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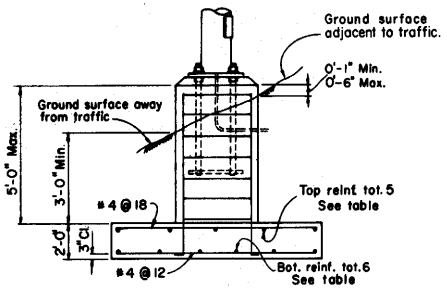
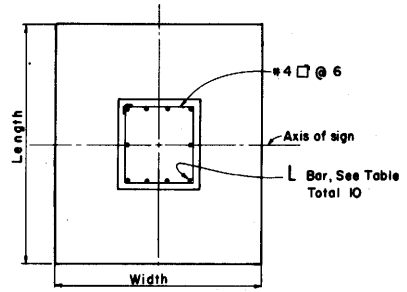


ELEVATION

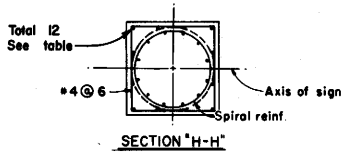


PLAN

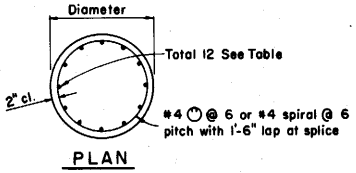
SPREAD FOOTING

NOTES:

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

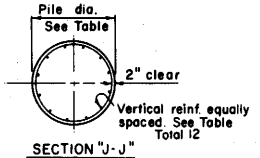


SECTION "H-H"



PLAN

6" & 8" POSTS



SECTION "J-J"

10" THRU 14" POSTS

PILE FOUNDATION

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OVERHEAD SIGNS
LIGHTWEIGHT
FOUNDATION

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DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET	TOTAL SHEETS

R C Cassidy
CHIEF, OFFICE OF STRUCTURES DESIGN
Registered Civil Engineer No. 5013

Date Approved July 1, 1980

INSTRUCTIONS TO FABRICATOR

PROJECT PLANS SHOW:

1. Sign structure location
2. Length of structure frame
3. Walkway length for two post signs
4. Panel size and locations on structure
5. Post type and height to bottom of frame
6. Base plate elevation.
7. Footing elevation or location of pile foundation
8. Photo electric cell location if required

REFER TO THE FOLLOWING SHEETS FOR DETAILS NOT SHOWN ON PROJECT PLANS:

S21. Instructions and examples
S22. Two post type - frame members
S23. Two post type - frame details
S24. Two post type - cantilever - frame details
S25. Two post type - frame juncture details
S26. Two post type - post details
S27. Single post type - frame members
S28. Single post cantilever - frame details
S29. Single post cantilever - frame juncture details
S30. Single post cantilever - post details
S31. Single post butterfly - frame details
S32. Single post butterfly - frame juncture details
S33. Single post butterfly - post details
S34. Single and two post types - sign panel mounting details
S 9. Walkway details No. 1
S 10. Walkway details No. 2
S 11. Walkway safety railing details
S39. Foundations
ES31. Fluorescent sign lighting equipment - Integral Ballast
ES32. Fluorescent sign lighting equipment - Integral Ballast - Sign Control Equipment Installations

WALKWAY BRACKETS:

Space all walkway brackets maintaining uniform spacing where possible. Maximum spacing shall not exceed 5'-6".

WALKWAY AND SAFETY RAILING: Walkway to be continuous for entire length of frame for single post signs. For 2 post signs see Project Plans. Safety railing to protect entire walkway, but continous for no more than 11' in one unit.

GENERAL NOTES

SPECIFICATIONS:

DESIGN: A.A.S.H.O. Specifications for the Design and Construction of Structural Supports for Highway Signs, dated 1968.

CONSTRUCTION: Standard Specifications, and the Special Provisions

LOADING:

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

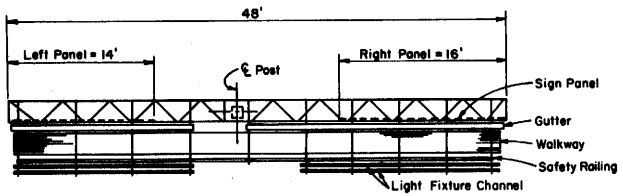
WALKWAY LOADING: Dead load + 500 lbs. concentrated live load.

UNIT STRESSES:

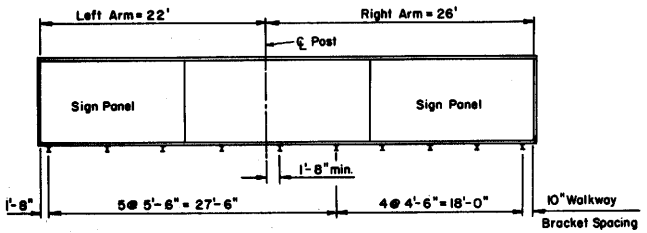
STRUCTURAL STEEL:	Fs = 20,000 P.S.I.
REINFORCED CONCRETE:	Fs = 20,000 P.S.I., Fc = 1,200 P.S.I.
FOOTING SOIL PRESSURE:	1¼ tons/sq. ft.

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

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

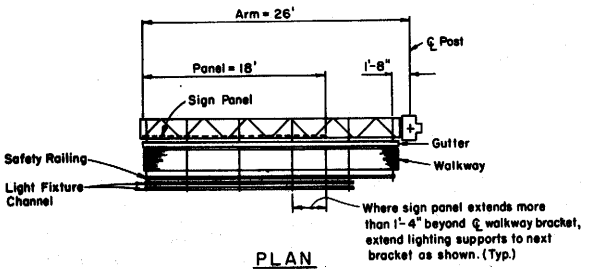


PLAN



SINGLE POST BUTTERFLY

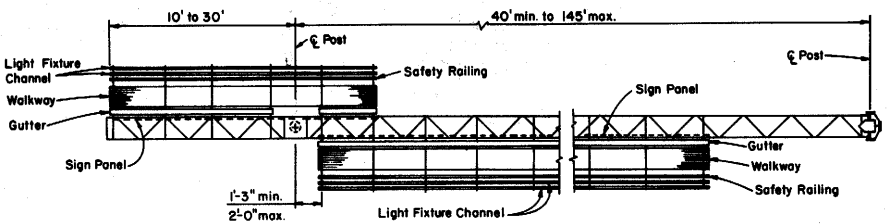
EXAMPLE NO. 1



PLAN

SINGLE POST CANTILEVER

EXAMPLE NO. 2



PLAN

TWO POST TYPE WITH CANTILEVER
(PART DOUBLE-FACED)

EXAMPLE NO. 3

Standard Plan Sheet No.
Detail No.

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

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
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OVERHEAD SIGNS
BOX BEAM
INSTRUCTIONS AND EXAMPLES

S 21-4

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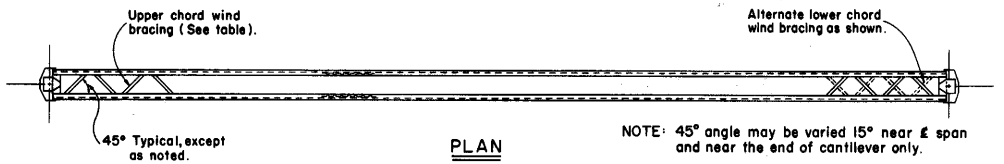
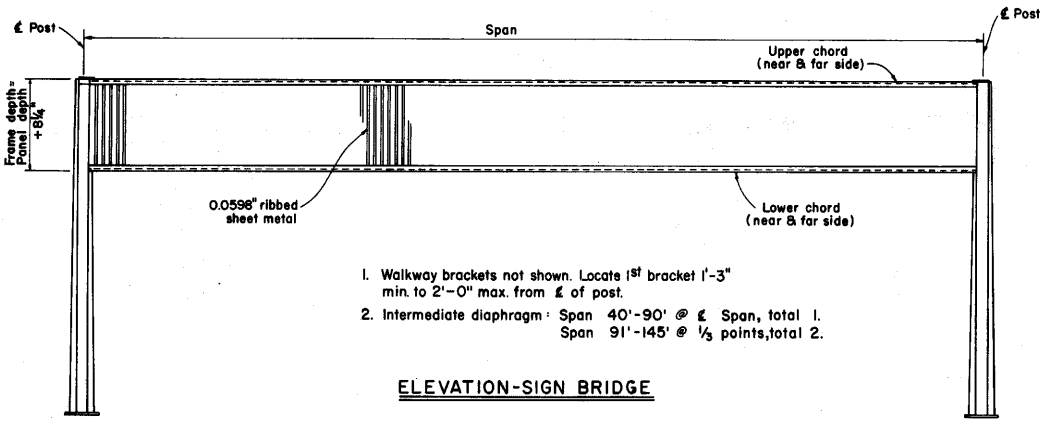


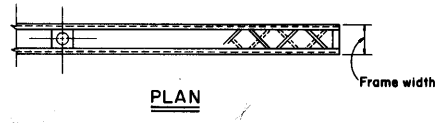
PLAN

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

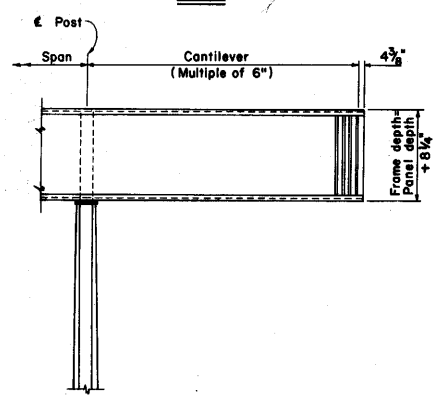


1. Walkway brackets not shown. Locate 1st bracket 1'-3" min. to 2'-0" max. from ℄ of post.
2. Intermediate diaphragm: Span 40'-90' @ ℄ Span, total 1.
   Span 91'-145' @ ⅓ points, total 2.

ELEVATION-SIGN BRIDGE



PLAN



ELEVATION - SIGN BRIDGE CANTILEVER

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

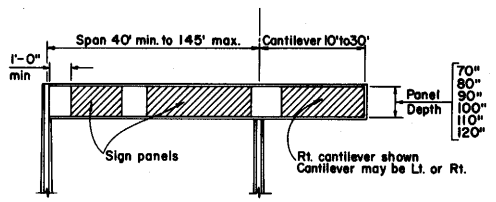
100" Panel Depth				110" Panel Depth				120" Panel Depth			
Span	Frame Width	Chord L's	Wind Bracing	Span	Frame Width	Chord L's	Wind Bracing	Span	Frame Width	Chord L's	Wind Bracing
40'-50'	2'-0"	4 x 4 x ⅜	1½ x 1½ x ¼	40'-50'	2'-0"	4 x 4 x ⅜	1½ x 1½ x ¼	40'-50'	2'-0"	4 x 4 x ⅜	1½ x 1½ x ¼
51'-60'		4 x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

TABLE I

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

TABLE II

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



RANGE OF STRUCTURE SIZES

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

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

CHIEF, OFFICE OF STRUCTURES DESIGN
Registered Civil Engineer No. 9013

Date Approved July 1, 1980

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
BOX BEAM
TWO POST TYPE
FRAME MEMBERS

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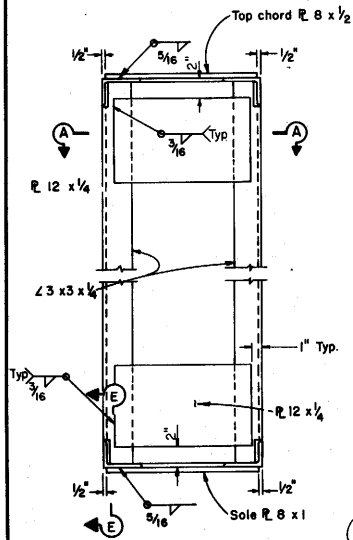
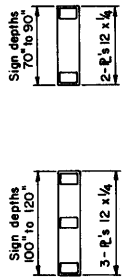
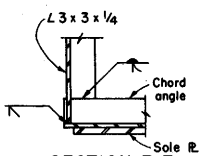


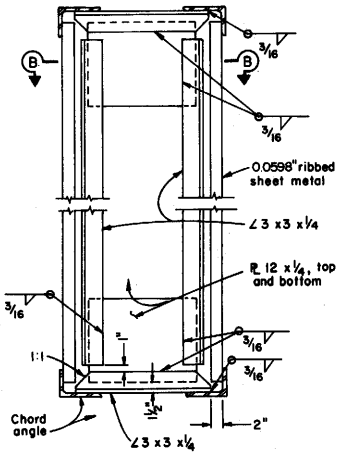
END VIEW



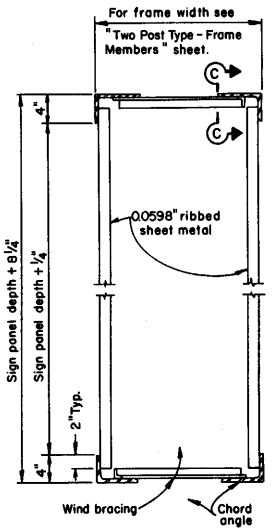
DIAPHRAGM PL LAYOUT



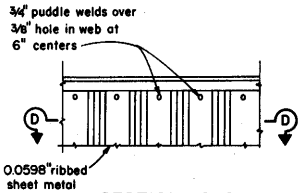
SECTION E-E



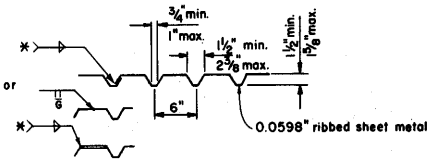
SECTION AT DIAPHRAGM



TYPICAL SECTION

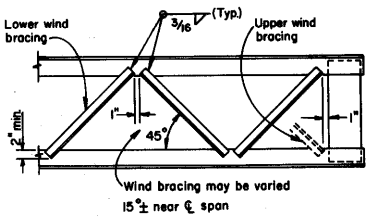


SECTION C-C



* Lap splice shall be continuous weld both sides.
For weld qualification test, see Sheet S34 A-5.

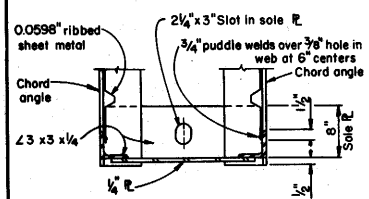
SECTION D-D



WIND BRACING DETAILS

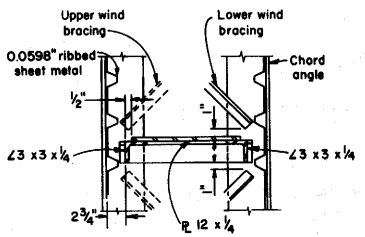
Chord Angle Splice Notes:

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



SECTION A-A

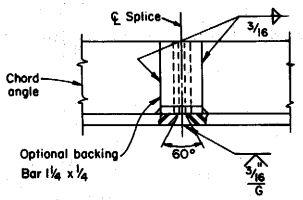
END DIAPHRAGM DETAILS



SECTION B-B

Note:
Details for top and bottom connections are similar.

INTERMEDIATE DIAPHRAGM DETAILS



WELDED CHORD SPLICE

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

R. C. Cannon
CHIEF, OFFICE OF STRUCTURES DESIGN
Registered Civil Engineer No. 9013

Date Approved July 1, 1980

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
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OVERHEAD SIGNS
BOX BEAM
TWO POST TYPE
FRAME DETAILS

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DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET	TOTAL SHEETS

CHIEF, OFFICE OF STRUCTURES DESIGN
Registered Civil Engineer No. 9018

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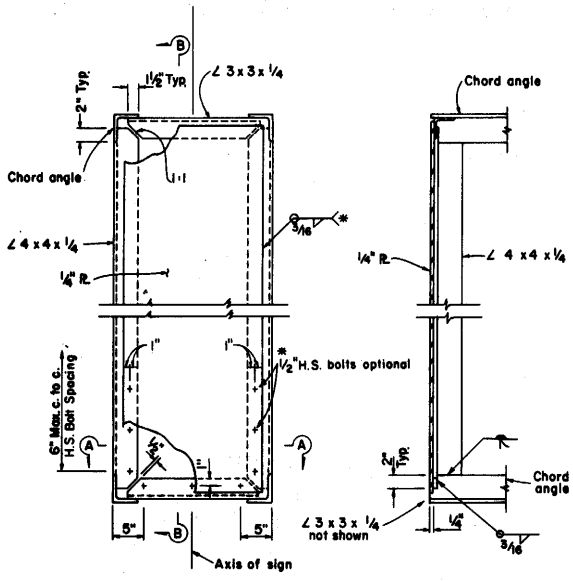
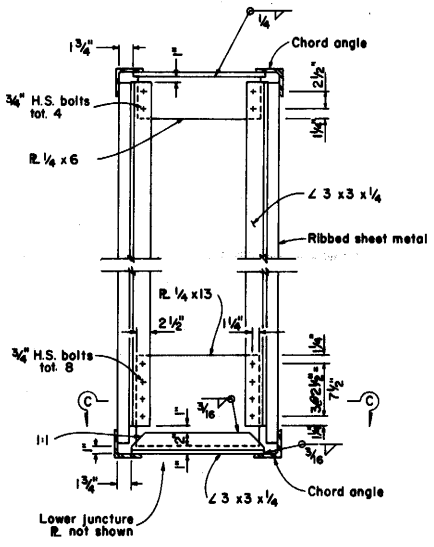
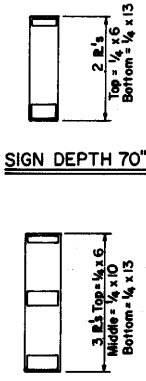


CANTILEVER END VIEW

SECTION B-B

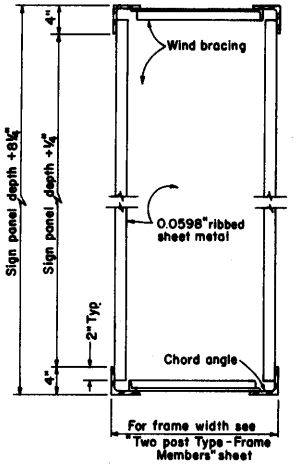




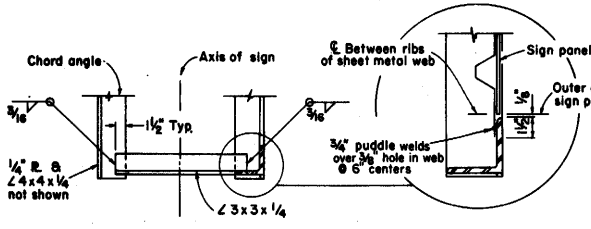
SIGN DEPTH 70"-90"

SIGN DEPTH 100"-120"

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

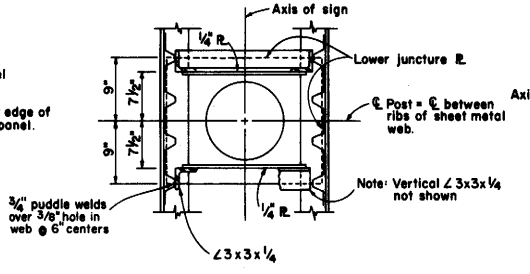


TYPICAL SECTION



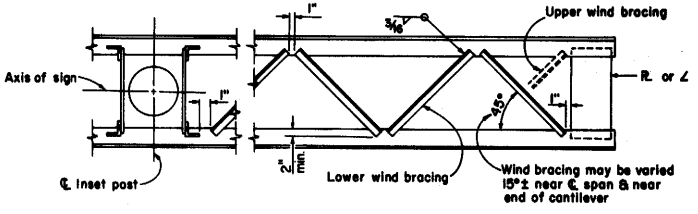
SECTION A-A

END DIAPHRAGM DETAILS



SECTION C-C

INSET POST DIAPHRAGM DETAILS



WIND BRACING DETAILS

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OVERHEAD SIGNS
BOX BEAM
TWO POST TYPE WITH CANTILEVER
FRAME DETAILS

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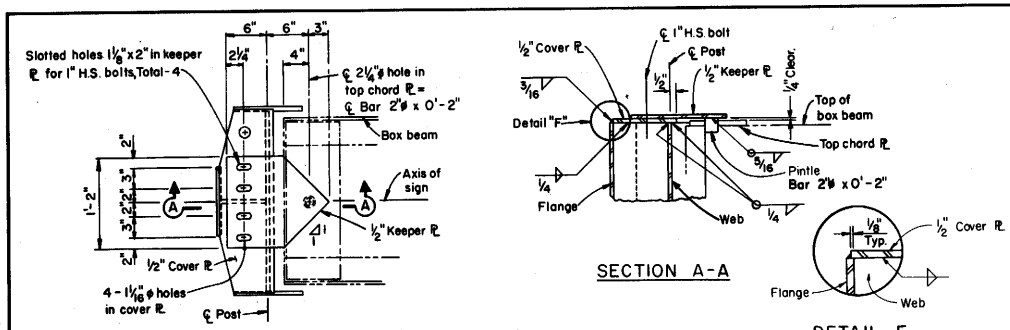
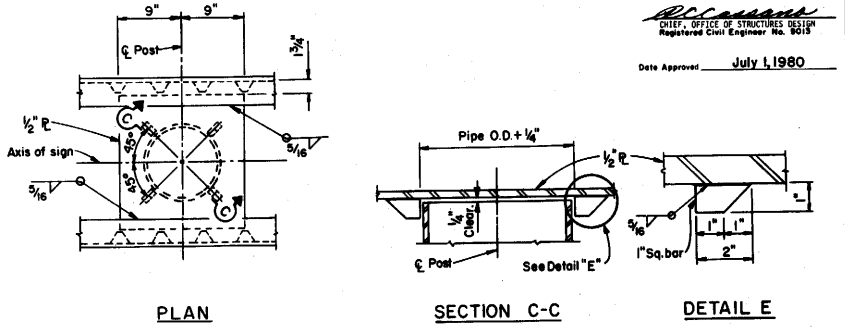
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF STRUCTURES DESIGN
Registered Civil Engineer No. 9013

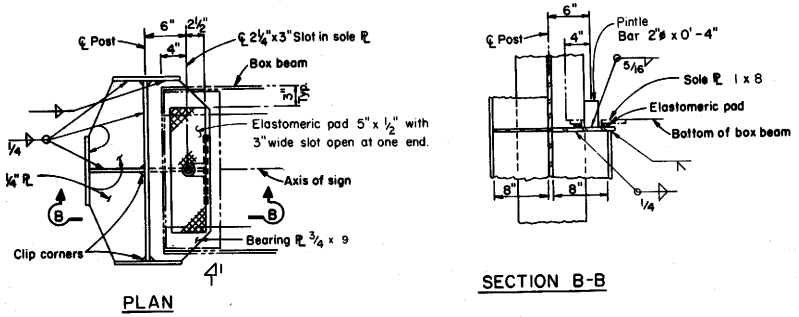
Date Approved July 1, 1980



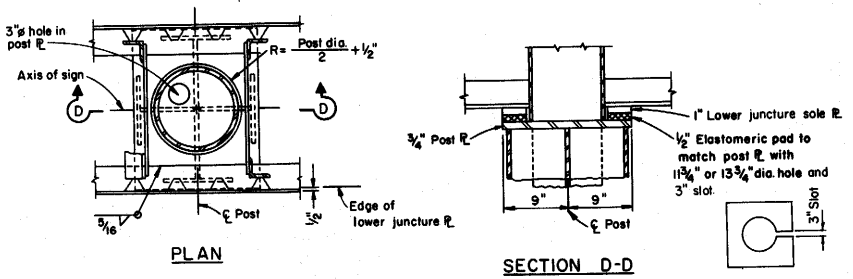
UPPER JUNCTURE CONNECTION
END POST



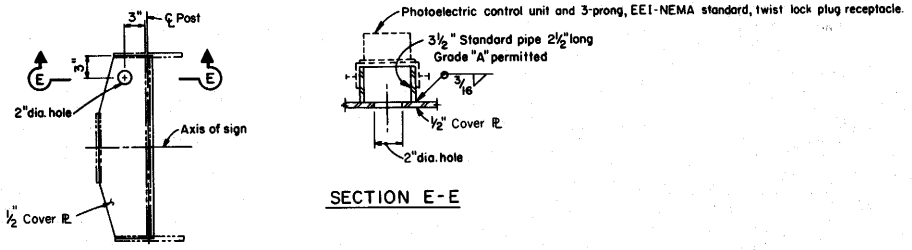
UPPER JUNCTURE CONNECTION
INSET POST



LOWER JUNCTURE CONNECTION
END POST



LOWER JUNCTURE CONNECTION
INSET POST



PHOTOELECTRIC CONTROL UNIT

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
BOX BEAM
TWO POST TYPE
FRAME JUNCTURE DETAILS

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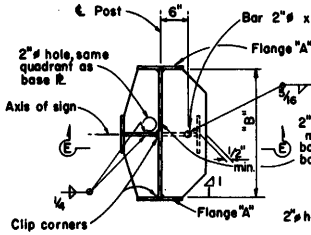
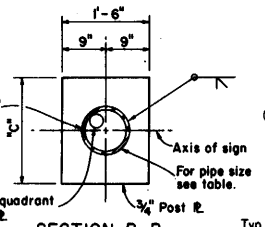
Return to Table of Contents

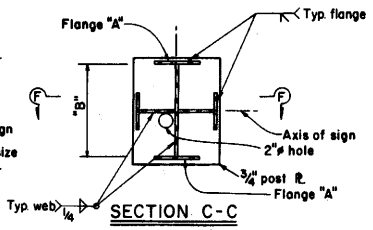
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET	TOTAL SHEETS



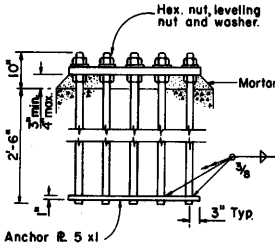
SECTION A-A



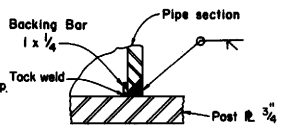
SECTION B-B



SECTION C-C



ANCHORAGE DETAILS

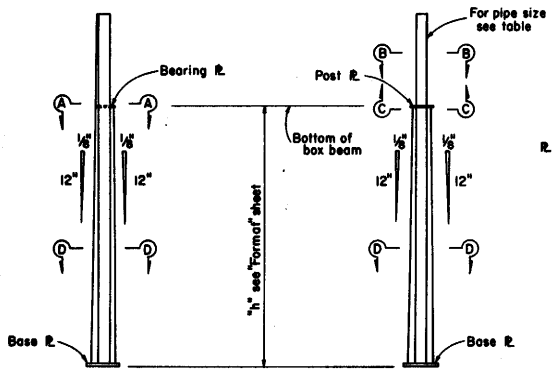


PIPE SECTION TO POST ℞

CHIEF, OFFICE OF STRUCTURES DESIGN
Registered Civil Engineer No. 9013

Date Approved July 1, 1980

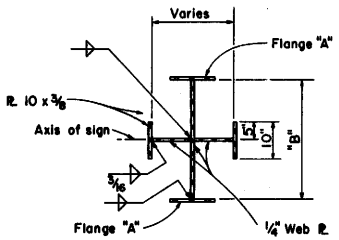
NOTE: For dimensions not shown see table



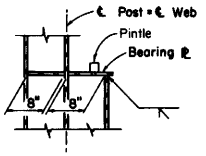
END POST
"A" & "B"

INSET POST
"C" & "D"

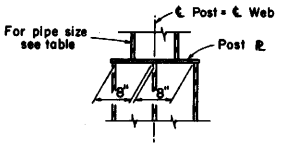
ELEVATION



SECTION D-D



SECTION E-E

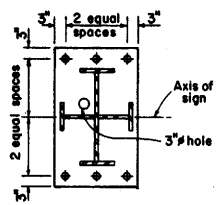


SECTION F-F

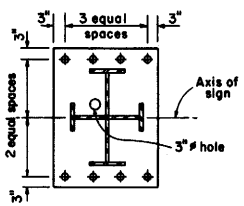
NOTE: Locate 3"ø hole for conduit in quadrant away from approaching traffic-center 2" from web plates.

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

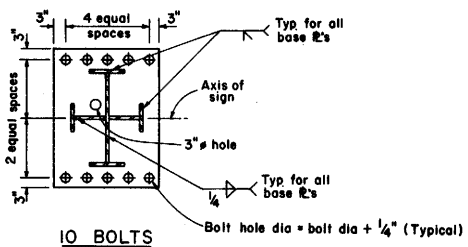
1. Thread upper 10" of anchor bolts and galvanize upper 1'-0".
2. Anchor ℞'s may be retained with hex. nut or formed head.
3. 2 1/2" ϕ anchor bolts may be substituted for 2 1/4" ϕ bolts.



6 BOLTS



8 BOLTS



10 BOLTS

TYPICAL BASE PLATES

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
BOX BEAM
TWO POST TYPE
POST DETAILS

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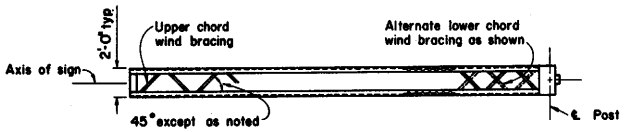
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

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

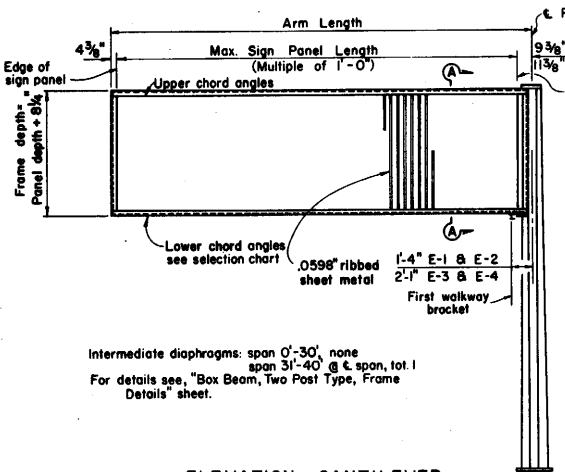


PLAN

PLAN

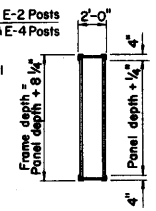
CHIEF, OFFICE OF STRUCTURES DESIGN
Registered Civil Engineer No. 9013

Date Approved July 1, 1989

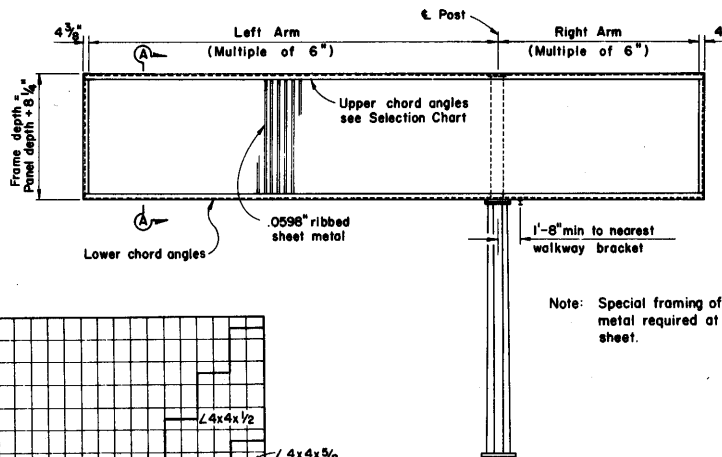


ELEVATION - CANTILEVER

Intermediate diaphragms: span 0'-30', none
span 31'-40' @ ℄ span, tot. 1
For details see, "Box Beam, Two Post Type, Frame Details" sheet.

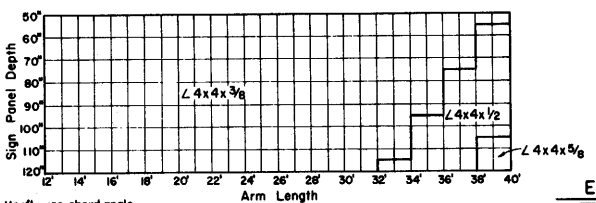


SECTION A-A



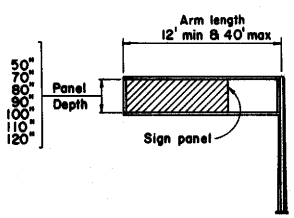
ELEV. - BUTTERFLY

Note: Special framing of ribbed sheet metal required at post. See S32-4 sheet.

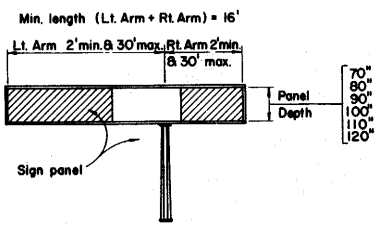


NOTES:
1. For butterfly, use chord angle size determined by longer arm for both sides.

UPPER & LOWER CHORD ANGLE SELECTION CHART

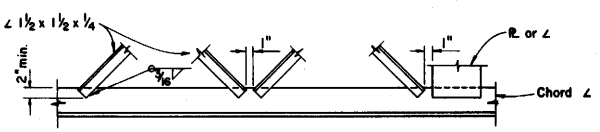


CANTILEVER



BUTTERFLY

RANGE OF STRUCTURE SIZES



WIND BRACING

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
BOX BEAM
SINGLE POST TYPE
FRAME MEMBERS

S 27-5

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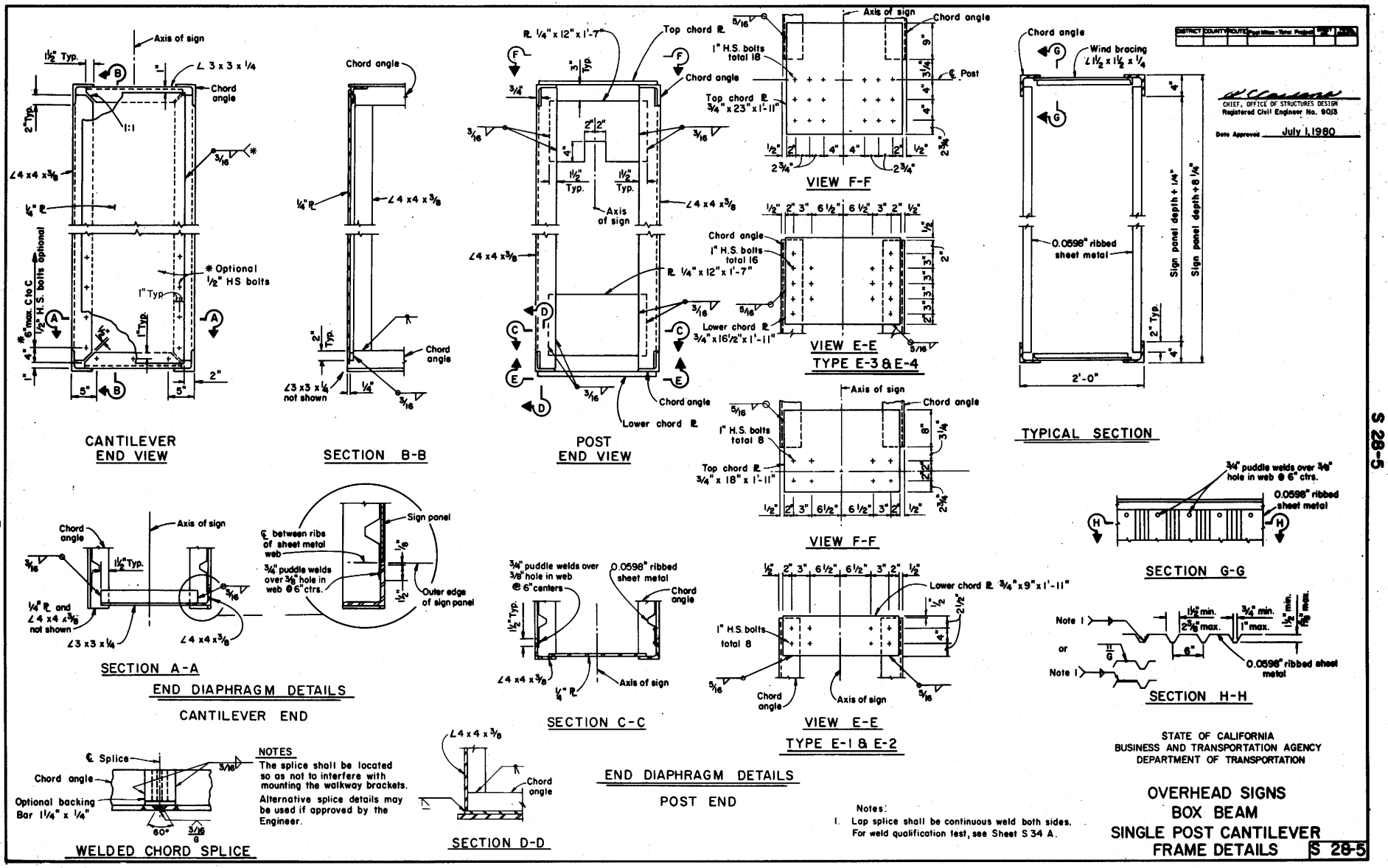
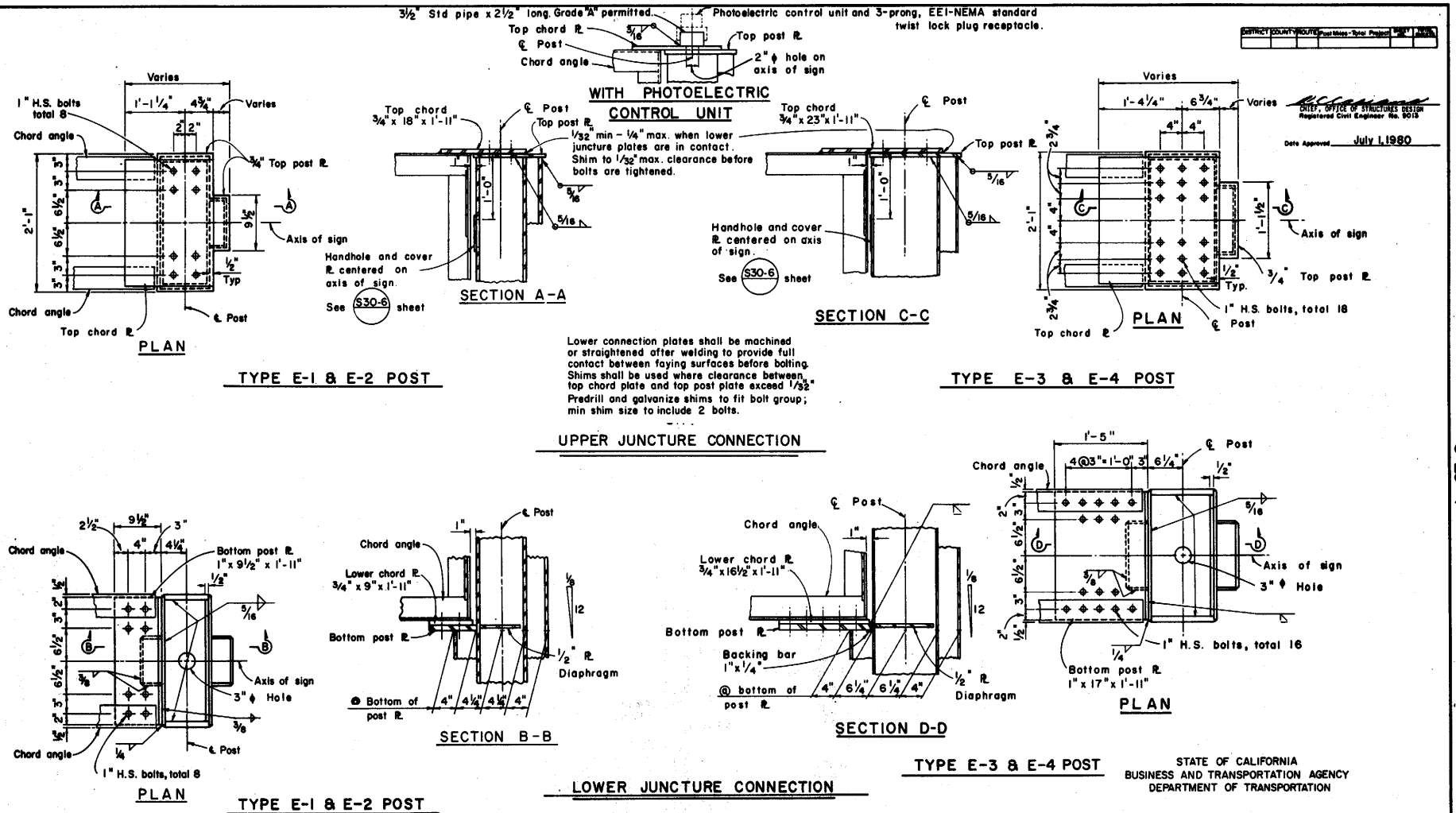
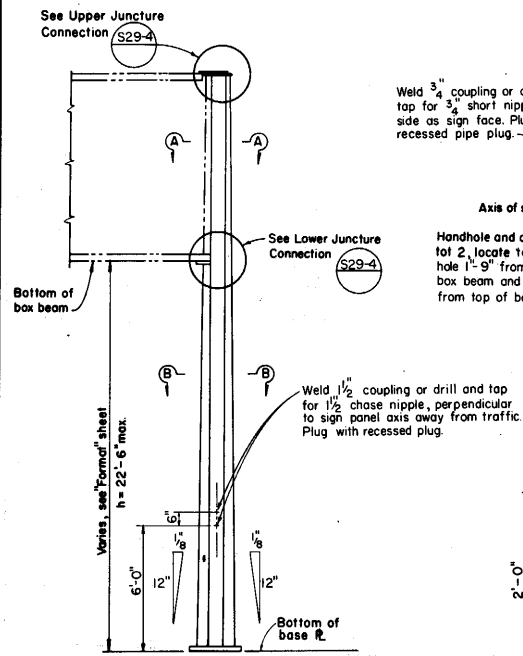


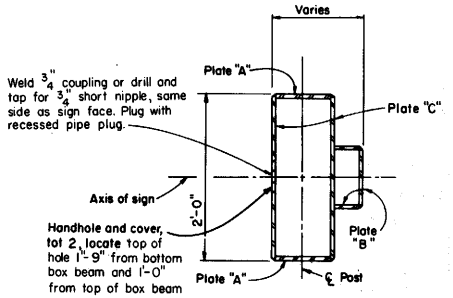
Return to Table of Contents



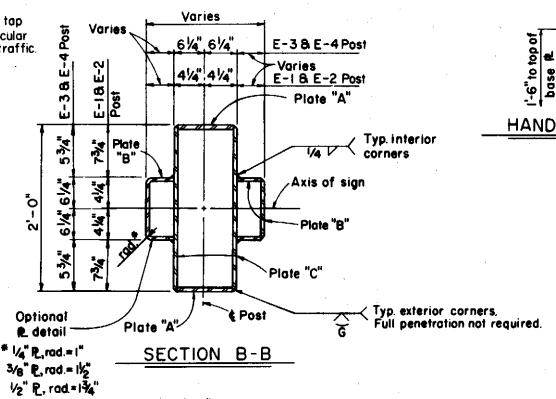
Return to Table of Contents



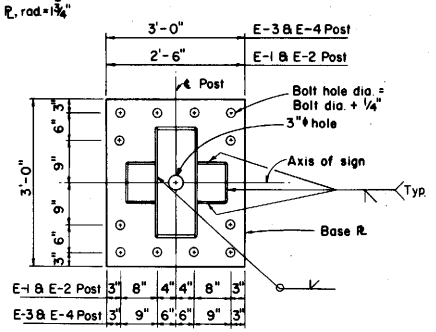
ELEVATION



SECTION A-A



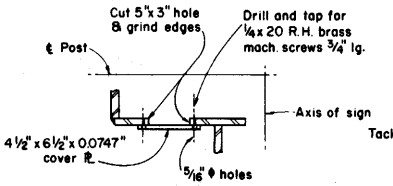
SECTION B-B

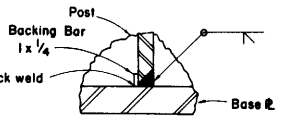


BASE PLATE

Post Type	Base Plate	Plate "A"	Plate "B"	Plate "C"	Anchor Bolts
E-1	30" x 2" x 3'-0"	½"	¼"	⅜"	12 - 1¾"
E-2	30" x 2½" x 3'-0"	1"	⅜"	½"	12 - 2"
E-3	3'-0" x 2½" x 3'-0"	1"	⅜"	½"	12 - 2¼"
E-4	3'-0" x 2½" x 3'-0"	1"	½"	⅝"	12 - 2¼"

2" ϕ Anchor bolts may be substituted for 1¾" ϕ bolts.

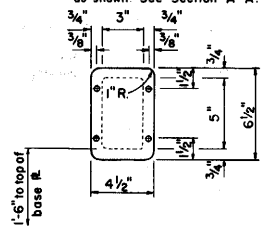




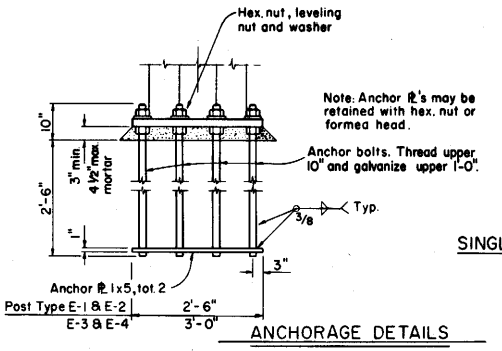
POST TO BASE PLATE

WELDING DETAILS

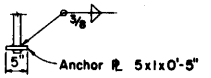
Note:
Face handhole and cover PL away from traveled way except as shown. See Section A-A.



HANDHOLE AND COVER DETAIL



ANCHORAGE DETAILS



SINGLE SIDE BOLT

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

CHIEF, OFFICE OF STRUCTURE DESIGN
Registered Civil Engineer No. 5013

Date Approved July 1, 1980

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
BOX BEAM
SINGLE POST CANTILEVER
POST DETAILS

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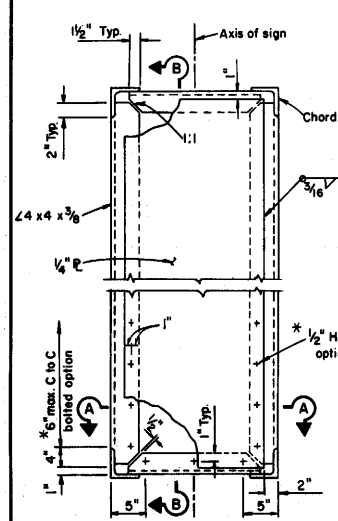
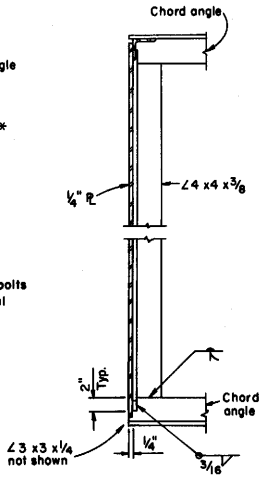
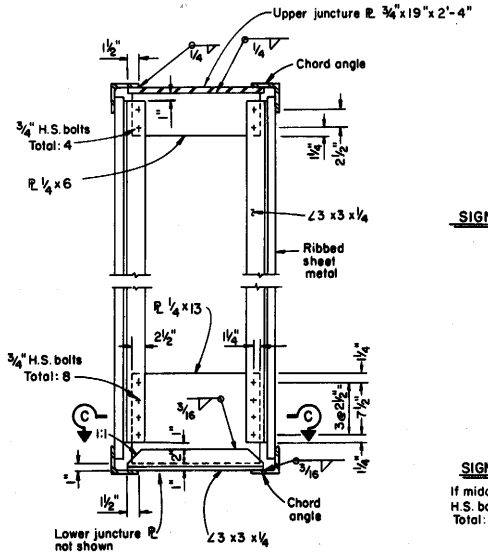


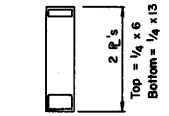
END VIEW



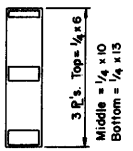
SECTION B-B



SECTION AT DIAPHRAGM

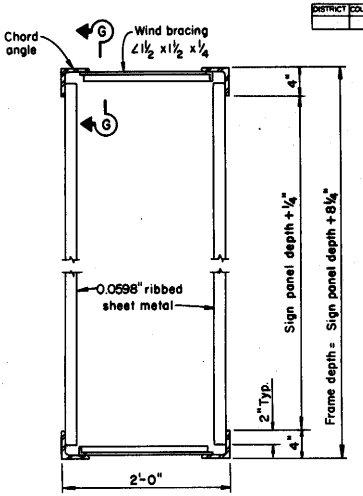


SIGN DEPTH 70"-90"



SIGN DEPTH 100"-120"

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



TYPICAL SECTION

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

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Registered Civil Engineer No. 9013

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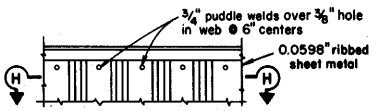
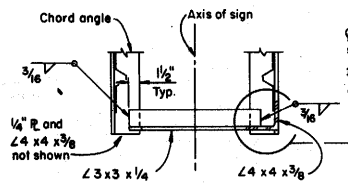
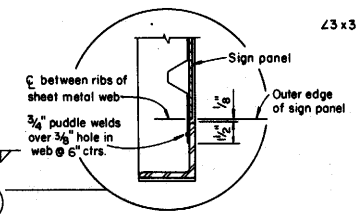


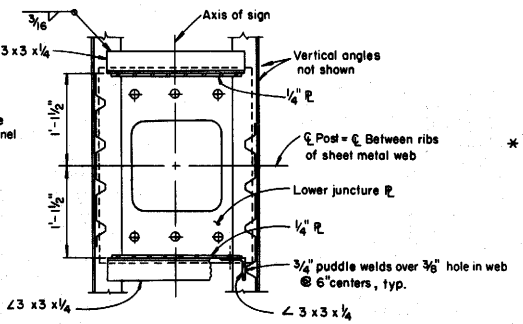
SECTION G-G



SECTION A-A



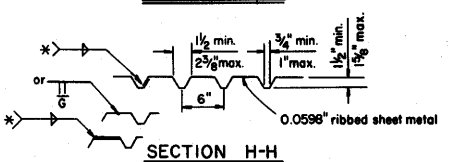
END DIAPHRAGM DETAILS



SECTION C-C

POST DIAPHRAGM DETAILS

* Lap splice shall be continuous weld both sides. For weld qualification test, see Sheet S 34 A-5.



SECTION H-H

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
BOX BEAM
SINGLE POST BUTTERFLY
FRAME DETAILS

S 31-3

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

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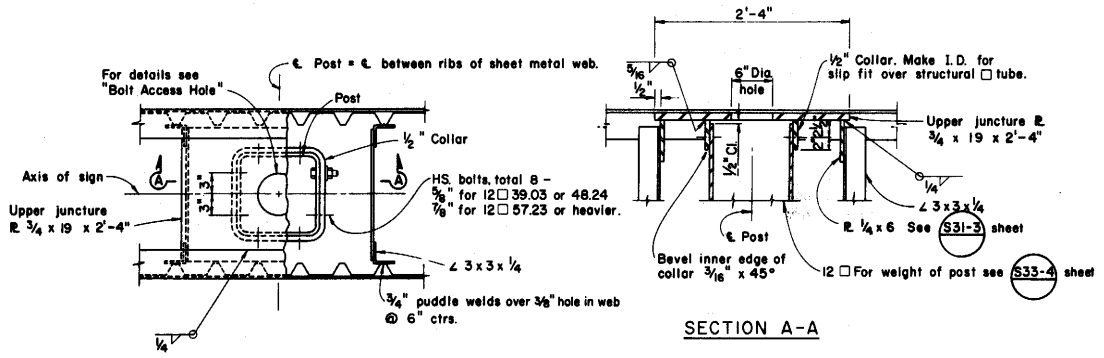
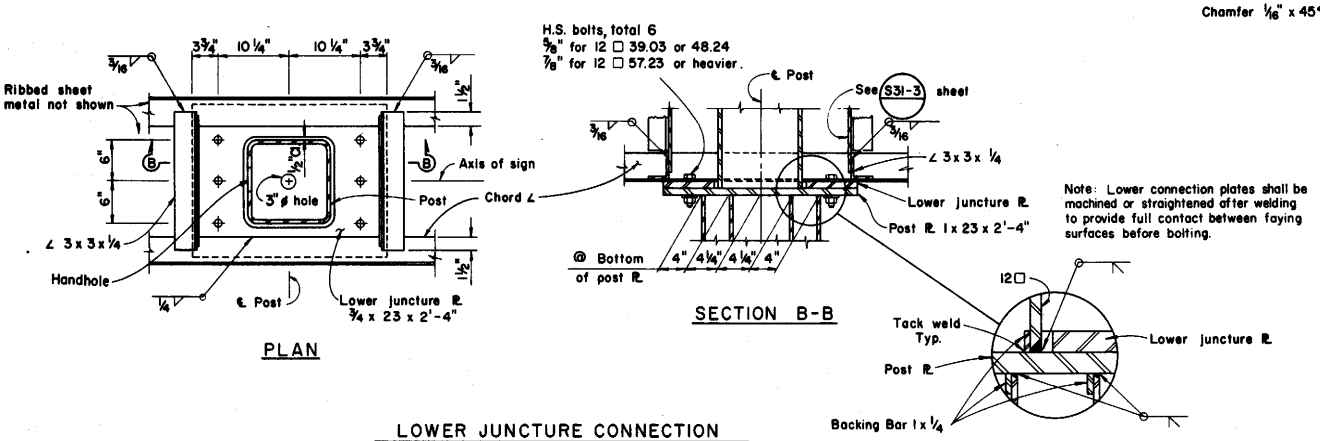
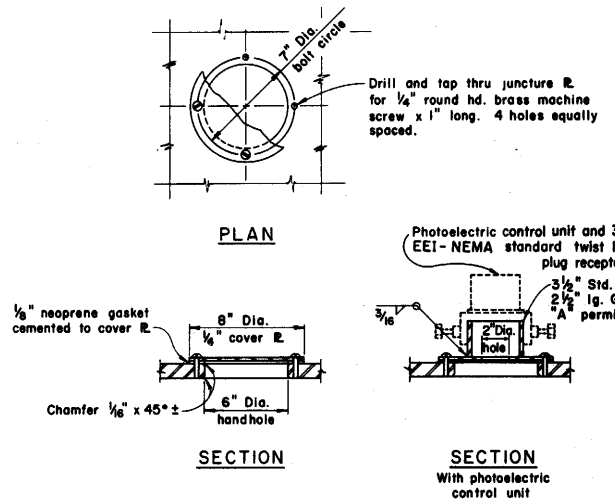


UPPER JUNCTURE CONNECTION



LOWER JUNCTURE CONNECTION



BOLT ACCESS HOLE

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
BOX BEAM
SINGLE POST BUTTERFLY
FRAME JUNCTURE DETAILS

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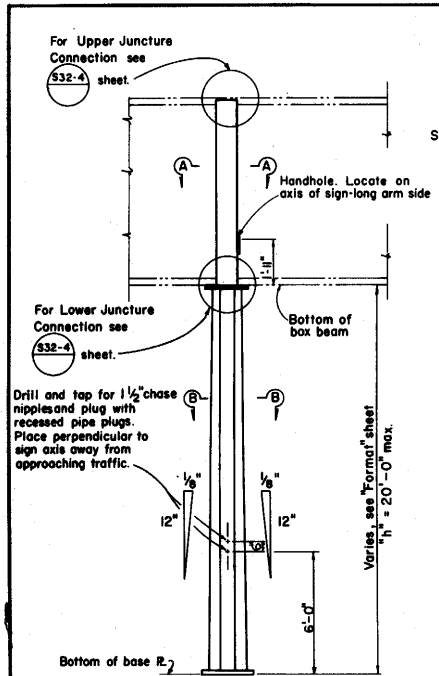
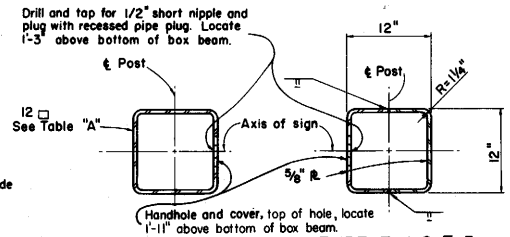
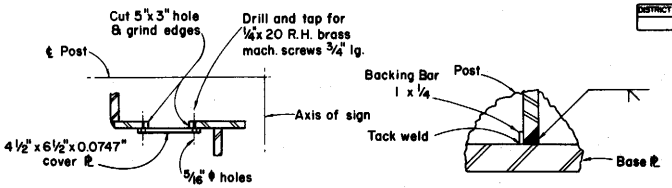
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS



ELEVATION



TYPE F-1 THRU F-3 TYPE F-4 & F-5



Note: Face handhole away from traveled way. On F-1 type posts locate handhole on ℄ Post in Plate "A".

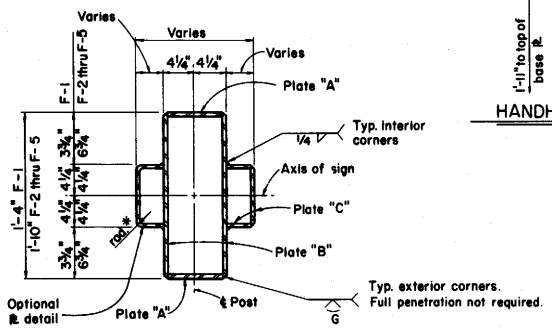
PLATES A, B & C
POST TO BASE PLATE

WELDING DETAILS

CHIEF, OFFICE OF STRUCTURES DESIGN
Registered Civil Engineer No. 30513

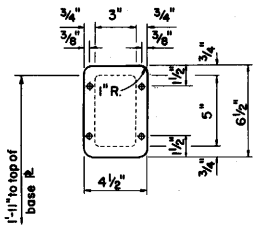
Date Approved July 1, 1980

SECTION A-A



* ¼" ℞, rad. = 1"
⅜" ℞, rad. = 1½"

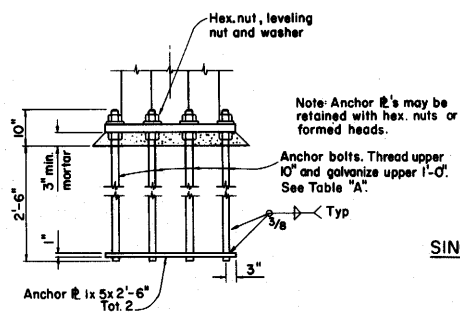
SECTION B-B



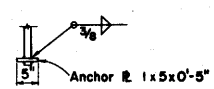
HANDHOLE AND COVER DETAIL

TABLE "A"						
Post Type	Plate "A"	Plate "B"	Plate "C"	Base Plate	Anchor Bolts* No. & Dia.	Structural Tube
F-1	¼" x 8"	¼"	¼"	2" x 30"x3'-0"	8 - 2"	12x12x0.3125
F-2	½" x 8"	¼"	¼"	2" x 30"x3'-0"	12 - 1¾"	12x12x0.375
F-3	1½" x 8"	¼"	¼"	2" x 30"x3'-0"	12 - 2"	12x12x0.500
F-4	1½" x 7¾"	⅜"	⅜"	2½" x 30"x3'-0"	12 - 2¼"	See Section A-A
F-5	1½" x 7"	¾"	⅜"	2¾" x 30"x3'-0"	12 - 2¼"	

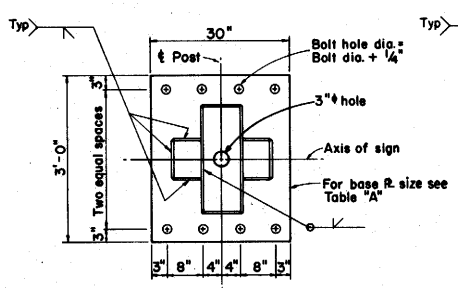
* 2" ϕ anchor bolts may be substituted for 1¾" ϕ bolts.



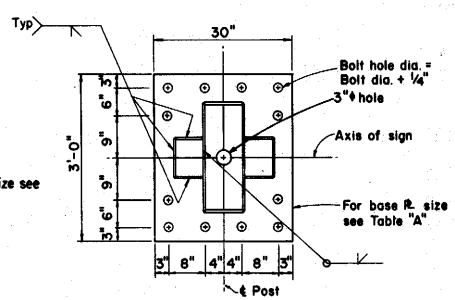
ANCHORAGE DETAILS



SINGLE SIDE BOLT



TYPE F-1



TYPE F-2 THRU F-5

BASE PLATE DETAILS

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
BOX BEAM
SINGLE POST BUTTERFLY
POST DETAILS

S 33-4

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

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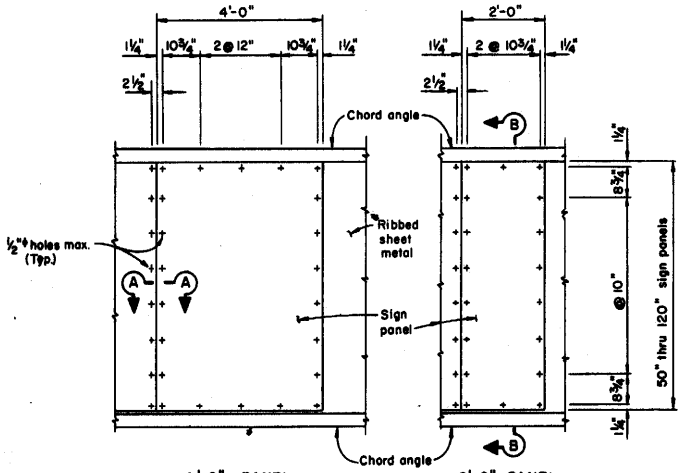
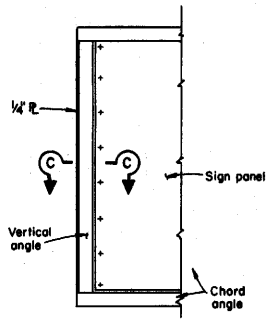
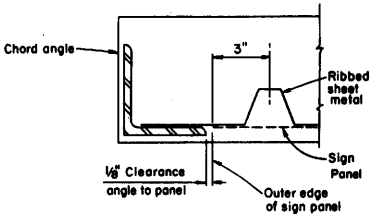


INTERIOR SPAN

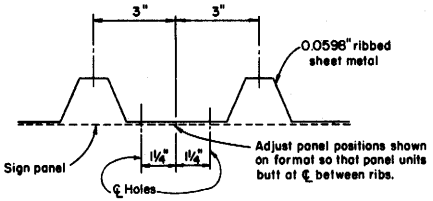
ELEVATION



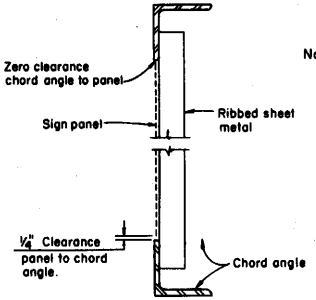
CANTILEVER ARM



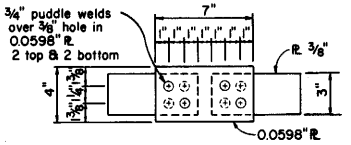
SECTION C-C



SECTION A-A

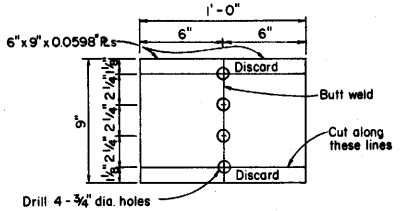


SECTION B-B



Note:
Two specimens req'd for each position to be welded.

TEST NO. 1



TEST NO. 2

WELD QUALIFICATION TESTS

Notes:

1. Sign panel mounting holes are ½" diameter max.
2. Holes shall be drilled in ribbed sheet metal by template. Sign panel may be considered a template.
3. ¼" clearance at bottom of sign panel is necessary for installation of 0.0598" splash plate. See "Walkway Details No.2" sheet, S10-9.
4. Test No. 2 shall be used for welder qualifications on square groove welds and fillet weld lap splices.

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
BOX BEAM
SIGN PANEL MOUNTING DETAILS
SINGLE SHEET SIGN PANEL

S 34A-5

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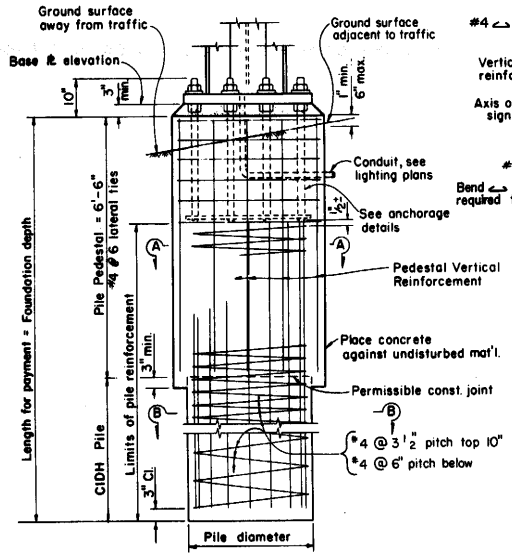

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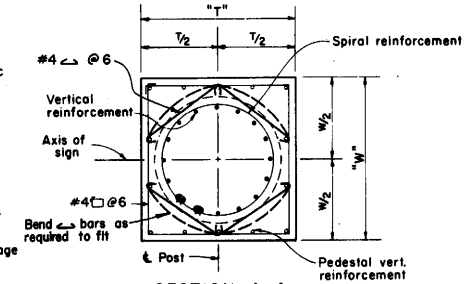
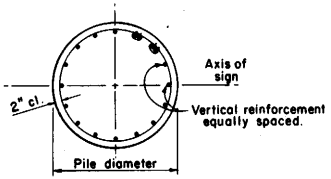
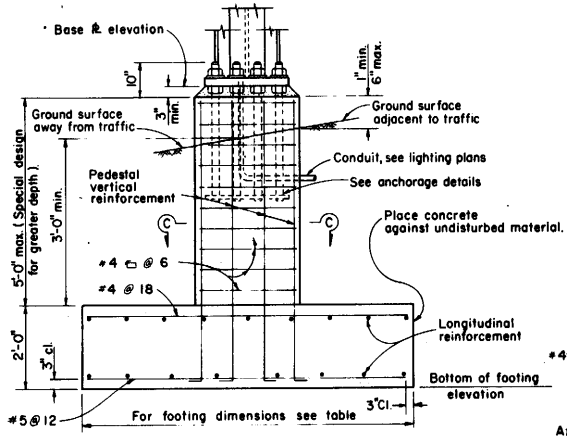


SECTION A-A

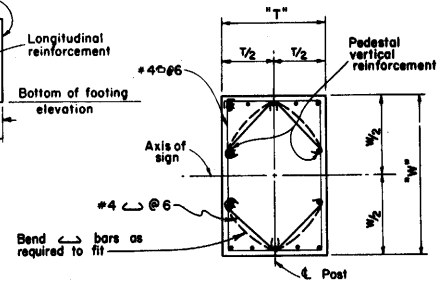


SECTION B-B

PILE FOUNDATION



ELEVATION



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.		Bottom Reinf.		
							Longit.	Transv.	Longit.	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"x 19'-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.		Bottom Reinf.		
							Longit.	Transv.	Longit.	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"x 18'-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"x 3'-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"x19'-0"	9-#6		10-#11		
D-2	3'-4"x 4'-2"	28*-#11	36"	24'	14-#10	8'-0"x21'-0"	7-#8		13-#11		
D-3	3'-10"x 4'-2"	24*-#11	42"	24'	14-#11	8'-0"x23'-0"	8-#8		16-#11		
D-4	3'-10"x 4'-2"	34*-#11	42"	27'	14-#11	8'-0"x23'-0"	8-#8		18-#11		
D-5	3'-10"x 4'-2"	34*-#11	42"	30'	28*-#10	8'-0"x25'-0"	9-#8		14-#14		
D-6	4'-2"x 4'-7"	34*-#11	42"	30'	14-#11	8'-0"x26'-0"	10-#8	↓	14-#14	↓	
D-7	4'-2"x 4'-7"	34*-#11	42"	30'	14-#11	8'-0"x26'-0"	10-#8	#4@18	15-#14	#5@12	

* Bundled bars

NOTES:

1. Base plates, pedestals and footings; longer sides shall be normal to axis of sign.
2. For anchor bolt layout see S30-6
3. For base plate elevation see "Format sheet.
4. Prior to erection of the post, backfill which is equivalent to the surrounding material shall be in place.
5. Pile pedestal shall be formed 6" min. below ground surface. Remainder to be placed against undisturbed material.
6. Pile footing - use foundation depth shown in table unless otherwise shown on "Format" sheet.
7. On single post sign structures the post shall be raked out of plumb with the use of the leveling nuts to make the bottom of the sign frame level.

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

CHIEF, OFFICE OF STRUCTURES DESIGN
Registered Civil Engineer No. 9013

Date Approved July 1, 1980

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS BOX BEAM AND CLOSED TRUSS ALTERNATIVE FOUNDATION

S 39-6

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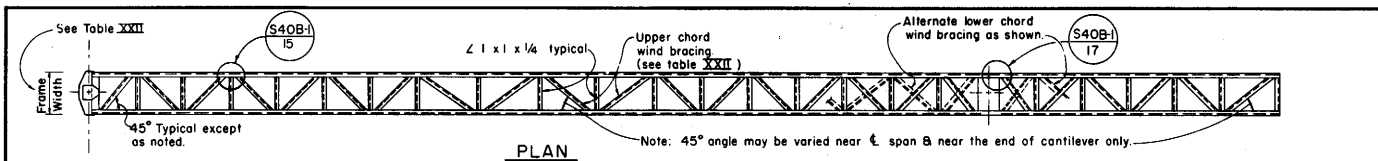
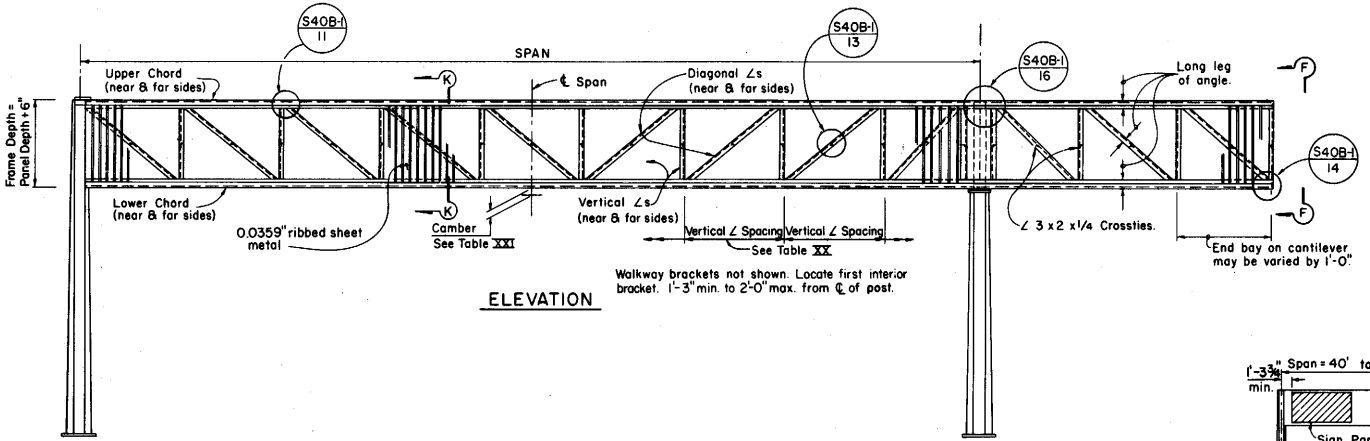


PLAN



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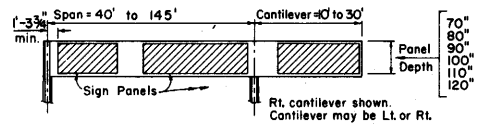

RANGE OF STRUCTURE SIZES

Span	70" Panel Depth					80" Panel Depth					90" Panel Depth				
	Frame Width	Chord ∠s	Vertical ∠s	Diagonal ∠s	Wind Bracing	Frame Width	Chord ∠s	Vertical ∠s	Diagonal ∠s	Wind Bracing	Frame Width	Chord ∠s	Vertical ∠s	Diagonal ∠s	Wind Bracing
40'-50'	2'-0"	5 x 3 x 7/16	3 x 3 x 5/16	3 x 3 x 1/4	1 1/2 x 1 1/2 x 1/4	2'-0"	5 x 3 x 7/16	3 x 3 x 5/16	3 x 3 x 1/4	1 1/2 x 1 1/2 x 1/4	2'-0"	5 x 3 x 7/16	3 x 3 x 5/16	3 x 3 x 5/16	1 1/2 x 1 1/2 x 1/4
51'-60'		5 x 3 x 7/16					5 x 3 x 7/16					5 x 3 x 7/16			
61'-70'		5 x 3 x 7/16					5 x 3 x 7/16					5 x 3 x 7/16			
71'-80'		5 x 3 x 7/16					5 x 3 x 7/16					5 x 3 1/2 x 1/2			
81'-90'		5 x 3 1/2 x 1/2					5 x 3 1/2 x 1/2					5 x 3 1/2 x 1/2			
91'-100'		5 x 3 1/2 x 5/8					5 x 3 1/2 x 5/8					5 x 3 1/2 x 5/8			
101'-110'		6 x 4 x 9/16					6 x 4 x 9/16					6 x 4 x 9/16			
111'-120'		6 x 4 x 5/8					6 x 4 x 5/8					7 x 4 x 5/8			
121'-132'		7 x 4 x 3/4				2'-6"	7 x 4 x 5/8			2 x 2 x 1/4	2'-6"	7 x 4 x 5/8			2 x 2 x 1/4
133'-145'	2'-6"	7 x 4 x 3/4			2 x 2 x 1/4	2'-6"	7 x 4 x 3/4			2 x 2 x 1/4	2'-6"	7 x 4 x 3/4			2 x 2 x 1/4

TABLE XXII

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-I sheet.
3. For Section K-K see S40B-I sheet.
4. For Foundation details see S39-6 sheet.

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

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO 9013

DATE APPROVED July 1, 1980

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
BOX BEAM
CLOSED TRUSS ALTERNATIVE
TWO POST TYPE
FRAME MEMBERS

S40A-I

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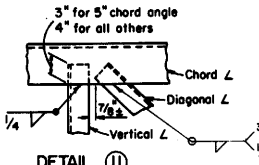
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO. OF TOTAL SHEETS

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

DATE APPROVED July 1, 1980



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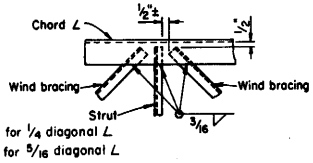

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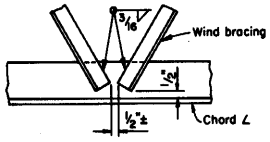

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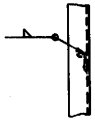

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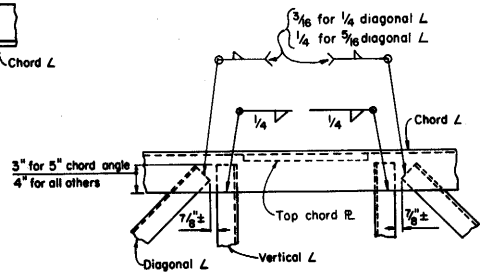

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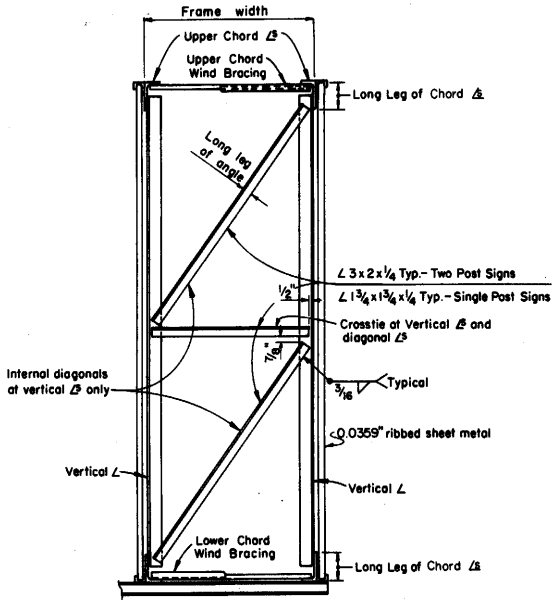
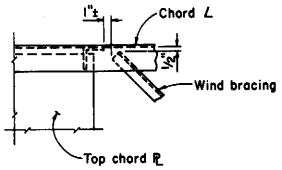


TYPICAL SECTION K-K



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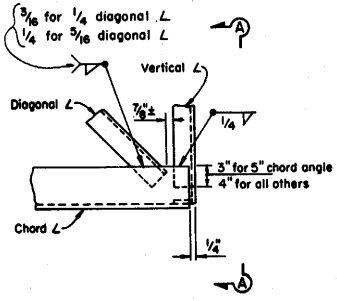

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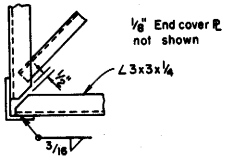
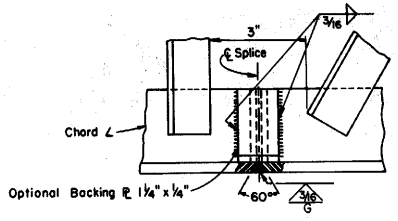


SECTION A-A



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

WELDED CHORD SPLICE

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
BOX BEAM
CLOSED TRUSS ALTERNATIVE
SINGLE AND TWO POST TYPE
GENERAL FRAME DETAILS

S40B-1

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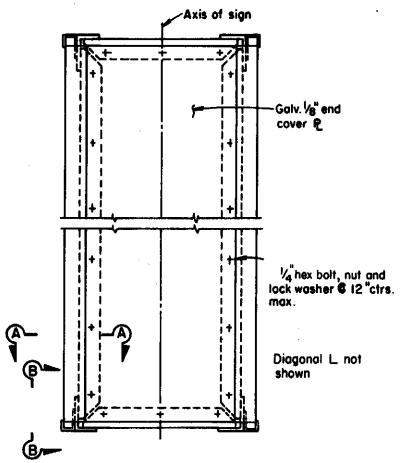
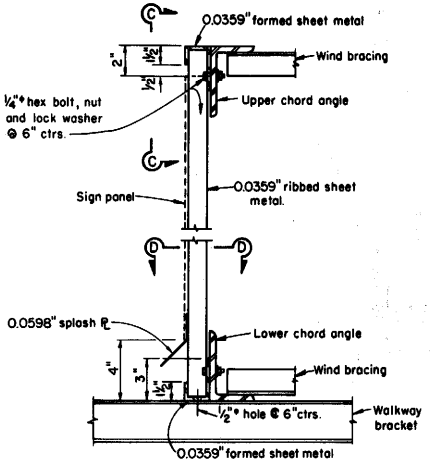
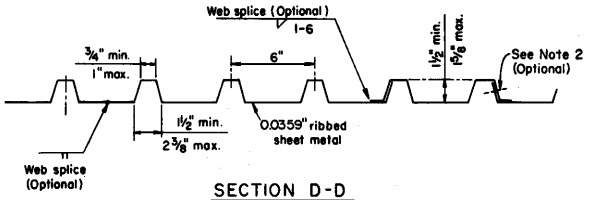


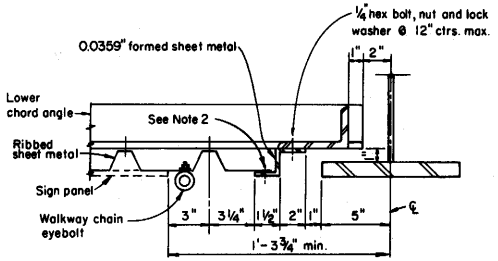
CANTILEVER END VIEW



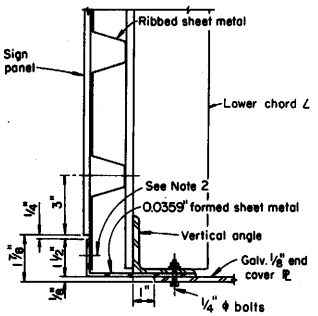
TYPICAL SECTION



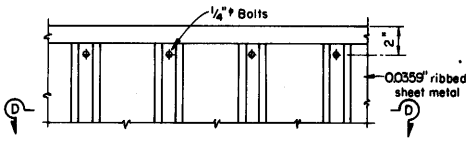
SECTION D-D



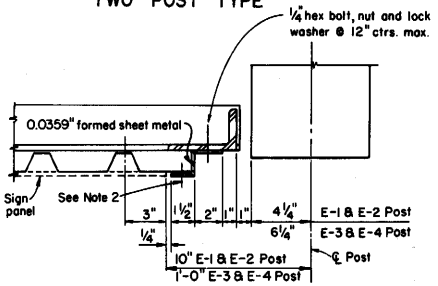
HORIZONTAL SECTION AT POST
TWO POST TYPE



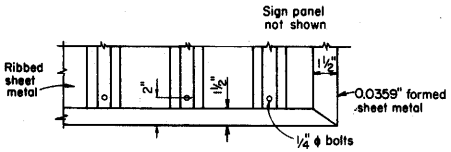
SECTION A-A



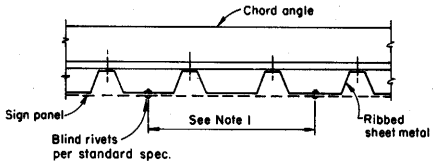
VIEW C-C



HORIZONTAL SECTION AT POST
CANTILEVER TYPE



VIEW B-B



MOUNTING DETAILS FOR
SINGLE SHEET SIGN PANELS

NOTES:

1. For rivet spacing and details not shown, see S34A-5
2. Approved blind rivets 3/16" dia. @ 6" ctrs.

DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET	TOTAL SHEETS

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

DATE APPROVED July 1, 1980

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
BOX BEAM
CLOSED TRUSS ALTERNATIVE
RIBBED SHEET METAL DETAILS

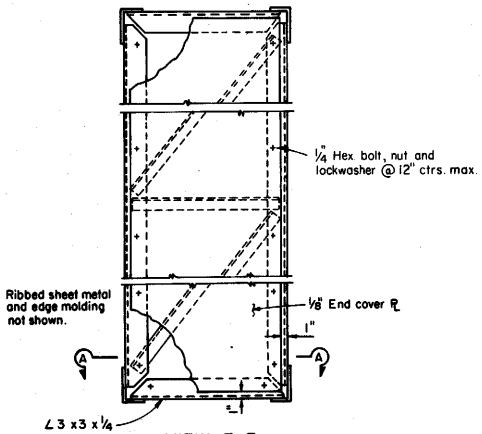
S40C-1

Return to Table of Contents

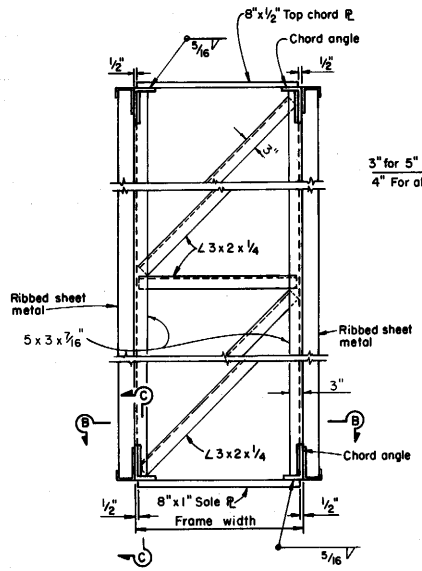
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

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

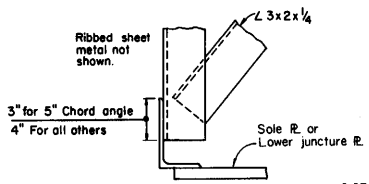
DATE APPROVED July 1, 1980



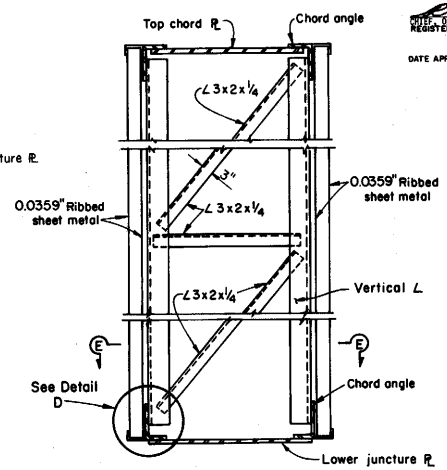
VIEW F-F
At Cantilever End



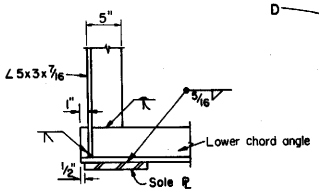
POST - END VIEW



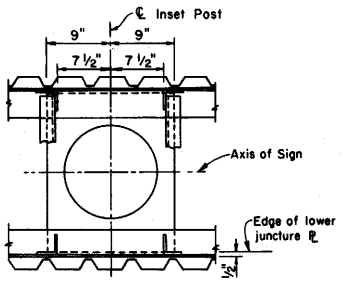
DETAIL D



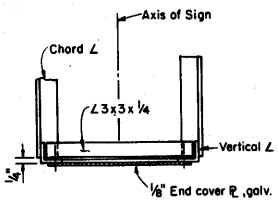
SECTION AT INSET POST



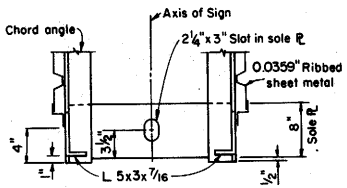
SECTION C-C



SECTION E-E



SECTION A-A



SECTION B-B

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
BOX BEAM
CLOSED TRUSS ALTERNATIVE
TWO POST TYPE
FRAME DETAILS

S40D-1

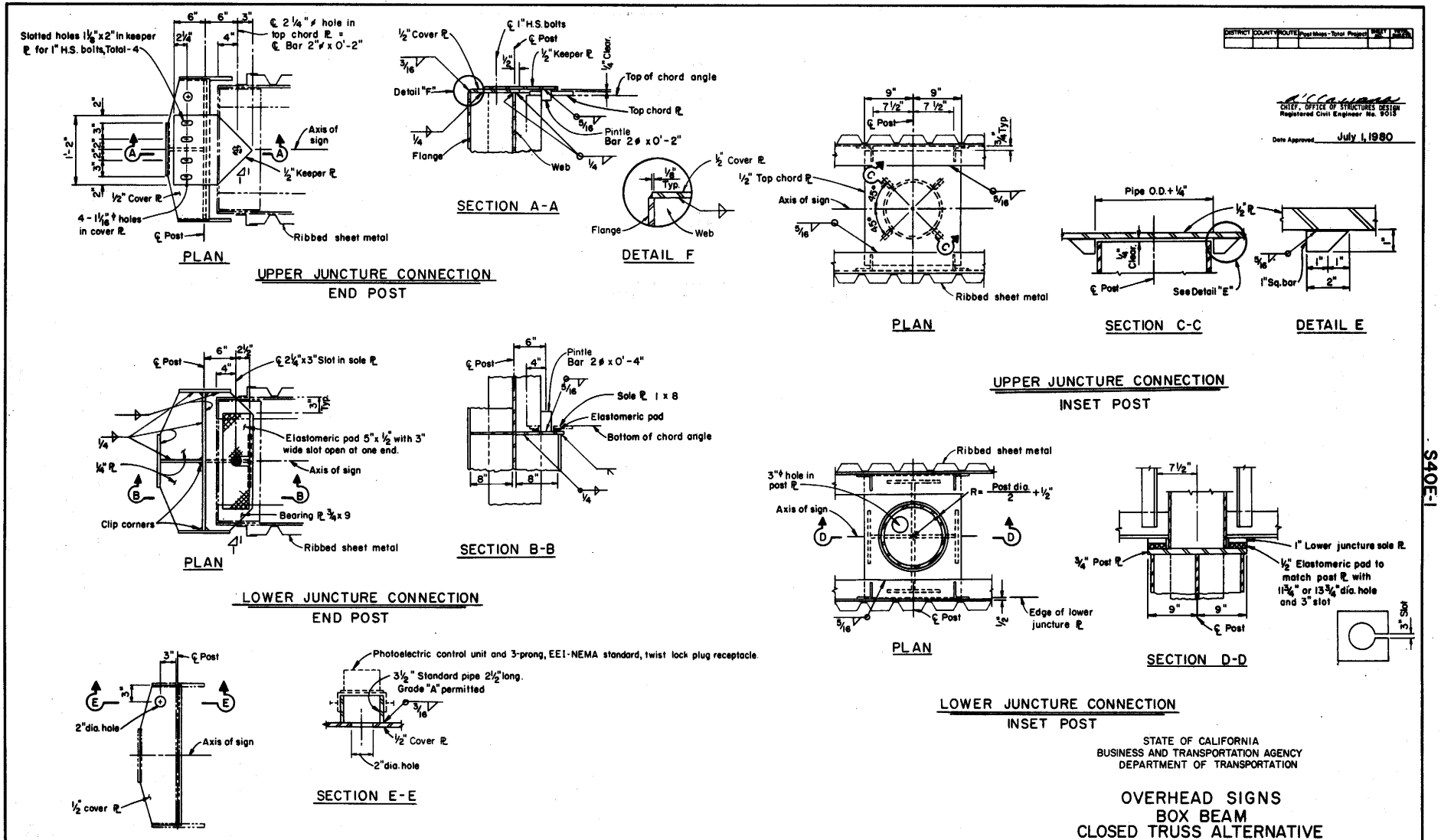
S40D-1

Return to Table of Contents

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

CHIEF, OFFICE OF STRUCTURES DESIGN
Registered Civil Engineer No. 9013

Date Approved July 1, 1980



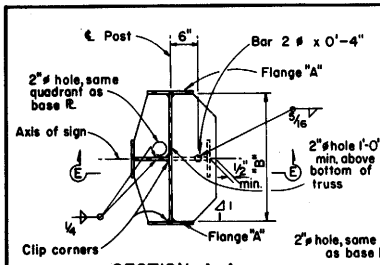
STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
BOX BEAM
CLOSED TRUSS ALTERNATIVE
TWO POST TYPE
FRAME JUNCTURE DETAILS

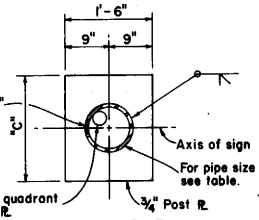
S40E-1

Return to Table of Contents

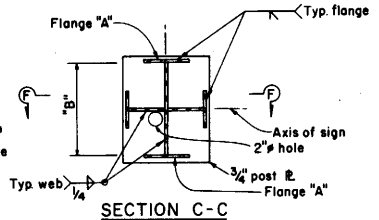
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET	TOTAL SHEETS



SECTION A-A

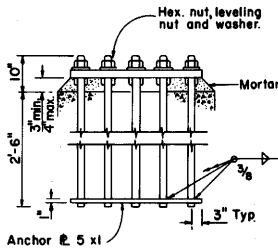


SECTION B-B

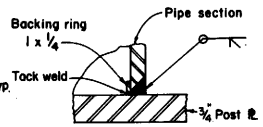


SECTION C-C

NOTE: For dimensions not shown see table



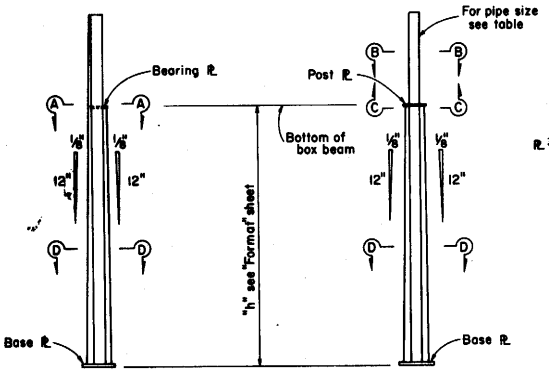
ANCHORAGE DETAILS



PIPE SECTION TO POST ℞

CHIEF, OFFICE OF STRUCTURES DESIGN
Registered Civil Engineer No. 9015

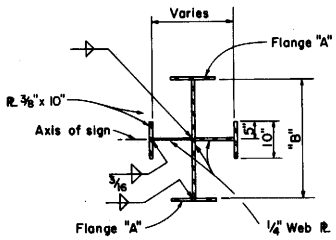
Date Approved July 1, 1980



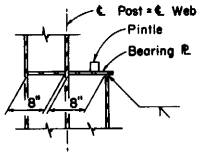
END POST
"A" & "B"

INSET POST
"C" & "D"

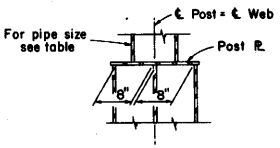
ELEVATION



SECTION D-D



SECTION E-E

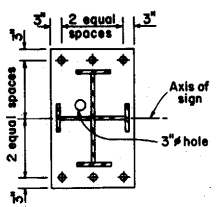


SECTION F-F

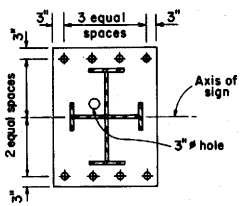
NOTE: Locate 3"ø hole for conduit in quadrant away from approaching traffic-center 2" from web plates.

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"	2¼"	6	⅜" x 10"	2'-2"		
A-2	2½" x 24" x 3'-4"	2¼"	8	½" x 10"			
A-3	2½" x 24" x 3'-4"	2½"	8	¾" x 10"			
A-4	2½" x 24" x 3'-4"	2½"	8	1" x 10"			
A-5	2½" x 24" x 3'-4"	2½"	8	1¼" x 10"	2'-2"		
B-1	2" x 30" x 3'-9"	2¼"	8	½" x 10"	2'-8"		
B-2	2" x 30" x 3'-9"	2½"	8	¾" x 10"			
B-3	2½" x 30" x 3'-11"	2½"	8	1" x 10"			
B-4	2½" x 30" x 3'-11"	2½"	8	1¼" x 10"			
B-5	2½" x 30" x 3'-11"	2½"	10	1½" x 10"	2'-8"		
C-1	2" x 24" x 2'-9"	2¼"	6	½" x 10"	1'-8"	2'-0"	10@43.7
C-2	2½" x 30" x 3'-0"	2¼"	8	¾" x 10"			10@58.0
C-3	2½" x 30" x 3'-0"	2½"	8	1" x 10"			10@76.9
C-4	2¾" x 30" x 3'-0"	2½"	8	1¼" x 10"			10@104.1
C-5	2¾" x 30" x 3'-0"	2½"	10	1½" x 10"		2'-0"	10@109.9
C-6	2¾" x 38" x 3'-2"	2½"	10	1¾" x 10"		2'-1½"	
C-7	2¾" x 38" x 3'-2"	2½"	10	2" x 10"		2'-1½"	
C-8	2¾" x 38" x 3'-2"	2½"	10	2¼" x 10"	1'-8"	2'-1½"	10@109.9
D-1	2½" x 24" x 3'-4"	2½"	8	¾" x 10"	2'-2"	2'-6"	12@65.4
D-2	2¾" x 30" x 3'-6"	2½"	8	1" x 10"			12@80.9
D-3	2¾" x 30" x 3'-6"	2½"	10	1¼" x 10"			12@107.2
D-4	2½" x 38" x 3'-6"	2½"	10	1½" x 10"		2'-6"	
D-5	2½" x 38" x 3'-6"	2½"	10	1¾" x 10"		2'-7½"	
D-6	3" x 42" x 3'-11"	2½"	10	2" x 10"		2'-7½"	
D-7	3" x 42" x 3'-11"	2½"	10	2¼" x 10"	2'-2"	2'-7½"	12@107.2

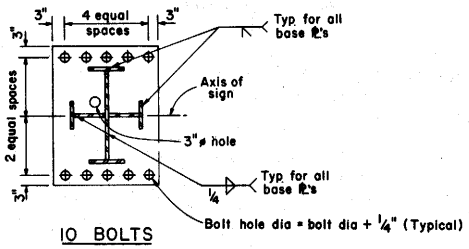
1. Thread upper 10" of anchor bolts and galvanize upper 1'-0"
2. Anchor ℞'s may be retained with hex. nut or formed head.
3. 2½" ϕ anchor bolts may be substituted for 2¼" ϕ bolts.
4. For Foundation details see S39-6 sheet.



6 BOLTS



8 BOLTS



10 BOLTS

TYPICAL BASE PLATES

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
BOX BEAM
CLOSED TRUSS ALTERNATIVE
TWO POST TYPE
POST DETAILS

S40F-1

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

CHIEF, OFFICE OF STRUCTURES DESIGN
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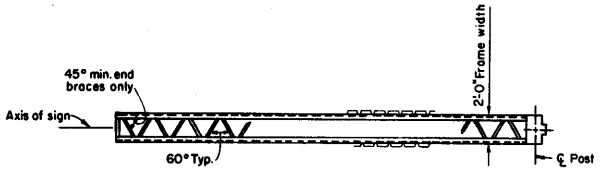
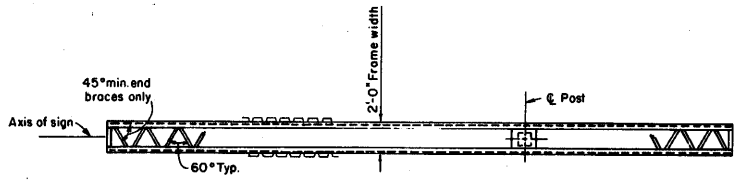
DATE APPROVED July 1, 1980



PLAN



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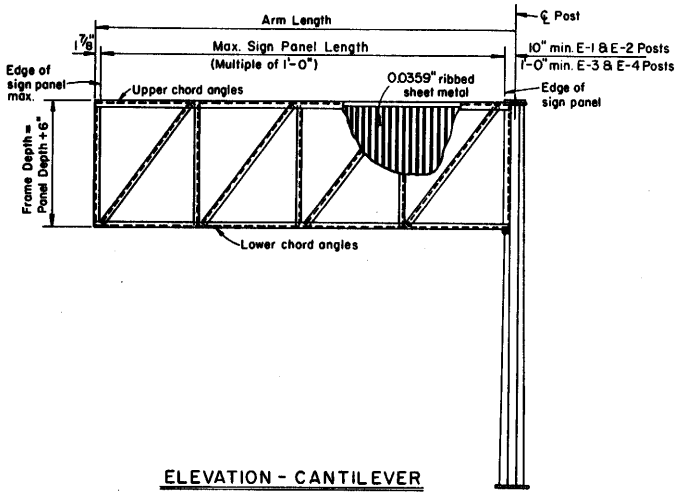
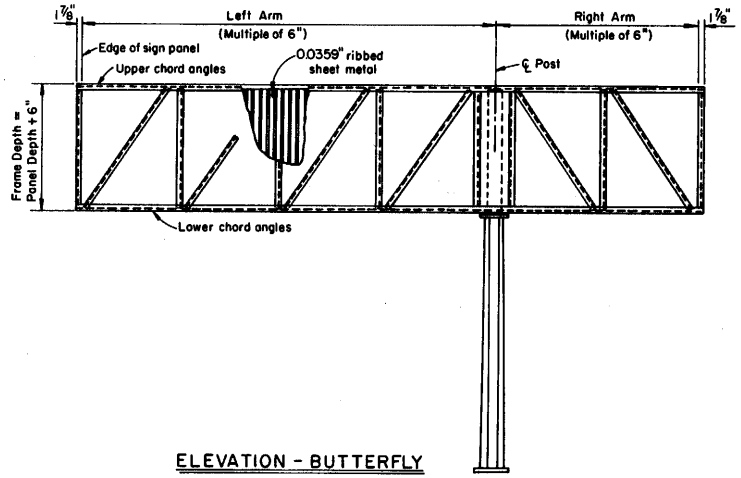
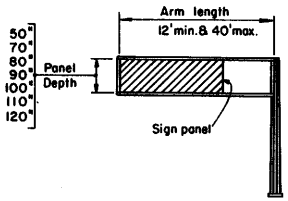


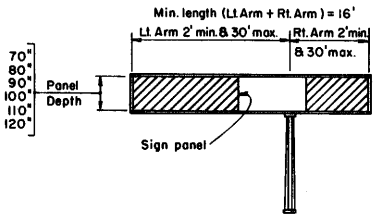
ELEVATION - CANTILEVER



ELEVATION - BUTTERFLY



CANTILEVER



BUTTERFLY

RANGE OF STRUCTURE SIZES

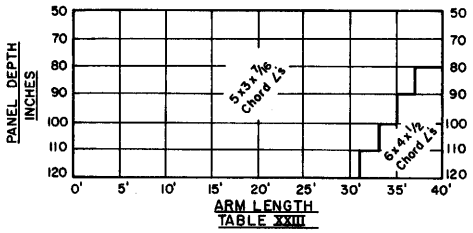


TABLE XXIII

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-1 and S40K-1 sheets.
3. For foundation details see S39-6 sheet.

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
BOX BEAM
CLOSED TRUSS ALTERNATIVE
SINGLE POST TYPE
FRAME MEMBERS

S40G-1

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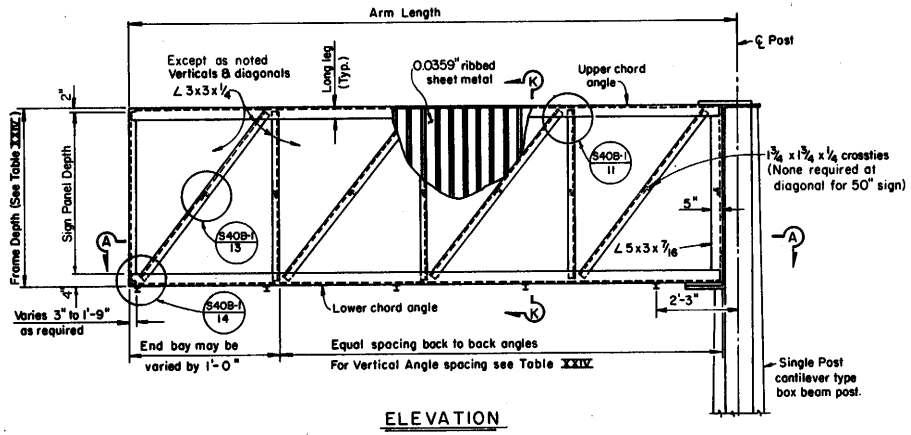
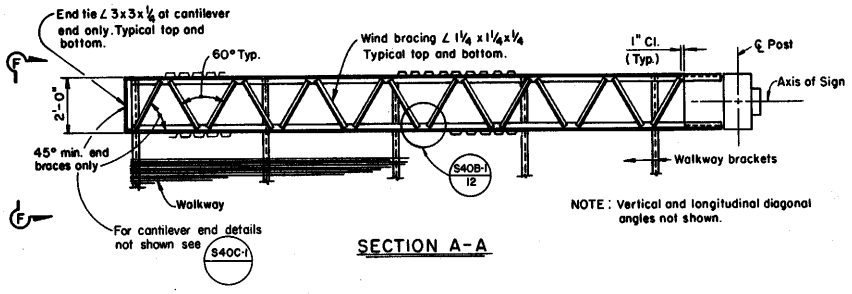
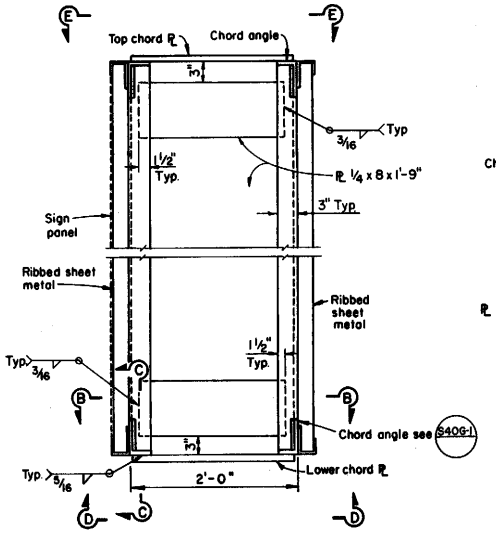


ELEVATION

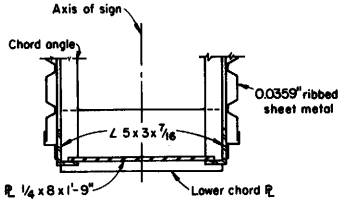


NOTE: Vertical and longitudinal diagonal angles not shown.

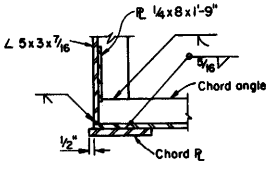
SECTION A-A



POST END VIEW



SECTION B-B



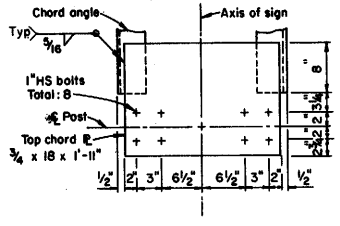
SECTION C-C

NOTE:

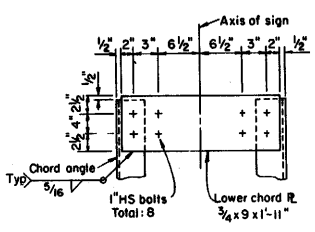
1. For Section K-K see S408-1 sheet.
2. For View F-F at cantilever end, see S400-1 sheet.

Sign Panel Depth	Frame Depth	Max. Vert. Angle Spacing
50"	4'-8"	4'-6"
70"	6'-4"	5'-6"
80"	7'-2"	6'-0"
90"	8'-0"	7'-0"
100"	8'-10"	7'-0"
110"	9'-8"	7'-6"
120"	10'-6"	7'-6"

TABLE XXIV

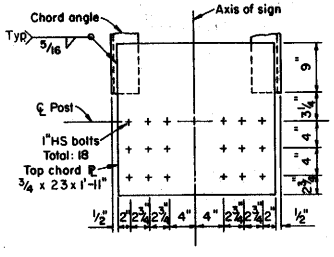


VIEW E-E

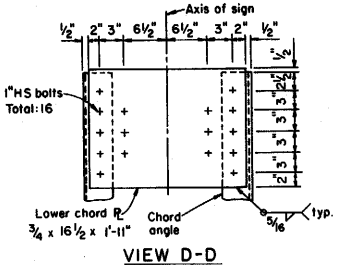


VIEW D-D

TYPE E-1 & E-2



VIEW E-E



VIEW D-D

TYPE E-3 & E-4

CHORD PLATE DETAILS

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

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

DATE APPROVED July 1, 1980

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS BOX BEAM CLOSED TRUSS ALTERNATIVE SINGLE POST CANTILEVER FRAME DETAILS

S40H-1

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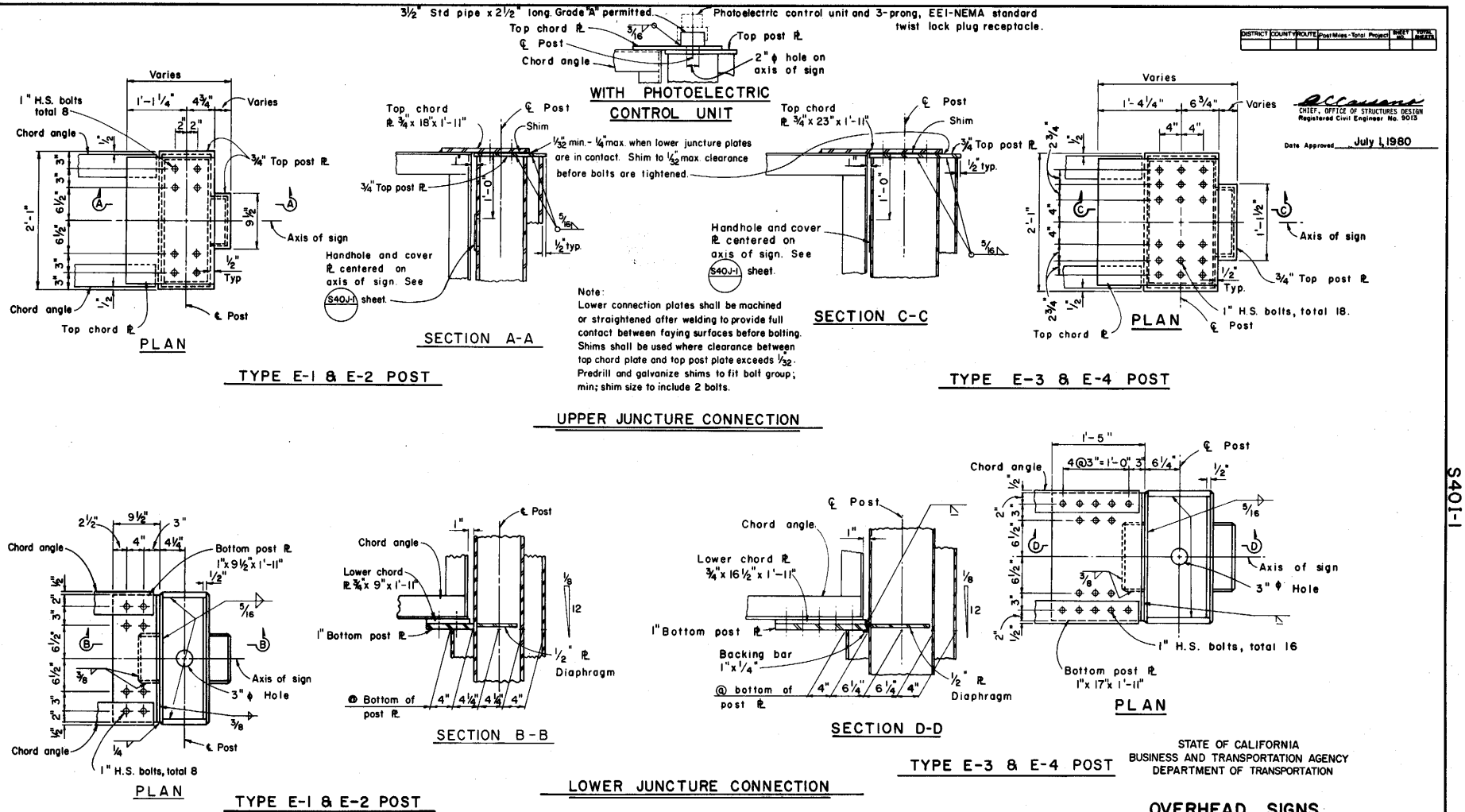
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS



CHIEF, OFFICE OF STRUCTURES DESIGN
Registered Civil Engineer No. 9013

Date Approved July 1, 1980

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS BOX BEAM

CLOSED TRUSS ALTERNATIVE
SINGLE POST CANTILEVER
FRAME JUNCTURE DETAILS

S401-1

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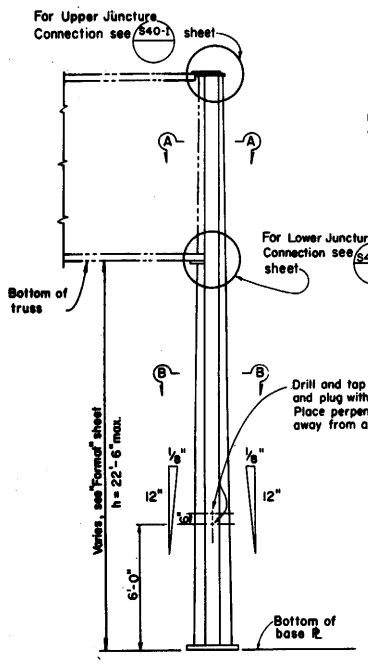
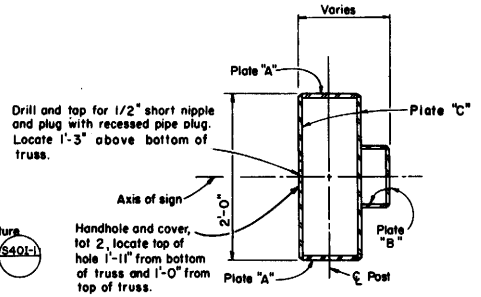
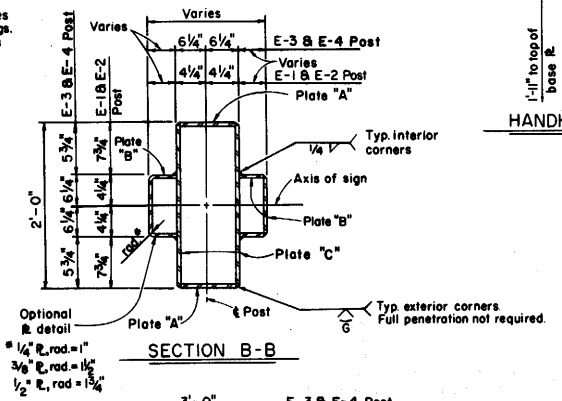


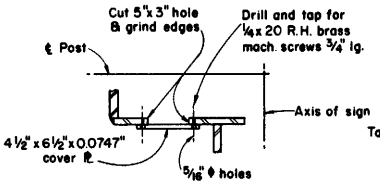
ELEVATION

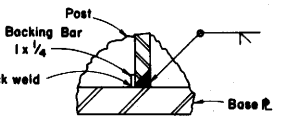


SECTION A-A



SECTION B-B

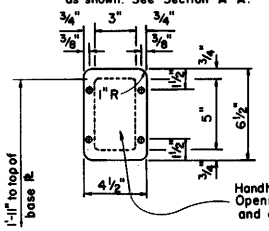




POST TO BASE PLATE

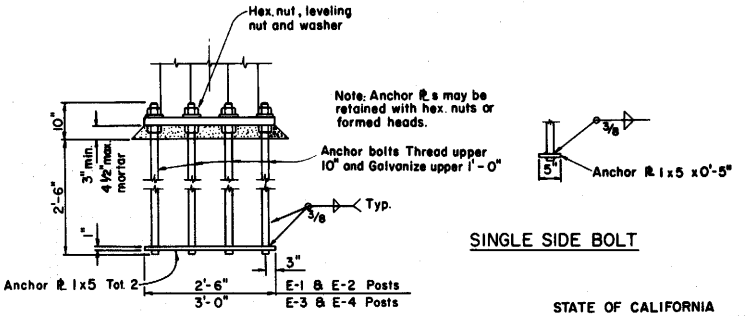
WELDING DETAILS

Note:
Face handhole and cover ℞ away from traveled way except as shown. See Section A-A.



HANDHOLE AND COVER DETAIL

Note:
1. For Foundation details see S39-6 sheet.

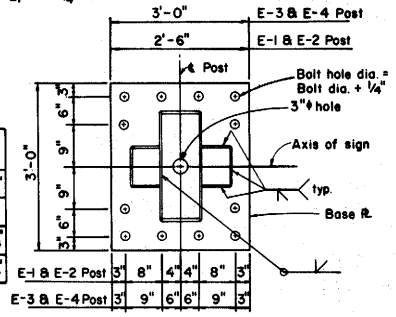


SINGLE SIDE BOLT

ANCHORAGE DETAILS

Post Type	Base Plate	Plate "A"	Plate "B"	Plate "C"	*Anchor Bolts
E-1	2" x 30" x 3'-0"	½"	¼"	⅜"	12-1¾"
E-2	2½" x 30" x 3'-0"	1"	⅜"	½"	12-2"
E-3	2½" x 36" x 3'-0"	1"	⅜"	½"	12-2¼"
E-4	2½" x 36" x 3'-0"	1"	½"	⅝"	12-2¼"

* 2" ϕ Anchor bolts may be substituted for 1¾" ϕ bolts.



BASE PLATE

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
BOX BEAM

CLOSED TRUSS ALTERNATIVE

SINGLE POST CANTILEVER POST DETAILS

S40J-1

S40J-1

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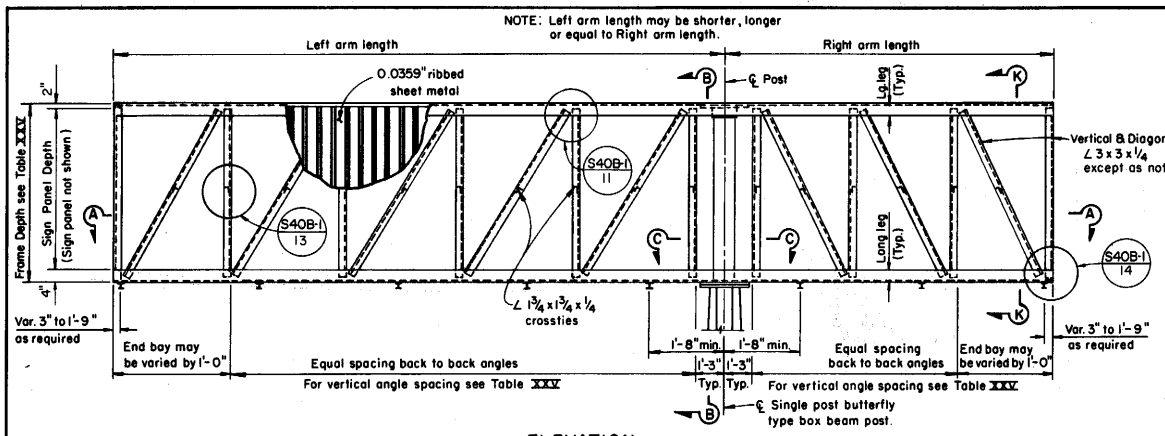

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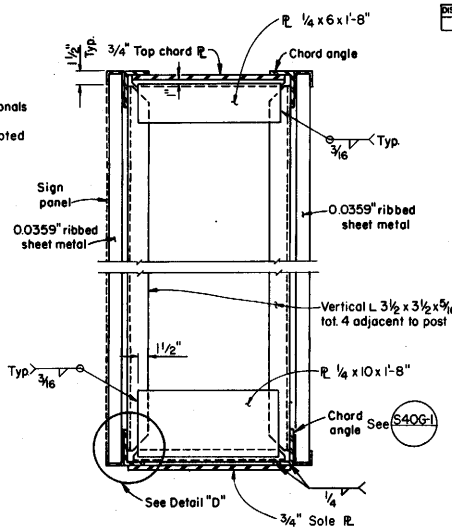
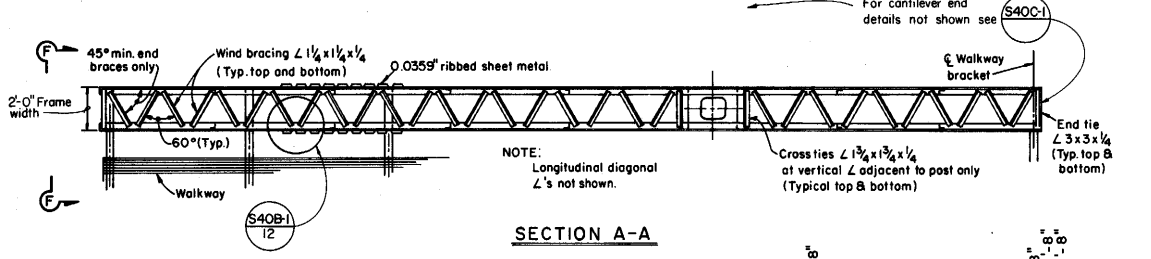


SECTION B-B

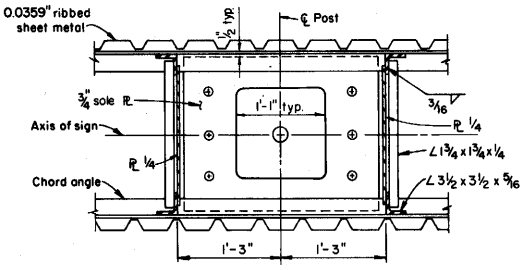
Sign Panel Depth	Frame Depth	Max. Vert. Angle Spacing	Arm Length
70"	6'-4"	5'-6"	4'
80"	7'-2"	6'-0"	5'
90"	8'-0"	7'-0"	5'
100"	8'-10"	7'-0"	6'
110"	9'-8"	7'-6"	6'
120"	10'-6"	7'-6"	6'

No diagonals required

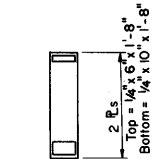
TABLE XXV



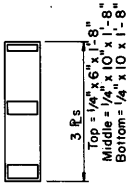
SECTION A-A



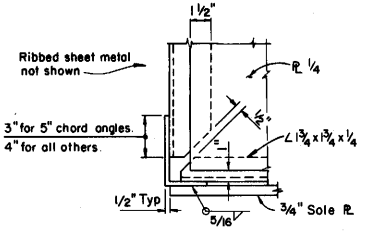
SECTION C-C



SIGN DEPTH 70"-90"



SIGN DEPTH 100"-120"



DETAIL D

NOTES:
1. For Detail (11) thru (14) and Section K-K, see S40B-1
2. For View F-F at cantilever end, see S40D-1

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
BOX BEAM
CLOSED TRUSS ALTERNATIVE
SINGLE POST BUTTERFLY
FRAME DETAILS

S40K-1

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

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

DATE APPROVED July 1, 1980

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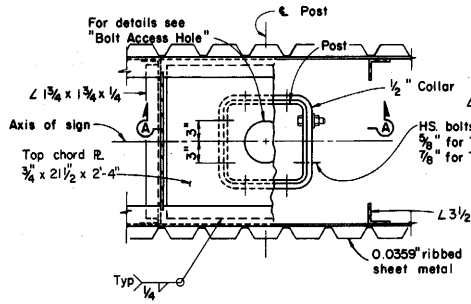
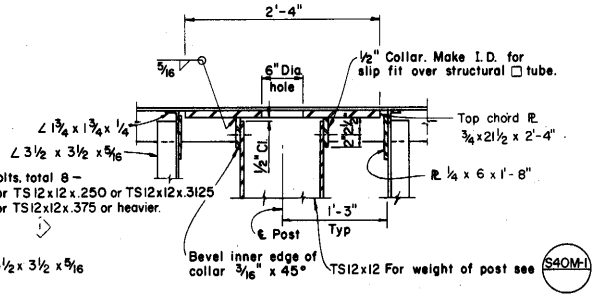
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF STRUCTURES DESIGN
Registered Civil Engineer No. 9013

Date Approved July 4, 1980

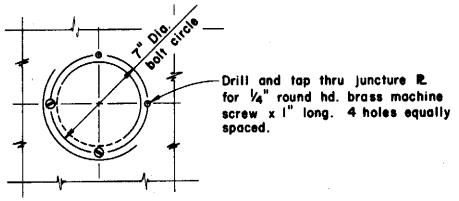


PLAN

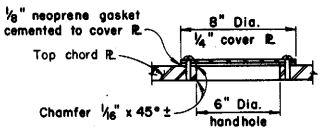


SECTION A-A

UPPER JUNCTURE CONNECTION



PLAN



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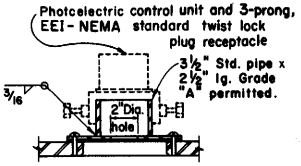
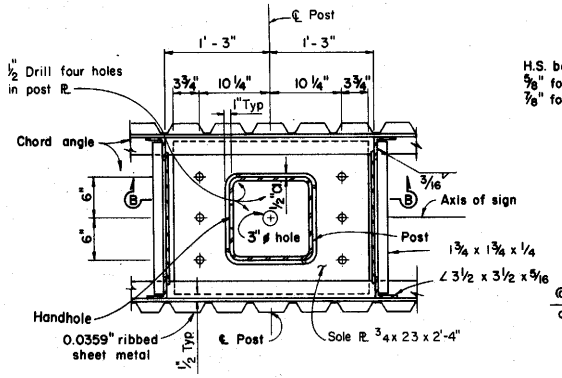


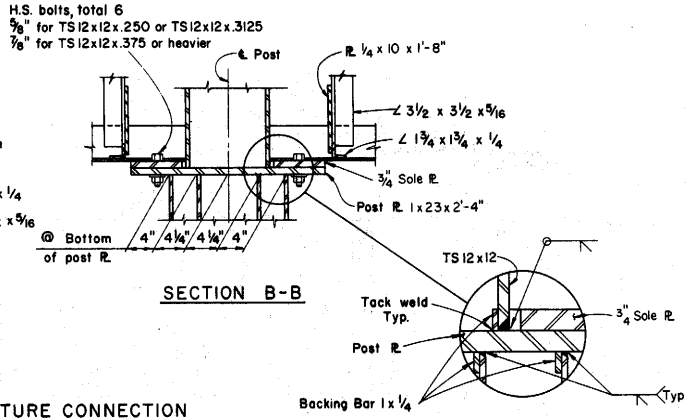
SECTION
With photoelectric control unit

BOLT ACCESS HOLE



PLAN

Note: Lower connection plates shall be machined or straightened after welding to provide full contact between faying surfaces before bolting.



SECTION B-B

LOWER JUNCTURE CONNECTION

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
BOX BEAM
CLOSED TRUSS ALTERNATIVE
SINGLE POST BUTTERFLY
FRAME JUNCTURE DETAILS

S40L-3

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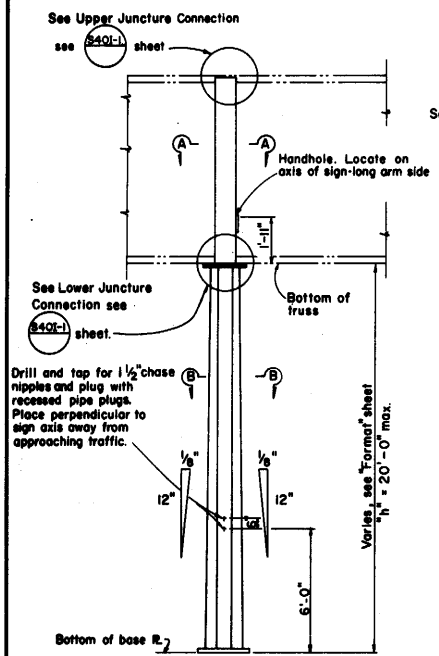
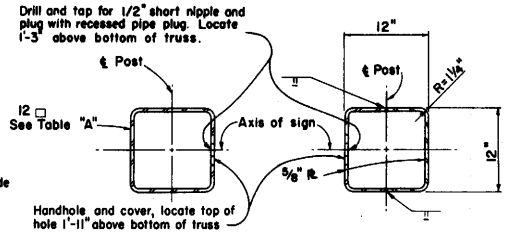
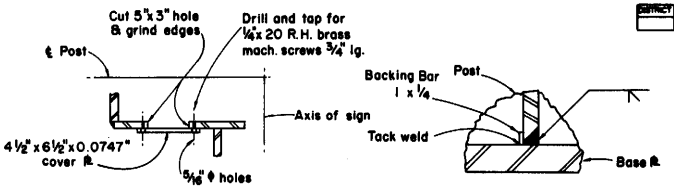


ELEVATION



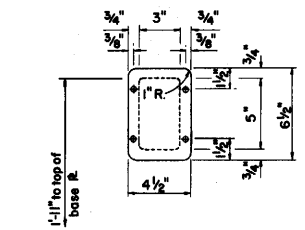
TYPE F-1 THRU F-3 TYPE F-4 & F-5

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

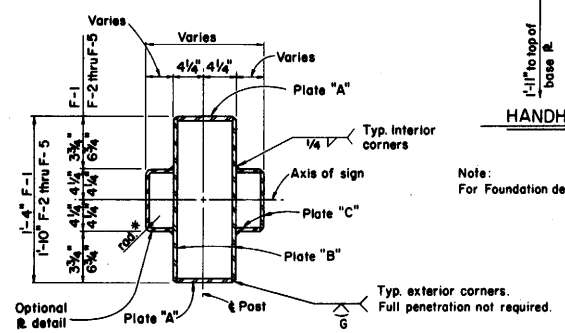


HANDHOLE AND COVER DETAIL

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"x7 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"	

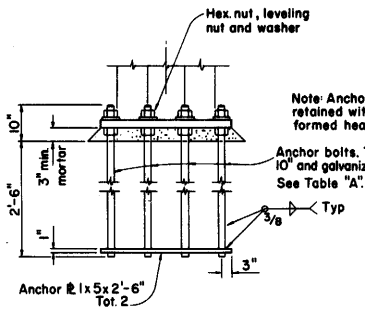
Note:
For Foundation details see S39-6 sheet

* 2" ϕ anchor bolts may be substituted for 1 3/4" ϕ bolts.

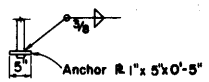


* 1/4" PL, rad. = 1"
3/8" PL, rad. = 1 1/2"

SECTION B-B

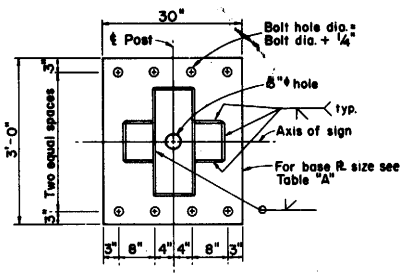


Note: Anchor PL's may be retained with hex. nuts or formed heads.

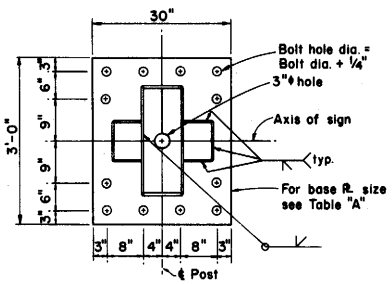


SINGLE SIDE BOLT

ANCHORAGE DETAILS



TYPE F-1



TYPE F-2 THRU F-5

BASE PLATE DETAILS

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
BOX BEAM
CLOSED TRUSS ALTERNATIVE
SINGLE POST BUTTERFLY
POST DETAILS

S40M-1

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

CHIEF, OFFICE OF STRUCTURES DESIGN
Registered Civil Engineer No. 9015

Date Approved July 1, 1980

S40M-1

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

CHIEF, OFFICE OF STRUCTURES DESIGN
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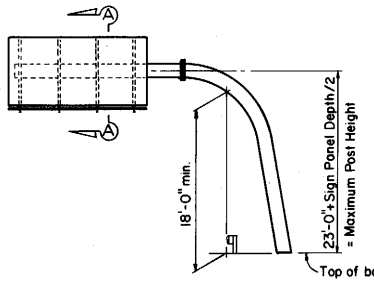
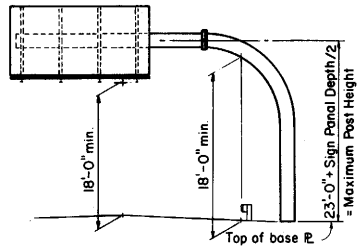
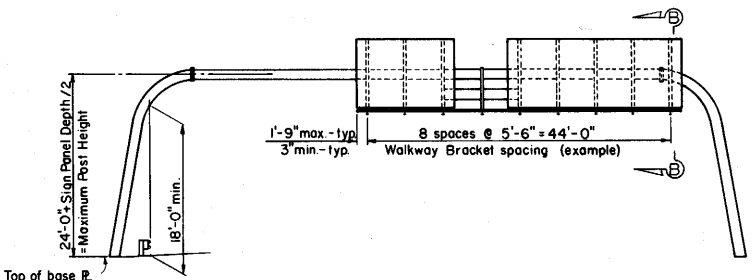
APPROVED July 1, 1980



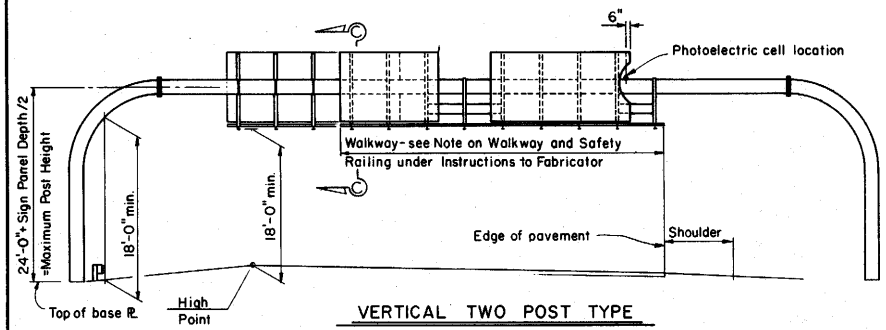
SLANTED SINGLE POST TYPE



VERTICAL SINGLE POST TYPE



SLANTED TWO POST TYPE



VERTICAL TWO POST TYPE

Instructions to Fabricator

Format sheet shows:

1. Sign structure location.
2. Length of structure span.
3. Panel size and location on structure.
4. Post height to bottom of panel or mast arm elevation.
5. Base plate elevation.
6. Photoelectric cell location if required
7. Walkway location.

INDEX

1. Instructions and examples.
2. Single Post Type - Layout and Pipe Selection.
3. Two Post Type - Layout and Pipe Selection.
4. Structural Frame Details No. 1.
5. Structural Frame Details No. 2.
6. Walkway Details (S9-12) sheet.
7. Safety Railing and Cable Details (S11-10) sheet.
8. Foundation Details.

Walkway Brackets:

Maintain uniform spacing where possible.
Maximum spacing shall not exceed 5'-6"
Minimum clear to field splice = 1' ±

Walkway and Safety Railing:

Walkway to extend full length of sign area and be continuous between signs. Extend walkway to Edge of Pavement if required. Safety railing to protect entire walkway, but continuous for more than 11' in one unit.

Photoelectric Cell:

Place behind sign panel nearest right shoulder unless otherwise shown on Format sheet.

GENERAL NOTES

Specifications:

Design: A.A.S.H.O. Specifications for the Design and Construction of Structural Supports for Highway Signs, dated 1975.
Wind dynamics and resultant fatigue life were analyzed using Department of Transportation program WEFFLS as modified by Structures, Design.

Construction: Standard Specifications and the Special Provisions.

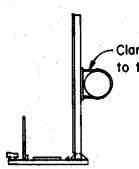
Wind Loading: 80 MPH velocity.

Soil Pressure:

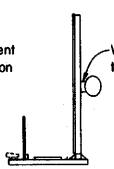
Minimum Vertical Clearance: 18'-0" above roadway and shoulders.

Maximum Height: 50'-0" from ground to center of sign panel. (Regardless of post height)

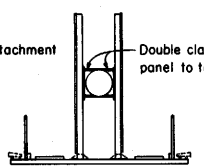
Welding: All welding continuous unless otherwise noted on the plans. All welding to be done in accordance with the Standard Specifications.



SECTION A-A



SECTION B-B



SECTION C-C

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATIONS

OVERHEAD SIGNS
TUBULAR
INSTRUCTIONS AND EXAMPLES

S40N

S40N

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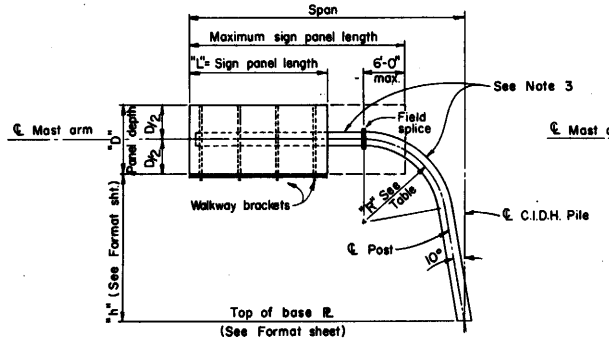
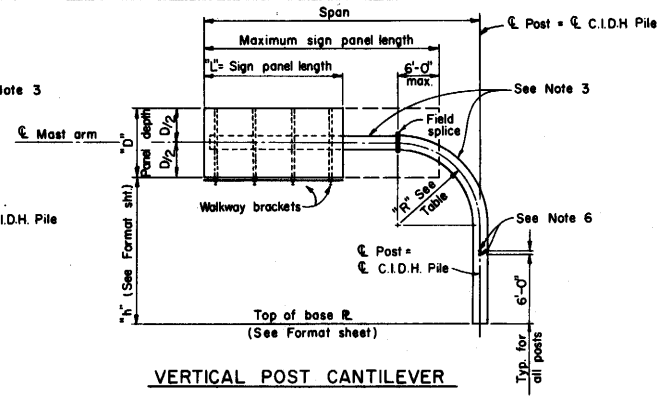


SLANTED POST CANTILEVER



VERTICAL POST CANTILEVER

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

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

APPROVED July 1, 1980

NOTES:

1. The maximum sign panel overlap onto the post elbow shall not exceed 6'-0" from the field splice.
2. When several sign panels are to be installed with spaces between the panels, the total sign panel length is the sum of the individual sign panel length only.
3. All posts between base plate and field splice are Extra Strong pipe. All mast arms are Standard pipe.
4. During sign erection the post shall be raked as necessary with the use of the leveling nuts to make the sign panel level.
5. At final position of post all top and bottom anchor bolt nuts shall be wrench tightened against base plate.
6. Drill and tap for 1½" chase nipples and plug with recessed pipe plugs. Place perpendicular to sign panel axis and away from approaching traffic.

SLANTED POST PIPE SELECTION PROCEDURE

A. Enter table to proper column with known panel depth "D" and appropriate height "h"

B. Read down column to desired span length.

C. Determine Pipe Post "Dia." and "R" for elbow by reading to the left horizontally.

VERTICAL POST PIPE SELECTION PROCEDURE

A. For vertical post cantilevers add 2'-0" to the vertical post span and enter table to proper column with known panel depth "D" and appropriate height "h."

B. Read down column to desired span length.

C. Determine Pipe Post "Dia." and "R" for elbow by reading to the left horizontally.

SLANTED POST CANTILEVER (See Note 2)

PIPE POST		"D" →	70"		80"		90"		100"		110"		120"	
"R"	Dia.	"h" →	≤20	>20,≤23	≤20	>20,≤23	≤20	>20,≤23	≤20	>20,≤23	≤20	>20,≤23	≤20	>20,≤23
8'-0"	12"	Span (Ft.)	0 - 17	0 - 18	0 - 18	0 - 19	0 - 20	0 - 18	0 - 21	0 - 21	0 - 20	0 - 19	0 - 18	0 - 18
8'-0"	14"		18 - 19	19	19 - 23	20	21 - 22	19	22 - 24	21	21 - 22	20 - 21	20 - 21	19 - 21
8'-0"	16"		20 - 22	20	24	21	23 - 26	20 - 23	25 - 28	22 - 25	23 - 28	22 - 25	22 - 25	22 - 24
10'-0"	18"		23 - 26	21 - 23	25 - 28	22 - 25	27 - 30	24 - 27	29 - 32	26 - 30	29 - 33	26 - 31	26 - 31	25 - 30
10'-0"	20"		27 - 29	24 - 26	29 - 31	26 - 28	31 - 34	28 - 30	33 - 36	31 - 33	34 - 38	32 - 34	32 - 35	31 - 34
12'-0"	24"		30 - 34	27 - 31	32 - 37	29 - 34	35 - 39	31 - 37	37 - 40	34 - 40	39 - 40	35 - 40	36 - 40	35 - 40

* Mast arm same diameter as post.

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS TUBULAR SINGLE POST TYPE LAYOUT AND PIPE SELECTION

S40P

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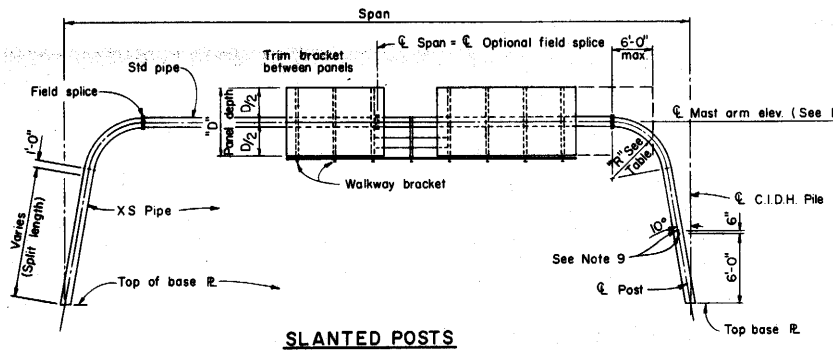
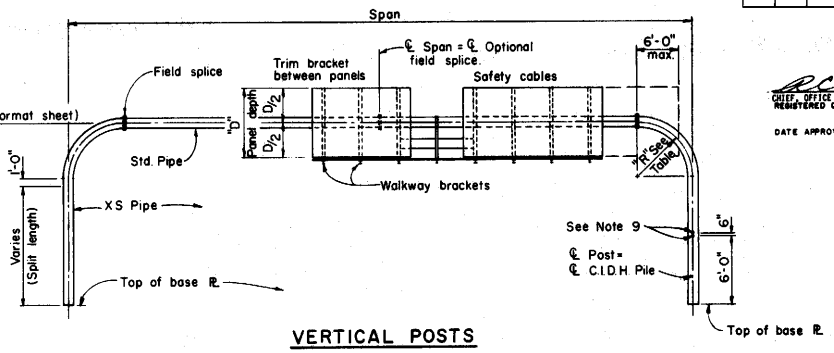
DIST.	COUNTY	ROUTE	POST MILE—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS



SLANTED POSTS



VERTICAL POSTS

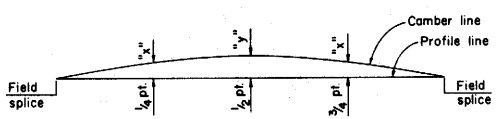
*Mast arm diameter same as post.

◯ Indicates camber type, see Table.

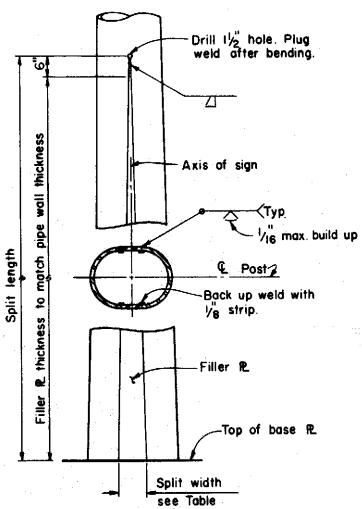
SLANTED POSTS (See Note 2)									
*PIPE POST			"D" →	70"	80"	90"	100"	110"	120"
"R"	Dia.	Split							
8'-0"	8"	5"	Span (Ft.)	Ⓐ 50-57	Ⓐ 50-57				
8'-0"	10"	4" 6"		Ⓐ 58-67	Ⓐ 58-67	Ⓐ 50-67	Ⓐ 50-67	Ⓐ 50-60	Ⓐ 50-57
8'-0"	12"	4" 8"		Ⓑ 68-77	Ⓑ 67-77	Ⓑ 68-77	Ⓑ 68-77	Ⓑ 61-72	Ⓐ 58-70
8'-0"	14"	4" 8"		Ⓑ 78-84	Ⓑ 78-88	Ⓒ 78-89	Ⓒ 78-87	Ⓑ 73-85	Ⓑ 71-83
8'-0"	16"	0" 4" 8"		Ⓑ 85-89	Ⓑ 89-95	Ⓒ 90-100	Ⓒ 88-100	Ⓒ 86-93	Ⓒ 84-93
10'-0"	18"	0" 5" 8"		Ⓑ 90-96	Ⓒ 96-103	Ⓒ 101-108	Ⓒ 101-110	Ⓒ 94-107	Ⓒ 94-105
10'-0"	20"	0" 5"		Ⓑ 97-102	Ⓒ 104-108	Ⓒ 109-115	Ⓓ 111-120	Ⓓ 108-115	Ⓒ 106-110
12'-0"	24"	0" 5"		Ⓑ 103-115	Ⓒ 109-123	Ⓓ 116-129	Ⓓ 121-135	Ⓓ 116-140	Ⓓ 111-115 Ⓓ 116-135[Ⓓ]

Ⓓ May increase to 145' with total panel coverage limited to 75' camber type Ⓔ

CAMBER		
Type	"x"	"y"
Ⓐ	1 1/2"	2"
Ⓑ	2 1/4"	3"
Ⓒ	2 3/4"	4"
Ⓓ	3 1/2"	5"
Ⓔ	4 1/2"	6"



CAMBER DIAGRAM



POST SPLIT DETAILS

NOTES:

1. The maximum sign panel overlap onto elbow shall not exceed 6'-0" from the field splice.
2. For vertical post type, add 8'-0" to the vertical post span and enter the table for slanted post type. This adjusted span (vertical span + 8') shall not exceed the maximum span shown on the table.
3. When several sign panels are to be installed with spaces between the panels the total sign panel length is the sum of the individual sign panel lengths only.
4. Maximum total sign panel coverage = 70% of slanted post span, 80% of vertical post span for spans up to 110' above 110', varies on a straight line to 60% of vertical post span at 140'
5. All posts between base plate and field splice are Extra Strong pipe. All mast arms are Standard pipe.
6. Before any portion of the sign frames are assembled in their final positions the Contractor shall demonstrate to the Engineer by preassembly or other approved methods that the span lengths of the frames in the no load condition match within 1/2" ± the field measured span lengths between foundations.
7. If the sign frames are erected as one unit, they shall be adequately suspended to avoid distortions or changes in span length between base plates.
8. At final position of post, all top and bottom anchor bolt nuts shall be wrench tightened against base plate.
9. Drill and tap for 1 1/2 chase nipples and plug with recessed pipe plugs. Place perpendicular to sign panel axis and away from approaching traffic.
10. Maximum difference between post heights on an idividual frame = 5'-0"
11. For standard pipe members (Mast Arms) with lengths greater than 80'-0" an optional field splice will be permitted at ℄ of span to facilitate hauling operations.

STATE OF CALIFORNIA
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OVERHEAD SIGNS TUBULAR TWO POST TYPE LAYOUT AND PIPE SELECTION

S40Q

S40Q

R.C. Cousino
CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013
DATE APPROVED July 1, 1980.

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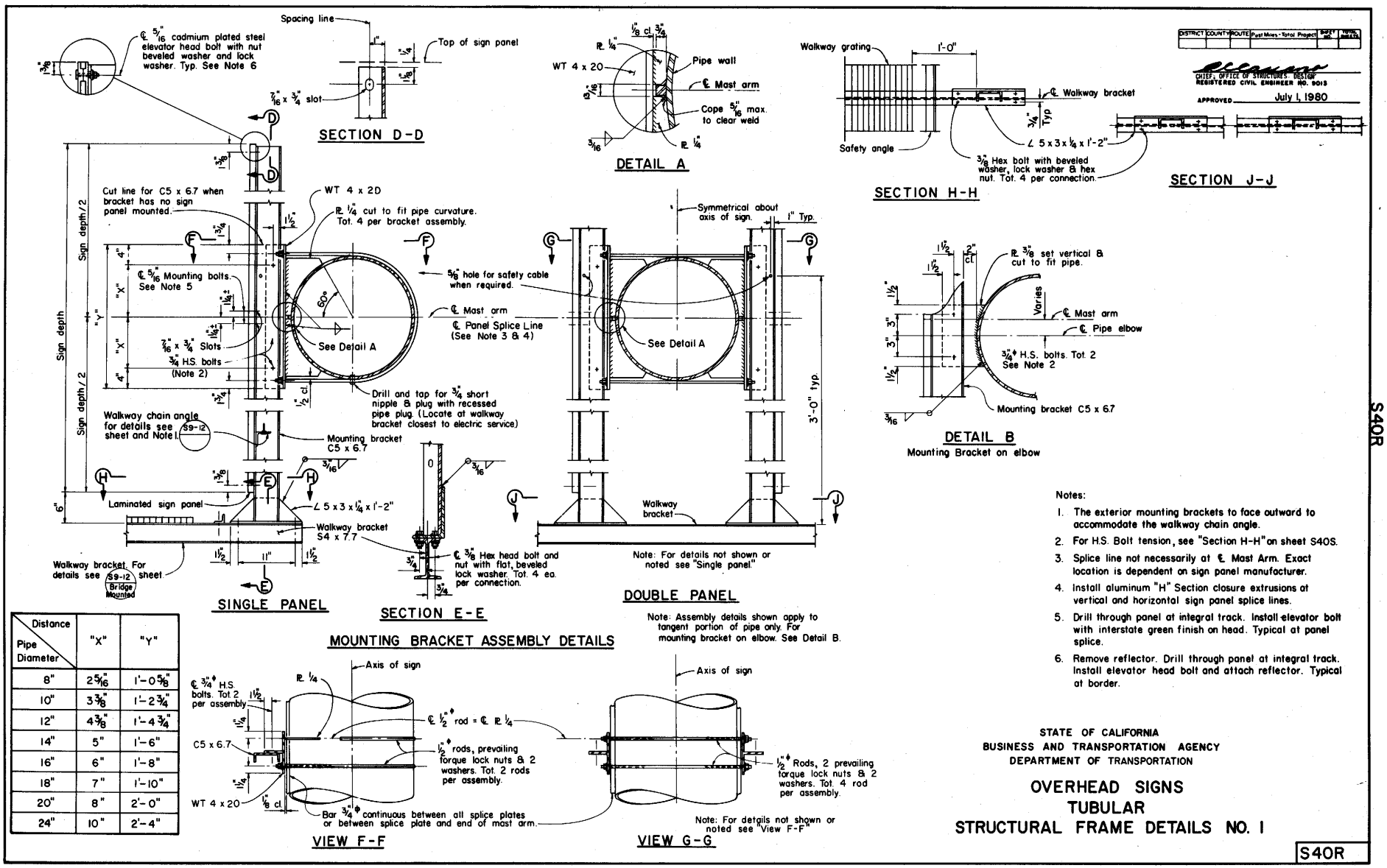

Distance / Pipe Diameter	"X"	"Y"
8"	2 5/16"	1'-0 5/8"
10"	3 3/8"	1'-2 3/4"
12"	4 3/8"	1'-4 3/4"
14"	5"	1'-6"
16"	6"	1'-8"
18"	7"	1'-10"
20"	8"	2'-0"
24"	10"	2'-4"

Notes:

1. The exterior mounting brackets to face outward to accommodate the walkway chain angle.
2. For H.S. Bolt tension, see "Section H-H" on sheet S40S.
3. Splice line not necessarily at ℄ Mast Arm. Exact location is dependent on sign panel manufacturer.
4. Install aluminum "H" Section closure extrusions at vertical and horizontal sign panel splice lines.
5. Drill through panel at integral track. Install elevator bolt with interstate green finish on head. Typical at panel splice.
6. Remove reflector. Drill through panel at integral track. Install elevator head bolt and attach reflector. Typical at border.

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

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 8015
APPROVED July 1, 1980

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS TUBULAR STRUCTURAL FRAME DETAILS NO. 1

S40R

S40R

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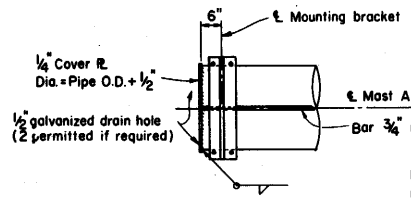
DISTRICT	COUNTY	ROUTE	Post Mileg - Total Project	SHEET NO.	TOTAL SHEETS

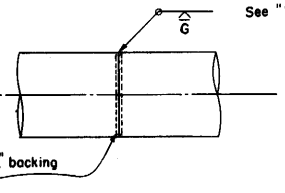
CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 8013

APPROVED JULY 1, 1980

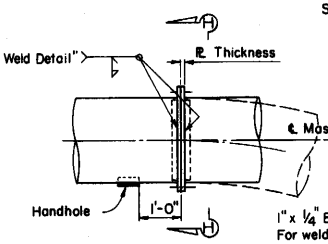


MAST ARM END DETAIL

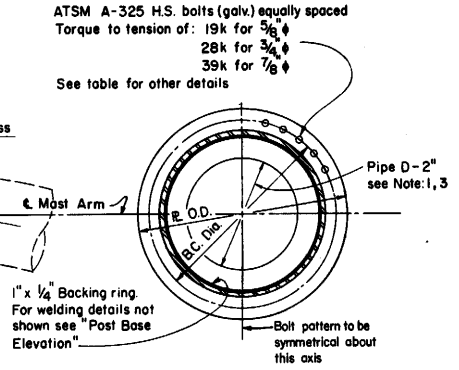
(For "Single Post Type" only)



SHOP SPLICE



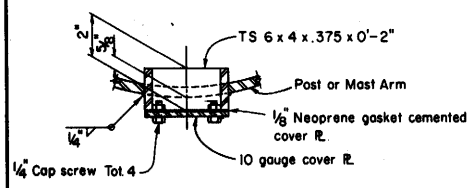
FIELD SPLICE

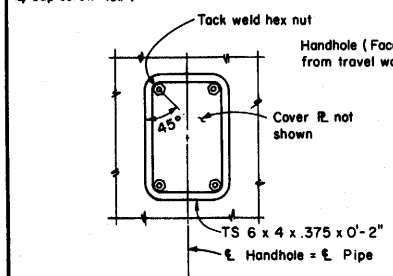


SECTION H-H

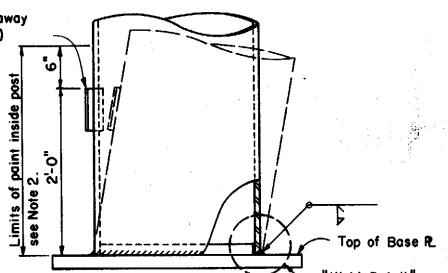
FIELD SPLICE				
Pipe Diameter	℞ Thickness	H.S. Bolts	B.C. Diameter	℞ O.D.
8"	1⅛"	13-⅝"	11⅛"	13⅜"
10"	1¼"	20-⅝"	13¼"	15¾"
12"	1¼"	17-¾"	15¼"	17¾"
14"	1¼"	19-¾"	16½"	19"
16"	1¼"	22-¾"	18½"	21"
18"	1⅜"	26-¾"	20½"	23"
20"	1⅜"	29-¾"	22½"	25"
24"	1½"	26-⅞"	27"	30"

Note: Design based on capacity of Standard pipe.



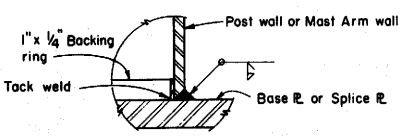


HANDHOLE & COVER DETAILS

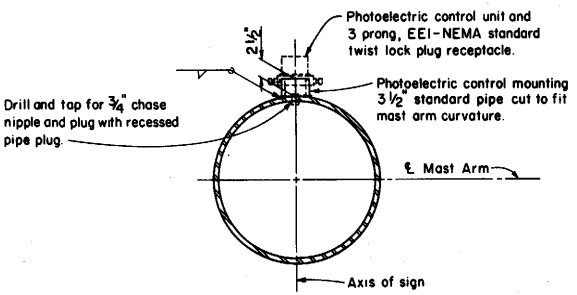


POST BASE ELEVATION

(For Base ℞ Details see "Foundation Details" sheet.)



WELD DETAIL



PHOTOELECTRIC CONTROL DETAILS

(See "Layout" sheet for location when required)

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 ℞ to 6" above lower handhole — unless post is galvanized.
3. "D" is inside diameter of "extra strong pipe."

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
TUBULAR
STRUCTURAL FRAME DETAILS NO. 2

S40S

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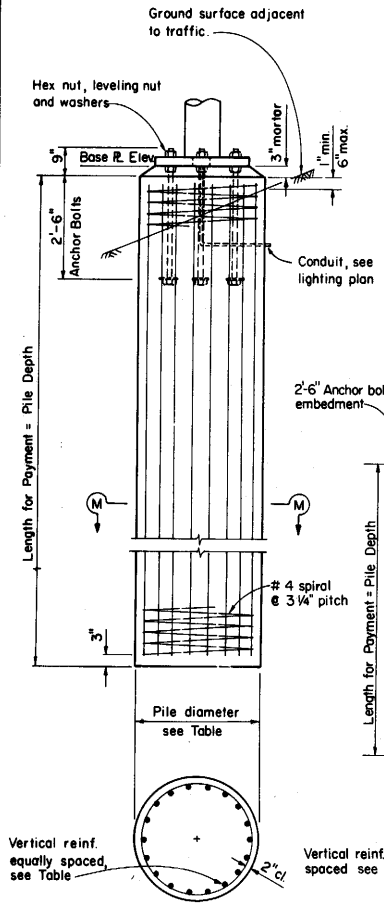
DISTRICT	COUNTY	ROUTE	POST MILES	SHEET NO.	TOTAL SHEETS

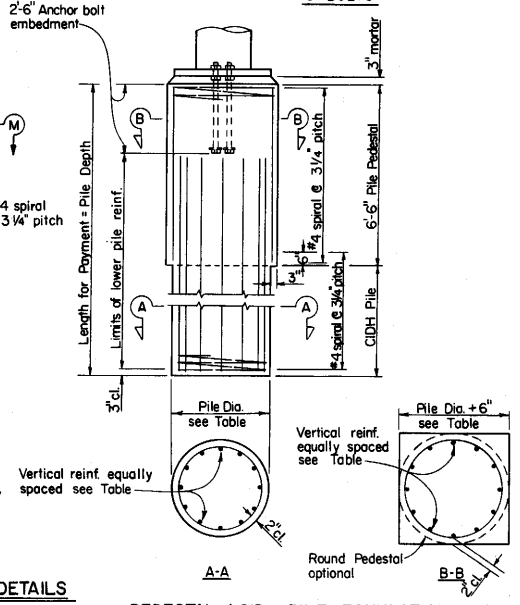
R C Cannon
CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

DATE APPROVED JULY 1, 1980



SECTION M-M

CIDH PILE FOUNDATION DETAILS

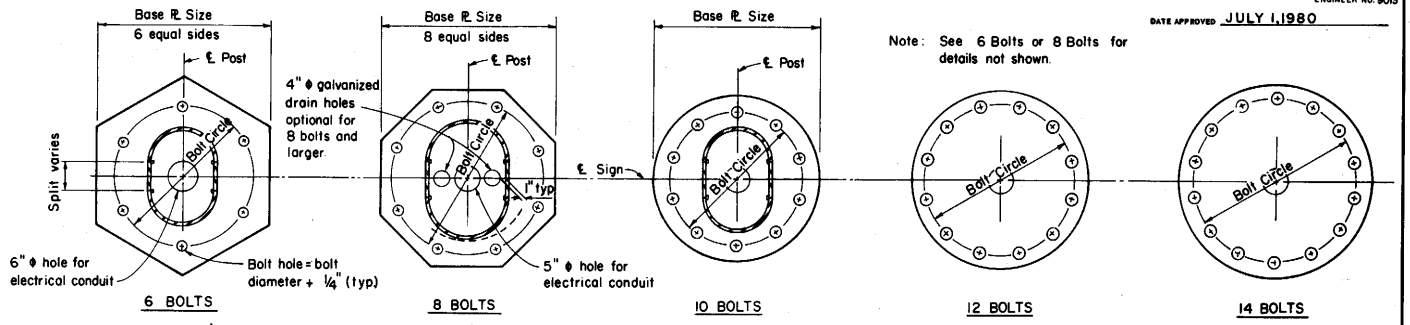


A-A

B-B

PEDESTAL / CIDH PILE FOUNDATION DETAILS

(CIDH Denotes cast in drilled hole)

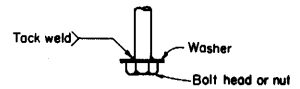


6 BOLTS | 8 BOLTS | 10 BOLTS | 12 BOLTS | 14 BOLTS

BASE PLATE DETAILS

Post Type	Pipe Size	Split	Base ℞ Size	Bolt Circle	Anchor Bolts	Pile Dia.	Vertical Reinf.	Pile Depth
A	8 x-s	5"	2'-3"x2 1/2"	23"	6-2 1/4"	36"	8-#9	11'
B	10 x-s	4"	2'-3"x2 1/2"	23"	6-2 1/4"	36"	8-#9	12'
C	10 x-s	6"	2'-6"x2 1/2"	25"	8-2 1/4"	36"P	11-#9	14'
D	12 x-s	–	2'-2"x2 1/2"	22"	6-2 1/4"	36"	8-#9	12'
E	12 x-s	4"	2'-6"x2 1/2"	25"	8-2 1/4"	36"P	11-#9	13'
F	12 x-s	6"	2'-8"x2 3/4"	27"	8-2 1/4"	36"P	12-#9	13'
G	14 x-s	–	2'-3"x2 1/2"	23"	6-2 1/4"	36"	8-#9	13'
H	14 x-s	4"	2'-8"x2 3/4"	27"	8-2 1/4"	36"P	12-#9	14'
J	14 x-s	8"	36" Dia.x2 3/4"	29"	10-2 1/4"	36"P	15-#9	17'
K	16 x-s	–	2'-6"x2 1/2"	25"	8-2 1/4"	36"P	11-#9	14'
L	16 x-s	4"	36" Dia.x2 3/4"	29"	10-2 1/4"	36"P	15-#9	15'
M	16 x-s	8"	40" Dia.x3"	33"	12-2 1/2"	42"P	18-#9	24'
N	18 x-s	–	2'-8"x2 3/4"	27"	8-2 1/4"	36"P	12-#9	17'
O	18 x-s	5"	40" Dia.x3"	33"	12-2 1/2"	42"P	18-#9	19'
P	18 x-s	8"	40" Dia.x3"	33"	12-2 1/2"	42"P	18-#9	22'
R	20 x-s	–	36" Dia.x2 3/4"	29"	10-2 1/4"	36"P	15-#9	19'
S	20 x-s	5"	40" Dia.x3"	33"	12-2 1/2"	42"P	18-#9	22'
T	24 x-s	–	40" Dia.x3"	33"	12-2 1/2"	42"P	18-#9	22'
V	24 x-s	5"	42" Dia.x2 1/2"	35 3/4"	14-2 1/2"	42"P	26-#9	22'

Note: P denotes pedestal



ANCHORAGE DETAIL

Notes:

1. Thread upper 10" and galvanize upper 12" of the anchor bolts.
2. Pile shall be Class "A" P.C.C. and placed against undisturbed material.
3. Provide bolt template during installation of anchor bolts.
4. Prior to erection of the post, backfill which is equivalent to the surrounding material shall be in place.
5. Pile shall be formed 6" minimum below ground surface.

STATE OF CALIFORNIA
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OVERHEAD SIGNS TUBULAR FOUNDATION DETAILS

S40T

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

CHIEF, OFFICE OF STRUCTURES DESIGN
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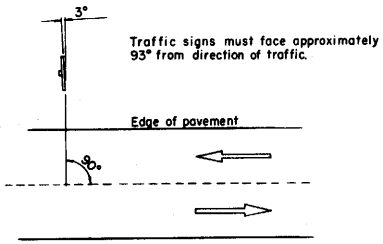
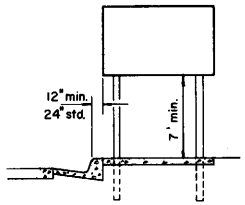
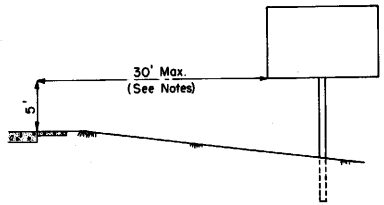


PLAN VIEW

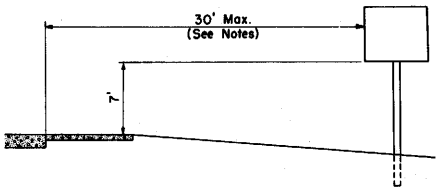


URBAN LOCATIONS

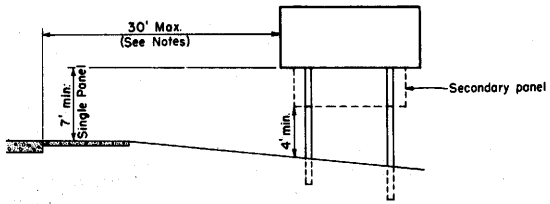


RURAL LOCATIONS

CONVENTIONAL HIGHWAYS AND INTERCHANGE AREAS



REGULATORY AND WARNING SIGNS AND ROUTE SHIELDS



GUIDE SIGNS

FREEWAY AND EXPRESSWAY LOCATION

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.

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

ROADSIDE SIGNS
TYPICAL INSTALLATION DETAILS NO. 1 S 41-3

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DIST	COUNTY	ROUTE	POST MILE	Sheet No.	Total

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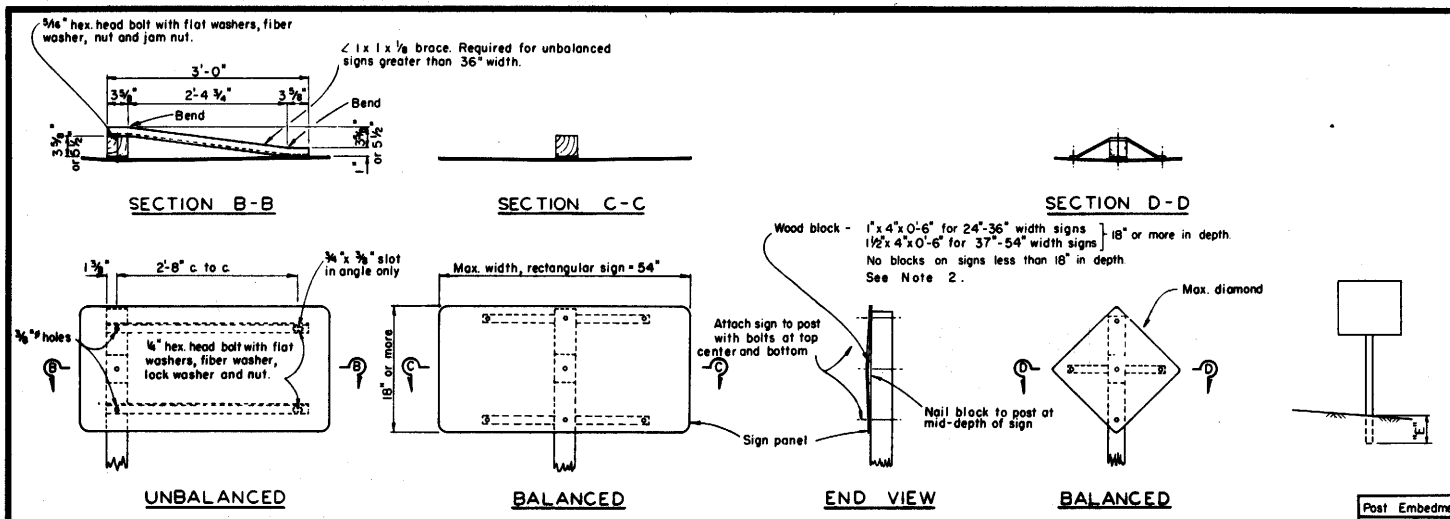

Post Size	Embedment "E"
4" x 4"	3.5'
4" x 6"	4.5'
6" x 6"	5.0'
6" x 8"	6.0'

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

Notes:

1. Place long dimension of post cross section normal to sign axis.
2. Balanced single post installations of unframed single sheet aluminum panel signs shall have blocks if 18" or more in depth and a combination of blocks and back braces if 18" or more in depth and 34" or more in width. Signs panels less than 18" in depth and 34" or more in width shall have back braces only.
3. For post size see sign layout, format or quantity sheets.
4. Balanced single post installations of Laminated Panel and Framed single sheet panel signs require back braces when 34" or more in width.

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

ROADSIDE SIGN
WOOD POSTS
TYPICAL INSTALLATION DETAILS NO. 2 | S 42-15

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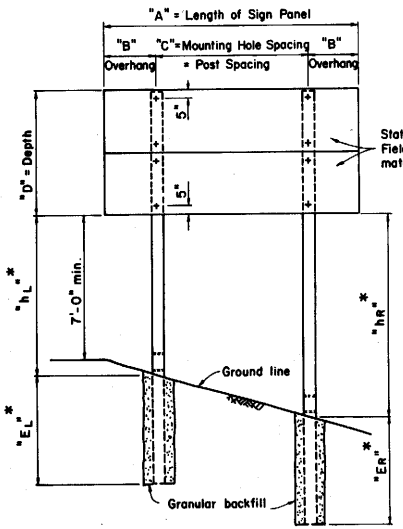
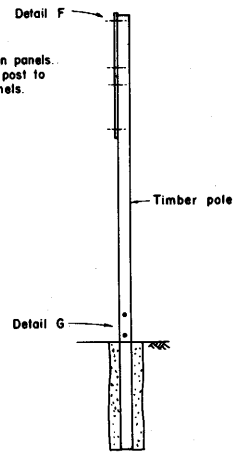
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 5013

APPROVED JULY 1, 1980 '74

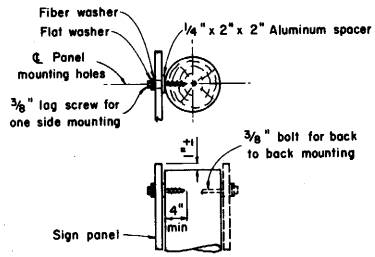


ELEVATION

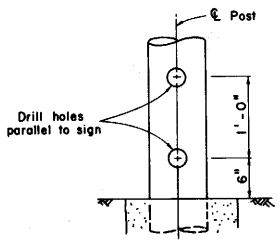


END VIEW

* Dimensions given on Project Plans are for fabrication. At time of installation adjust these dimensions to provide a level sign approximately 7' above roadway shoulder.



DETAIL F



DETAIL G

Pole Diameter at Ground Line	Hole Dia.
6" to less than 7"	2"
7" to less than 8"	2"
8" to less than 9"	2 1/2"
9" to less than 10 1/2"	3"
10 1/2" to less than 12"	3 1/2"
Over 12"	4"

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

LAMINATED PANELS

Notes: See Project plans for:

1. Station of each sign.
2. Distance from edge of pavement or other layout line.
3. Length of Sign "A".
4. Depth of Sign "D".
5. Height "h" of each pole above foundation.
6. Depth of embedment "E" for each pole.
7. Diameter of post hole.
8. Class of timber pole.

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

ROADSIDE SIGNS
TIMBER POLES
TYPICAL INSTALLATION DETAILS NO. 3

S 43-15

S 43-15

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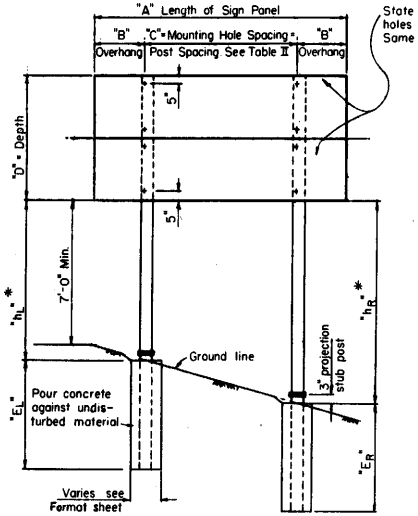
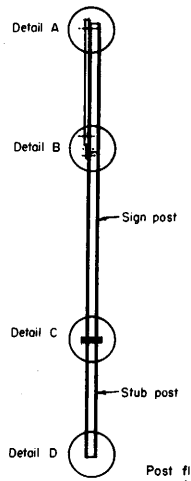
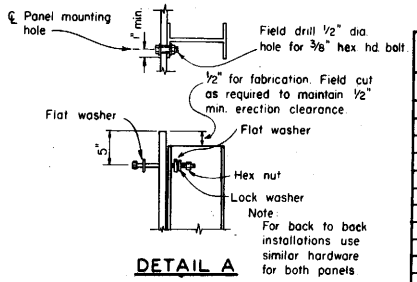


ELEVATION

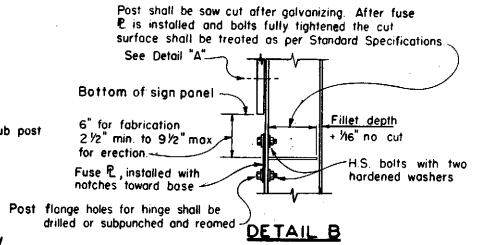


END VIEW

* Dimensions given on project plans are for fabrication. At time of installation adjust these dimensions to provide a level sign approximately 7' above roadway shoulder.



DETAIL A



DETAIL B

Note: Detail shown is typical for signs located right of traffic. For median installations orient Detail "B" so that the fuse plate will face traffic nearest to post.

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

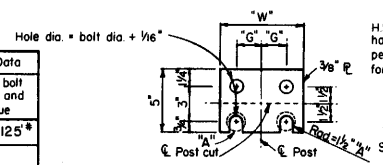
LAMINATED PANELS

TABLE II

Post Size	Base Connection Data: H.S. bolt size and torque	Base ℄ "W"	Base ℄ "T"	Base ℄ "R"	Fuse Plate Data: Fuse ℄ "W"	Fuse ℄ "G"	H.S. bolt size and torque
W6x12	5/8"x 38'*	5"	1"	11/32"	4"	1 1/4"	5/8"x 125'*
W6x15		7"					
W8x21	1"x 85'*				5"	1 1/2"	
W8x24							
W8x28		8"					3/4"x 250'*
W8x31			1 1/2"	17/32"			
W8x35							
W10x39	1"x 106'*	9"			7"	2 1/2"	
W10x45				19/32"			

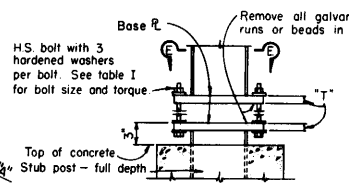
BASE PLATE & FUSE PLATE DATA

TABLE I

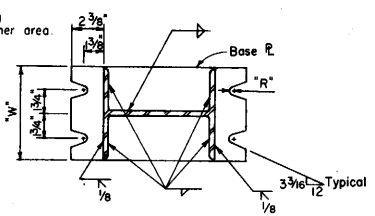


FUSE PLATE DETAIL

(See Table I for dimensions not shown) the faying surfaces marked "A" and the adjoining surfaces shall be roughened by abrasion.

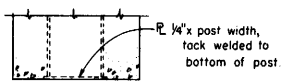


DETAIL C

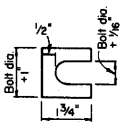


SECTION E-E

(Top plate shown – bottom plate similar)



DETAIL D



SHIM DETAIL

Furnish shims .012" ± thick & .034" ± thick. Shim shall be fabricated from brass shim stock or strip conforming to ASTM-B36.

Assembly Procedure

1. Assemble sign post to foundation post verifying that there is one flat washer on each bolt between plates.
2. Shim as required to plumb post.
3. Tighten all bolts to a snug-tight postion to bed washers and shims and to clean out threads. Then loosen each bolt in turn and retighten in a systematic order to the prescribed torque.
4. Burr threads at junction with nut using a center punch to prevent nut loosening.

BREAK-AWAY STEEL POSTS

Notes: See Project Plans for:

1. Station of each sign.
2. Distance from edge of pavement or other layout line.
3. Length of Sign "A".
4. Depth of Sign "D".
5. Height "h" of each post or pole above foundation.
6. Depth of embedment "E" for each post.
7. Diameter of post hole.
8. Size of post.

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

DATE APPROVED JULY 1, 1980

R. Leasure

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

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

ROADSIDE SIGNS
STEEL POSTS
TYPICAL INSTALLATION DETAILS

S43-B

S43-B

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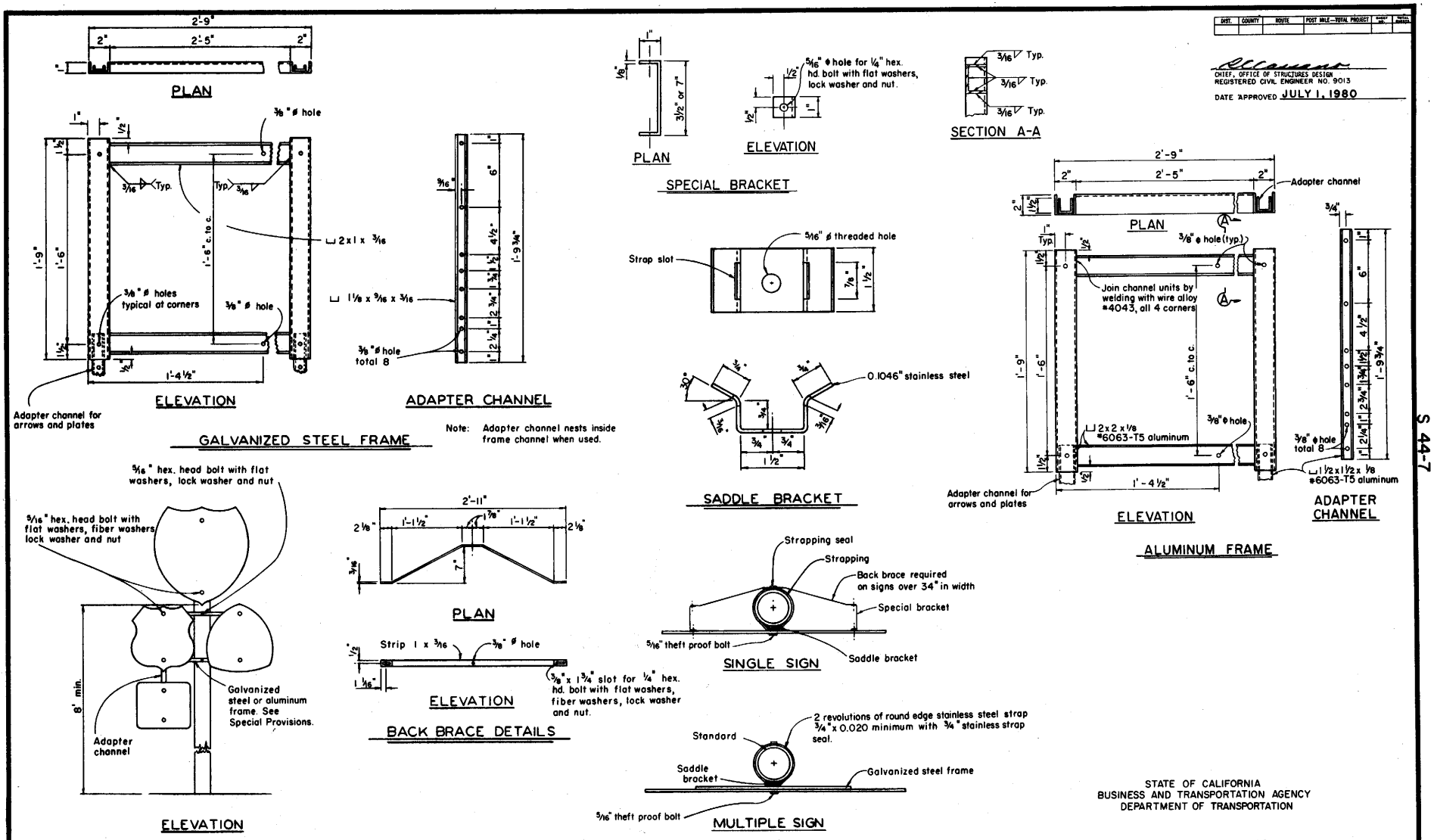
DIST.	COUNTY	ROUTE	POST MILE—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013
DATE APPROVED JULY 1, 1980



STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

ROADSIDE SIGNS
TYPICAL INSTALLATION DETAILS NO. 4 S 44-7

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ELECTROLIERS

STANDARD TYPES
15 ROADWAY
15 STRUCTURE
21 STRUCTURE
30 ROADWAY
31 ROADWAY
32 ROADWAY

NOTES:

1. All Luminaires shall be provided with a 200-watt HPS Lamp, unless otherwise specified or indicated.
2. All Luminaires shall be ANSI Type III, Medium Semi Cut Off Lighting Distribution, unless otherwise specified or indicated.
3. Variations noted adjacent to symbol on Project Plans.

Electrolier (See Project Notes).

Existing Electrolier to Remain in Place unless otherwise specified or indicated.

ABBREVIATIONS AND EQUIPMENT DESIGNATIONS

PROPOSED	EXISTING	
AC+		An Ungrounded Conductor.
AC−		A Grounded Conductor.
AWG		American Wire Gage.
C		Conduit.
DLC	dlc	Loop Detector Lead in Cable.
EMS		Extinguishable Message Sign.
F		Flasher Unit.
HB	hb	High Beam Sign Lighting Fixture.
HPS		High Pressure Sodium.
LB	lb	Low Beam Sign Lighting Fixture.
MA	ma	Mast Arm.
MC	mc	Mercury Contactor.
MLC	mlc	Magnetometer Detector Lead in Cable.
M/M	m/m	Multiple to Multiple Transformer.
MT	mt	Conduit with Pull Wire or Rope Only.
NC		Normally Closed.
NO		Normally Open.
PEC	pec	Photo Electric Control. (Type I, II, III or IV as shown).
Ped		Pedestrian.
PEU	peu	Photo Electric Unit.
PPB	ppb	Pedestrian Push Button.
RIS	ris	Radio Interference Suppressor.
RL		Relocated Equipment.
RM	rm	Ramp Metering.
SB		Slip Base.
SBI		Slip Base Insert.
S/M	s/m	Series to Multiple Transformer.
SN		Solid Neutral.
SP	sp	Service Point.
SW	sw	Switch.
WP	wp	Weather Proof.
XFMR	xmfr	Transformer.

SOFFIT AND WALL MOUNTED LUMINAIRES

Pendant, 70 Watt HPS

Pendant, 100 Watt HPS

Flush, 70 Watt HPS

Flush, 100 Watt HPS

Wall Surface, 100 Watt HPS

Existing Soffit or Wall Luminaire to Remain Unmodified.

Existing Soffit or Wall Luminaire to be Modified as specified or indicated.

NOTES:

1. All Luminaires shall be provided with a HPS Lamp, unless otherwise specified or indicated.
2. Arrow indicates "Street Side" of Luminaire or Glassware.
3. Variations noted adjacent to Symbol on Project Plans.

STANDARD NOTES

- AB — Abandon. If Applied to Conduit, Remove Conductors.
- BC — Install Pull Box in Existing Conduit Run.
- CB — Install Conduit into Existing Pull Box.
- CC — Connect New and Existing Conduit. Remove Existing Conductors and Install Conductors as indicated.
- CF — Conduit to remain for Future Use. Remove Conductors. Install pull wire or rope.
- LC — Install Lighting Control.
- MP — Metering Point.
- NG — No Glare Shield Required.
- NS — No Slip Base on Standard.
- PEC — Photoelectric Control.
- RC — Equipment to be Removed and Become the Property of the Contractor.
- RE — Remove Electrolier and Ballast. Tape Disconnects.
- RR — Remove and Reuse Equipment.
- RS — Remove and Salvage Equipment.
- SB — Install Slip Base on Standard.
- SC — Splice New to Existing Conductors.
- SF — Standard to remain for Future Use. Remove Luminaire, Pole Conductors and Ballast. Tape Disconnects.
- SD — Service Disconnect

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

CHIEF, OFFICE OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 11210

APPROVED JULY 1, 1980

EQUIPMENT IDENTIFICATION

Sign No. S1234M — Illuminated Sign Identification Number: Sign Number – Place on Post or Structure.

10HB, S2, 1.0 — Transformer Rating (KVA). Type of Sign Control. Number and Type of Fixtures. DO NOT Place on Standard or Structure.

D2345-25 — Electrolier or Equipment Identification Number. Mast Arm Length in Feet, if shown, Do Not Place on Standard or Structure. Equipment Number – Place on Standard or Structure.

1½"C, 2#8, 15#14, 2DLC — Conduit and Conductor Identification: Number and Size of Conductors and Cables. Size of Conduit in Inches.

ø1, ø2, ø2W, etc. — Traffic Phase Identification for Signal Faces, Detectors and Phase Diagrams.

1 2 3 — Project Note Numbers – See Applicable Notes.

① ② ③ — Equipment Description, Installation or Item Numbers

1 2 3 — Conduit Run Numbers – See Conductor Schedule.

19A - 3 - 70 — Signal and Lighting Standard (Typical Designation). Wind Velocity = 70 MPH. Case 3 Arm Loading. Standard Type

Standard Plan Sheet Number. Detail Number or Letter

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND HIGHWAY LIGHTING DETAILS

SYMBOLS AND ABBREVIATIONS | ES-1A

ES-1A

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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 Circuit.
—F— —	—f— —	Fire Alarm Conduit.
— — —]	— — —]	Conduit Termination. (Detail C, ES-7B in Structures).
R	r	Conduit Riser in Structure.

SERVICE EQUIPMENT

PROPOSED	EXISTING	
— - — -	— - — -	Overhead Lines
	U	Wood Pole. "U" Indicates Utility Owned.
		Pole Guy- With Anchor.
		Pad Mount for Ground-Mounted Utility Transformer.
III -3		Service Cabinet Type. Wiring Diagram Number.
		Service Cabinet. Door Swing as Shown.

POLE-MOUNTED SERVICE DESIGNATION

TYPE K-3-25'

- Type of Installation.
- Wiring Diagram Number.
- Pole Height above Grade.

SIGN LIGHTING EQUIPMENT

PROPOSED	EXISTING	
		Illuminated Sign-Single Post.
		Illuminated Sign- Two Post.
		Illuminated Sign-Mounted On Structure.
		Illuminated Sign With Roadway Luminaire Attached.
S	S	Incandescent Sign Light.

SIGNAL EQUIPMENT

PROPOSED	EXISTING	
		Pedestrian Signal.
		Pedestrian Push Button Post.
		Pedestrian Barricade.
		Traffic Signal Face, 3-Section: 8" Red, Yellow and Green Sections.
		Traffic Signal Face With Angle Visor.
PV	L	Modifications of Basic Symbol: "L" Indicates All Non-Arrow Sections Louvered. "LG" Indicates Louvered Green Section Only. "PV" Indicates 12-Inch Programmed Visibility Sections. "12" Indicates All 12-Inch Sections.
		Traffic Signal Face With Back Plate.
		Traffic Signal Face With 12-Inch Left Green Arrow and 8-Inch Red and Yellow Sections.
		Traffic Signal Face With 12-Inch Up Green Arrow.
		Traffic Signal Face (5-Section) With 12-Inch Yellow and Green Right Arrows and 8-Inch Red, Yellow and Green Sections.
		Type I Standard and Attached Signals.
		Standard With Signal Mast Arm Only and Attached Signals.
PV PV	PV PV	Left-Turn Signal and Sign Standard, Type 33.
		Standard With Luminaire and Signal Mast Arms and Attached Signals.
		Cantilever Flashing Beacons. Type 9 Frame, Unless Otherwise Specified or Indicated.
R	Y	Flashing Beacon. One-Way 1-Section With 12-Inch Lens and Visor. "R" Indicates Red Lens, "Y" Indicates Yellow Lens.
		Controller Cabinet. Door Swing as Shown.

PULL BOXES

PROPOSED	EXISTING
3	9A(21)

3 = No. 3½

6 = No. 6

7 = No. 7 (Ceiling Pull Box)

8 = No. 8 (Pendant Soffit Pull Box)

9 = No. 9

9A = No. 9A

Pull Box-No. 5 Unless Otherwise Indicated or Noted as Below.

Pull Box-Additional Designations or Descriptions.

- (C) = Communications Pull Box.
- (E) = Pull Box with Extension.
- (15) = Anchor Bolts and Conduit for Future Installation of Type 15 Standard.
- (S) = Sprinkler Control Pull Box.
- (21) = Anchor Bolts and Conduit for Future Installation of Type 21 Standard.
- (T) = Pull Box with Traffic Cover.

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

CHIEF, OFFICE OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 11310

APPROVED JULY 1, 1980

VEHICLE DETECTORS

4 P 5 J 9 U

- Detector Type
- Detector Identification number
- Vehicle Detector for Traffic Signals- Inductive Loop Detector, Unless Otherwise Indicated.
- U = Upper
- L = Lower
- Slot Number in Input File.
- Input file (I or J)
- Phase
- Detector type P = Loop C = Magnetic R = Magnetometer
- Type of Installation (see ES-5A, 5B, & 5C)

1 = 1 2 = 2 3 = 3 4 = 4

		Inductive Loop Detector. Outline and Location of Sawcuts Shown.
		Magnetometer Detectors
		Magnetic Detector.
	D	Pressure Detector. Subscript "D" Indicates Directional Type.
		Termination Pull Box-No. 5 for Detector Cables.

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND HIGHWAY LIGHTING DETAILS

SYMBOLS AND ABBREVIATIONS ES-1B

ES-1B

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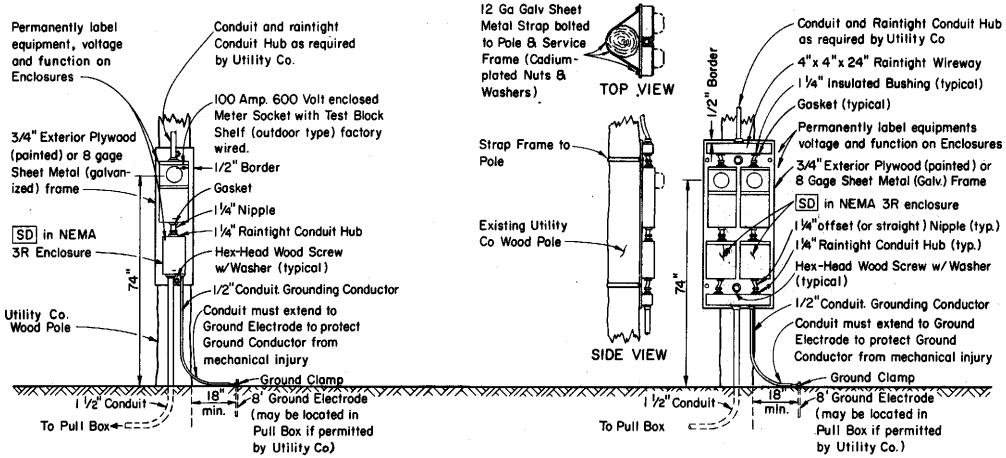
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

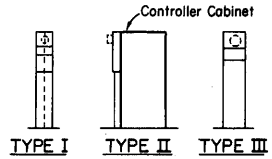
CHIEF, OFFICE OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 11210

APPROVED July 1, 1980



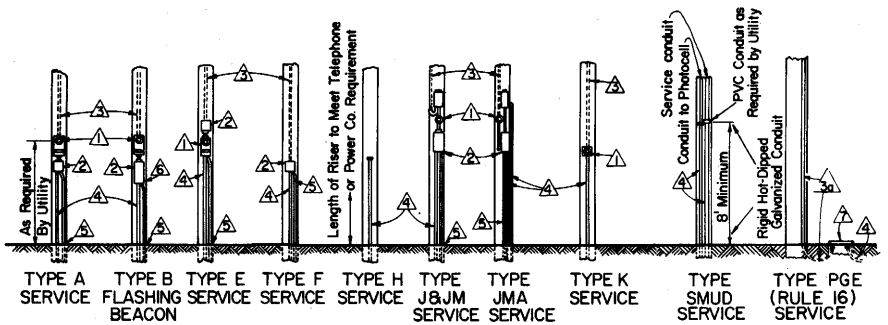
TYPE SCE-1 SERVICE

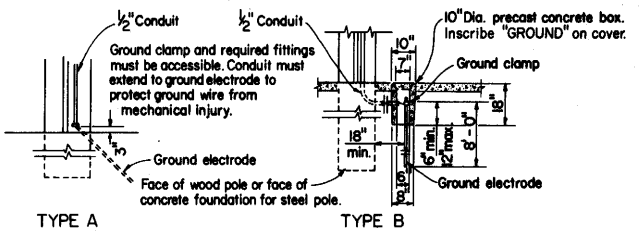
TYPE SCE-2 SERVICE



TYPES OF SERVICE (TYPICAL)

Type I Service Equipment Cabinet mounted on Pedestal Type Wiring Gutter.
Type II Service Equipment Cabinet mounted on side of a Controller Cabinet.
Type III Complete Free-Standing Service Equipment Cabinet.





SERVICE GROUNDING

Use where serving utility requires 18" clearance between electrode and pole or service cabinet. Installation shown is for sidewalk or paved areas. In unpaved areas, omit special box and locate ground clamp above ground or locate ground clamp in nearest pull box.

NOTES:

1. Meter socket
2. Service enclosure 60 Amp. size minimum, unless otherwise shown.
3. (a) Utility owned pole. Service riser (and contactor with PEC where required) furnished and installed by Utility.
   (b) State owned pole. Service riser and all other required equipment furnished and installed by Contractor.
4. Conduit, size as required.
5. Ground conduit, 1/2" C, 1-#6 AWG bare copper. See "SERVICE GROUNDING" detail.
6. Flashing Beacon Control.
7. Service pull box (#5 w/ext. unless otherwise noted) furnished & installed by Contractor. Exact location determined by utility.

POLE MOUNTED SERVICE INSTALLATIONS

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND HIGHWAY LIGHTING DETAILS
SERVICE EQUIPMENT

ES-2A

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

CHIEF, OFFICE OF TRAFFIC ENGINEERING
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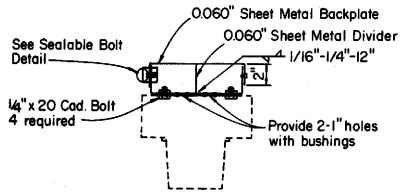
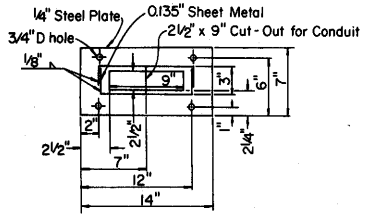
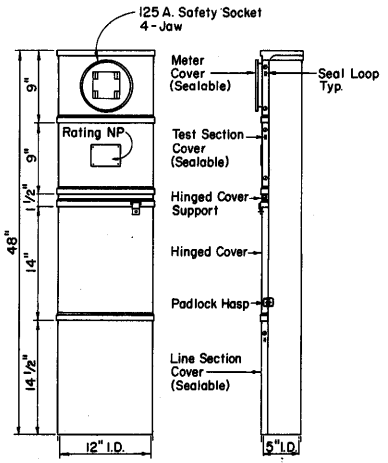
APPROVED July 1, 1980



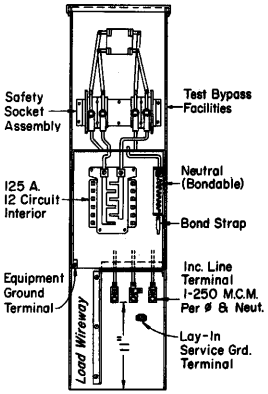
SECTION A-A



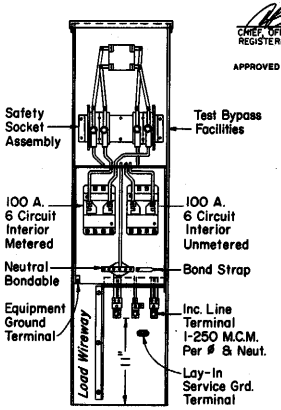
SECTION B-B



FRONT SIDE

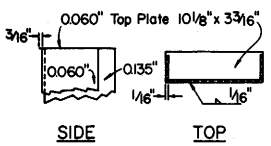


FRONT VIEW
(LESS COVERS & DEADFRONT)
FOR
METERED CIRCUITS ONLY



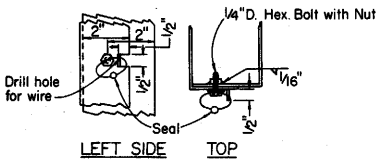
FRONT VIEW
(LESS COVERS & DEADFRONT)
FOR
METERED AND UNMETERED CIRCUITS

TYPE II SERVICE EQUIPMENT CABINET



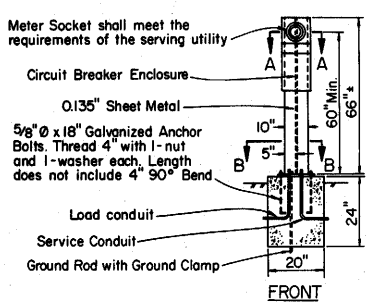
SIDE TOP

TOP PLATE DETAIL (TYPICAL)

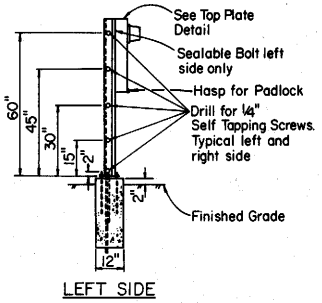


LEFT SIDE TOP

SEALABLE BOLT DETAIL



FRONT



LEFT SIDE

TYPE I SERVICE EQUIPMENT CABINET

EQUIPMENT ENCLOSURES NOTES

1. Service Equipment Enclosures shall conform to Section 86-2.11, "Service", of the Standard Specifications. Painting shall conform to Section 86-2.16, "Painting".
2. Service Equipment Enclosures and metering equipment shall meet the requirements of the serving utility.
3. Service Equipment Cabinets shall be factory wired and conform to NEMA Standards.
4. All Control Wiring shall be No. 14 TW 19-Strand Machine Tool Wire unless otherwise noted.
5. An engraved phenolic nameplate indicating the function of each circuit breaker shall be installed on the dead front panel adjacent to the breaker. An external nameplate shall indicate service point number and voltage.
6. A Plastic Laminated Wiring Diagram shall be provided and attached to the inside of Front Door.
7. All Service Equipment Cabinets shall be NEMA 3-R Construction and shall be provided with Dead Front Panel and provisions for padlocking.
8. All equipment supplied shall be a currently manufactured item.
9. Type I and II Service Equipment Cabinets shall be provided with Dead Front Panels and Outside Top-Hinged Raintight Covers removable without the use of tools.
10. When the Utility provides both metered and unmetered circuits, the Service Cabinet shall be provided with a separate bus for each circuit.
11. In unpaved areas, a raised PCC pad of 24" x 4" x width of foundation shall be placed in front of Type I and III Service.
12. Type I and Type II Service Equipment Cabinets shall be fabricated from 0.080" minimum thickness zinc coated sheet steel. All external and internal covers shall be fabricated from 0.060" minimum thickness zinc coated sheet steel.

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ES-2B

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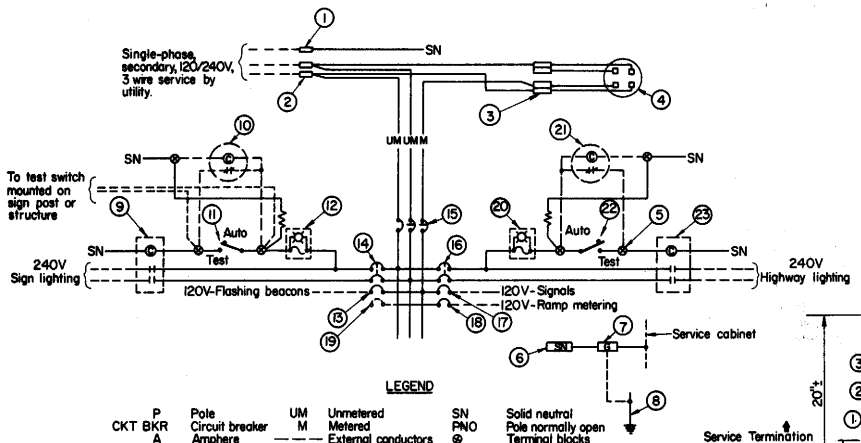
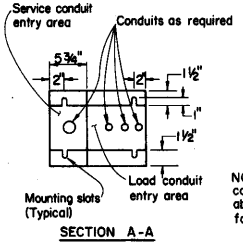


LEGEND

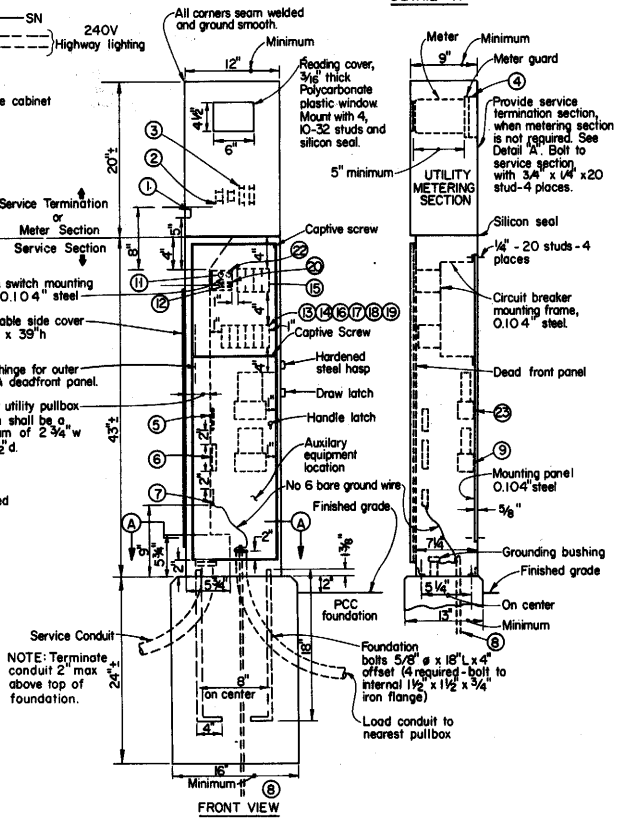
P	Pole	UM	Unmetered	SN	Solid neutral
CKT BKR	Circuit breaker	M	Metered	PNO	Pole normally open
A	Amphere		External conductors		Terminal blocks
V	Volts		Tie point		47K, 1 Watt resistor
			Conductor or Buss		
			Contactor coil		Contactor, contact PNC
			Contactor contacts PNO	PNC	Pole normally closed

120/240 SERVICE WIRING DIAGRAM (TYPICAL)

TYPE III A SERVICE (120/240) EQUIPMENT LEGEND		
ITEM NO.	COMPONENT	NAMEPLATE DESCRIPTION
1	Neutral Lug	
2	Landing Lug	
3	Test Bypass Facilities	
4	Meter Socket and Support	
5	Terminal Blocks	
6	Solid Neutral Lug	
7	Ground Lug	
8	Ground Rod	
9	30A, 2PNO, Mercury Contactor	
10	Photo Electric Unit	
11	15A, IP, Test Switch	Sign lighting test switch
12	15A Fuse with Indicating Lamp	Sign lighting control
13	15A, 120V, IP, CKT BKR	Flashing beacon
14	30A, 240V, 2P CKT BKR	Sign lighting
15	100A, 240V, 3P CKT BKR	Main breaker
16	40A, 240V, 2P CKT BKR	Highway lighting
17	40A, 120V, IP CKT BKR	Signals
18	20A, 120V, IP CKT BKR	Ramp metering
19	Knock out space for IP CKT BKR	
20	15A Fuse with indicating lamp	Highway lighting control
21	Photo Electric Unit	
22	15A, IP, Test Switch	Highway lighting test switch
23	60A, 2PNO, Mercury Contactor	

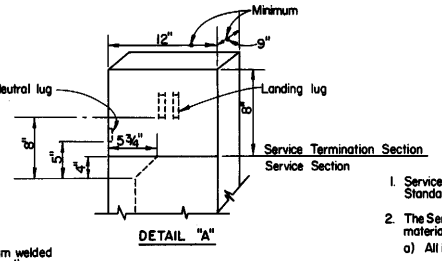


SECTION A-A



FRONT VIEW

TYPE III-A SERVICE EQUIPMENT CABINET



DETAIL "A"

EQUIPMENT ENCLOSURE NOTES

1. Service Equipment Enclosures shall conform to Section 86-2.11, "Service" of the Standard Specifications. Painting shall conform to Section 86-2.16, "Painting".
2. The Service Equipment Cabinet shall be fabricated of sheet steel with thickness of materials as follows:
   a) All interior panels shall have a minimum thickness of 0.080".
   b) All walls, exterior doors and cover shall have a minimum thickness of 0.104".
3. The meter section shall have a sealable, lockable, rain-tight cover that can be removed without the use of tools.
4. The two dead front panels (inner doors) shall have a continuous stainless steel piano hinge on the same side as outer door. The panel in front of the breakers shall be secured with at least 2 captive screws; the lower panel shall be secured with a handle latch.
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. Cabinets 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 made from 0.20" diameter wire. Secure screen after painting with at least four bolts and frame.
7. Circuit Breakers shall be the molded case, thermal-magnetic, bolt-on type with a minimum fault interrupting capacity of 10,000 amperes and with trip ratings as shown on the plan.
8. All control wiring shall be 600 volt 60°C, No. 14 MTW stranded machine tool wire. Where subject to flexing, 19 strand shall be used.
9. All main busing shall be 125 amperes rated copper with silver plated contact areas.
10. A plastic laminated wiring diagram shall be provided with brass mounting eyelets and attached to the inside of the front door with hooks to permit removal without the use of tools.
11. An engraved phenolic nameplate on the upper dead front panel shall be installed with stainless steel rivets or stainless steel screws;
    a) Adjacent to the breaker or device. Marking shall be as shown in the schedule.
    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".
12. The plan shows the approximate location of devices within the enclosure. Components may be rearranged, however, the dimensions shown within the enclosure are "working" clearances and shall be maintained.
13. In unpaved areas a raised PCC pad 24"x4"x width of foundation shall be placed in front of new service installation. Pad shall be set to elevation of foundation.
14. Terminal lugs shall be copper, or tin-plated aluminum. Solid neutral terminal strip shall be copper with cadmium-plated screws. All terminals shall be compatible with either copper or aluminum conductors and sized to suit the conductors shown on the plan. The terminals shall include but not be limited to:
    a) Incoming terminals (land lugs).
    b) Neutral lugs.
    c) Solid neutral terminal strip.
    d) Ground lug.
    e) Terminal strips for conductors within the cabinet.
15. Fuseholder with neon indicating lamp shall be the panel mount, drip proof type with bayonet knob rated for 250 volts at 30 amperes. The fuses shall be the fast acting glass or ceramic type 1/4" Ø by 1-1/4" long rated at 5 amperes.
16. Service Equipment Enclosures and metering equipment shall meet the requirements of the serving utility.
17. All screws, nuts, bolts and washer shall be stainless steel.
18. The enclosure shall have no screws, nuts or bolts on the exterior.

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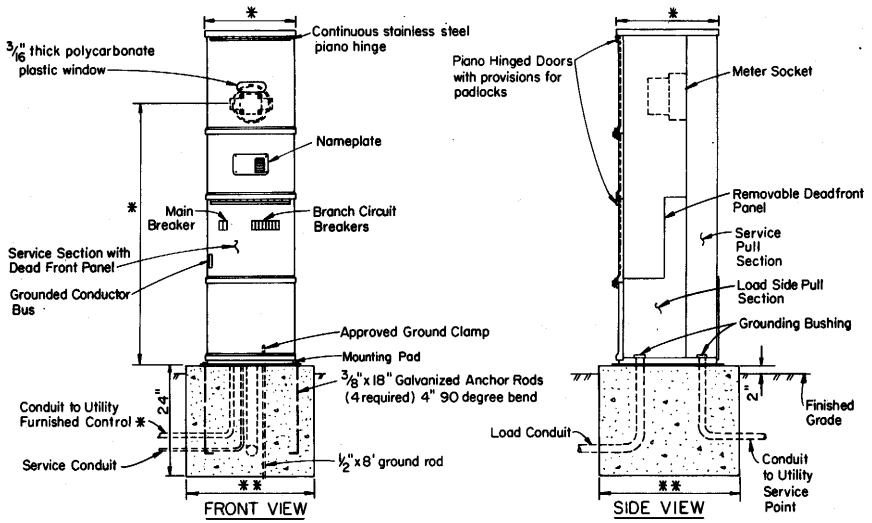
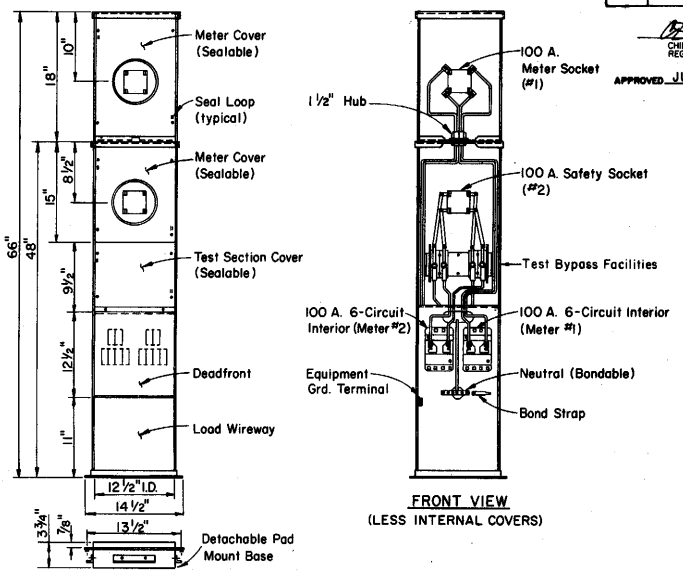


* Per Utility Company Requirements

** Foundation shall extend 2" min. beyond edge of cabinet.

TYPE III-B SERVICE EQUIPMENT CABINET WITH PROVISIONS FOR ONE 100 A. METER



TYPE III-B SERVICE EQUIPMENT CABINET WITH PROVISIONS FOR TWO 100 A. METERS

TYPE III-B SERVICE EQUIPMENT CABINETS

EQUIPMENT ENCLOSURES NOTES

1. Service Equipment Enclosures shall conform to Section 86-2.11, "Service" of the Standard Specifications. Painting shall conform to Section 86-2.16, "Painting".
2. Service Equipment Enclosures and metering equipment shall meet the requirements of the serving utility.
3. Service Equipment Cabinets shall be factory wired and conform to NEMA Standards.
4. All Control Wiring shall be No. 14 TW 19-Strand Machine Tool Wire unless otherwise noted.
5. An engraved phenolic nameplate indicating the function of each Circuit Breaker shall be installed on the dead front panel adjacent to the Breaker. An external nameplate shall indicate service point number and voltage.
6. A Plastic Laminated Wiring Diagram shall be provided and attached to the inside of Front Door.
7. All Service Equipment Cabinets shall be NEMA 3-R Construction and shall be provided with Dead Front Panel and provisions for padlocking.
8. All equipment supplied shall be a currently manufactured item.
9. Type III-B Cabinets shall be fabricated from 0.080" minimum thickness zinc coated sheet steel. All exterior and interior covers and panels shall be fabricated from 0.060" minimum thickness zinc coated sheet steel.
10. When the Utility provides both metered and unmetered circuits, the Service Cabinet shall be provided with a separate bus for each circuit.
11. In unpaved areas, a raised PCC pad of 24" x 4" x width of foundation shall be placed in front of Service Cabinet.
12. Circuit Breakers with Ratings shown on the Plans (and the 15-amp Breaker for the Photoelectric Control, if required) shall be installed in each Service Cabinet.
13. At least 8 standard single pole circuit breaker spaces (3/4" nominal) shall be provided in Type III-B service cabinets. This shall include silver plated copper busing and mounting hardware. Busing shall be rated at 125 amp minimum.
14. Cabinets 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 made from 0.20" diameter wire. Secure screen after painting with at least four bolts and frame.

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TRAFFIC SIGNAL AND HIGHWAY LIGHTING DETAILS
SERVICE EQUIPMENT

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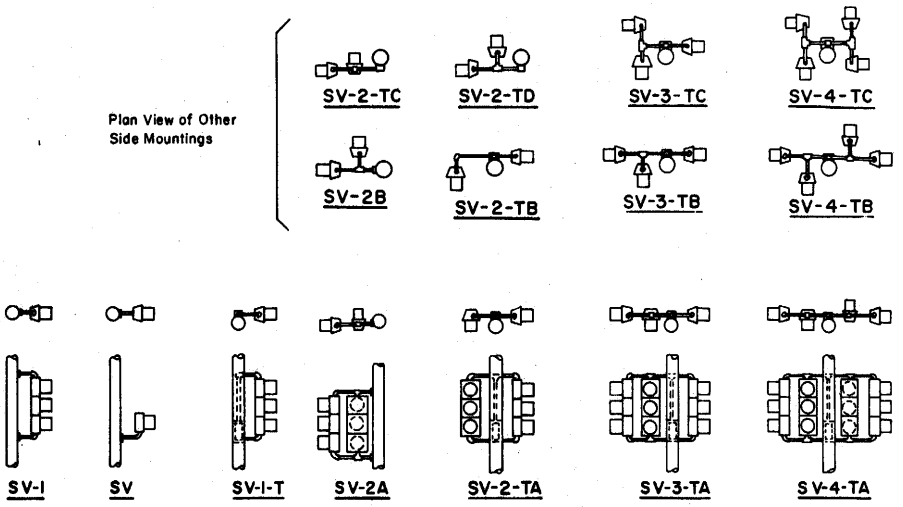
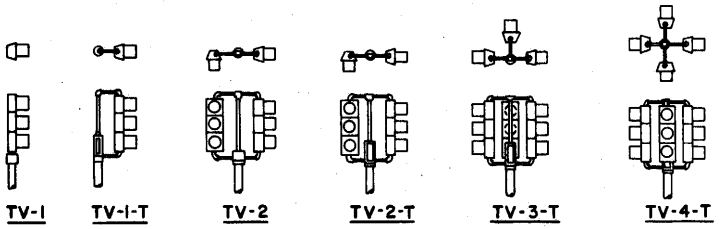
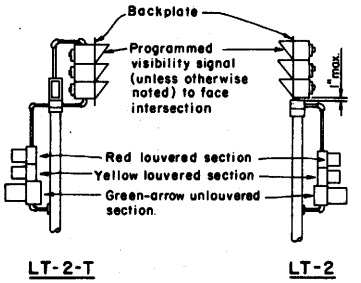


SIDE MOUNTINGS

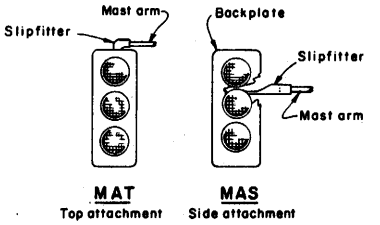


TOP MOUNTINGS

VEHICULAR SIGNALS AND MOUNTING



LEFT TURN MOUNTINGS



MAST ARM MOUNTINGS

ABBREVIATIONS

TV	Top mounted Vehicular signals
SV	Side mounted Vehicular signals
MAT	Mast Arm mtd. vehicular signals - Top attachment
MAS	Mast Arm mtd. vehicular signals - Side attachment
LT	Left Turn 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 Plan ES-3D for attachment fittings details.
4. All arrow indications and all mast arm indications shall be 12-inch.
5. All mast arm mounted signal heads and all programmed visibility signal heads shall be provided with backplates.

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TRAFFIC SIGNAL AND HIGHWAY LIGHTING DETAILS

SIGNAL HEADS AND MOUNTINGS | ES-3A

ES-3A

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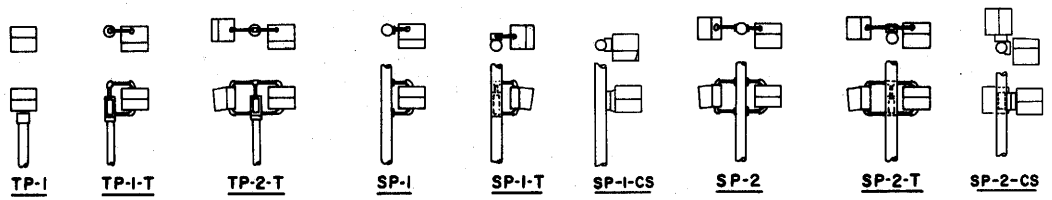
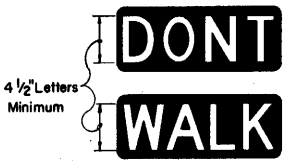


TOP MOUNTINGS

SIDE MOUNTINGS

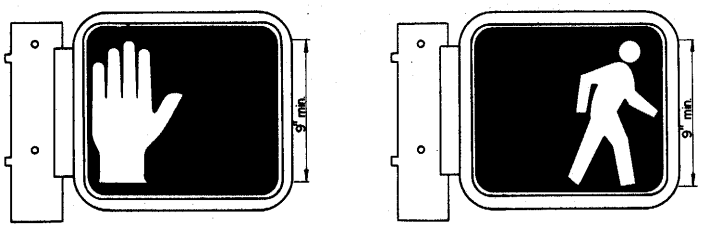
PEDESTRIAN SIGNALS



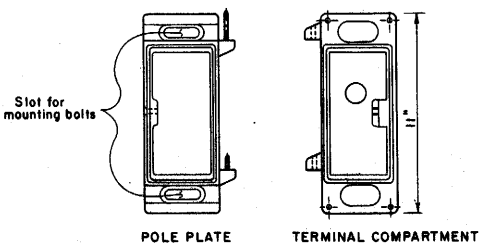
PEDESTRIAN SIGNAL FACE MESSAGES

ABBREVIATIONS

TP	Top mounted Pedestrian signal
SP	Side mounted Pedestrian signal
CS	Clamshell mounting hardware
T	Terminal compartment
1,2,3,4	Number of signal faces



PEDESTRIAN SIGNAL – INTERNATIONAL SYMBOL
(To be used only when specified.)



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

("CS" Mounting shown is "typical" See contract plans for mounting requirements.)

PEDESTRIAN SIGNALS AND MOUNTINGS

NOTES

1. Mountings shall be oriented to provide maximum horizontal clearance to adjacent roadway.
2. Pedestrian signals shall be positioned on the side of standard nearest crosswalk controlled.
3. Bracket arms shall be long enough to permit proper alignment of signals.
4. See Standard Plan ES-3D for attachment fittings details.

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SIGNAL HEADS AND MOUNTINGS

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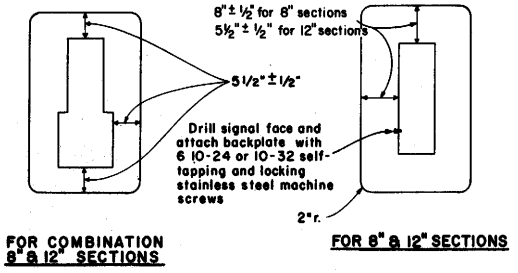
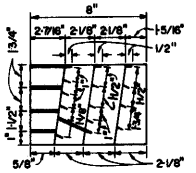
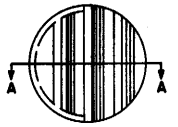


BACKPLATE

0.051-inch minimum thickness.
3001-14 aluminum or plastic



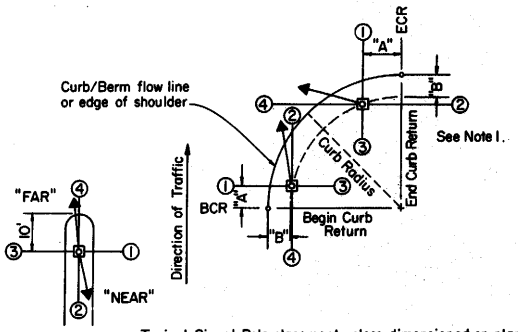
SECTION A-A



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.

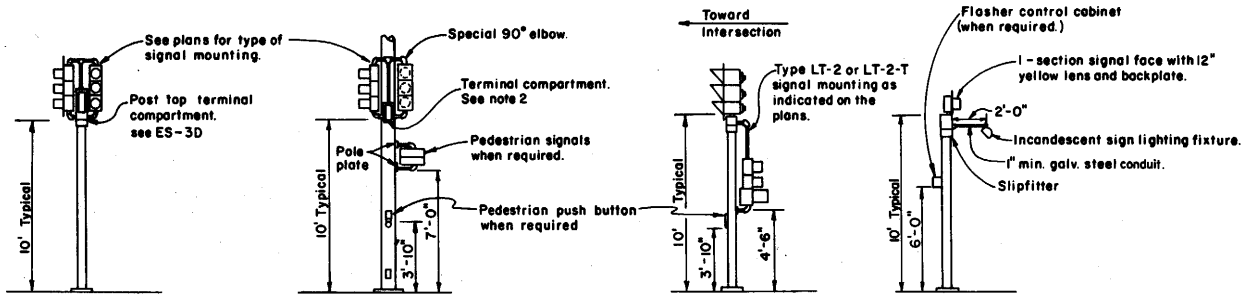


Typical Signal Pole placement unless dimensioned on plans.
(4) denotes side of pole signal head mountings or terminal compartments are to be placed.

SIGNAL STANDARD PLACEMENT DIMENSIONS & EQUIPMENT LOCATIONS

NOTES

1. For "A" and "B" dimensions, see Pole Schedule, or as directed by the Engineer.
2. Terminal compartment shall be located on side #3 of the standard unless otherwise shown.



TOP MOUNTED SIGNALS (TV)

Type 1A, 1B, 1C or 1D standard as indicated on the plans

SIDE MOUNTED SIGNALS (SV & SP)

Normally used on standards with luminaire and/or signal mast arm.

LEFT TURN LANE SIGNALS (LT)

Type 1A, 1B, 1C or 1D standard as indicated on the plans

ADVANCE FLASHING BEACON INSTALLATION

Type 1A, 1B, 1C or 1D standard as indicated on the plans

TYPICAL SIGNAL INSTALLATIONS

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SIGNAL HEADS AND MOUNTINGS | ES-3C

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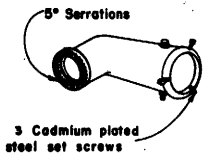
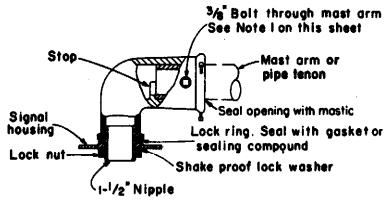
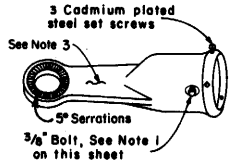




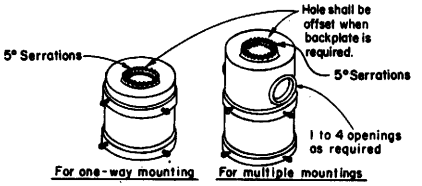
MAST ARM MOUNTING - TYPE "MAT"

For 2" pipe - See Note 1 on this sheet



MAST ARM MOUNTING TYPE "MAS"

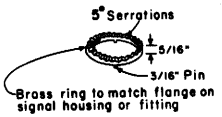
For 2" pipe - See Note 1 on this sheet



TOP MOUNTING

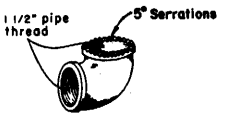
For 4" pipe - See Note 2 on this sheet

SIGNAL SLIP-FITTERS



LOCK RING

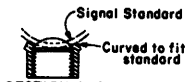
Use where locking ring is not integral with signal housing or fitting.



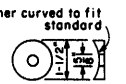
SPECIAL 90° ELBOW

One for each face, except those with special slip-fitter mounting

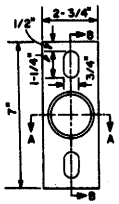
MISCELLANEOUS MOUNTING HARDWARE

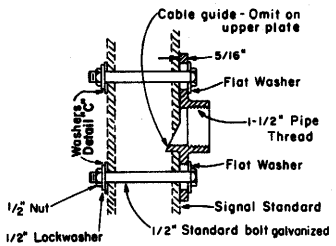


SECTION A-A



WASHER DETAIL "C"

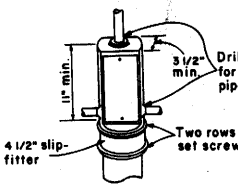




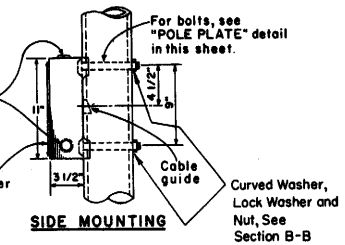
SECTION B-B

POLE PLATE

For Side Mountings



TOP MOUNTING



SIDE MOUNTING

TERMINAL COMPARTMENTS

NOTES

1. After mast arm signal has been plumbed and secured, drill 7/16" hole through mast arm in line with slip-fitter hole. Place a 3/8" galvanized bolt with washer under bolt head through hole and secure with washer, nut, and locknut. Seal openings between MAS or MAT mountings and mast arm.
2. (a) Threaded top mounted slip fitter openings shall be 1 1/2" I.P.S.
   (b) Serrations in fittings shall match those on bottom of signal heads or in lock ring.
   (c) Top opening shall be offset when backplate is used.
3. Wireway shall have a cross-section area of 0.95 sq. in. minimum. Min. width of 0.50 in.

STATE OF CALIFORNIA
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DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND HIGHWAY LIGHTING DETAILS

SIGNAL HEADS AND MOUNTINGS

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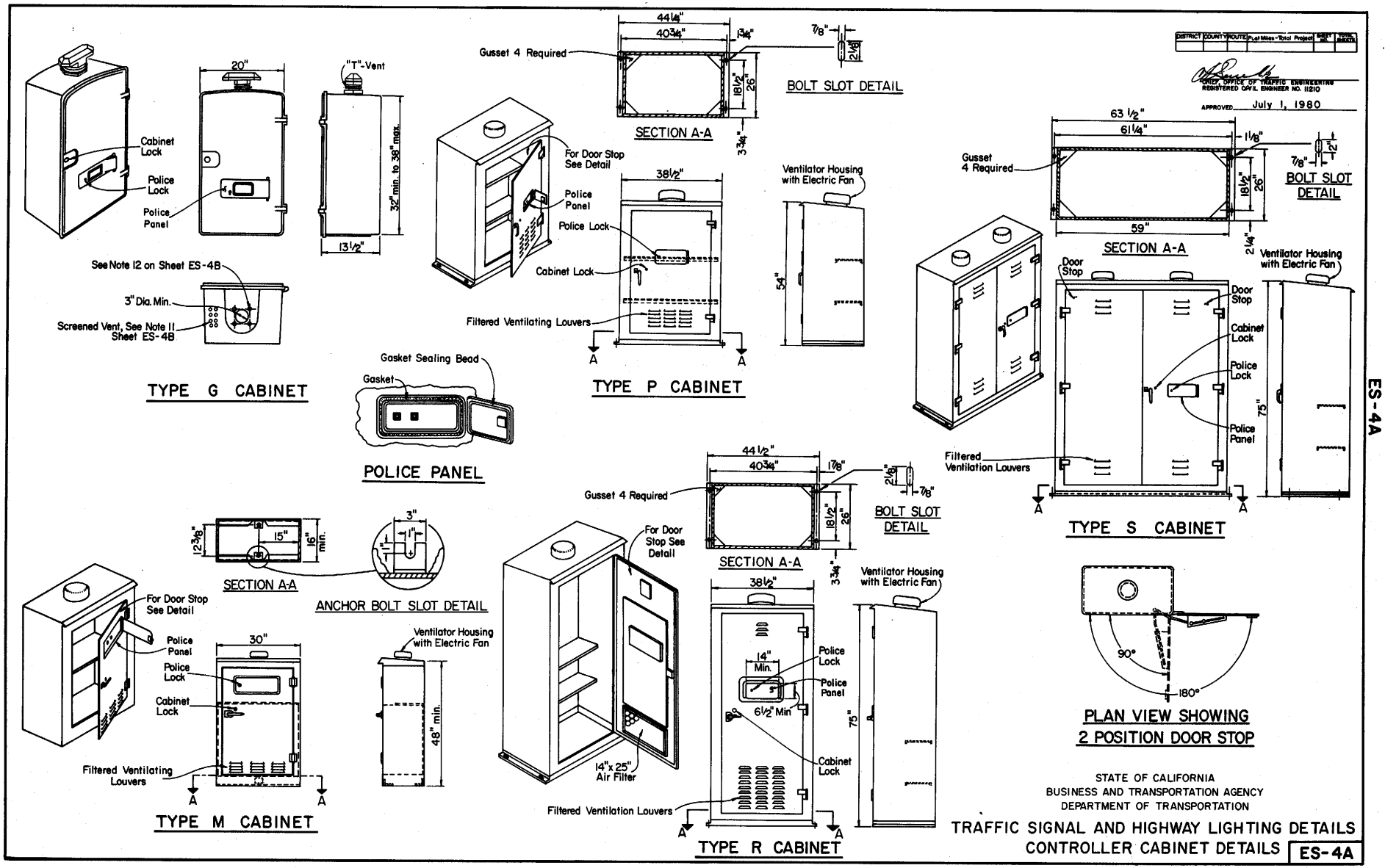

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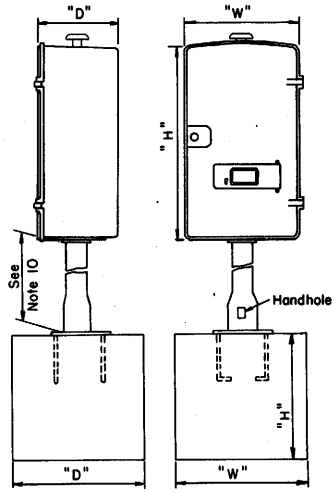
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 11210

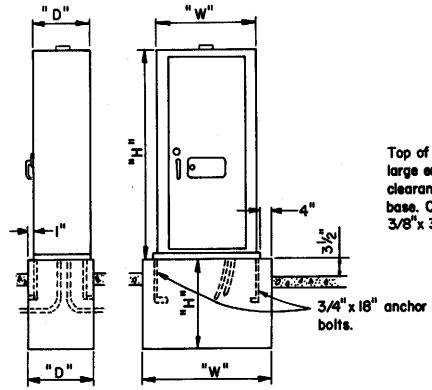
APPROVED July 1, 1980

NOTES - CONTROLLER CABINETS

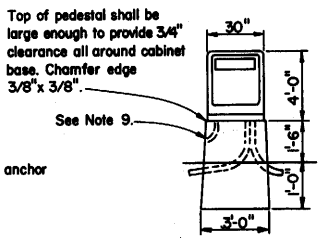
1. All cabinet dimensions are nominal.
2. Foundations shall be located to provide 2'-0" minimum clearance between face of curb and any portion of cabinet.
3. Type G, M, P, R and S cabinets shall be installed with the back toward the nearest lane of traffic.
4. All anchor bolts shall be bonded to conduit. All conduits shall be bonded together using bonding bushings.
5. In unpaved areas, a raised P.C.C. pad shall be placed in front of each controller cabinet. Pad shall be 3'-0" x 3'-0" x 0'-4" for type G cabinets and shall be 3'-0" x 0'-4" thick x width of foundation for Type M, P, R and S cabinets.
6. In unpaved areas, the top of foundation for Type G, P, R and S cabinets shall be 6" above surrounding grade. Top of foundation for Type M cabinet shall be 18" above surrounding grade.
7. In sidewalks and other paved areas, top of foundation for Type G cabinet shall be level with surrounding grade. Top of foundation for Type P, R and S cabinets shall be 3½" above surrounding grade.
8. The steel pedestal, base plate, bolt circle and foundation for the Type G cabinet shall be the same as that shown for a Type I-C standard. Pedestal shall be 25"-30" in length. Anchor bolts shall be ¾" x 18" with a 2"-90° bend. Four bolts required per cabinet.
9. Type G cabinet shall be provided with a slipfitter to permit mounting on 4½" O.D. pedestal. Slipfitter shall be bolted to bottom of the cabinet.
10. Type G cabinet shall be provided with 8 screened, raintight holes, ½" diameter or larger, in the bottom of the cabinet.
11. A 1" drain shall be provided through the foundation of a Type M cabinet. Drain pipe shall be screened.
12. See Table for cabinet and foundation dimensions; "D"- Depth, "H"- Height, "W"- Width. See Table for anchor bolt spacing; "D"- Depth, "W"- Width.
13. All cabinet shelves shall be adjustable for vertical spacing and shall be removable. Type M, P, R and S cabinets cabinets shall be provided with a minimum of two shelves.
14. Anchor bolts for Type M, P, R, and S cabinets shall be ¾"x 18" with a 2"- 90° bend. Four bolts required per cabinet. Anchor bolts may be inside or outside cabinets.
15. An approved mastic or caulking compound shall be placed on the foundation prior to placing the cabinet to seal all openings between bottom of cabinet and foundation.
16. Controller units, plug-mounted equipment, shelf-mounted equipment and wall-mounted equipment shall be located to permit its safe and easy removal or replacement without removing any other piece of equipment.
17. Main breaker shall be rated for 30 amperes in Type G and M cabinets. It shall be rated at 60 amperes in Type P, R and S cabinets.
18. Cabinet fan may be installed at an alternate location near the top of the cabinet when approved by the Engineer.
19. Where telephone interconnect is specified, a minimum of 5" clear vertical space shall be provided inside the cabinet for the equipment.
20. Telephone interconnect conductors shall be enclosed in a ¾" or larger conduit through the foundation. Liquidtight flexible metal conduit shall be used to seperate telephone and power conductors in cabinets and pedestals.



P.C.C. FOUNDATION FOR TYPE G CABINET

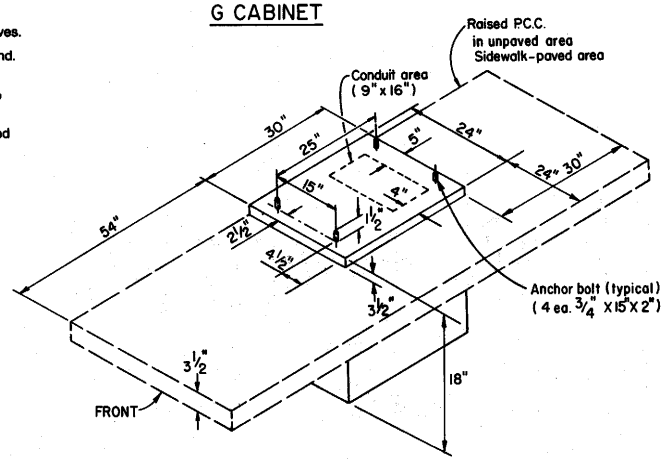


P.C.C. FOUNDATION FOR TYPE P, R and S CABINETS



P.C.C. PEDESTAL FOUNDATION FOR TYPE M CABINET

CABINET				FOUNDATION			BOLT MOUNTING	
TYPE	H	W	D	H	W	D	D	W
G	32"	20"	13½"	36"	24"	24"	BOLT PATTERN (AS REQ)	
M	48"	30"	16"	30"	36"	22"	12⅝"	
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
TYPE 170, 200, 332 AND 334 CABINETS

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND HIGHWAY LIGHTING DETAILS
CONTROLLER CABINET DETAILS

ES-4B

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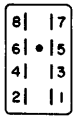
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 11210

APPROVED July 1, 1980

The Flash Transfer Relay shall intermate with a CINCH - JONES Socket S-408-SB or equal connected as follows:

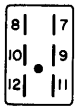
Pin No.	CIRCUIT	Pin No.	CIRCUIT
1	Coil	5	Common, Circuit #1
2	Coil	6	Common, Circuit #2
3	N.C. Circuit #1	7	N.O. Circuit #1
4	N.C. Circuit #2	8	N.O. Circuit #2



CONNECTOR SOCKET
FLASH TRANSFER RELAY

The FLASHER shall intermate with a CINCH-JONES Socket S-406-SB or equal connected as follows:

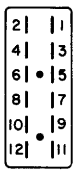
Pin No.	CIRCUIT	Pin No.	CIRCUIT
7	Load, Ckt. #1	10	AC⁻
8	Load, Ckt. #2	11	AC⁺
9	Chassis Ground	12	Not Used



CONNECTOR SOCKET
SOLID STATE FLASHER UNIT

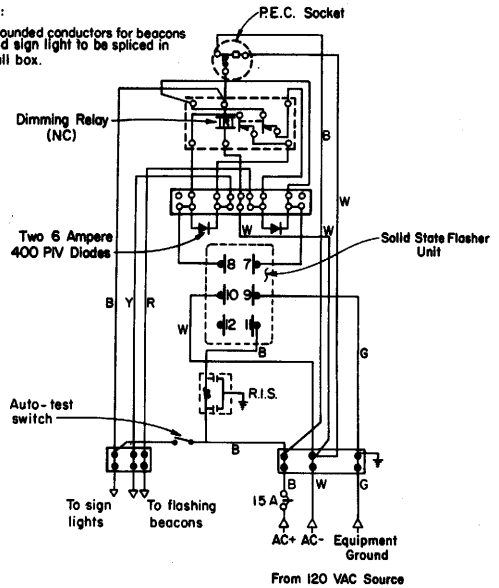
The Solid-state Switching devices shall intermate with a CINCH-JONES Socket S-2412-SB or equal connected as follows:

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

Note:
Grounded conductors for beacons and sign light to be spliced in pull box.



WIRING DIAGRAM
FLASHING BEACON CONTROL ASSEMBLY

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND HIGHWAY LIGHTING DETAILS
CONTROLLER CABINET DETAILS

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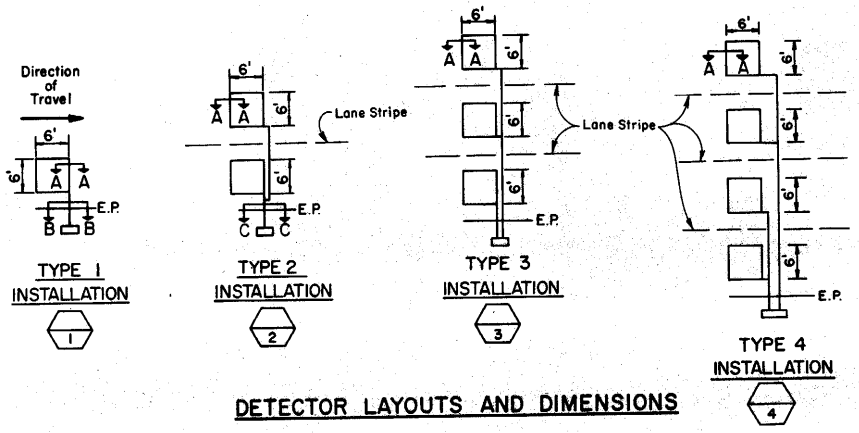
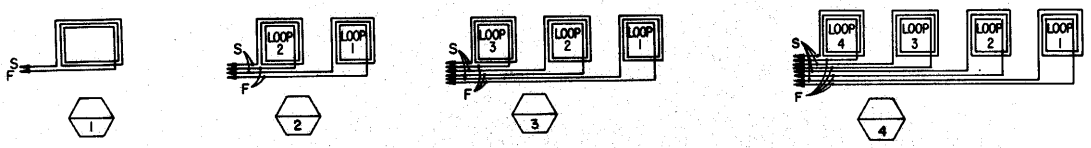
LOOP INSTALLATION PROCEDURE

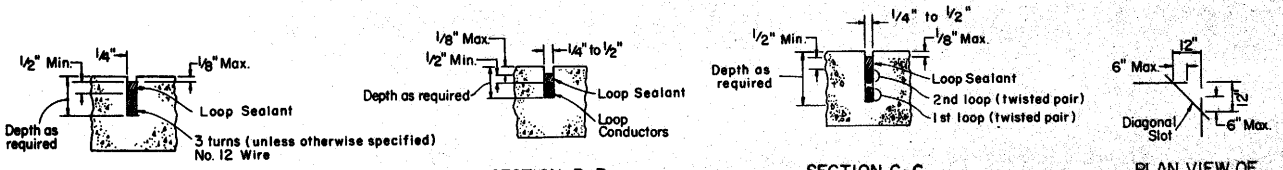
1. Saw slots in pavement for loop conductors as shown in details.
2. Clean out slots with water (if necessary) and compressed air and allow slots to dry thoroughly before installing conductors.
3. Install termination pull box and curb or shoulder termination detail (see ES—5D).
4. Install #12 loop conductor in slot using a 3/16" to 1/4" thick wood paddle.
5. Allow additional length of conductor for the run to termination pull box plus 5 feet of slack in pull box.
6. The additional length of each conductor for each loop shall be twisted together into a pair (at least 2 turns per foot) before being placed in the slot and conduit to termination pull box.
7. No more than 4 loop conductors (2 twisted pairs) shall be installed in one sawed slot.
8. Identify and tag loop circuit pairs in the termination pull box. Identify and tag with loop number, start (S) and finish (F) of conductor. Identify and tag lead-in cable with sensor number and phase.
9. Test each loop circuit for continuity, circuit resistance and insulation resistance at the pull box before filling slots.
10. Fill slots as shown in details.
11. Splice loop conductors to lead-in cable. All splices shall be soldered using rosen-core solder.
12. Lead-in cable shall be taped and waterproofed to prevent moisture from entering the cable.
13. Lead-in cable shall not be spliced between the termination pull box and the controller cabinet terminals.
14. Test each loop circuit for continuity, circuit resistance and insulation resistance at the controller cabinet location. The loop circuit resistance shall not exceed 0.5 ohms plus 0.35 ohms per 100 feet of lead-in cable. The insulation resistance shall be performed between each circuit conductor and ground. The insulation resistance shall not be less than 100 megohms.
15. Where loop conductors are not to be spliced to a lead-in cable, the ends of the conductors shall be taped and waterproofed with an electrical insulating coating.
16. Distance between side of loop and a lead-in saw cut from adjacent detectors shall be 2 feet minimum. Distance between lead-in saw cuts shall be 6 inches minimum.



DETECTOR LAYOUTS AND DIMENSIONS



STANDARD LOOP WINDING PATTERNS



SLOT DETAILS

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND HIGHWAY LIGHTING DETAILS

DETECTORS ES-5A

Chief, Office of Traffic Engineering
Registered Civil Engineer No. 11210
Date Approved July 1, 1980

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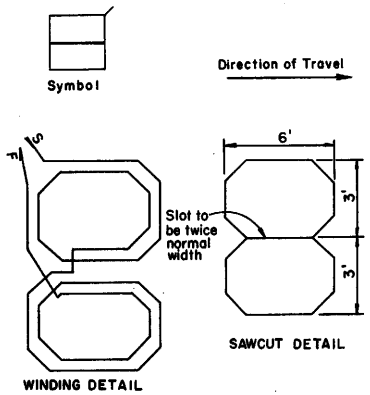
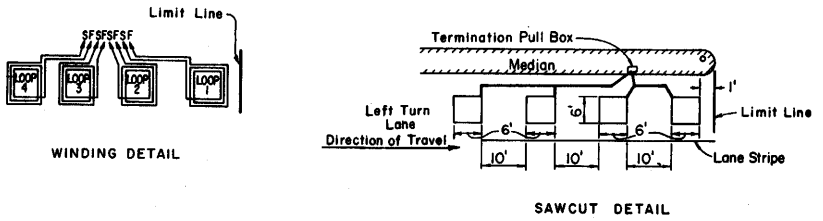
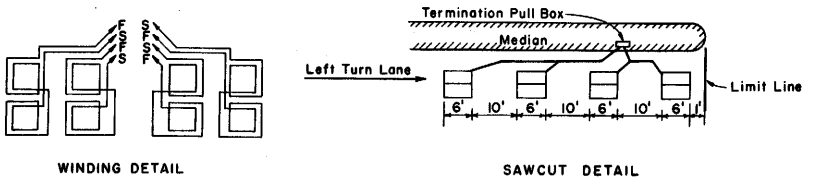


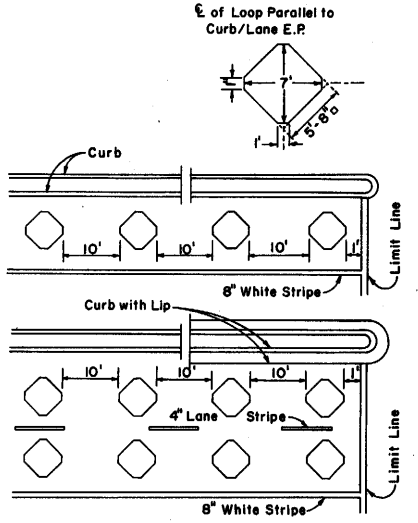
TYPE Q LOOP DETECTOR DETAILS
(Use only when specified or shown on the plans)



TYPE A LEFT TURN LANE INSTALLATION

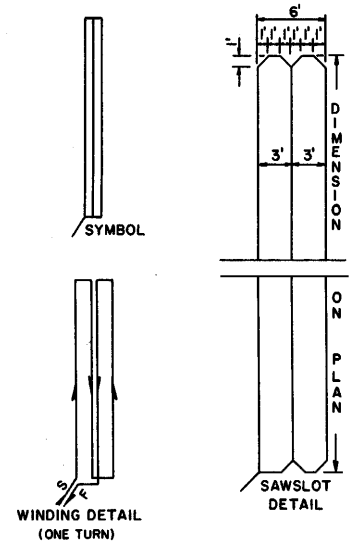


TYPE Q LEFT TURN LANE INSTALLATION
(Use only when specified or shown on plans)

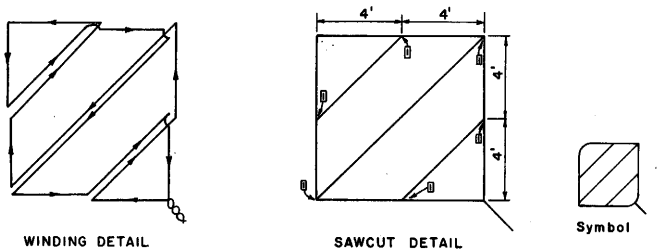


TYPE B LEFT TURN INSTALLATION

TYPICAL ONE AND TWO LANE LEFT TURN DETECTORS PLACEMENT DETAILS
(Use only when specified or shown on plans)



TYPE C LOOP DETECTOR CONFIGURATION
(Use only when specified or shown on the plans)



Wind 2 successive layers. Each layer shall be wound with the same direction of winding as shown.

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.

STATE OF CALIFORNIA
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TRAFFIC SIGNAL
AND HIGHWAY LIGHTING DETAILS

DETECTORS

ES-5B

Chief Office of Traffic Engineering
Registered Civil Engineer No. 11310
Date Approved July 1, 1980

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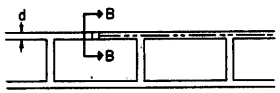
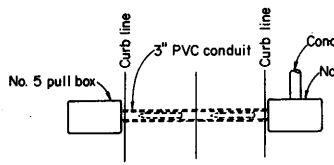
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

CHIEF OFFICE OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 11210

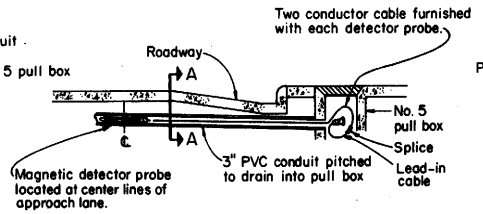
APPROVED JULY 1, 1980



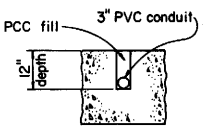
INSTALLATION DETAIL



PLAN

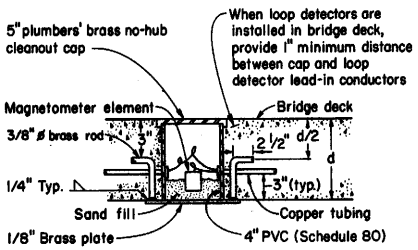


ELEVATION

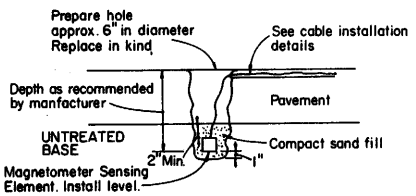


SECTION A-A

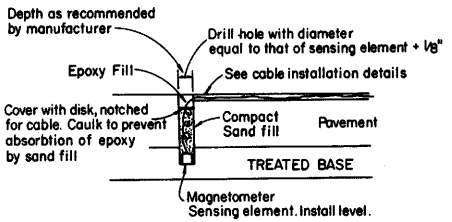
NON-DIRECTIONAL MAGNETIC VEHICLE DETECTOR INSTALLATION DETAILS



SECTION B-B

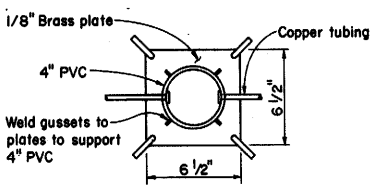


LIGHT DUTY ROADWAY
(WITH UNTREATED BASE)



HEAVY DUTY ROADWAY
(WITH TREATED BASE)

MAGNETOMETER SENSING ELEMENT INSTALLATION DETAILS

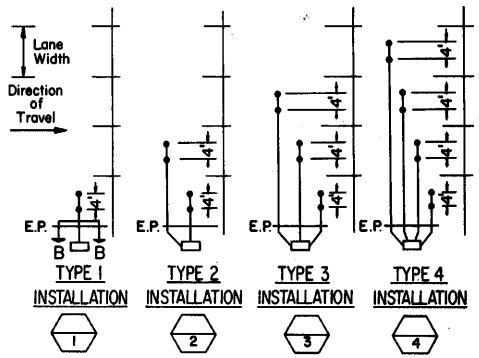


DETECTOR INSTALLATION IN BRIDGE DECK

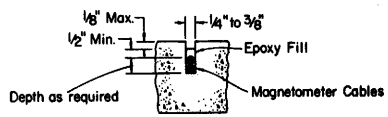
MAGNETOMETER DETECTOR INSTALLATION PROCEDURE:

1. Prepare holes for sensing elements and saw slots in pavement for connecting cables as shown in details. Blow out and dry thoroughly with compressed air.
2. Install termination pull box. See termination details.
3. Install heads in holes and install cables in slots using a 3/16" to 1/4" thick wood paddle and run to adjacent pull box allowing 5 feet of slack at the pull box.
4. Identify cables by lane or sensor unit designation.
5. Splice sensing element cables to lead-in cables. All splices shall be soldered using rosin core solder.
6. Test each sensing element circuit at controller or count station cabinet before filling holes and slots. Excitation circuits shall have a resistance of 50 ohms* per head and detection circuits shall have a resistance of 300 ohms* per head. Measurements shall be made with a low range ohm-meter.
7. Fill slots and sensing element holes as shown in details.
8. Lead-in cable shall not be spliced between the termination pull box and the controller cabinet.
9. See Sheet ES-5D for curb termination details.

*Or other resistance per manufacturers' specifications



LAYOUTS AND DIMENSIONS



SECTION B-B

SLOT DETAILS

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND HIGHWAY LIGHTING DETAILS
DETECTORS

ES-5C

ES-5C

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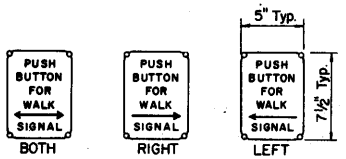
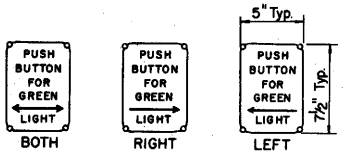


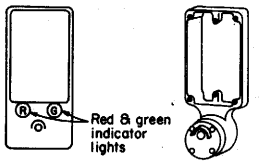
FOR WALK-DONT WALK SIGNALS



FOR 3-LIGHT SIGNALS

PEDESTRIAN PUSHBUTTON SIGNS

Signs shall be porcelain enameled.
Black letters on White background.

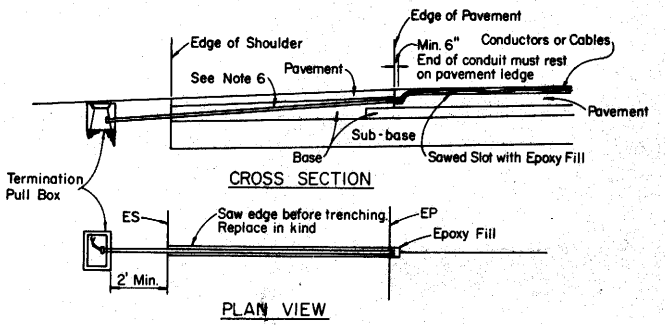


TYPE A TYPE B
(Use Only When Specified)

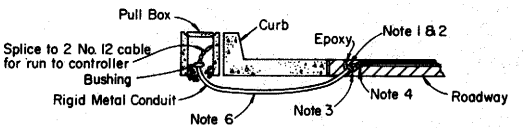
TYPE C
(Use Only When Specified)

PEDESTRIAN PUSH BUTTONS

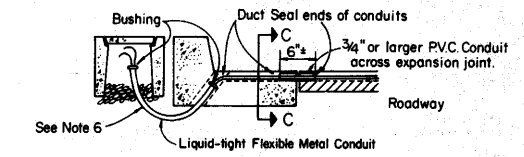
1. Shape back of casting to fit curvature of post.
2. Provide cover fitting for top of post, when PPB is mounted on pedestrian push button post.
3. Install pushbutton on crosswalk side of standard.

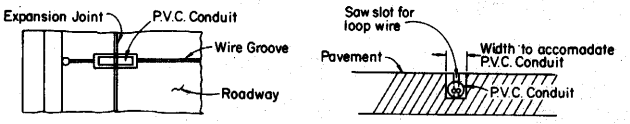


SHOULDER TERMINATION DETAILS



CURB TERMINATION DETAILS
TYPE A





PLAN VIEW SECTION C-C

CURB TERMINATION DETAILS
TYPE B

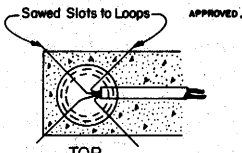
(Use only when specified)

1. Non-metallic bushing shall be used at roadway end of conduit.
2. Tape wire 3 inches each side of roadway bushing.
3. Install duct seal compound to each end of roadway conduit before installing epoxy, or other approved materials.
4. Round all sharp edges where wire has to pass.
5. End of roadway conduit shall be 2 inches below roadway surface.
6. Install 1" conduit minimum. Install 1½" conduit for more than 4-#12 loop conductors or 3 magnetometer cables.

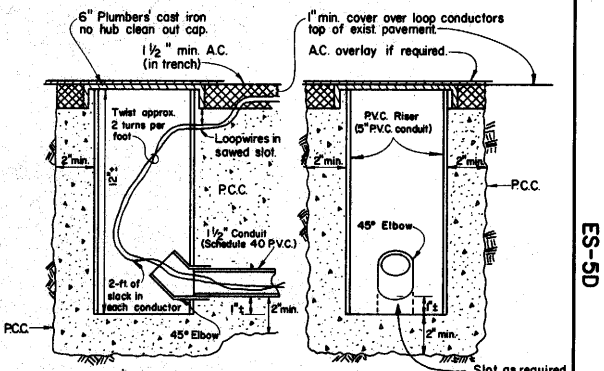
DISTRICT	COUNTY	ROUTE	P.M. Miles - Total Project	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 11210

APPROVED JULY 1, 1980



TOP



ELEVATION SIDE

SPECIAL DETECTOR HANDHOLE INSTALLATION DETAILS

(Use only when shown on plans)

INSTALLATION NOTES

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 PVC conduit shall terminate in the adjacent pull box, and shall be reamed to prevent damage to conductor insulation.
3. The hole in the 5" P.V.C. riser shall not be larger than that required to insert the conduit elbow. The riser shall be slotted with the saw when loop slots are cut in pavement.
4. Each PVC riser shall be fabricated from 5" PVC conduit (Schedule 40 or 80). The riser shall be centered on the lane line, unless otherwise shown on the plans.
5. Entire length of trench, from PVC riser to adjacent pull box, shall be backfilled with P.C.C.
6. PVC riser and conduit shall be filled with water during the performance of the insulation resistance test on the loop wires.

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND HIGHWAY LIGHTING DETAILS
DETECTORS

ES-5D

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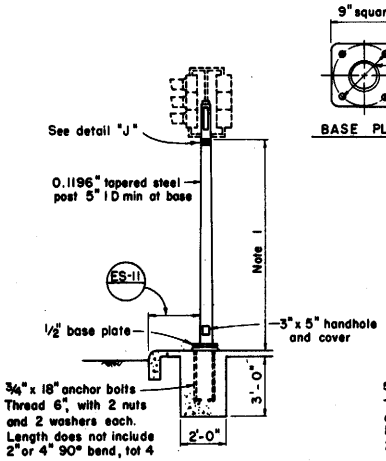
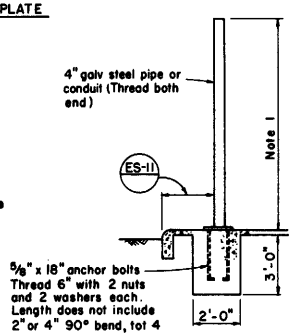
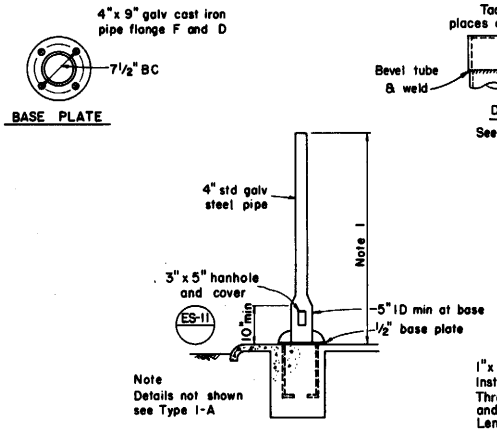


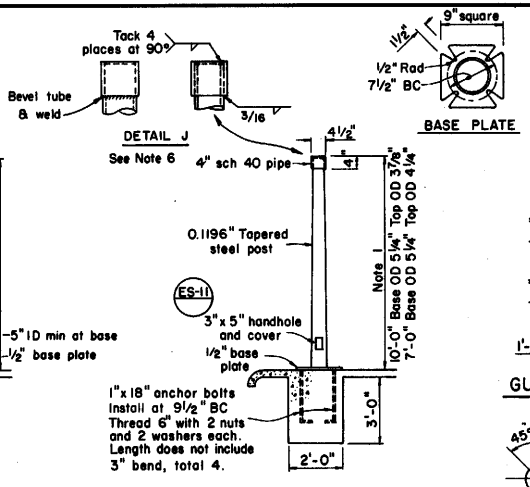
TYPE I-A STANDARD



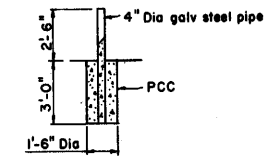
TYPE I-B STANDARD



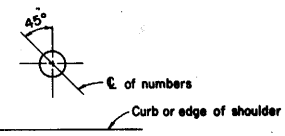
TYPE I-C STANDARD



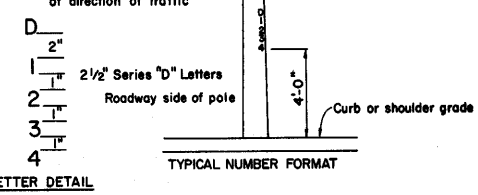
TYPE I-D STANDARD



GUARD POST



NOTE:
Paint numbers on Roadway side facing traffic when electrolier or post is left of direction of traffic

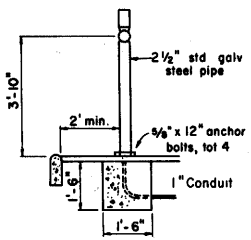


LOCATION OF EQUIPMENT NUMBERS ON STANDARDS AND POSTS

TYPE I SIGNAL STANDARDS

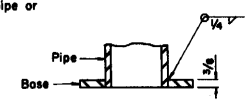
NOTES:

1. Standards shall be 10'-0" ±2" for vehicular signals and 7'-0" ±2" for pedestrian signals unless otherwise noted on plans.
2. Top of standards shall be 4 1/2" OD
3. Conduits shall extend 2" max above finished surface of foundation and for Type I-A, I-C and I-D shall be sloped toward handhole
4. Anchor bolts shall be bonded to conduit
5. Conduit between standard and adjacent pull box shall be 2" size minimum.
6. Tube may be inserted into schedule 40 pipe or butted as required.

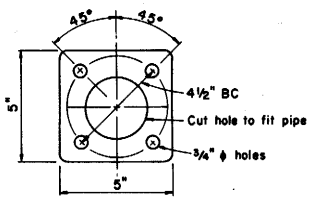


ELEVATION

Note
Conduit shall protrude 2" max above finished surface foundation

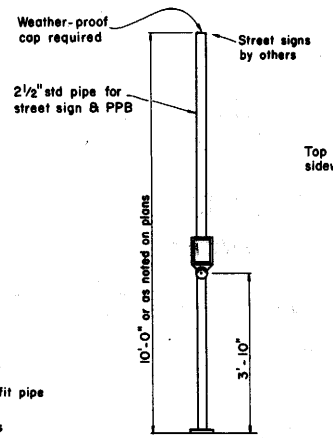


SECTION



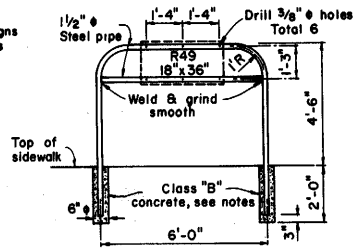
BASE PLATE

PEDESTRIAN PUSH BUTTON POST



Foundation and anchor bolt details same as PPB post

COMBINED STREET SIGN
PEDESTRIAN PUSH BUTTON POST



PEDESTRIAN BARRICADE

Notes:
2% calcium chloride may be added to concrete.

Pipe post to be set 1'-6" back from face of curb unless otherwise specified.

When side walk is existing, foundation may consist of 4-3/8" expansion bolts placed on 4" minimum diameter bolt circle. Use pipe flange to suit bolt circle.

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND LIGHTING STANDARDS
TYPE I STANDARDS AND PUSHBUTTON POSTS

Standard Plan Sheet No.
Detail No.

ES-6A

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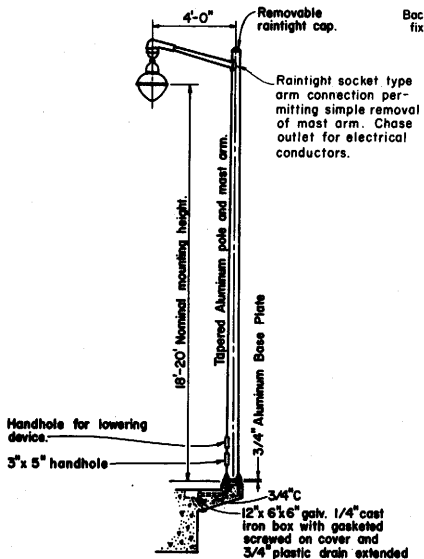
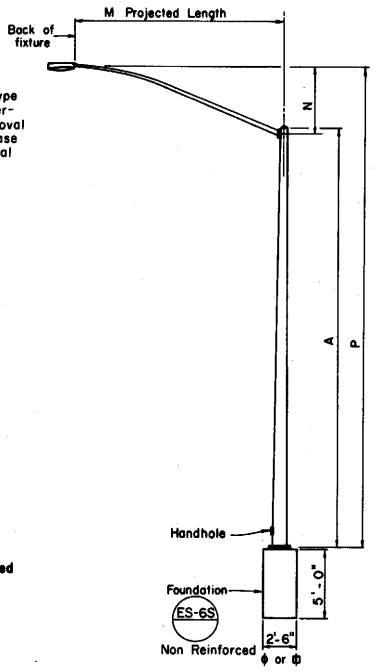
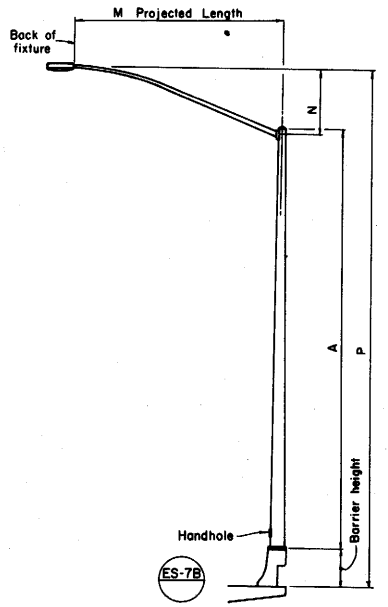


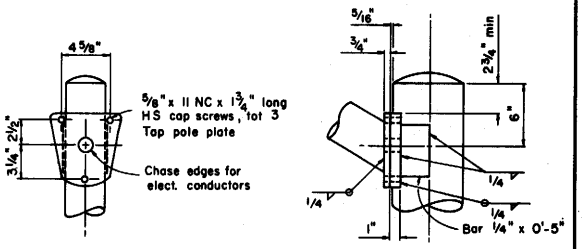
TYPE 14
(P.O.C. ELECTROLIER)



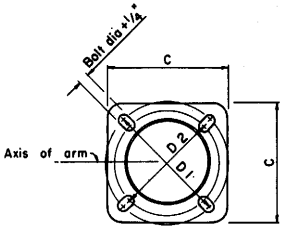
ELEVATION
TYPE 15



ELEVATION
TYPE 21 BRIDGE MOUNTED



DETAIL R
LUMINAIRE ARM CONNECTION



BASE PLATE
ES-6S Plan B

Pole Type	POLE DATA				BASE PLATE DATA						Luminaire Arm
	A Height	Min O D		Thickness	C	D 1	D 2	Thickness	Anchor Bolts		
		Base	Top						Size	Bolt Circle	
14	20'-0"	7"	4"	0.1888"	11"	11 1/2"	9 1/2"	3/4"	1"x 8"x 4"	10"	
15	30'-0"	8"	3 7/8"	0.1196"	12"	11 1/2"	11"	1"	1"x 36"x 4"	11"	6'-15' ☐
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' ☐

LUMINAIRE ARM DATA						
M Projected Length	N Rise	Min O D At Pole	Thickness	P Mounting Height		
				Type 15	Type 21	
					1'-3" Barrier	2'-8" Barrier
6'-0"	2'-0"±	3 1/4"	0.1196"	31'-6"±	36'-1"±	37'-6"±
8'-0"	2'-6"±	3 1/2"		32'-0"±	36'-7"±	38'-0"±
10'-0"	3'-3"±	3 7/8"		32'-9"±	37'-4"±	38'-9"±
12'-0"	4'-3"±	3 7/8"		33'-9"±	38'-4"±	39'-9"±
15'-0"	4'-9"±	4 1/4"		34'-3"±	38'-10"±	40'-3"±

Notes

1. ☐ Indicates arm length to be used unless otherwise noted on the plans.
2. For Anchorage Details see ES-7B
3. See ES-7B when type 15 is to be mounted on Bridge Railing
4. For type 15-SB, use type 15 standard with type 30 base plate details, sheet ES-6E.

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

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

APPROVED JULY 1, 1980

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

LIGHTING STANDARDS TYPES 14, 15 & 21

ES-6B

ES-6B

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

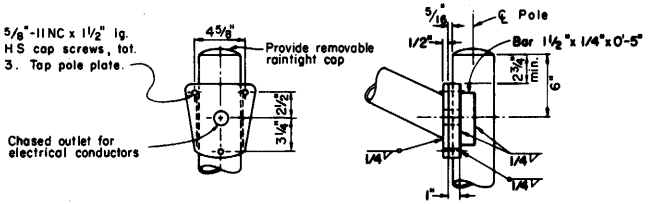
CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

DATE APPROVED JULY 1, 1980

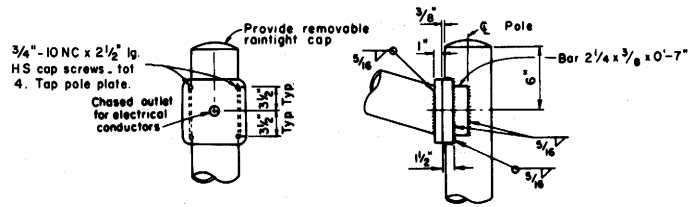
LUMINAIRE ARM DATA			
Projected Length	Thickness	Minimum OD @ Pole	Mounting Height
* 6'-0"	0.1196"	3¼"	36'-9"±
8'-0"		3½"	37'-3"±
10'-0"		3¾"	38'-0"±
12'-0"		3¾"	39'-0"±
15'-0"		4¼"	39'-6"±
** 20'-0"	0.1793"	5"	37'-0"±

* Type 30 - arm lengths 6'-15' max.

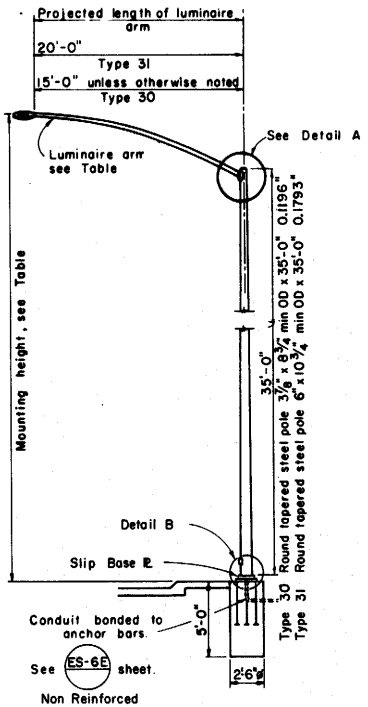
** Type 31 - arm lengths 20'



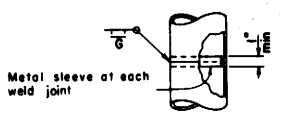
DETAIL A - TYPE 30



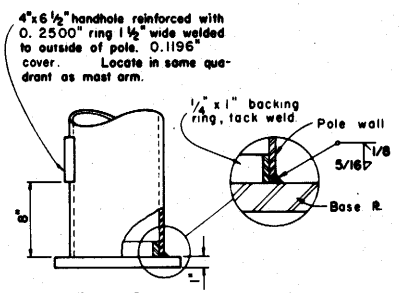
DETAIL A - TYPE 31



ELEVATION



POLE SPLICE



DETAIL B

Notes

1. Plates shall conform to ASTM A-36, except as noted.
2. In lieu of the torque requirements for HS bolts, cap screws shall be tightened by the turn-of-nut method ⅓ turn from snug tight condition. No washer will be required.

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

SPECIAL DETAILS LIGHTING STANDARDS TYPES 30 AND 31

ES-6D

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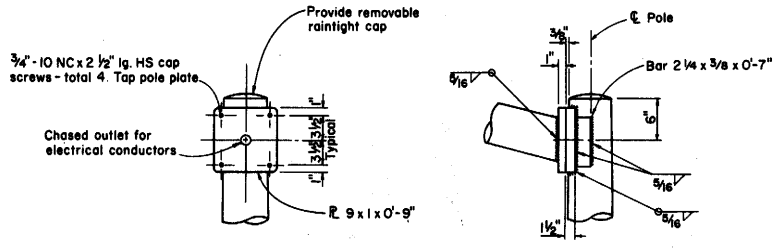
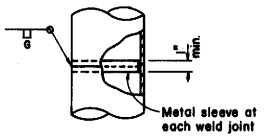
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

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

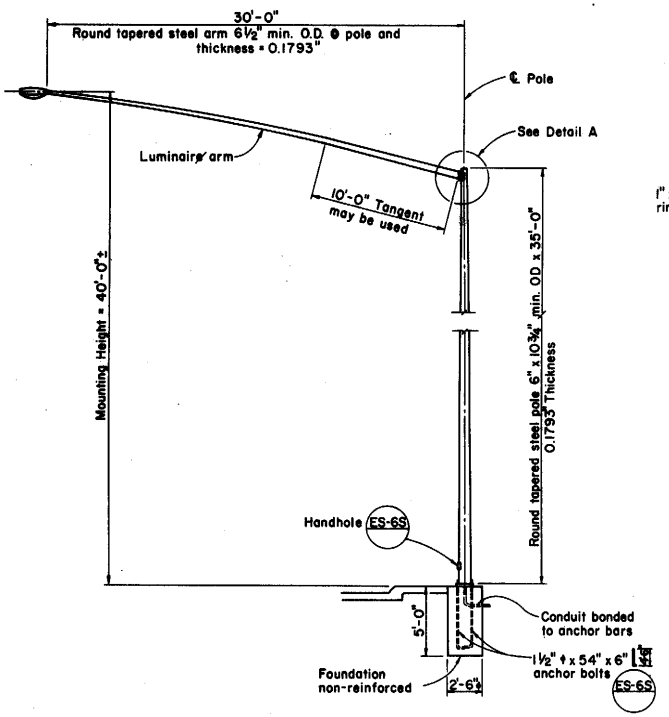
APPROVED JULY 1, 1980



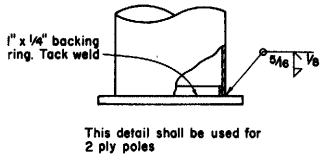
DETAIL A



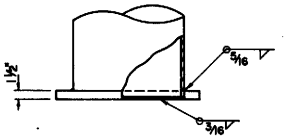
POLE SPLICE



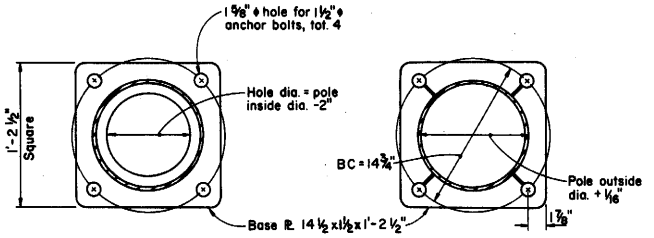
ELEVATION



ELEVATION



ELEVATION



PLAN

PLAN

ALTERNATIVE BASE PLATE DETAILS

Notes

1. Plates shall conform to ASTM A-36, except as noted.
2. In lieu of the torque requirements for H.S. bolts, cap screws shall be tightened by the turn-of-nut method 1/3 turn from snug tight condition. No washer will be required.

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

LIGHTING STANDARD TYPE 32

ES-6DA

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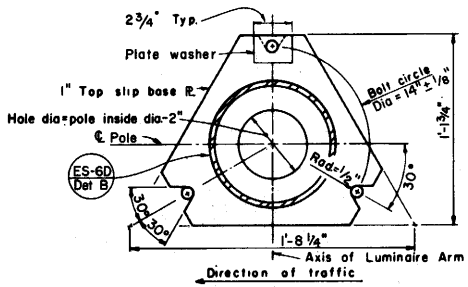
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

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

DATE APPROVED JULY 1, 1980



PLAN - TYPICAL BASE PLATE

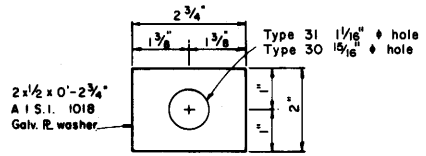
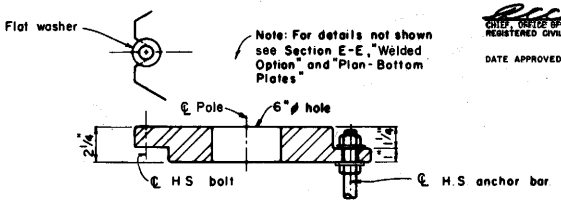
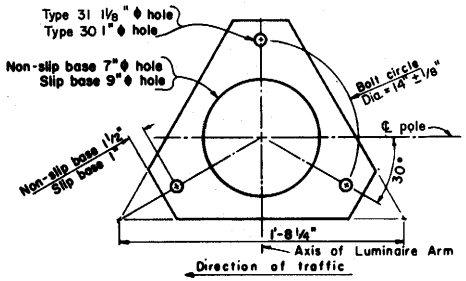


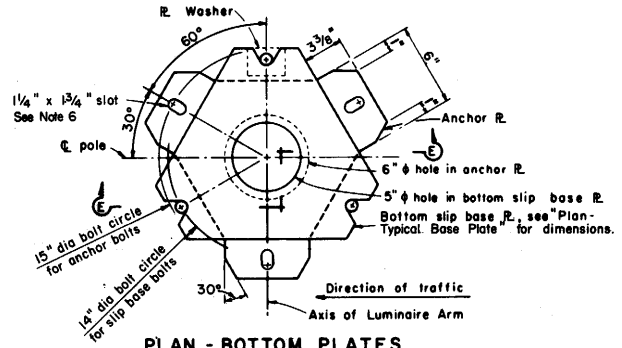
PLATE WASHER



CAST OPTION

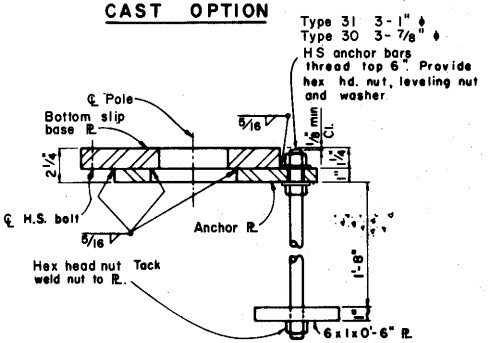


KEEPER PLATE



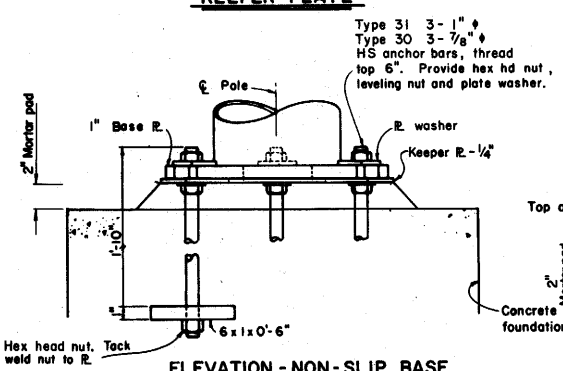
PLAN - BOTTOM PLATES

SLIP BASE PLATE DETAILS

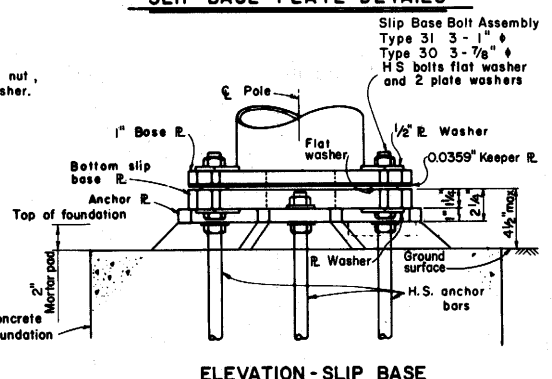


WELDED OPTION

SECTION E-E



ELEVATION - NON-SLIP BASE



ELEVATION - SLIP BASE

NOTES

1. Cast option shall conform to ASTM A-27 Grade 70-40
2. Torque 1" HS slip base bolts to 200 ft-lbs. Torque 7/8" HS slip base bolts to 150 ft-lbs.
3. 1" & 7/8" HS anchor bars, wrench tighten, torque requirement waived.
4. HS bolts, nuts and washers for HS anchor bars shall comform to ASTM A-325.
5. A slip base is to be furnished unless the plans or special provisions specify a non-slip base.
6. 7/8" ø anchor bars in the slot hole require a hardened over size washer minimum 2 1/4"ø or 2 1/4" x 1 3/4"□. Two washers are required for each slotted hole. Place one washer on each side of anchor plate.

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

LIGHTING STANDARDS TYPES 30 AND 31 BASE PLATE DETAILS

ES-6E

ES-6E

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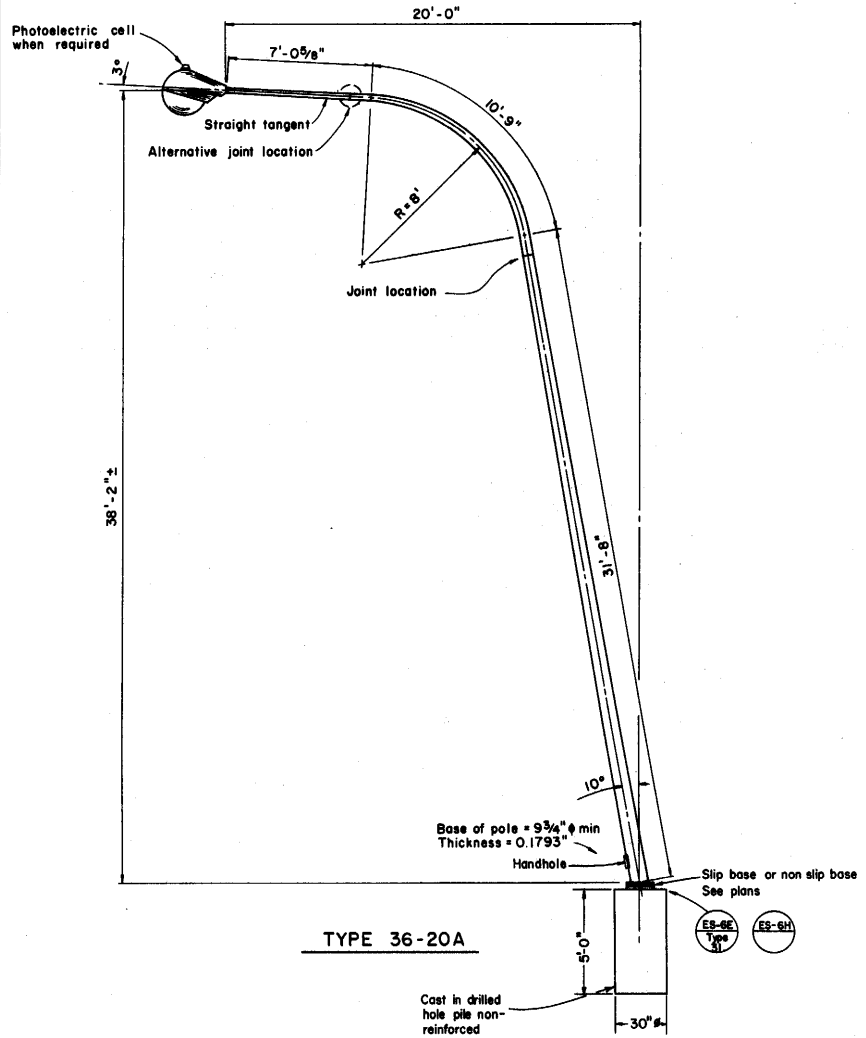
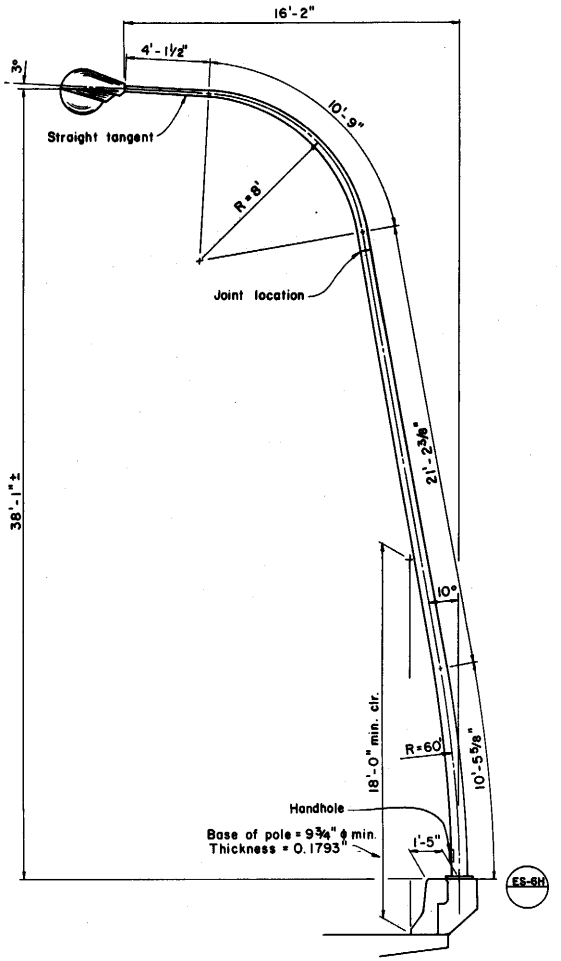


TYPE 36-20A



TYPE 35

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

CHIEF, OFFICE OF STRUCTURE DESIGN
REGISTERED CIVIL ENGINEER NO. 5015

APPROVED JULY 1, 1980

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

10 DEGREE LIGHTING STANDARDS

ES-6F

ES-6F

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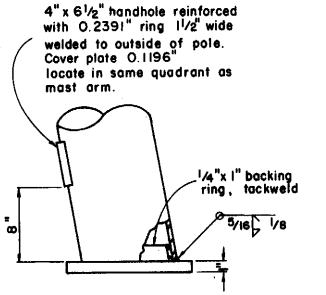
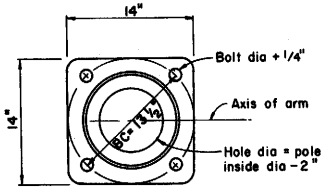
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

CHIEF OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

APPROVED JULY 1, 1980

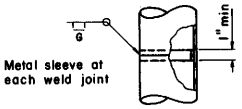


ELEVATION

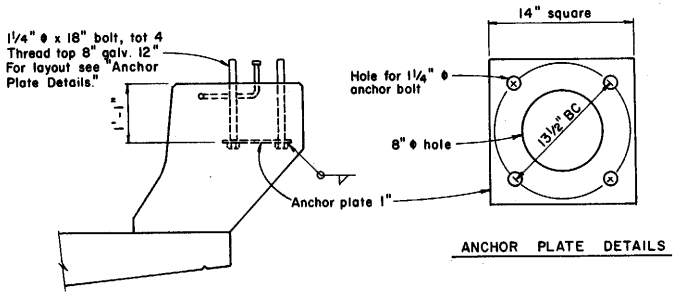


PLAN TYPE 35

BASE PLATE DETAILS

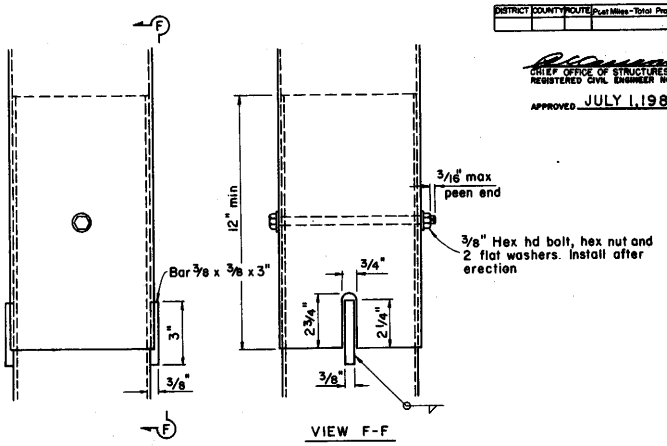


POLE SPLICE



ANCHORAGE DETAILS
Type 35

ANCHOR PLATE DETAILS



SLIP JOINT DETAILS

NOTES:

1. Pole and arm configurations shown are the final form when erected in place. Provide camber as necessary.
2. Poles and arms shall be round, tapered steel tubes with a taper of 0.1375 to 0.1400 inches per foot.
3. Alternate slip joint or sleeve joint designs may be submitted with calculations to the Engineer for approval.
4. Knee radius 8'-0" min - 10'-0" max.
5. Tube bends shall be made in a manner to prevent buckling or crimpling.
6. A 2" pipe tendon 8" max long may be used for the luminaire connection.

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

10 DEGREE LIGHTING STANDARDS DETAILS

ES-6H

ES-6H

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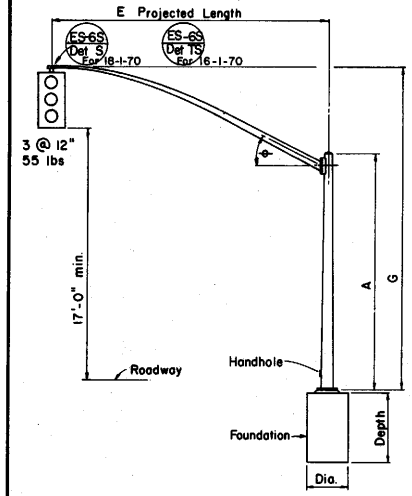
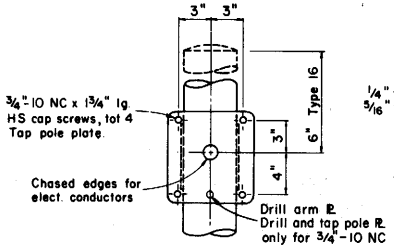
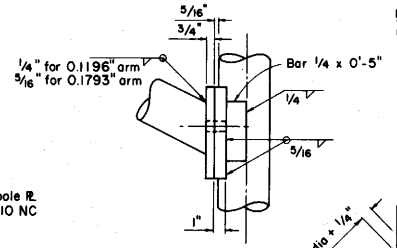


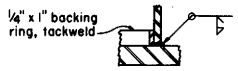
ELEVATION

TYPE 16-1-70
18-1-70

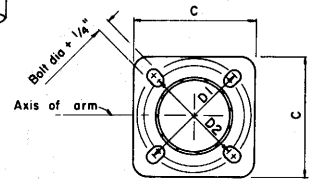




SIGNAL ARM CONNECTION FOR 15', 18' & 20' ARMS

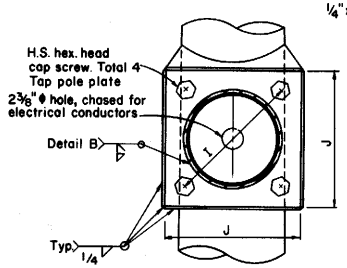


DETAIL B

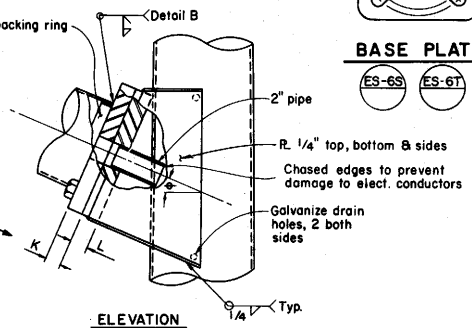


BASE PLATE

ES-6S ES-6T

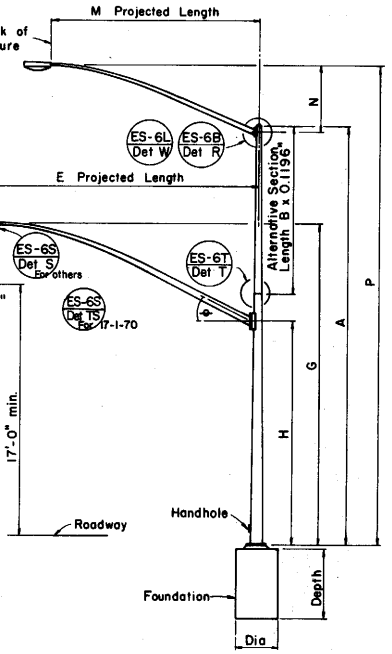


SECTION A-A



ELEVATION

SIGNAL ARM CONNECTION DETAILS FOR 25' & 30' ARMS



ELEVATION

TYPE 17-1-70, 17A-1-70
19-1-70, 19A-1-70

SIGNAL ARM DATA										
E Projected Length	G Mounting Height	H	Min OD At Pole	Thickness	I Bolt Circle	HS Cap Screws	J Plate Size	K Arm PL Thickness	L Pole PL Thickness	ϕ
15'-0"	22'-3"±	17'-6"	4 5/8"	0.1196"						
18'-0"	23'-3"±		5 1/4"							
20'-0"			5"	0.1793"						
25'-0"	22'-7"±	16'-0"	7 5/16"	0.1196"	11"	1"-8NCx2 1/2"	10 1/2"	1"	1 1/4"	23°
30'-0"	23'-0"±	16'-0"	8"		11"	1"-8NCx2 1/2"	10 1/2"	1"	1 1/4"	23°

LUMINAIRE ARM DATA					
M Projected Length	N Rise	Min 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"±			33'-9"±	38'-9"±
15'-0"	4'-9"±	4 1/4"		34'-3"±	39'-3"±

Pole Type	Load Case	Wind Velocity mph	POLE DATA A Height	Min OD Base	Min OD Top	Thickness	Alternative Section B Length	Alternative Section Bottom	Alternative Section Top	BASE PLATE DATA C	D1	D2	Thickness	Anchor Bolts Size	Anchor Bolts Bolt Circle	Luminaire Arm	Signal Arm	CIDH PILE FOUNDATION Diameter	Depth	Reinforced
16-1-70	1	70	18'-0"	8"	5 1/2"	0.1196"	None	10'-0"	5 1/4"	12"	11 1/2"	11"	1"	1"x 36"x 4"	11"	None	15' - 20'	2'-6"	5'-0"	No
17-1-70			30'-0"		3 7/8"	0.1793"	10'-0"		3 7/8"					1 1/4"x 44"x 4"		6'-15' [12]	15'	3'-6"		
17-1-70						0.2391"							1 1/4"			6'-12' [12]	18'			
17-1-70																15'				
17-1-70																6'-15' [15]	20'			
17A-1-70			35'-0"	9 3/8"	4 1/2"	0.1793"	15'-0"	6 5/8"	4 1/2"	16"	15"			1 1/2"x 54"x 6"	15"	6'-15' [15]	[15] 18' or 20'			
18-1-70			17'-0"		7"		None									None	25' or 30'	2'-6"	6'-0"	Yes
19-1-70			30'-0"		5 1/4"		10'-0"		5 1/4"							6'-15' [12]				
19A-1-70			35'-0"	10 3/4"	5 15/16"		15'-0"	8"	5 15/16"							6'-15 [15]				

☐ Indicates arm length to be used unless otherwise noted on plans

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND LIGHTING STANDARDS
CASE I ARM LOADING
WIND VELOCITY=70MPH ARM LENGTHS 15' TO 30'

ES-6J

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

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013
APPROVED JULY 1, 1980

ES-6J

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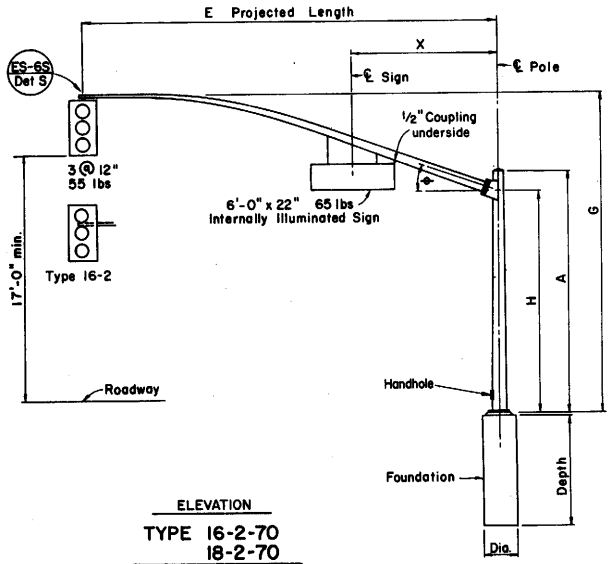
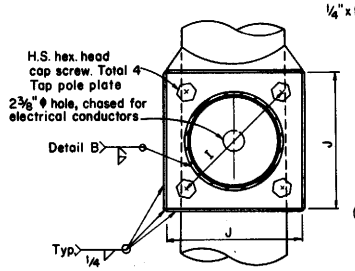
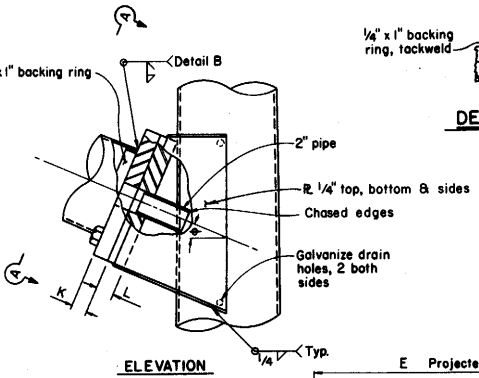


ELEVATION

TYPE 16-2-70
18-2-70

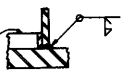


SECTION A-A



ELEVATION

SIGNAL ARM CONNECTION DETAILS



DETAIL B

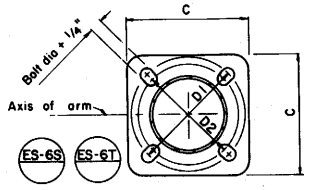
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

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

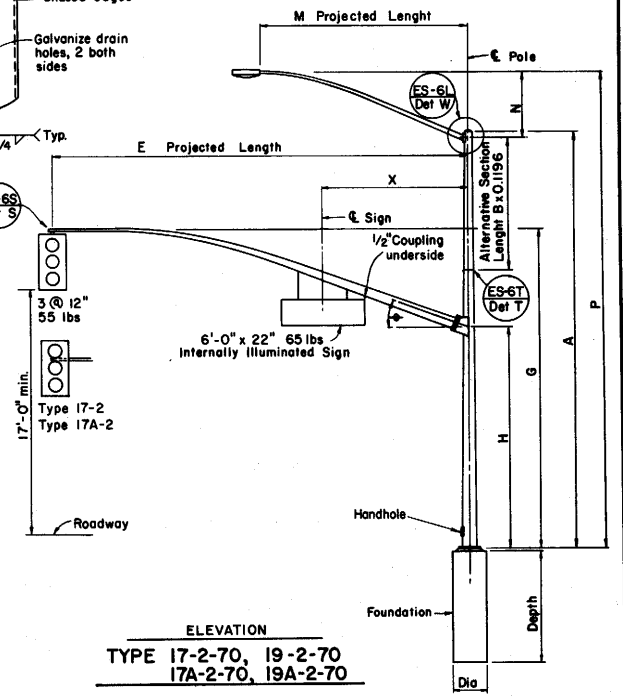
APPROVED JULY 1, 1980

LUMINAIRE ARM DATA					
M Projected Length	N Rise	Min O D At Pole	Thickness	P Mounting Height 30'-0" Pole	P Mounting Height 35'-0" Pole
6"-0"	2'-0"±	3 1/4"	0.1196"	31'-6"±	36'-6"±
8'-0"	2'-6"±	3 1/2"		32'-0"±	37'-0"±
10'-0"	3'-3"±	3 7/8"		32'-9"±	37'-9"±
12'-0"	4'-3"±			33'-9"±	38'-9"±
15'-0"	4'-9"±	4 1/4"		34'-3"±	39'-3"±

SIGNAL ARM DATA												
E Projected Length	G Mounting Height	H	Min O D At Pole	Thickness	I Bolt Circle	HS Cap Screws	J Plate Size	K Arm ℞ Thickness	L Pole ℞ Thickness	ϕ	X Max.
20'-0"	21'-9"±	16'-0"	6 5/8"	0.1196"	11"	1"-8NC x 2 1/2"	10 1/2"	1"	1 1/4"	23°	10'-6"
25'-0"	22'-7"±		7 5/16"								
30'-0"	23'-0"±		8"								



BASE PLATE



ELEVATION

TYPE 17-2-70, 19-2-70
17A-2-70, 19A-2-70

Pole Type	Load Case	Wind Velocity mph	POLE DATA A Height	Min OD Base	Min OD Top	Thickness	Alternative Section B Length	Alternative Section Bottom	Alternative Section Top	BASE PLATE DATA C	D1	D2	Thickness	Anchor Bolts Size	Anchor Bolts Bolt Circle	Luminaire Arm	Signal Arm	CIDH PILE FOUNDATION Diameter	Depth	Reinforced
16-2-70	2	70	17'-0"	9 3/8"	7"	0.1196"	None			16"	15"		1 1/4"	1 1/4" x 44" x 4"	15"	None	20'	3'-6"	5'-0"	No
17-2-70			30'-0"		5 1/4"		10'-0"	6 5/8"	5 1/4"							6'-15' [12]				
17A-2-70			35'-0"	10 3/4"	5 15/16"	0.1793"	15'-0"	8"	5 15/16"							6'-15' [15]				
18-2-70			17'-0"	9 3/8"	7"		None							1 1/2" x 54" x 6"		None	25' or 30'	2'-6"	6'-0"	Yes
19-2-70			30'-0"	10 3/4"	6 5/8"		10'-0"	8"	6 5/8"							6'-15' [12]				
19A-2-70			35'-0"		5 15/16"		15'-0"		5 15/16"							6'-15' [15]				

Camber the pole shaft to compensate for dead load pole deflection.

☐ Indicates arm length to be used unless otherwise noted on plans.

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND LIGHTING STANDARDS
CASE 2 ARM LOADING
WIND VELOCITY=70MPH ARM LENGTHS 20' TO 30'

ES-6K

ES-6K

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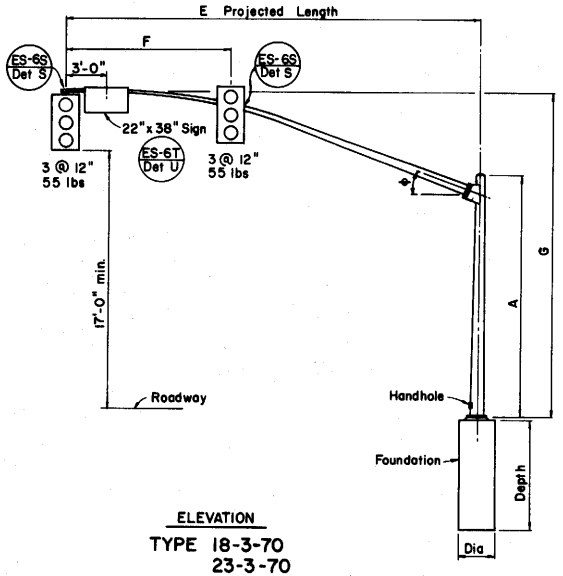
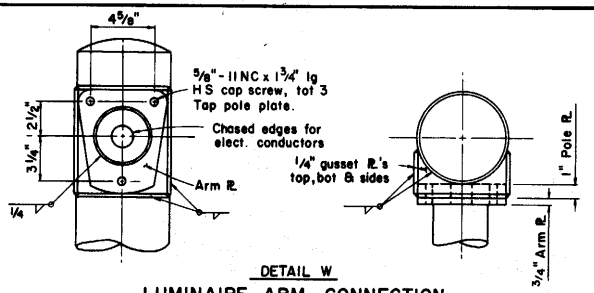


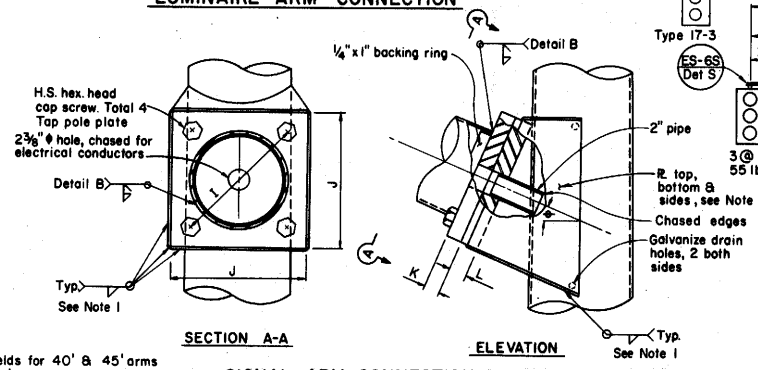
ELEVATION

TYPE 18-3-70
23-3-70
27-3-70



DETAIL W

LUMINAIRE ARM CONNECTION

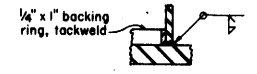


SECTION A-A

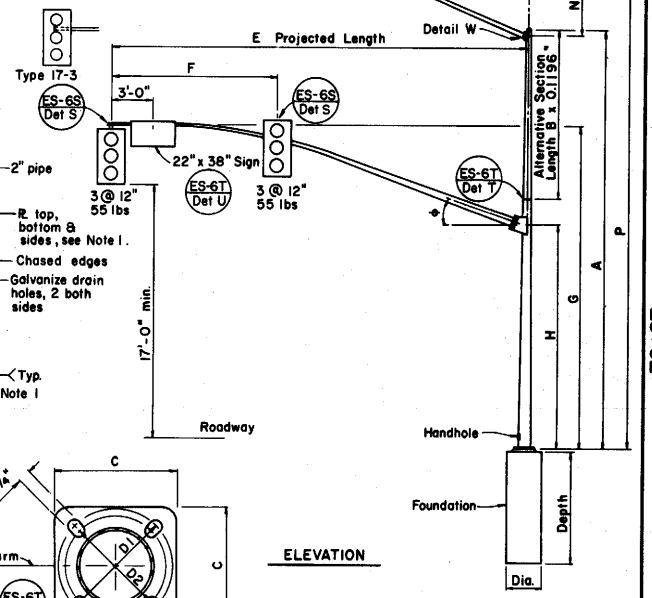
ELEVATION

SIGNAL ARM CONNECTION DETAILS

Note:
1. 5/16" plates and welds for 40' & 45' arms
1/4" for arms <40'

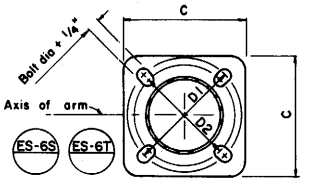


DETAIL B



ELEVATION

TYPE 17-3-70, 24A-3-70
19-3-70, 26-3-70
19A-3-70, 26A-3-70
24-3-70



BASE PLATE

SIGNAL ARM DATA											
E Projected Lenght	F Min Spacing	G Mounting Height	H	Min O D At Pole	Thickness	I Bolt Circle	HS Cap Screws	J Plate Size	K Arm ℞ Thickness	L Pole ℞ Thickness	ϕ
20'-0"	8'-0"	21'-9" ±	16'-0"	6⅝"	0.1196"	11"	1"-8NC x 2½"	10½"	1"	1¼"	23°
25'-0"	12'-0"	22'-7" ±		7 5/16"	0.1793"						
30'-0"				8"							
35'-0"	14'-0"	23'-0" ±	16'-0"	8 11/16"		13"		13"	1¼"	1½"	21°
40'-0"	15'-0"			9⅜"	0.2391"	13"	1¼"-7NC x 3"	13"	1½"	1¾"	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" ±	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" ±

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
17-3-70	3	70	30'-0"	9⅜"	5¼"	0.1793"	10'-0"	6⅝"	5¼"	16"	15"		1¼"	1¼" x 44" x 4"	15"	6'-15' [12']	20'	2'-6"	7'-0"	Yes
18-3-70			17'-0"	10¾"	8 7/16"		None									None				
19-3-70			30'-0"	11⅜"	7¼"		10'-0"	8⅝"	7¼"	17"	16½"	15"			16½"	6'-15 [12']	25' or [30']		8'-0"	
19A-3-70			35'-0"		6⅝"		15'-0"		6⅝"							6'-15' [15']				
23-3-70			17'-0"	12"	9"		None	9⅜"		18"	17½"	16"	1½"	1¾" x 60" x 6"	17½"	None	35'			
24-3-70			30'-0"		8"		10'-0"		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"	0.2391"	10'-0"		8"			17"				6'-15' [12']	40' or [45']	3'-6"		
26A-3-70			35'-0"		7 5/16"		15'-0"		7 5/16"							6'-15' [15']				
27-3-70			17'-0"		9¾"		None									None				

Camber the pole shaft to compensate for dead load pole deflection.

☐ Indicates arm length to be used unless otherwise noted on plans.

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

CHIEF OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 5013

APPROVED JULY 1, 1980

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND LIGHTING STANDARDS
CASE 3 ARM LOADING
WIND VELOCITY=70MPH ARM LENGTHS 20' TO 45'

ES-6L

ES-6L

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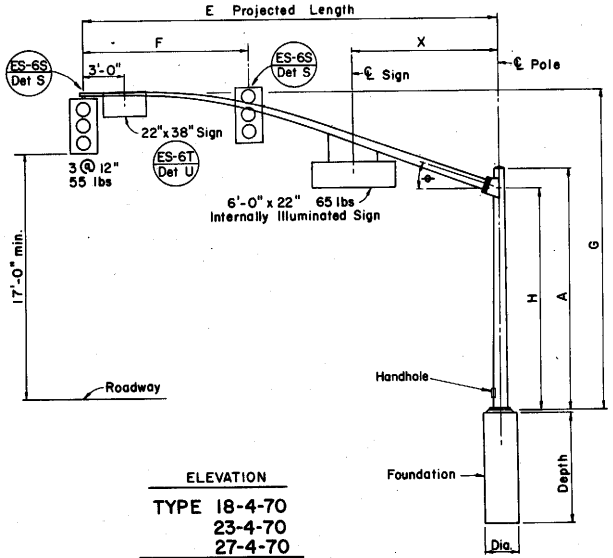
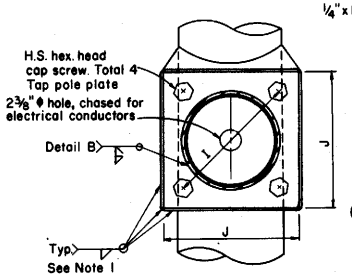
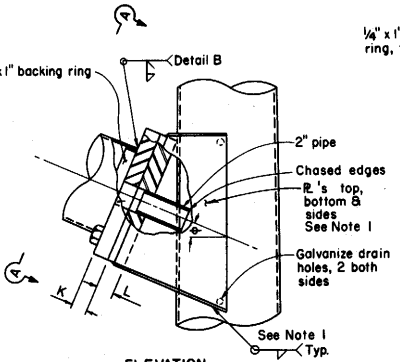


ELEVATION

TYPE 18-4-70
23-4-70
27-4-70

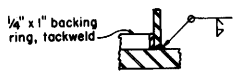


SECTION A-A



ELEVATION

SIGNAL ARM CONNECTION DETAILS



DETAIL B

DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET	TOTAL SHEETS

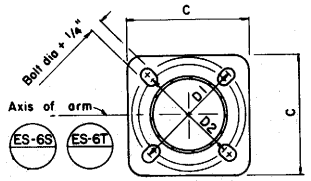
CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

APPROVED JULY 1, 1980

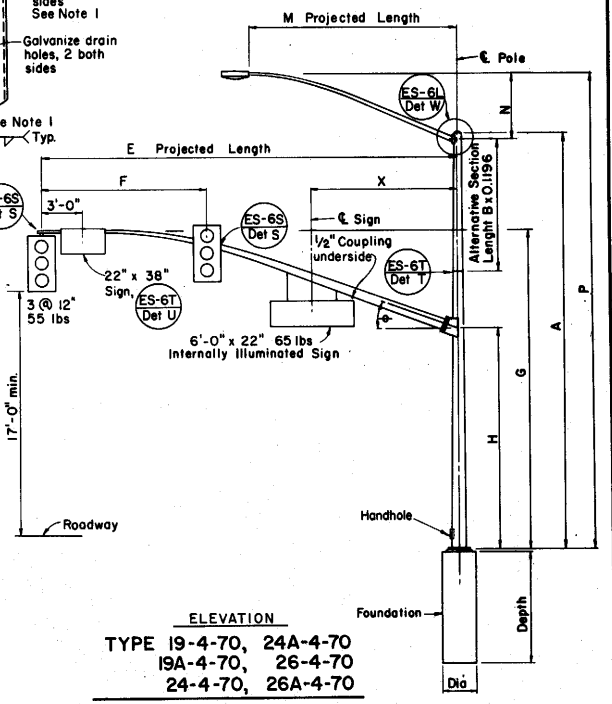
LUMINAIRE ARM DATA					
M Projected Length	N Rise	Min O D At Pole	Thickness	P Mounting Height 30'-0" Pole	P Mounting Height 35'-0" Pole
6'-0"	2'-0"±	3¼"	0.1196"	31'-6"±	36'-6"±
8'-0"	2'-6"±	3½"		32'-0"±	37'-0"±
10'-0"	3'-3"±	3⅞"		32'-9"±	37'-9"±
12'-0"	4'-3"±			33'-9"±	38'-9"±
15'-0"	4'-9"±	4¼"		34'-3"±	39'-3"±

NOTE
1. 5/16" plates and welds for 40' & 45' arms. ¼" for arms <40'

SIGNAL ARM DATA												
E Projected Length	F Min. Spacing	G Mounting Height	H	Min O D At Pole	Thickness	I Bolt Circle	HS Cap Screws	J Plate Size	K Arm ℄ 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"	23'-0"±		8"		13"	1¼"-7NCx3"	13"	1¼"	1½"	21°	
35'-0"	14'-0"			8 11/16"								
40'-0"	15'-0"			9⅜"	0.2391"	13"		13"	1½"	1¾"	15°	13'-0"
45'-0"		23'-6"±		10 1/16"								



BASE PLATE



ELEVATION

TYPE 19-4-70, 24A-4-70
19A-4-70, 26-4-70
24-4-70, 26A-4-70

POLE 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	Depth	Reinforced
18-4-70	4	70	17'-0"	10¾"	8 7/16"	0.1793"	None			17"	16½"	15"	1¼"	1¾"x60"x6"	15"	None	25' or [30]	2'-6"	8'-0"	Yes
19-4-70			30'-0"		6 5/8"	0.2391"	10'-0"	8"	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"	0.1793"	None			18"	17½"	16"	1½"		17½"	None	35'			
24-4-70			30'-0"	12½"	8 1/4"		10'-0"	9 11/16"	8 1/4"							6'-15' [12]				
24A-4-70			35'-0"		7 9/16"		15'-0"		7 9/16"							6'-15' [15]				
26-4-70			30'-0"	12"	8"	0.2391"	10'-0"	9⅜"	8"			17"				6'-15' [12]	40' or [45]	3'-6"		
26A-4-70			35'-0"	12½"	7 9/16"		15'-0"	9 11/16"	7 9/16"							6'-12' [15]				
27-4-70			17'-0"	12"	9¾"		None									None				

Camber the pole shaft to compensate for dead load pole deflection.

☐ Indicates arm length to be used unless otherwise noted on plans.

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND LIGHTING STANDARDS
CASE 4 ARM LOADING
WIND VELOCITY=70MPH ARM LENGTHS 25' TO 45'

ES-6M

ES-6M

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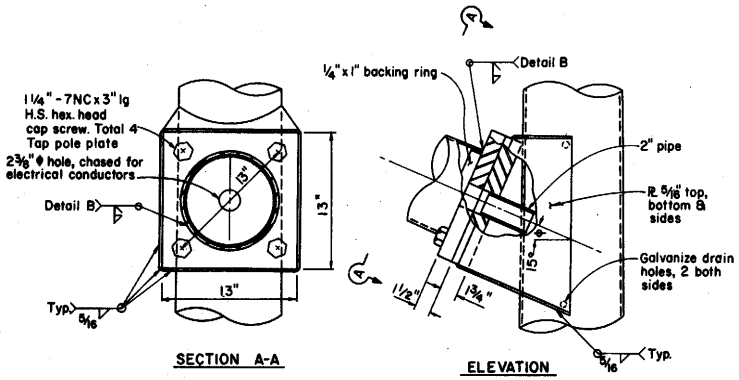
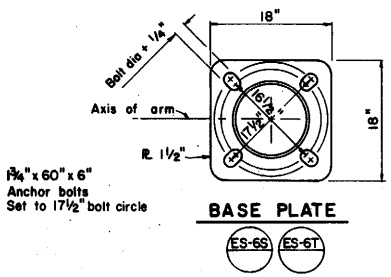


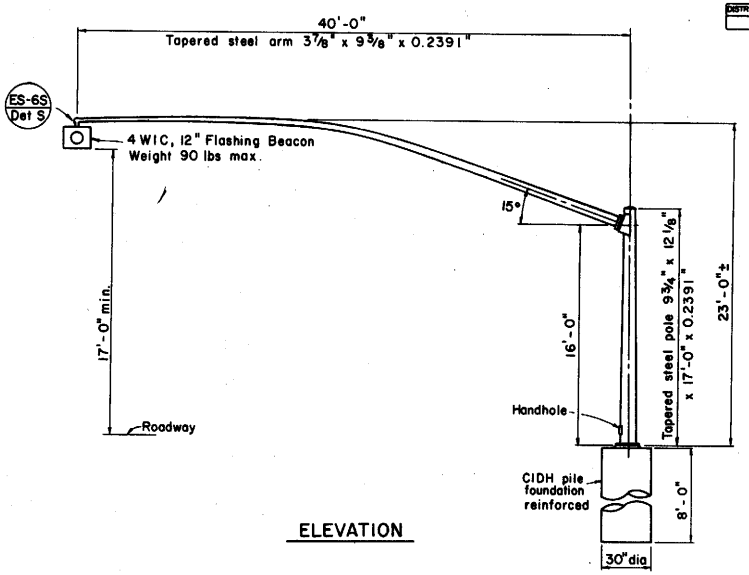
SIGNAL ARM CONNECTION DETAILS

DETAIL B



BASE PLATE

ES-6S ES-6T



ELEVATION

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

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 8013

APPROVED JULY 1, 1980

NOTE
For details not shown see "Traffic Signal and Lighting Standards, ES 6S & ES 6T.

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND LIGHTING STANDARDS
TYPE 40-0-80

ES-6N

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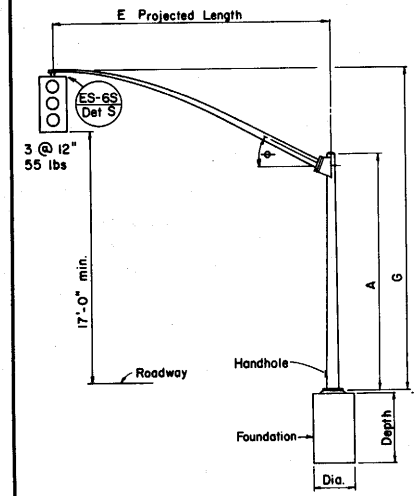
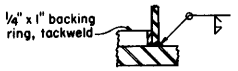
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013
APPROVED. JULY 1, 1980

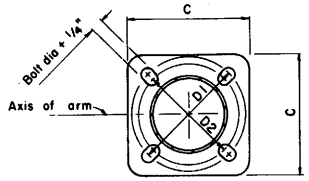


ELEVATION

TYPE 18-1-80

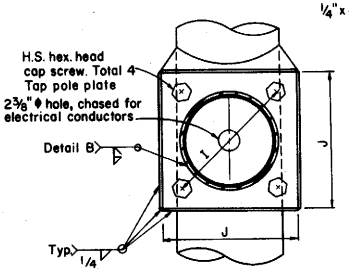


DETAIL B

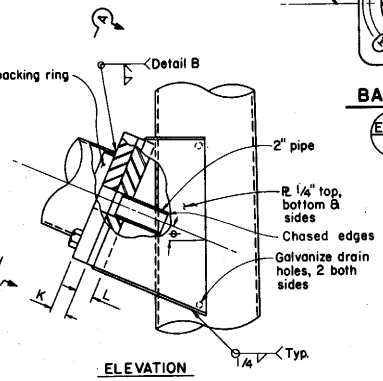


BASE PLATE

ES-6S ES-6T

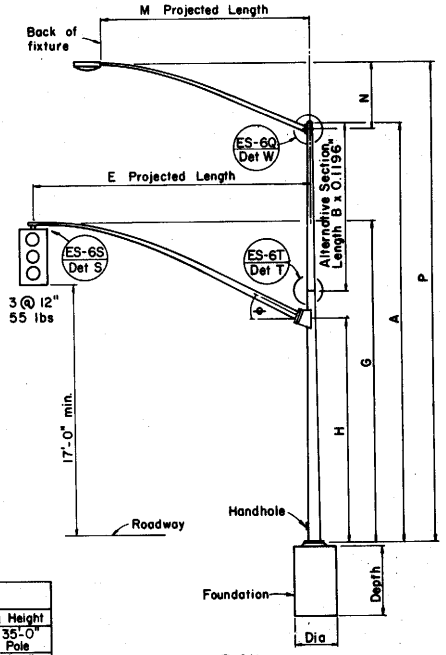


SECTION A-A



ELEVATION

SIGNAL ARM CONNECTION DETAILS



ELEVATION

TYPE 19-1-80, 19A-1-80

SIGNAL ARM DATA										
E Projected Length	G Mounting Height	H	Min O D At Pole	Thickness	I Bolt Circle	HS Cap Screws	J Plate Size	K Arm PL Thickness	L Pole PL Thickness	ϕ
25'-0"	22'-7"±	16'-0"	7 5/16"	0.1196"	11"	1"-8NC-2 1/2"	10 1/2"	1"	1 1/4"	23°
30'-0"	23'-0"±		8"							

LUMINAIRE ARM DATA					
M Projected Length	N Rise	Min O D At Pole	Thickness	P Mounting Height 30'-0" Pole	P Mounting Height 35'-0" Pole
6'-0"	2'-0"±	3 1/4"	0.1196"	31'-6"±	36'-6"±
8'-0"	2'-6"±	3 1/2"		32'-0"±	37'-0"±
10'-0"	3'-3"±	3 7/8"		32'-9"±	37'-9"±
12'-0"	4'-3"±			33'-9"±	38'-9"±
15'-0"	4'-9"±	4 1/4"		34'-3"±	39'-3"±

Pole Type	Load Case	Wind Velocity mph	POLE DATA A Height	Min OD Base	Min OD Top	Thickness	Alternative Section B Length	Alternative Section Bottom	Alternative Section Top	BASE PLATE DATA C	D1	D2	Thickness	Anchor Bolts Size	Anchor Bolts Bolt Circle	Luminaire Arm	Signal Arm	CIDH PILE FOUNDATION Diameter	Depth	Reinforced
18-1-80	1	80	17'-0"	9 3/8"	7"	0.1793"	None			16"	15"		1 1/4"	1 1/4" x 44" x 4"	15"	None	25' or 30'	2'-6"	7'-0"	Yes
19-1-80			30'-0"	10 3/4"	6 5/8"		10'-0"	8"	6 5/8"					1 1/2" x 54" x 6"		6'-15' [12]				
19A-1-80			35'-0"		5 15/16"		15'-0"		5 15/16"							6'-12' [15]				

☐ Indicates arm length to be used unless otherwise noted on plans

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND LIGHTING STANDARDS
CASE I ARM LOADING
WIND VELOCITY=80MPH ARM LENGTHS 25' TO 30'

ES-60

ES-60

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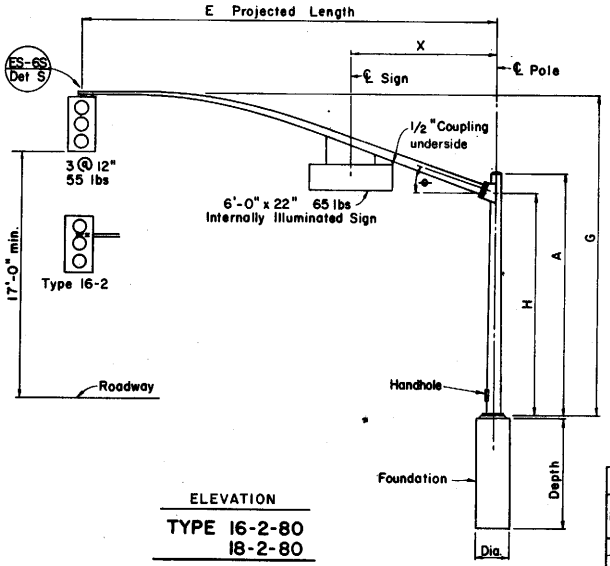
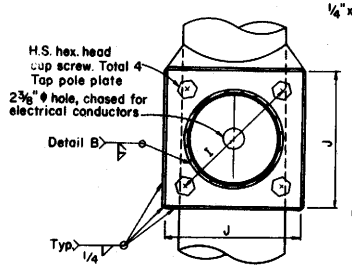
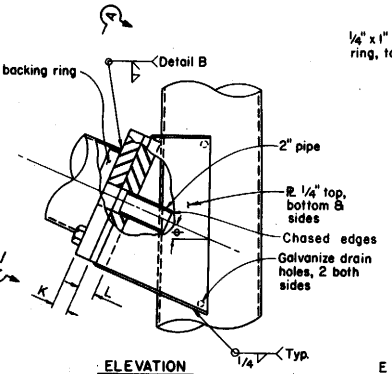


ELEVATION

TYPE 16-2-80
18-2-80



SECTION A-A



ELEVATION

SIGNAL ARM CONNECTION DETAILS

DETAIL B

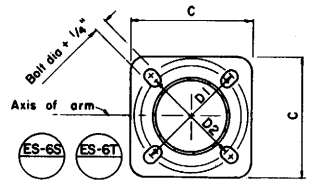
DISTRICT	COUNTY	ROUTE	Post Miles-Total Project	SHEET NO.	TOTAL SHEETS

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

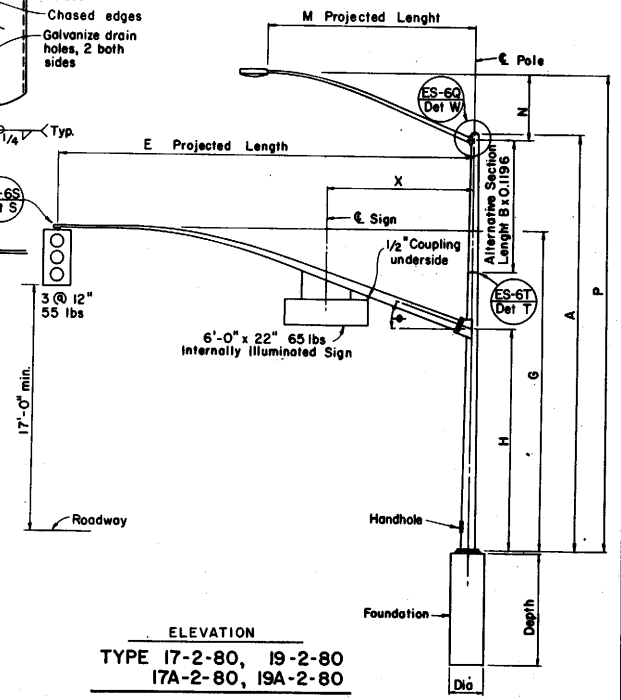
APPROVED JULY 1, 1980

LUMINAIRE ARM DATA					
M Projected Length	N Rise	Min O D At Pole	Thickness	P Mounting Height 30'-0" Pole	P Mounting Height 35'-0" Pole
6' - 0"	2'-0"±	3 1/4"	0.1196"	31'-6"±	36'-6"±
8' - 0"	2'-6"±	3 1/2"		32'-0"±	37'-0"±
10' - 0"	3'-3"±	3 7/8"		32'-9"±	37'-9"±
12' - 0"	4'-3"±			33'-9"±	38'-9"±
15' - 0"	4'-9"±	4 1/4"		34'-3"±	39'-3"±

SIGNAL ARM DATA											
E Projected Length	G Mounting Height	H	Min O D At Pole	Thickness	I Bolt Circle	HS Cap Screws	J Plate Size	K Arm ℞ Thickness	L Pole ℞ Thickness	ϕ	X Max.
20' - 0"	21'-9"±	16'-0"	6 5/8"	0.1793"	11"	1"-8NCx2 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 15/16"	0.1793"	None			16"	15"		1 1/4"	1 1/4"x 44"x4"	15"	None	20'	3'-6"	5'-0"	No
17-2-80			30'-0"	10 3/4"	6 5/8"		10'-0"	8"	6 5/8"							6'-15' [2]		2'-6"	7'-0"	Yes
17A-2-80			35'-0"		5 15/16"		15'-0"		5 15/16"					1 1/2"x 54"x6"		6'-15' [5]				
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' [2]				
19A-2-80			35'-0"		5 15/16"	0.2391"	15'-0"		5 15/16"	17"	16 1/2"	15"		1 3/4"x60"x6"		6'-15' [5]				

Camber the pole shaft to compensate for dead load pole deflection.

☐ Indicates arm length to be used unless otherwise noted on plans.

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND LIGHTING STANDARDS
CASE 2 ARM LOADING
WIND VELOCITY=80MPH ARM LENGTHS 20' TO 30'

ES-6P

ES-6P

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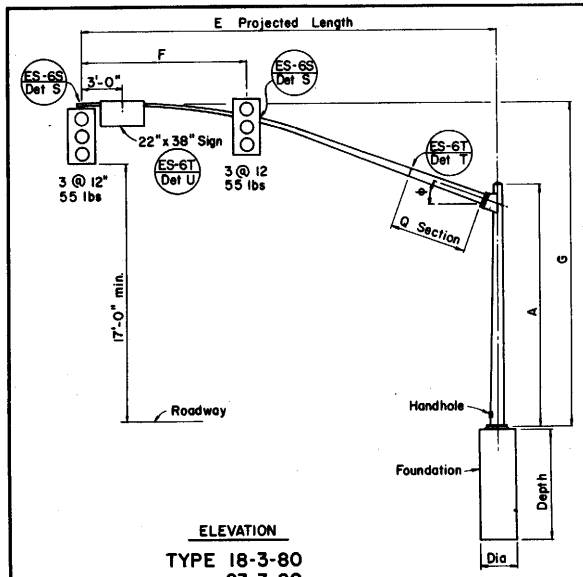
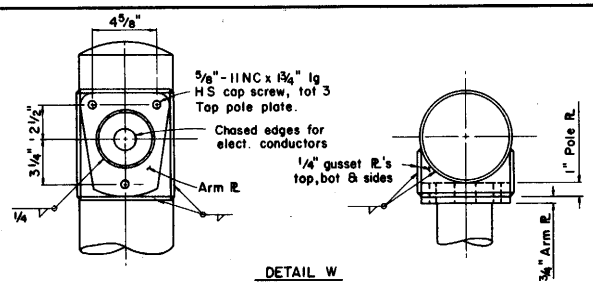


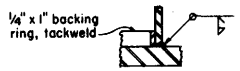
ELEVATION

TYPE 18-3-80
23-3-80
27-3-80

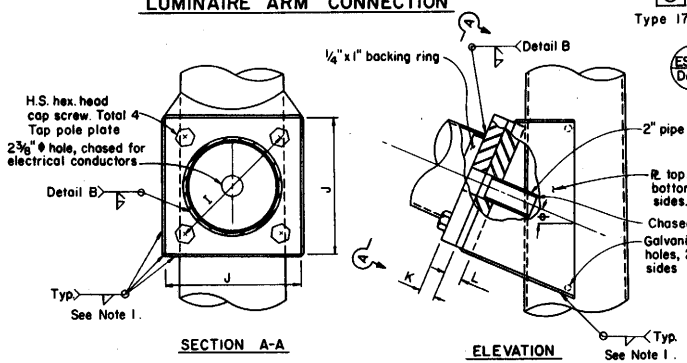


DETAIL W

LUMINAIRE ARM CONNECTION



DETAIL B



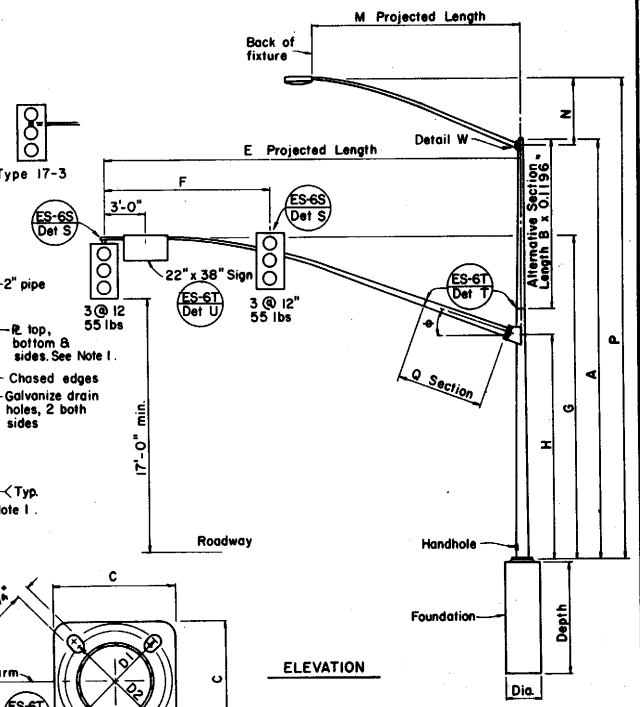
SECTION A-A

ELEVATION

SIGNAL ARM CONNECTION DETAILS

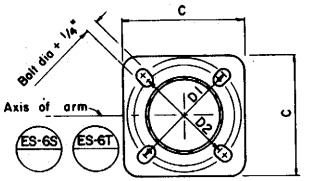
Note:
1. 5/16" plates and welds for 40' & 45' arms.
1/4" for arms <40'.

Type 17-3



ELEVATION

TYPE 17-3-80, 24A-3-80
19-3-80, 26-3-80
19A-3-80, 26A-3-80
24-3-80



BASE PLATE

SIGNAL ARM DATA														
E Projected Lenght	F Min Spacing	G Mounting Height	H	Min O D At Pole	Thickness	I Bolt Circle	HS Cap Screws	J Plate Size	K Arm ℄ Thickness	L Pole ℄ Thickness	ϕ	Q Section Length	Q Section Thickness
20'-0"	8'-0"	21'-9" ±	16'-0"	6 5/8"	0.1793"	11"	1"-8NC-2 1/2"	10 1/2"	1"	1 1/4"	23°		
25'-0"	12'-0"	22'-7" ±		7 5/16"	0.2391"								
30'-0"				8"									
35'-0"	14'-0"	23'-0" ±		8 11/16"		13"		13"	1 1/4"	1 1/2"	21°		
40'-0"	15'-0"			9 3/8"	0.2391"	13"	1 1/4"-7NC-3"	13"	1 1/2"	1 3/4"	15°	10'-0"	0.3125"
45'-0"		23'-6" ±		10 1/16"	x 30'-0"							15'-0"	

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 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
17-3-80	3	80	30'-0"	10 3/4"	6 5/8"	0.1793"	10'-0"	8"	6 5/8"	16"	15"		1 1/4"	1 1/2" x 54" x 6"	15"	6'-15' [12']	20'	2'-6"	7'-0"	Yes
18-3-80			17'-0"		8 7/16"		None									None			8'-0"	
19-3-80			30'-0"		6 5/8"		10'-0"	8"	6 5/8"	17"	16 1/2"	15"		1 3/4" x 60" x 6"	16 1/2"	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"		8 7/16"		None									None				
24-3-80			30'-0"	11 3/8"	7 1/4"		10'-0"	8 5/8"	7 1/4"	18"	17 1/2"	16"	1 1/2"		17 1/2"	6'-15' [12']	35'			
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 66" x 6"		6'-15' [12']	40' or [45']	3'-6"		
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				

Camber the pole shaft to compensate for dead load pole deflection.

☐ Indicates arm length to be used unless otherwise noted on plans.

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

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

APPROVED JULY 1, 1980

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND LIGHTING STANDARDS
CASE 3 ARM LOADING
WIND VELOCITY=80 MPH ARM LENGTHS 20' TO 45'

ES-6Q

ES-6Q

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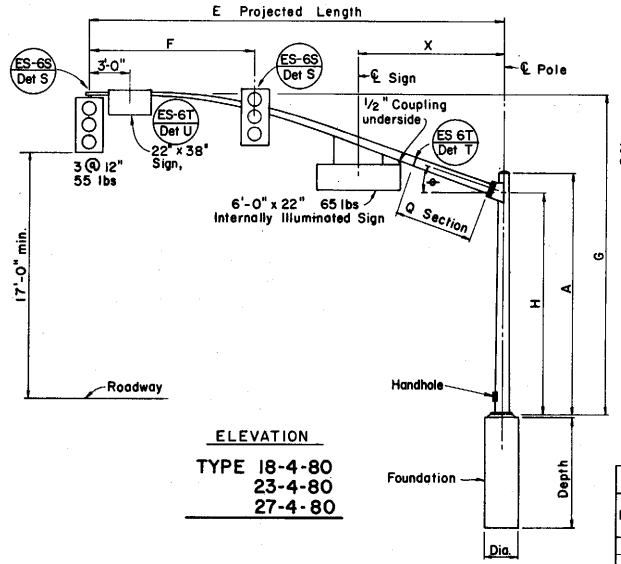
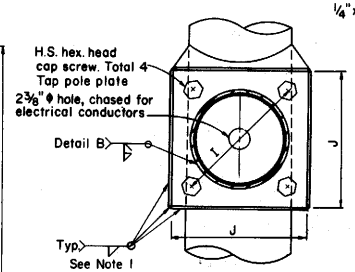
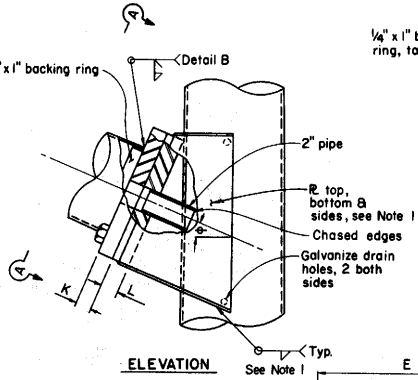


ELEVATION

TYPE 18-4-80
23-4-80
27-4-80

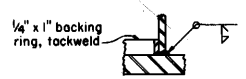


SECTION A-A



ELEVATION

SIGNAL ARM CONNECTION DETAILS

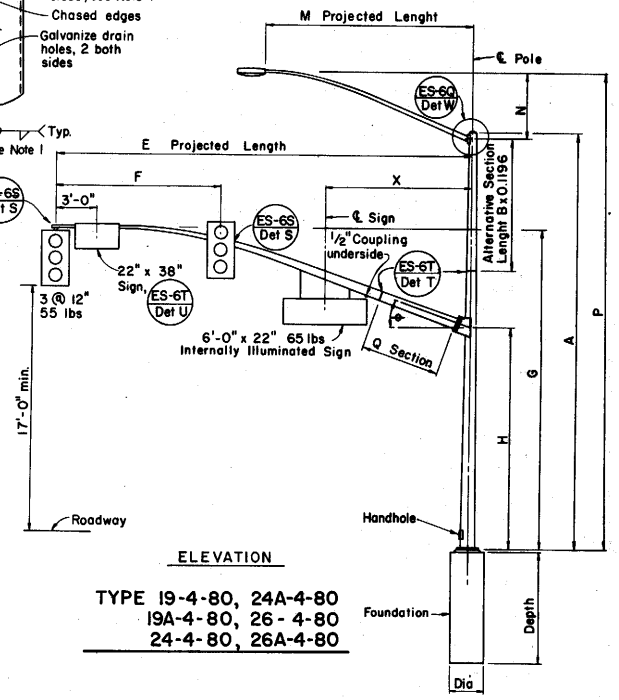


DETAIL B

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

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

APPROVED JULY 1, 1980



ELEVATION

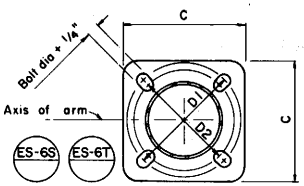
TYPE 19-4-80, 24A-4-80
19A-4-80, 26-4-80
24-4-80, 26A-4-80

NOTE

1. 5/16" plates and welds for 40' & 45' arms.
   1/4" for arms < 40'.

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	F Min. Spacing	G Mounting Height	H	Min O D At Pole	Thickness	I Bolt Circle	HS Cap Screws	J Plate Size	K Arm ℄ Thickness	L Pole ℄ Thickness	ϕ	Q Section Length	Q Section Thickness	X Max
25'-0"	10'-0"	22'-7"±	16'-0"	7 5/16"	0.2391"	12"	1 1/4"-7NC x 3"	12"	1 1/4"	1 1/2"	23°			10'-6"
30'-0"	12'-0"	23'-0"±		8"		13"		13"			21°			
35'-0"	14'-0"			8 11/16"										
40'-0"	15'-0"			9 3/8"	0.2391" x 30'-0"	13"		13"	1 1/2"	1 3/4"	15°	10'-0"	0.3125"	13'-0"
45'-0"		23'-6"±		10 1/16"								15'-0"		



BASE PLATE

Pole Type	Load Case	Wind Velocity mph	POLE DATA A Height	Min OD Base	Min OD Top	Thickness	Alternative Section B Length	Alternative Section Bottom	Alternative Section Top	BASE PLATE DATA C	D1	D2	Thickness	Anchor Bolts Size	Anchor Bolts Bolt Circle	Luminaire Arm	Signal Arm	CIDH PILE FOUNDATION Diameter	Depth	Reinforced
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 60" x 6"	16 1/2"	None	25' or 30'	2'-6"	8'-0"	Yes
19-4-80			30'-0"	11 3/8"	7 5/16"		10'-0"		7 5/16"							6'-15' 12'				
19A-4-80			35'-0"		6 5/8"		15'-0"		6 5/8"							6'-15' 15'				
23-4-80			17'-0"	12"	9"		None	9 3/8"		18"	17 1/2"	16"	1 1/2"		17 1/2"	None	35'			
24-4-80			30'-0"		8"		10'-0"		8"							6'-15' 12'				
24A-4-80			35'-0"		7 5/16"		15'-0"		7 5/16"							6'-15' 15'				
26-4-80			30'-0"	12 1/8"	8"	0.3125"	10'-0"		8"			17"		2" x 66" x 6"		6'-15' 12'	40' or 45'	3'-6"		
26A-4-80			35'-0"		7 5/16"		15'-0"		7 5/16"							6'-15' 15'				
27-4-80			17'-0"		9 3/4"		None									None				

Camber the pole shaft to compensate for dead load pole deflection.

☐ Indicates arm length to be used unless otherwise noted on plans.

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND LIGHTING STANDARDS
CASE 4 ARM LOADING
WIND VELOCITY=80 MPH ARM LENGTHS 25' TO 45'

ES-6R

ES-6R

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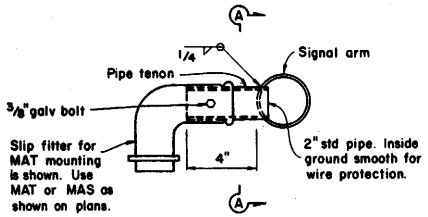
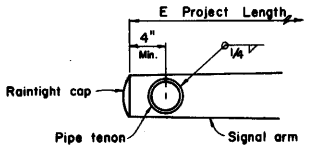
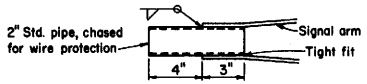


DETAIL S - SIDE TENON

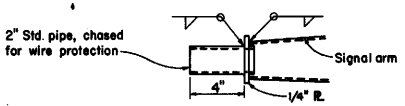


SECTION A-A

PIPE TENONS

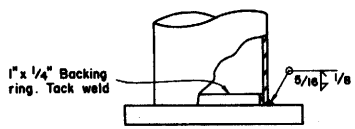


DETAIL TS - TIP TENON



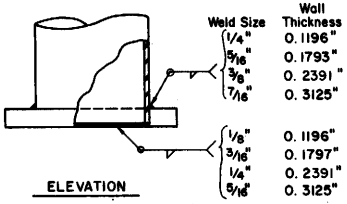
DETAIL TL - TIP TENON

This detail supersedes Detail S when so designated

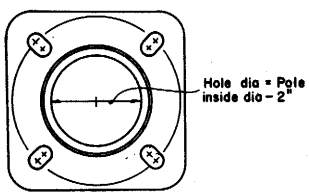


This detail shall be used for 2 ply poles

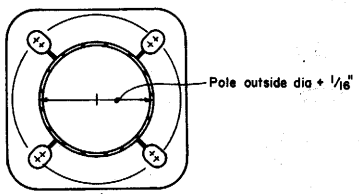
ELEVATION



ELEVATION



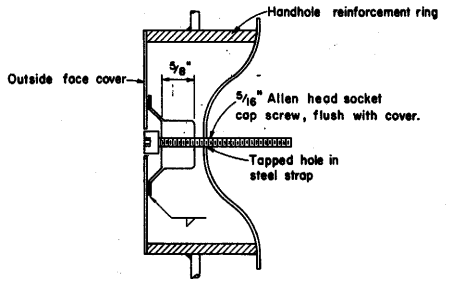
PLAN A



PLAN B

ALTERNATIVE BASE PLATE DETAILS

USE PLAN B UNLESS SHOWN OTHERWISE



TAMPER RESISTANT HANDHOLE COVER

IDENTIFICATION NUMBER

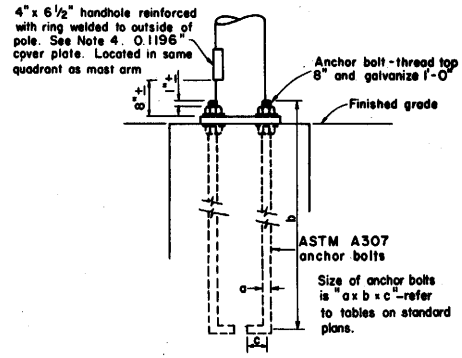
Rivet a stamped metal tag with each pole's identification number to shaft below handhole. 1/4" high number minimum.

Sample Identification Number

Type | Load Case | Design Wind Velocity | Signal Arm Length | Standard Plan Year

19A - 3 - 70 - 30 - 77

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.
3. Signal arms shall be round, tapered steel tubes, maximum taper 0.14 inches per foot.
4. Handhole reinforcement ring to be 1/4" x 1 1/2" for 0.1196" to 0.2391" poles, 3/8" x 2" for 0.3125".
5. In lieu of the torque requirements for HS bolts, cap screws shall be tightened by the turn-of-nut method 1/3 turn from a snug tight condition. No washer will be required.
6. Camber pole shafts for types 24 & 26 as required to compensate for dead load deflection.
7. Plan B 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.

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATIONS

TRAFFIC SIGNAL AND LIGHTING STANDARDS DETAILS NO 1

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

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

APPROVED JULY 1, 1980

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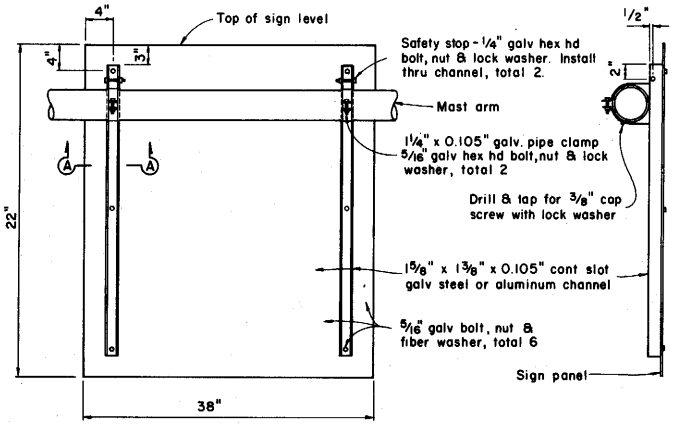
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

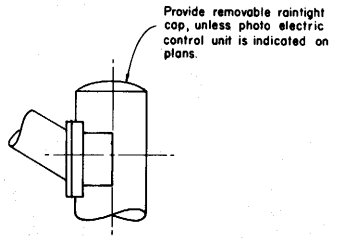
CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

APPROVED JULY 1, 1980

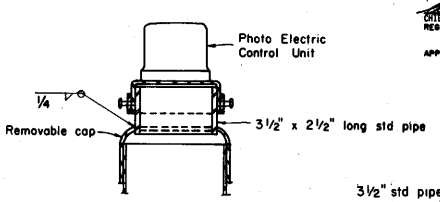


REAR VIEW — DETAIL U — SIDE VIEW

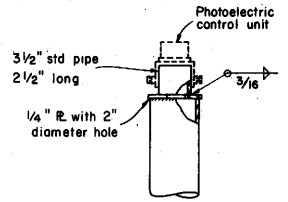
SIGN MOUNTING DETAILS



STANDARD TOP

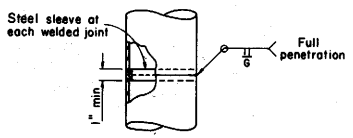


MOUNTING ADAPTER FOR PHOTO ELECTRIC CONTROL UNIT

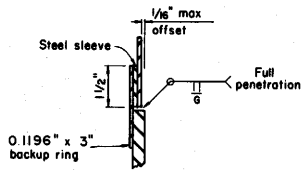


ALTERNATIVE MOUNTING ADAPTER

POLE TOP DETAILS

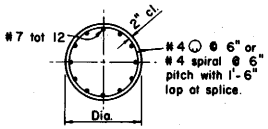


FOR UNIFORM TUBE THICKNESS

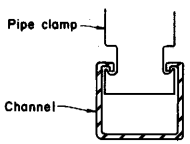


DETAIL T
AT TUBE THICKNESS CHANGE

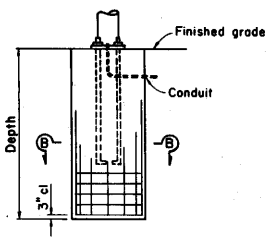
POLE SPLICES



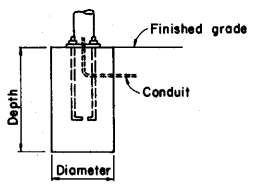
SECTION B-B



SECTION A-A



ELEVATION
REINFORCED PILE



ELEVATION
NON-REINFORCED PILE

CAST-IN-DRILLED HOLE PILE FOUNDATION

Poles To Be Installed On Reused Foundations

Bolt circles and anchor bolt sizes have been revised. The Contractor shall verify dependent dimensions before fabricating poles to be installed on reused foundations.

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND LIGHTING STANDARDS DETAILS NO 2

ES-6T

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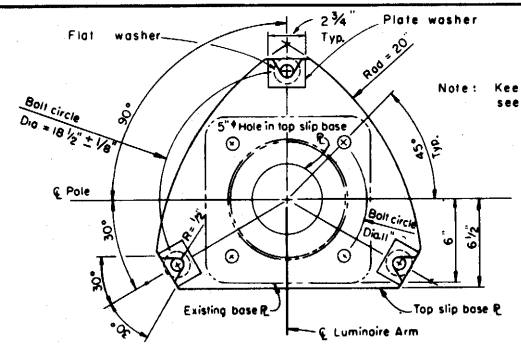
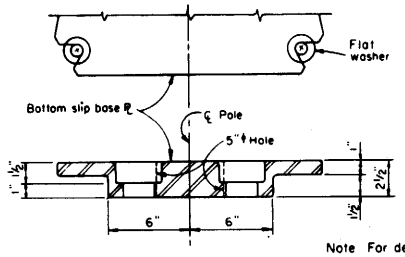


PLAN - TOP PLATES



SECTION C-C

CAST OPTION

Note For details not shown see "Bottom Base ℞ Details" and "Plan - Bottom Plates".

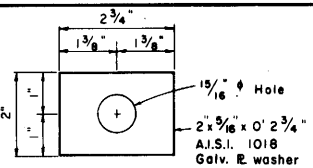
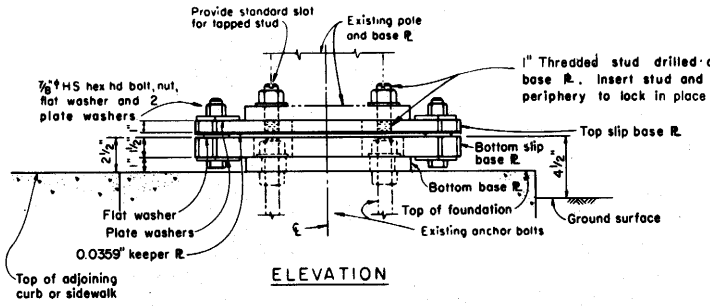


PLATE WASHER

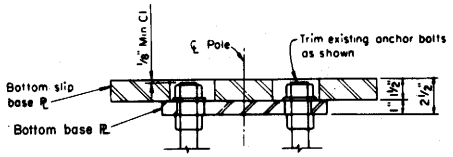
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	Sheet No.	Total Sheets

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER AND BOTH

APPROVED JULY 1, 1980

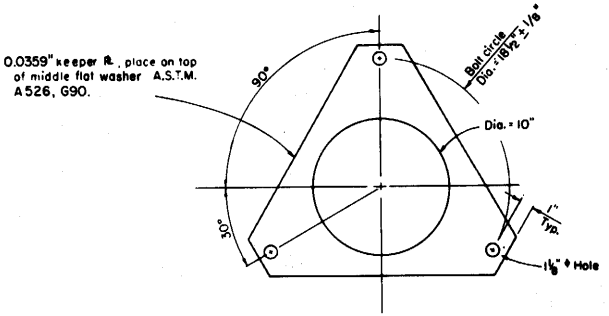


ELEVATION

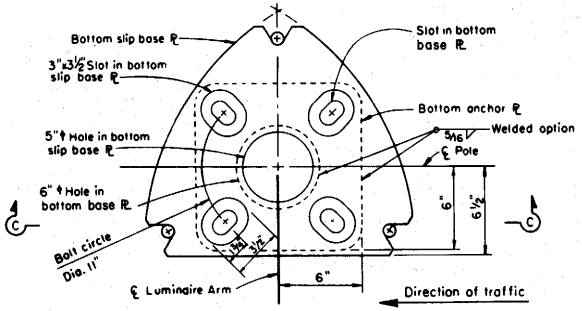


SECTION C-C

WELDED OPTION



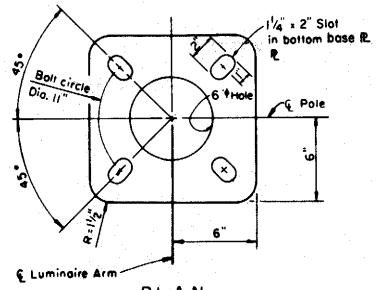
DETAIL D



PLAN - BOTTOM PLATES

Note: For Plate dimensions see "Plan - Top Plates"

SLIP BASE ℞ INSERT DETAILS



PLAN

BOTTOM BASE ℞ DETAILS

NOTES:

1. Torque 7/8" HS slip base bolts to 150 ft-lbs.
2. All new material to be galvanized after fabrication.
3. ℞'s shall conform to A.S.T.M. A-36, except as noted.
4. Cast option shall conform to A.S.T.M. A-27 Grade 70-40.
5. Flat washer shall conform to A.S.T.M. A-325.
6. The 1" threaded studs shall conform to the applicable requirements of A.S.T.M. A307 Grade A bolts.
7. Conduit riser (including bushing) shall protrude no more than 2 1/4" above top of footing.
8. When existing anchor bolts are 7/8"Ø provide an oversize hardened washer of 2 1/4" diameter at each slot hole.

STATE OF CALIFORNIA
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SLIP BASE INSERT
FOR TYPE 10 & 15
LIGHTING STANDARDS

ES-6U

ES-6U

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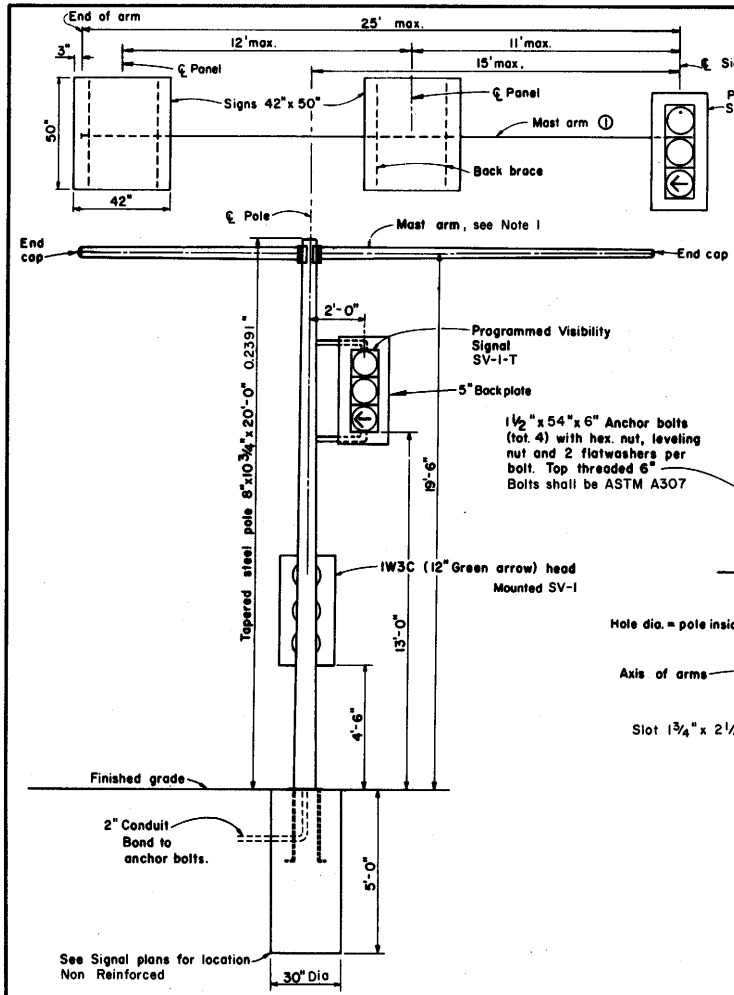
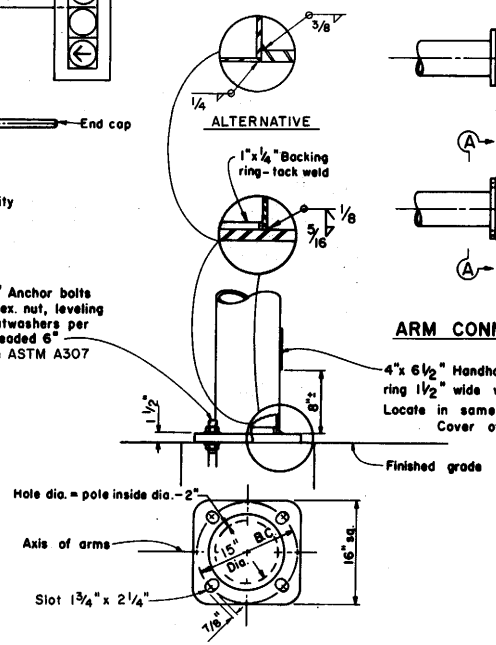
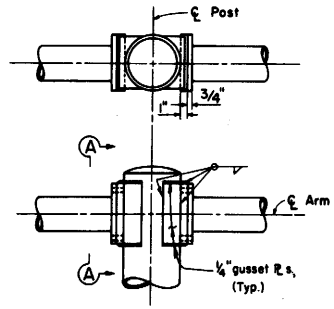


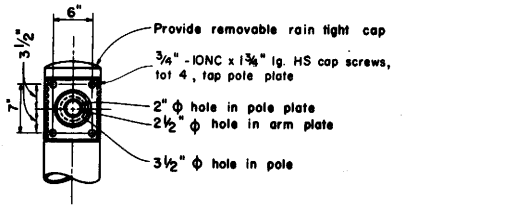
ELEVATION



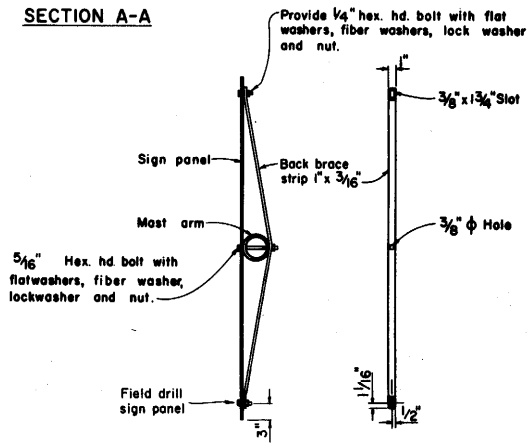
BASE PLATE



ARM CONNECTION DETAILS



SECTION A-A



PANEL MOUNTING DETAIL

Notes:

1. Round tapered steel tube 0.1793" with max taper of 0.14 inches per foot and 5½" OD minimun at pole.
2. In lieu of the torque requirements for H.S. bolts, cap screws shall be tightened by the turn-of-nut method, ⅓ turn from snug tight condition. No washer will be required.
3. For arm lengths and signs or signals req'd. each side of ℄ pole, see Signal plans.
4. Mast arm signal to be MAS mounted on pipe tenon Detail S - Sheet ES-6S

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

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO 5013

APPROVED JULY 1, 1980

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

LEFT TURN SIGNAL AND SIGN STANDARD TYPE 33

ES-6V

ES-6V

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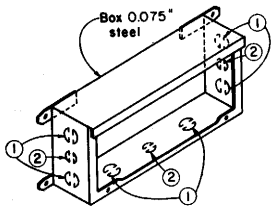
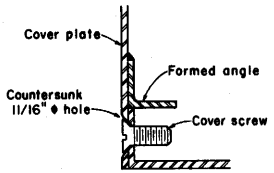
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

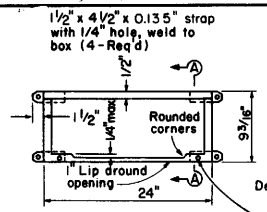
CHIEF, OFFICE OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO 11210

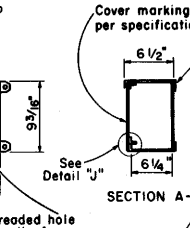
APPROVED July 1, 1980

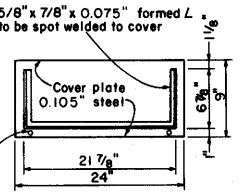




DETAIL J







COVER DETAIL

Countersink holes to permit seating of stainless steel flathead screw 3/8" x 16 x 3/4" (2 Req'd.)

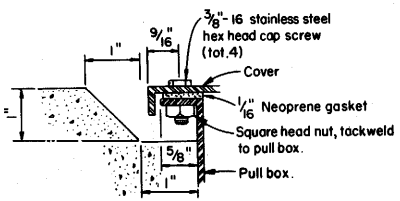
INSTALLATION NOTES:

Box axis shall be parallel to top of railing. Close box during pouring with 1/4" plywood of sufficient size to provide 1:1 chamfer on 3 sides of cover. Upper edge of plywood shall fit against lower edge of raintight hood.

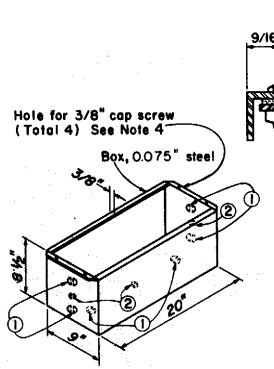
No.9 STRUCTURE PULL BOX

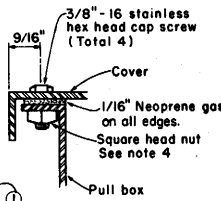
NOTES: No. 9 AND 9 A PULLBOX

1. All corner joints to be lapped and secured by spot welding or riveting.
2. Where cap screws are used to attach cover to box, either of the following methods of providing adequate threading may be used:
   a. Tack weld square nut to bottom of flange (Total 4), or
   b. Tack weld a 1/4" x 5/8" x 8" bar beneath flange (Total 2).

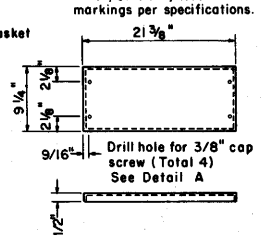


SECTION C-C





DETAIL A

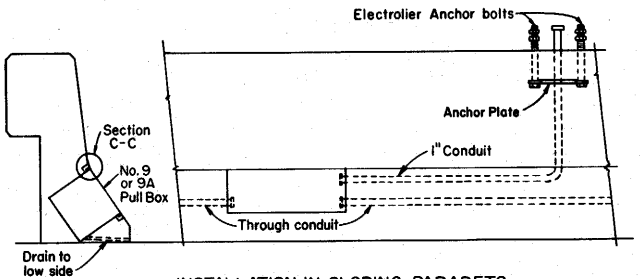


COVER DETAIL

No.9A STRUCTURE PULL BOX

KNOCKOUT SCHEDULE
No. 9 AND 9A PULLBOX

① 1½" conduit, 2 each end, 2 on bottom.
② 1" conduit, 1 each end, 1 on bottom.
③ ½" drain (Total 3). Pound knockouts flat after punching.
④ Multiple size knockouts will not be permitted.



INSTALLATION IN SLOPING PARAPETS

See Notes 3 and 4 on Standard Plan ES-7A.

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
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TRAFFIC SIGNAL AND HIGHWAY LIGHTING DETAILS

ELECTRICAL DETAILS STRUCTURE INSTALLATIONS

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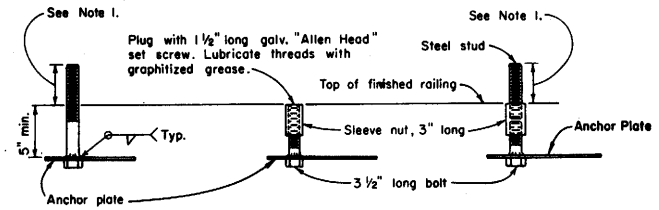
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO 11210

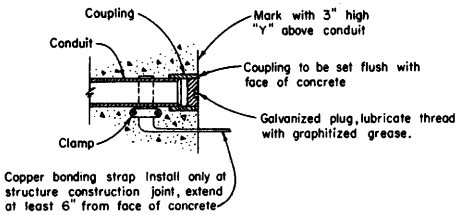
APPROVED July 1, 1980



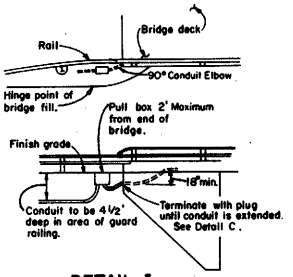
NOTES

1. Anchor bolt or stud length shall be such that thread extends 1/2" maximum above nut on level base plate after grouting. See Detail "N".
2. Electrolier anchor bolts shall be held in position for pouring by means of anchor plates and suitable templates. Deviation from the true position, vertical and height, shall not exceed 1/16"

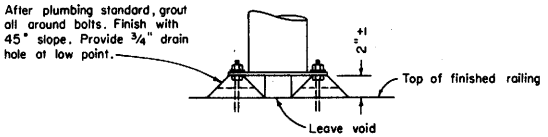
DETAIL B
ELECTROLIER ANCHOR BOLTS



DETAIL C
CONDUIT TERMINATION



DETAIL I
CONDUIT TERMINATION AT END OF STRUCTURE



DETAIL N
GROUTING AT ELECTROLIER

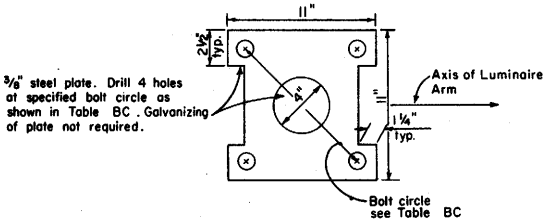


TABLE BC

Type	Bolt Circle	Anchor Bolt Diameter
15	11"	1"
21	12"	1 1/4"

ANCHOR PLATE

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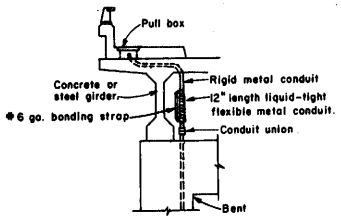
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

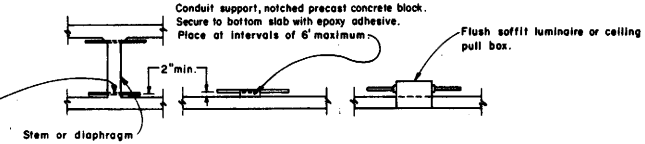
CHIEF, OFFICE OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO 11210

APPROVED July 1, 1980

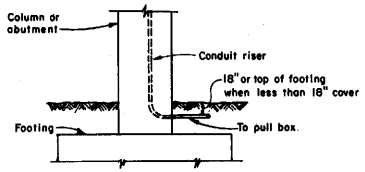


DETAIL R
CONDUIT RISER CONNECTION

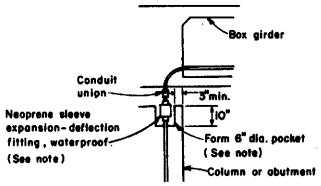
Conduit passing through girder or diaphragm of box girder section shall be either cast into concrete or passed through opening. Opening shall not be drainage opening and shall be only as large as required to install conduit. Conduit shall be run either parallel to or at right angles to girders.



DETAIL S
CONDUIT INSTALLATION WITHIN BOX GIRDER SECTIONS

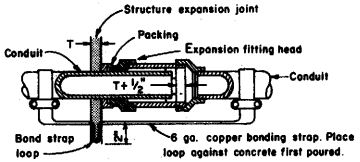


DETAIL T
LOWER END OF CONDUIT RISER AT COLUMN OR ABUTMENT



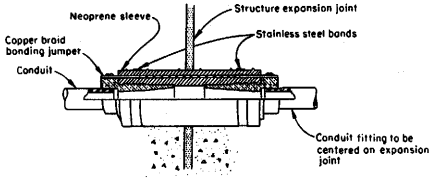
NOTES:
1. Fitting and pocket required only where movement can occur between girder and column or abutment.
2. Fill pocket around fitting with resilient waterproof compound.

DETAIL U
CONDUIT RISER CONNECTION AT COLUMN OR ABUTMENT



NOTES:
1. Except for sidewalk joints, a conduit expansion fitting or expansion-deflection fitting shall be installed at each 1/2 inch or greater structure joint, hinge or abutment.
2. Fittings shall be installed parallel to superstructure girders.
3. Where lateral movement greater than 1/4" may occur, a neoprene sleeve expansion-deflection fitting shall be installed straddling the joint.
4. The external bond strap may be omitted when the fitting is provided with an internal bond equivalent to a No.6 copper bond.

DETAIL X
CONDUIT EXPANSION FITTING



DETAIL Y
CONDUIT EXPANSION DEFLECTION FITTING

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
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TRAFFIC SIGNAL AND HIGHWAY LIGHTING DETAILS

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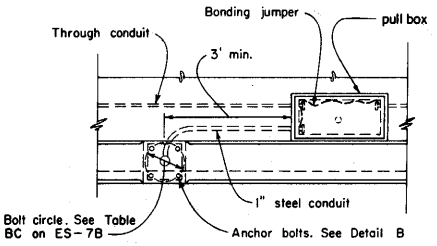
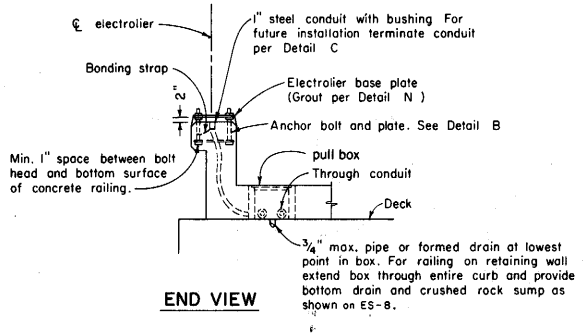
DISTRICT	COUNTY	ROUTE	Post Miles – Total Project	SHEET NO.	TOTAL SHEETS

CHIEF, TRAFFIC BRANCH
REGISTERED CIVIL ENGINEER NO. 11210

APPROVED July 1, 1980



TOP VIEW

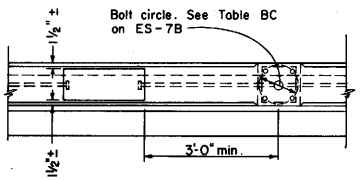


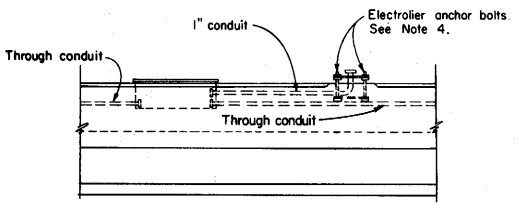
END VIEW

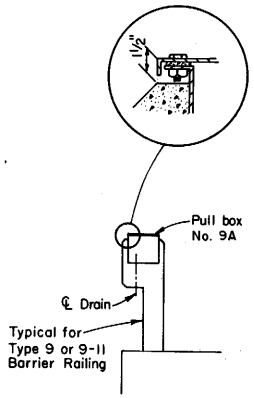
No. 3½, 5 or 6 PULL BOX INSTALLATION

INSTALLATION NOTES

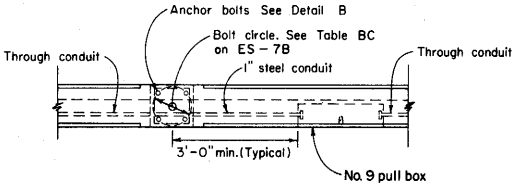
1. Axis of pull box shall be parallel to top of barrier, sidewalk, or railing.
2. Top of cover for boxes in barrier with sidewalk shall be flush.
3. Top of pull boxes in sidewalk areas shall be flush with top of sidewalk.
4. Boxes in side of vertical barrier or railing shall be closed during pouring of P.C.C. with 1/4" plywood of sufficient size to provide 1:1 chamfer on 3 sides of cover. Upper edge of plywood shall fit against lower edge of raintight hood.
5. See railing sheets for reinforcement and structural details at electroliers and pull boxes.
6. Use drain in center if box is horizontal, or at low end if box is inclined. When box is mounted in sloping parapet drill 1/2 elongated drain hole inside at center or near end as required for drainage.
7. For reinforcing in area of electrolier, see railing sheets. For electrolier anchor bolts, see ES-7B.



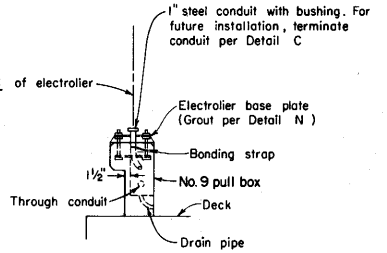




No. 9A PULL BOX INSTALLATION

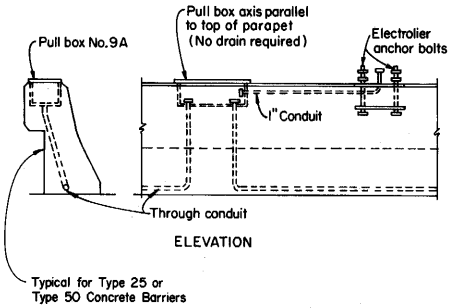


TOP VIEW



END VIEW

No. 9 PULL BOX INSTALLATION



ELEVATION

STATE OF CALIFORNIA
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TRAFFIC SIGNAL AND HIGHWAY LIGHTING DETAILS

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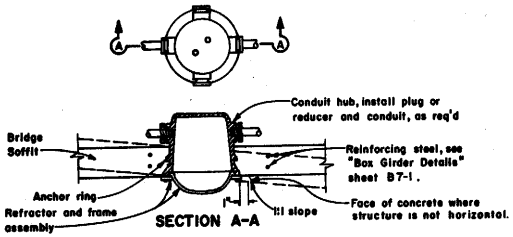
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

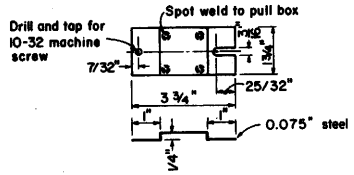
CHIEF, OFFICE OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 11210

APPROVED July 1, 1980

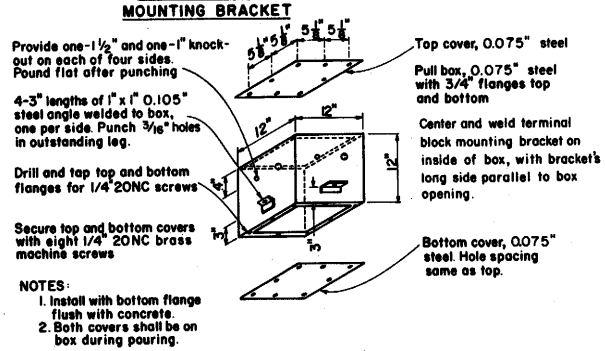


NOTES:
1. Place 1/4" plywood disk in body opening during pouring.
2. Install luminaire with axis vertical and "street side" of refractor oriented as indicated on lighting layout.
3. Luminaire shall be located so as to provide minimum clearance of 2 ft. from inside surface of girders and 1 ft. from near face of diaphragm.

DETAIL F
FLUSH SOFFIT LUMINAIRE INSTALLATION

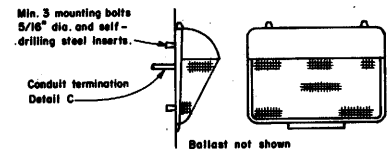


TERMINAL BLOCK MOUNTING BRACKET

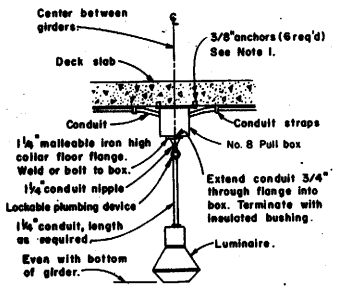


NOTES:
1. Install with bottom flange flush with concrete.
2. Both covers shall be on box during pouring.

No.7 CEILING PULL BOX

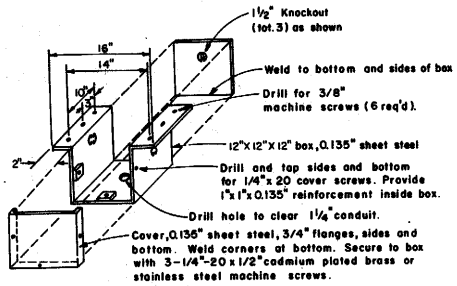


DETAIL W
WALL LUMINAIRE



NOTES:
1. Cast-in-place inserts or expansion anchor.
2. For future installation, omit suspension conduit and luminaire, closed flange with galvanized plug.
3. If conduit smaller than the knockout size is used it shall be bonded to the box.

DETAIL P
PENDANT SOFFIT LUMINAIRE INSTALLATION



No.8 PULL BOX

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

ELECTRICAL DETAILS
STRUCTURE INSTALLATIONS

ES-7E

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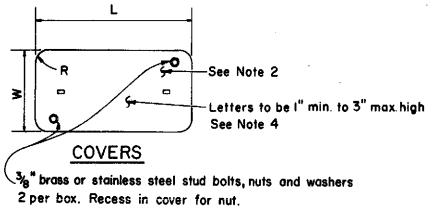
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

CHIEF OFFICE OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 11210

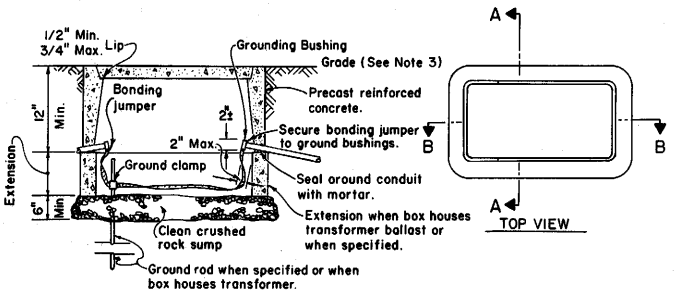
APPROVED JULY 1, 1980

NOTES ON PULL BOXES

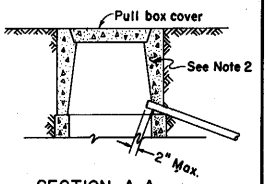
1. Use steel cover and special concrete footing, as shown, when box is to be installed where subject to vehicular traffic loads. Steel cover shall have embossed non-skid pattern.
2. Steel reinforcing shall be as regularly used in the standard products of the respective manufacturer.
3. Top of pull boxes shall be flush with surrounding grade or top of adjacent curb, except that in unpaved areas where pull box is not immediately adjacent to and protected by a concrete foundation, pole or other protective construction, the box shall be placed with its top 0.10 foot above surrounding grade. Where practicable, pull boxes shown in the vicinity of curbs shall be placed adjacent to the back of curb, and pull boxes shown adjacent to standards shall be placed on side of foundation facing traffic, unless otherwise noted.
4. Pull box covers shall be marked as follows:
   (a) "TRAFFIC SIGNAL" Where pull box contains traffic signal conductors with or without street lighting conductors.
   (b) "STREET LIGHTING" Where pull box contains street lighting conductors only. "HIGH VOLTAGE" shall be added, where street lighting voltage is above 600 volts.
   (c) "COMMUNICATION" For pull boxes where communication conduit enters the pull box.
   (d) "SPRINKLER CONTROL" For pull boxes where sprinkler control conduit enters the pull box.
   (e) "COUNT STATION" For pull boxes where count station conduit enters the pull box.
   (f) "RAMP METER" For pull boxes where ramp meter conduit enters the pull box.
   (g) "SERVICE". For pull boxes where riser conduits from utility pole terminate.
   (h) "CALTRANS" For all pull boxes.
5. Bonding jumper for metal covers shall be 36" long, minimum.
6. The nominal dimensions of the opening in which the cover sets shall be the same as the cover dimensions except the length and width dimensions shall be 1/8 inch greater.
7. All covers and boxes shall be interchangeable with California Standard male and female gages. When interchanged with a standard male or female gage, the top surfaces shall be flush within 1/8 inch. Top outside edge of all concrete covers and pull boxes shall have a 1/4" min. radius
8. Special Left Turn Termination Pullbox (L.T.T.C) shall be centered on the double yellow stripe, or centered between double/double yellow stripes.
9. When pull box is installed in sidewalk area on a structure, the depth of the pull box shall be adjusted so that the top of the box is flush with the top of sidewalk.



COVERS

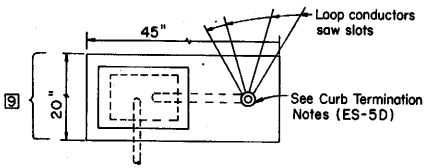


SECTION B-B

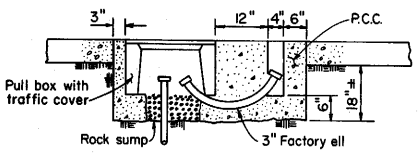


SECTION A-A

INSTALLATION DETAILS



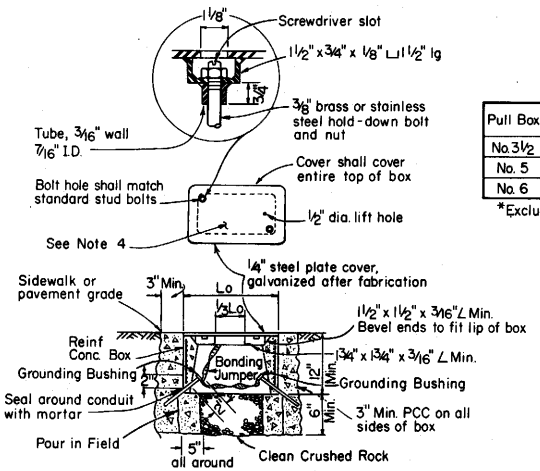
PLAN VIEW



ELEVATION

LEFT TURN TERMINATION PULL BOX (LTTC)

(For use in uncurbed medians only when shown on plans)



PULL BOX WITH TRAFFIC COVER

(CONCRETE BOX ONLY)

DIMENSION TABLE

Pull Box	CONCRETE BOX		PLASTIC BOX		CONCRETE OR PLASTIC COVERS				
	Min * Thickness	Min. Depth Box and Extension	Min.* Thickness	Min. Depth Box and Extension	L**	W**	R	Edge Thickness	Edge Taper
No. 3 1/2	1"	No Extension	5/16"	No Extension	15 3/8"	10 1/8"	1 1/8"	1 3/4"	1/8"
No. 5	1"	22"	5/16"	20"	23 1/4"	13 3/4"	1 1/4"	2"	1/8"
No. 6	1 1/2"	24"	3/8"	20"	30 5/8"	17 5/8"	1 1/4"	2"	1/8"

*Excluding conduit web. **Top dimension.

STATE OF CALIFORNIA
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DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND HIGHWAY LIGHTING DETAILS

PULL BOX DETAILS

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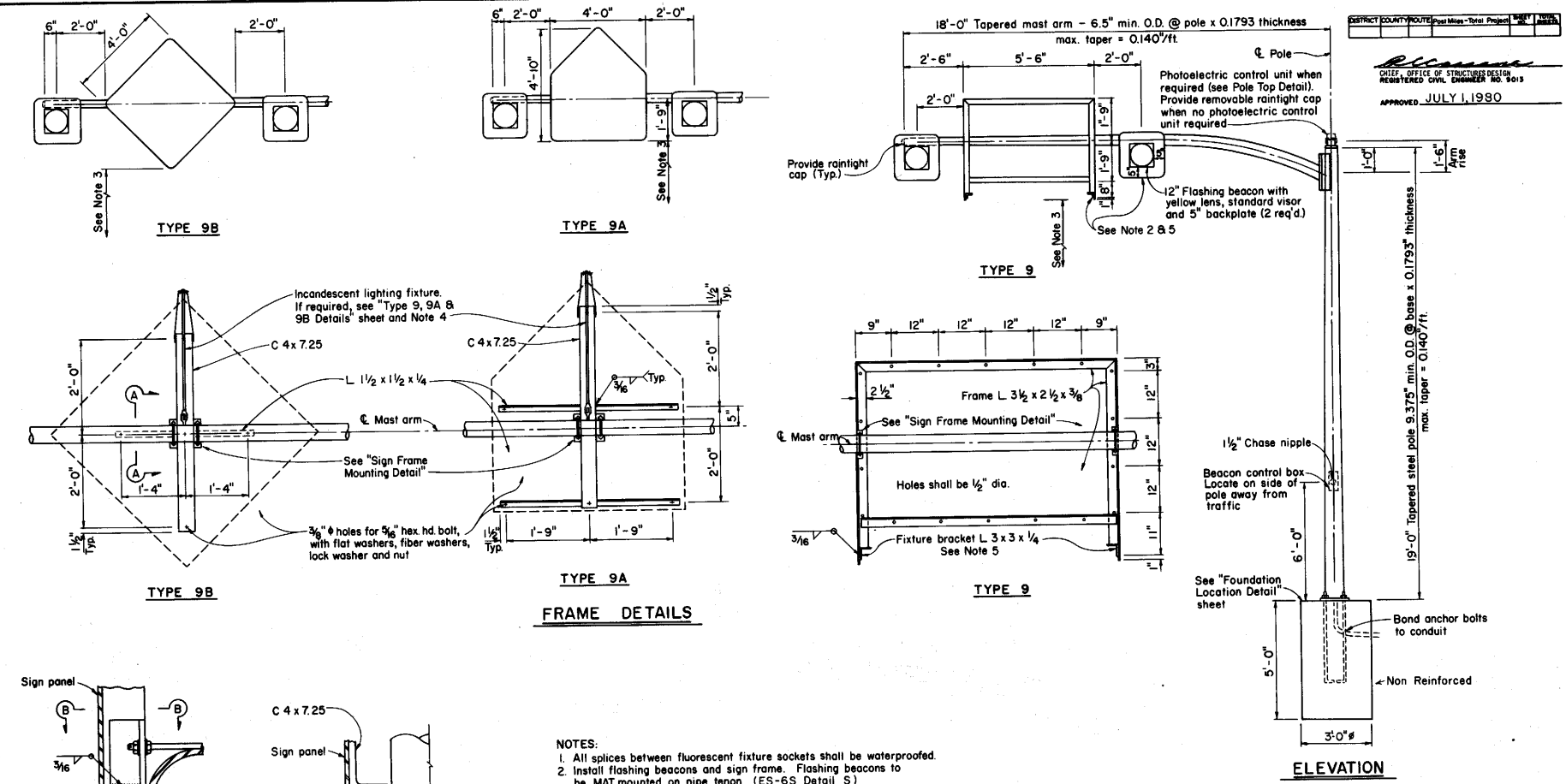

NOTES:

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. (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 "Fluorescent Sign Lighting Equipment (36 inch)" sheet ES-30
6. Anchor bolts shall be A.S.T.M. A-307 .

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

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

APPROVED JULY 1, 1980

STATE OF CALIFORNIA
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DEPARTMENT OF TRANSPORTATION

CANTILEVER FLASHING BEACON DETAILS TYPES 9, 9A, 9B

ES-9A

ES-9A

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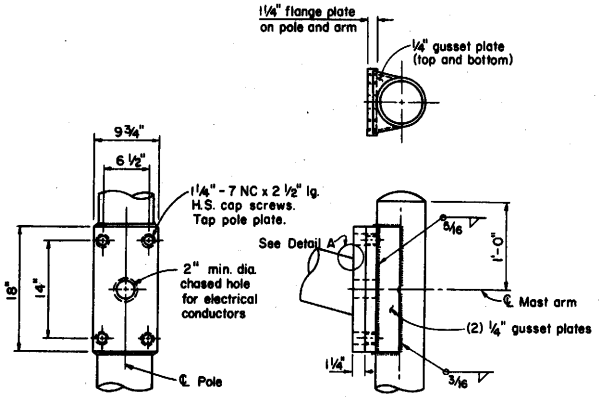
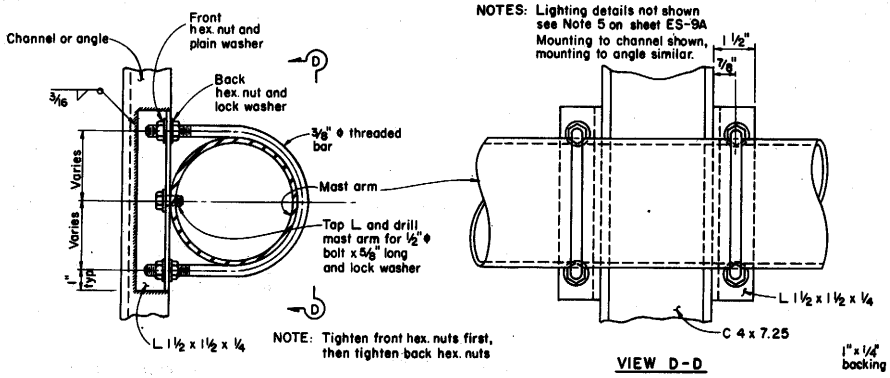
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET	TOTAL SHEETS

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 8015

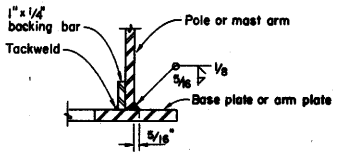
APPROVED JULY 1, 1980



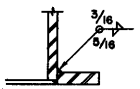
MAST ARM CONNECTION DETAILS



SIGN FRAME MOUNTING DETAILS
ALL TYPES

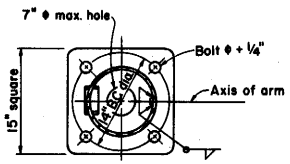


DETAIL A

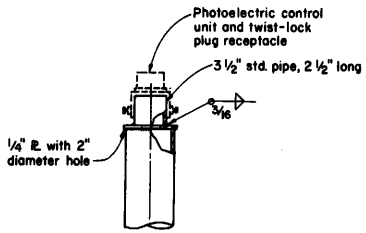


(For Pole-Base Plate only)

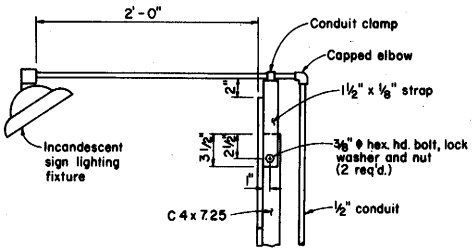
ALTERNATIVE DETAIL A

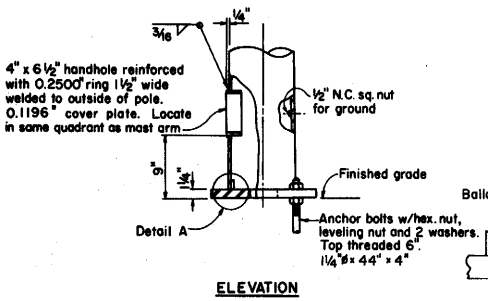


PLAN



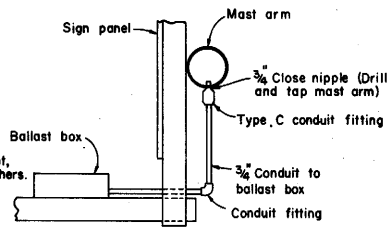
POLE TOP DETAIL



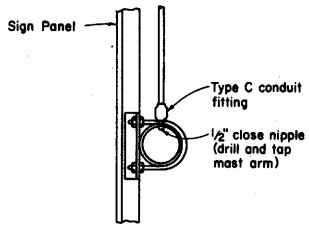


ELEVATION

BASE PLATE AND ANCHORAGE DETAILS



FLUORESCENT LIGHTING FIXTURE
TYPE 9 FRAME



INCANDESCENT LIGHTING FIXTURE
TYPES 9A & 9B
(See Note 4 on sheet ES-9A)

STATE OF CALIFORNIA
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CANTILEVER
FLASHING BEACON DETAILS
TYPES 9, 9A, 9B

ES-9B

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CHIEF OFFICE OF TRAFFIC ENGINEERING
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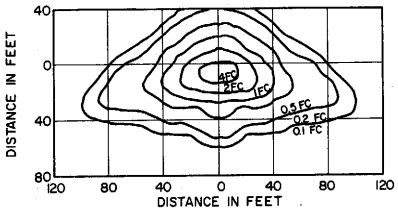
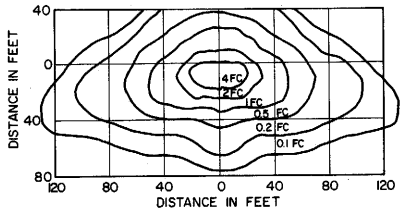
APPROVED JULY 1, 1980

ISOFOOTCANDLE CURVE — MINIMUM



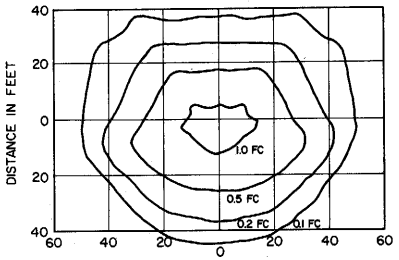
TYPE III MEDIUM SEMI-CUTOFF
Shielded Highway Lighting Luminaire
30' Mounting Height
LAMP OPERATED AT 22,000 LUMENS
200 WATT HIGH PRESSURE SODIUM LAMP ANSI DESIGNATION s66

ISOFOOTCANDLE CURVE — MINIMUM



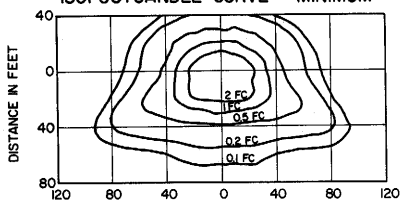
TYPE III MEDIUM SEMI-CUTOFF
Shielded Highway Lighting Luminaire
40' Mounting Height
LAMP OPERATED AT 37,000 LUMENS
310 WATT HIGH PRESSURE SODIUM LAMP
ANSI DESIGNATION s67

ISOFOOTCANDLE CURVE — MINIMUM



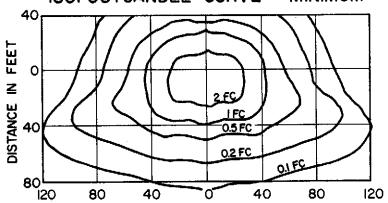
DETAIL "F" SOFFIT LUMINAIRE
17' Mounting Height
LAMP OPERATED AT 5,800 LUMENS
70 WATT HIGH PRESSURE SODIUM LAMP ANSI DESIGNATION s62

ISOFOOTCANDLE CURVE — MINIMUM



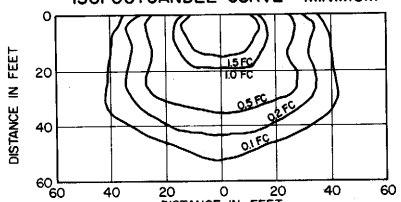
TYPE III MEDIUM CUTOFF
Cutoff Highway Lighting Luminaire
30' Mounting Height
LAMP OPERATED AT 22,000 LUMENS
200 WATT HIGH PRESSURE SODIUM LAMP ANSI DESIGNATION s66

ISOFOOTCANDLE CURVE — MINIMUM



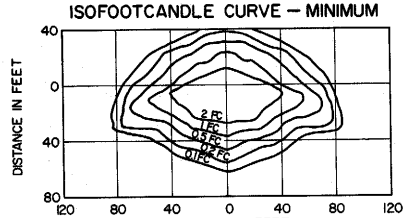
TYPE III MEDIUM CUTOFF
Cutoff Highway Lighting Luminaire
40' Mounting Height
LAMP OPERATED AT 37,000 LUMENS
310 WATT HIGH PRESSURE SODIUM LAMP
ANSI DESIGNATION s67

ISOFOOTCANDLE CURVE — MINIMUM



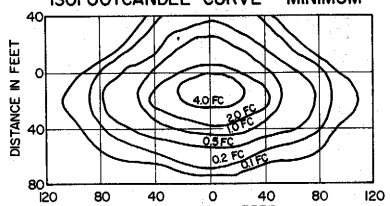
DETAIL "W" WALL LUMINAIRE
15' Mounting Height
LAMP OPERATED AT 9,500 LUMENS
100 WATT HIGH PRESSURE SODIUM LAMP ANSI DESIGNATION s54

ISOFOOTCANDLE CURVE — MINIMUM



TYPE III MEDIUM SEMI-CUTOFF
Shielded Highway Lighting Luminaire
30' Mounting Height
LAMP OPERATED AT 27,500 LUMENS
250 WATT HIGH PRESSURE SODIUM LAMP ANSI DESIGNATION s50

ISOFOOTCANDLE CURVE — MINIMUM



TYPE III MEDIUM SEMI-CUTOFF
Shielded Highway Lighting Luminaire
40' Mounting Height
LAMP OPERATED AT 50,000 LUMENS
400 WATT HIGH PRESSURE SODIUM LAMP ANSI DESIGNATION s51

NOTE: Isolux diagrams show the minimum horizontal foot-candles required.

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TRAFFIC SIGNAL AND HIGHWAY LIGHTING DETAILS
ISOLUX DIAGRAMS

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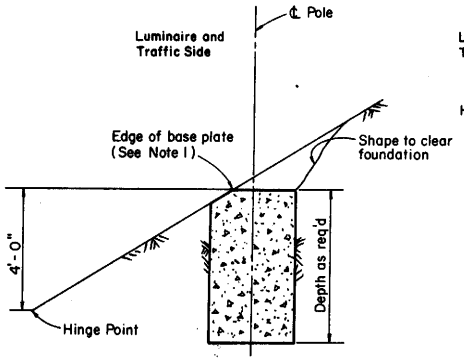
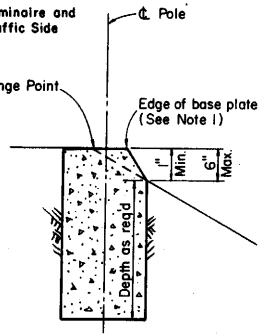
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 11210

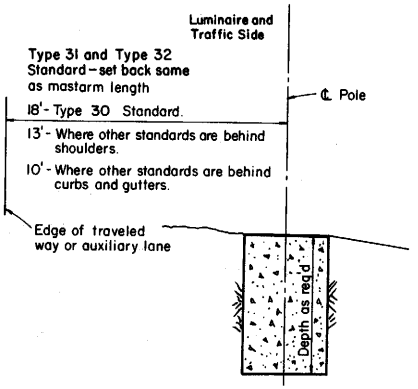
APPROVED July 1, 1980



CUT SLOPES
STEEPER THAN 4:1

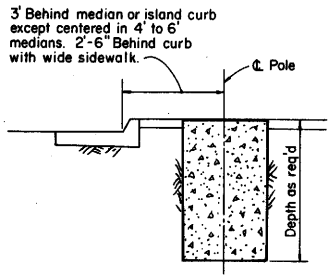


FILL SLOPES
STEEPER THAN 4:1

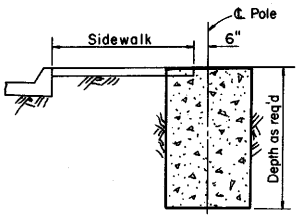


FLAT SECTIONS, CUT OR FILL SLOPES
4:1 OR FLATTER

FOUNDATIONS ADJACENT TO ALL ROADWAYS EXCEPT IN SIDEWALK, MEDIAN AND ISLAND AREAS



MEDIAN, ISLAND
OR WIDE SIDEWALK
(7' WIDE AND WIDER)



NARROW SIDEWALK
(LESS THAN 7' WIDE)

FOUNDATIONS IN SIDEWALK, MEDIAN AND ISLAND AREAS

NOTES:

1. Where a portion of the foundation is above grade the top edges shall have a 1" chamfer.
2. Pull boxes for electroliers and signal standards shall be located at the same station (± 5 feet) as the adjacent electrolier or signal standard.
   Pull boxes shall be placed adjacent to back of curb or edge of shoulder except where this is impracticable, a box may be placed in another suitably protected and accessible location. Pull boxes shall be flush with surrounding grade and shall not be buried.

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TRAFFIC SIGNAL AND HIGHWAY LIGHTING DETAILS
FOUNDATION INSTALLATIONS

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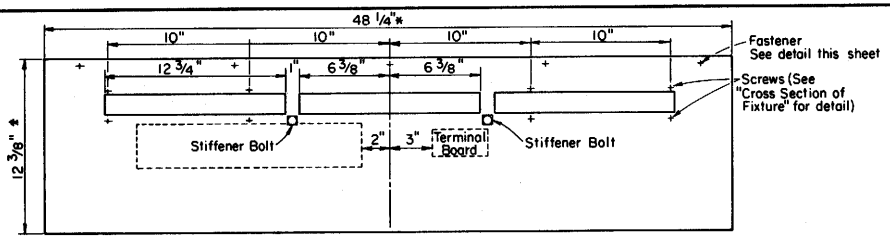
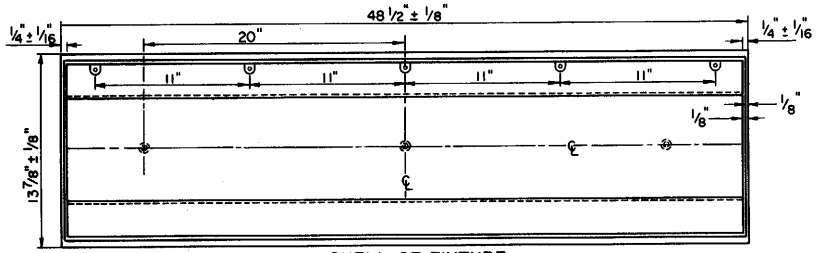


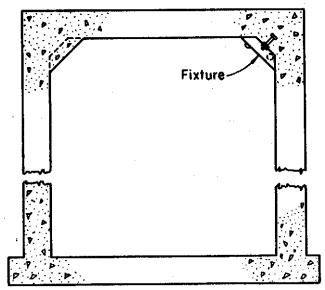
DOOR OF FIXTURE



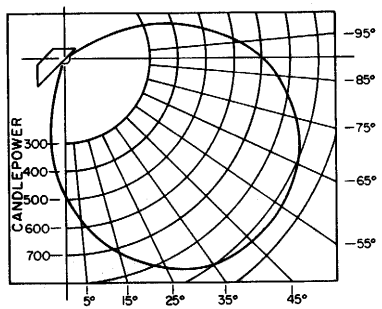
SHELL OF FIXTURE

*Dimensions of door shall vary to fit fixture shell within 1/16" of actual door recess dimensions

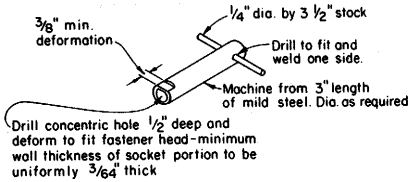
NOTES;
1. The max. tolerance between door and lens shall be 1/64 inch.
2. Casting dimensions of shell are nominal and are subject to such tolerances as are consistant with sound foundry practice.
3. For fixture locations see Highway or Structure Lighting Plan.



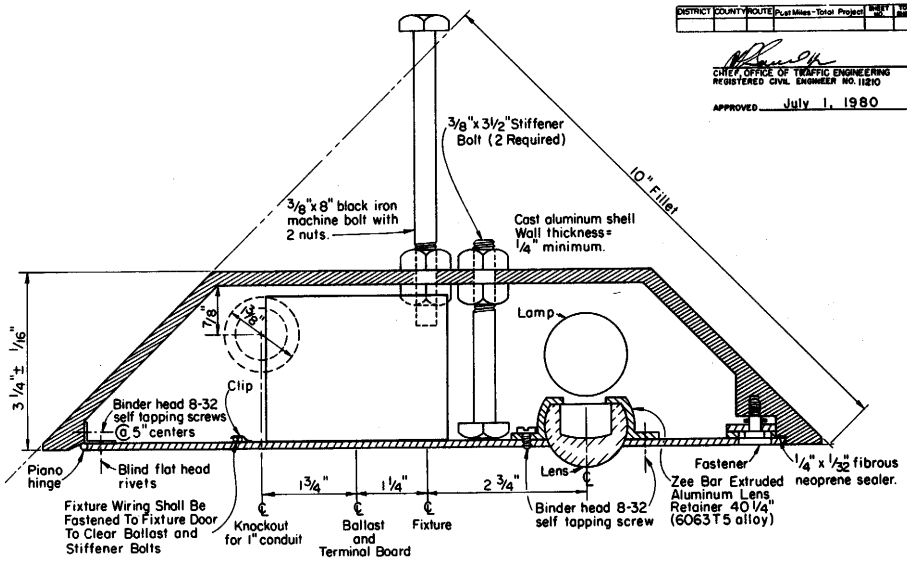
CROSS SECTION OF PEDESTRIAN U.C.



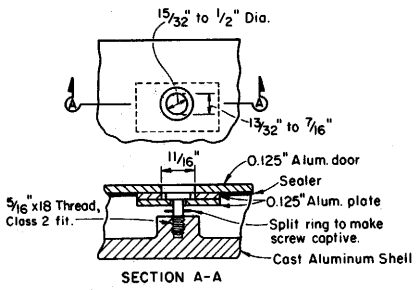
TYPICAL CANDLEPOWER DISTRIBUTION



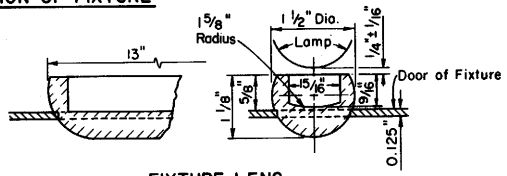
SPECIAL SOCKET WRENCH



CROSS SECTION OF FIXTURE



FASTENER DETAIL



FIXTURE LENS

NOTE:
When fixture shell is installed, stiffener bolts shall be set with about 1/8" clearance between bolt head and door before placing concrete.
When fixture door is mounted, stiffener bolts shall be reset to barely clear inside of fixture door and inside nut shall be tightened.

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

CHIEF, OFFICE OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 11210

APPROVED July 1, 1980

STATE OF CALIFORNIA
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DEPARTMENT OF TRANSPORTATION

PEDESTRIAN UNDERCROSSING
FLUORESCENT
LIGHTING FIXTURE ES-12

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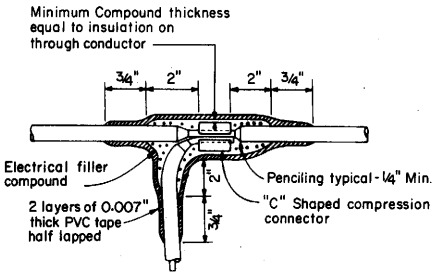
DISTRICT	COUNTY	ROUTE	P.M. Miles - Total Project	SHEET NO.	TOTAL SHEETS

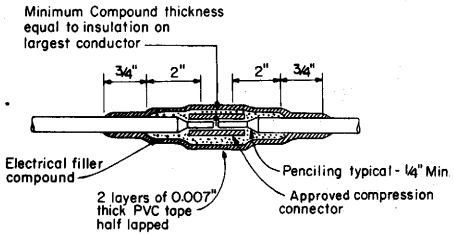
CHIEF, OFFICE OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 11210

APPROVED July 1, 1980



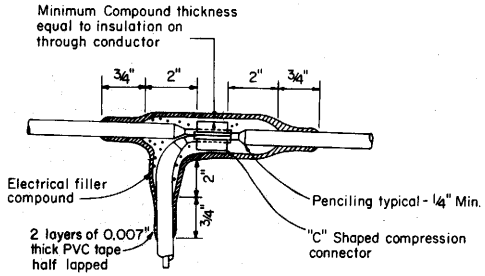
TYPE "C" SPLICE

(Between 1 Free-End and 1 through Conductor)



TYPE "S" SPLICE

(Between 2 Free-Ends)

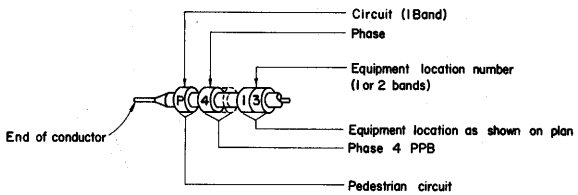


TYPE "T" SPLICE

(For 3 Free-Ends)

GENERAL NOTES

1. All dimensions are minimal.
2. Rubber tapes shall be rolled after application.
3. When PVC tape is used as final layer, paint finished splice with electrical insulating coating.
4. Pressure sleeve type connectors may be used for type "S" and "T" splices.



TYPICAL BANDING OF CONDUCTOR ENDS

INSULATING METHODS

Low Voltage Circuits (0-600 Volts)

METHOD "A"

1. Completely cover the splice with an electrical insulating compound and allow to dry.
2. Apply electrical filler compound and PVC tape as shown.

OR

METHOD "B"

1. Completely cover the splice with an electrical insulating compound and allow to dry.
2. Use 2 layers of electrical insulating pad of minimum thickness of 1/8" each or 2 layers, half lapped, synthetic, oil resistant, self fusing rubber tape.
3. Apply 0.007" thick PVC tape to a thickness equal to original insulation.

High Voltage Circuits (Over 600 Volts)

1. Completely cover the splice with an electrical insulating compound and allow to dry.
2. Apply high voltage tape to a thickness equal to original insulation.
3. Apply 2 layers of PVC tape, half lapped.

LUMINAIRE BALLAST FUSING

Primary lines of multiple ballasts shall be provided with fused connectors. Fuse ratings shall be as noted below.

CIRCUIT VOLTAGE	FUSE VOLTAGE RATING	FUSE CURRENT RATING													
		HPS LAMP BALLASTS							MERCURY LAMP BALLASTS				MULTIPLE TO MULTIPLE TRANSFORMERS		
		70 WATT	100 WATT	150 WATT	200 WATT	250 WATT	310 WATT	400 WATT	175 WATT	250 WATT	400 WATT	700 WATT	1 KVA	2 KVA	3 KVA
120 V	250V	3	3	3	5	6	10	10	3	6	10	10	15	25	30
240V	250 V	3	3	3	3	3	5	5	3	3	5	10	10	15	25
480V	500-600V	3	3	3	3	3	5	5	3	3	5	5	6	6	10

NOTE: Fuses shall be slow-blowing type.

FUSE RATINGS FOR FUSED CONNECTORS

STATE OF CALIFORNIA
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DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND HIGHWAY LIGHTING DETAILS
WIRING DETAILS AND FUSE RATINGS

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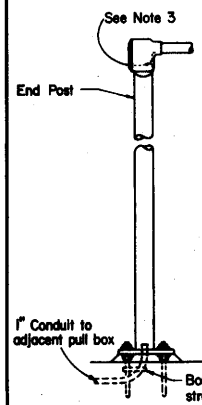
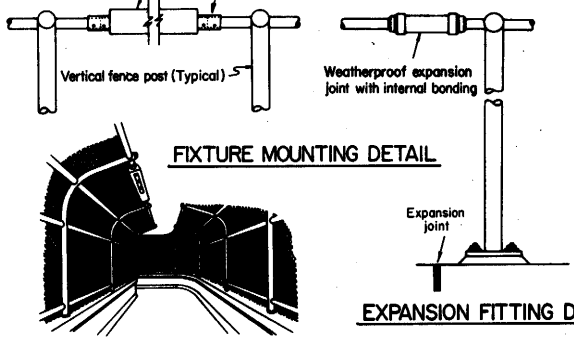
APPROVED JULY 1, 1980



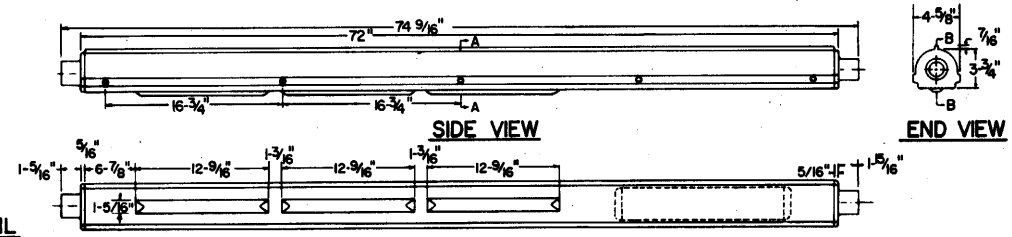
END POST DETAIL



FIXTURE MOUNTING DETAIL

TYPICAL ARRANGEMENT

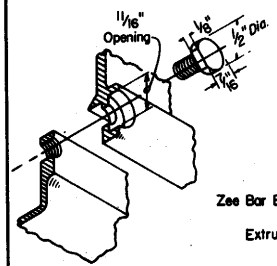
EXPANSION FITTING DETAIL



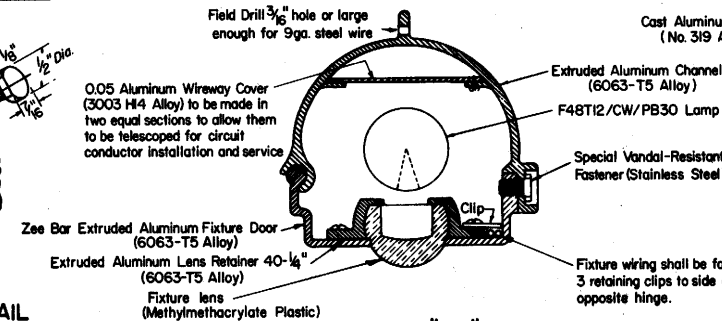
SIDE VIEW

END VIEW

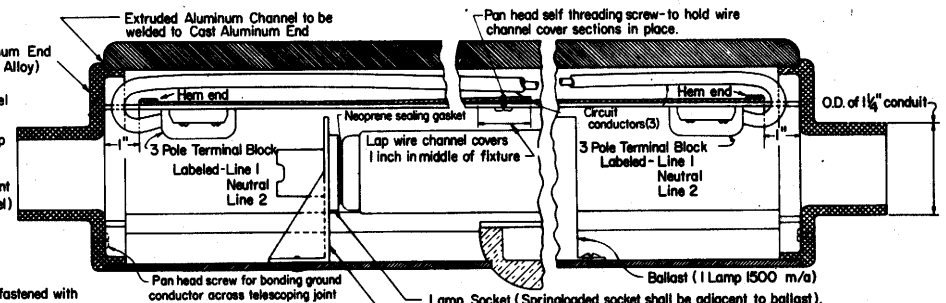
BOTTOM VIEW



FASTENER DETAIL



SECTION "AA"



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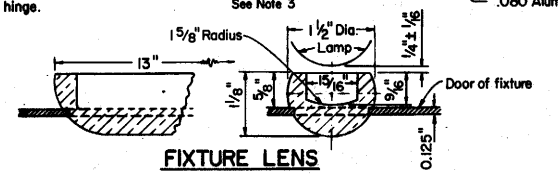
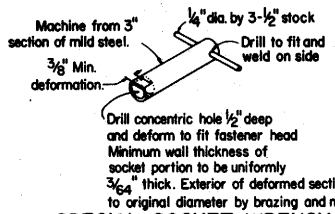
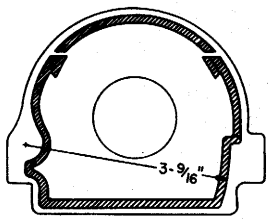


FIXTURE LENS



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 & are subject to such tolerances as are consistant with sound foundry practice.

2 - See sheet for "Chain Link Sidewalls Railing Type 3L" for positioning of light fixture.

3 - Continuous grounding between fixtures and from fixture to end post carrying conductors shall be provided.

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PEDESTRIAN OVERCROSSING
FLUORESCENT
LIGHTING FIXTURE

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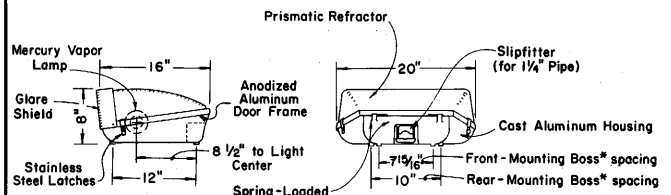
DIST.	COUNTY	ROUTE	POST MILE—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

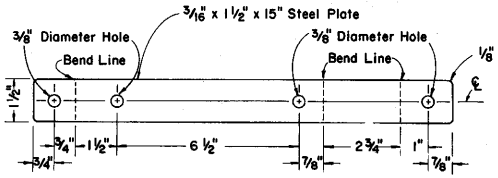
CHIEF, OFFICE OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 11210

DATE APPROVED JULY 1, 1980

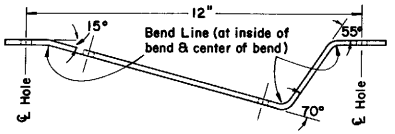


MERCURY SIGN LIGHTING FIXTURE

No Scale



BEFORE BENDING (TOP VIEW)

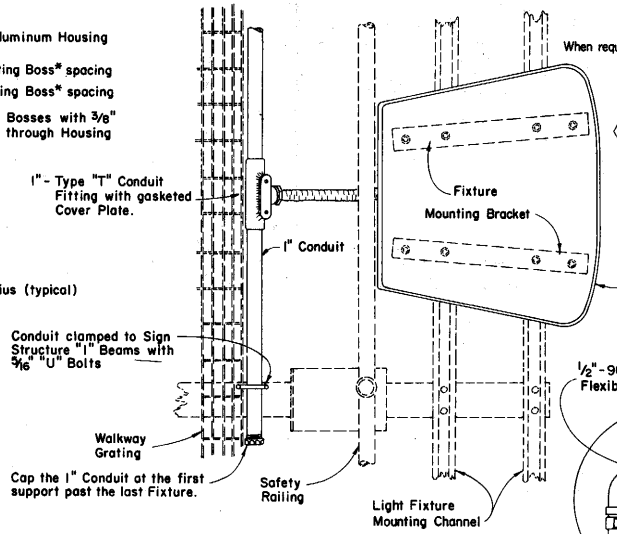


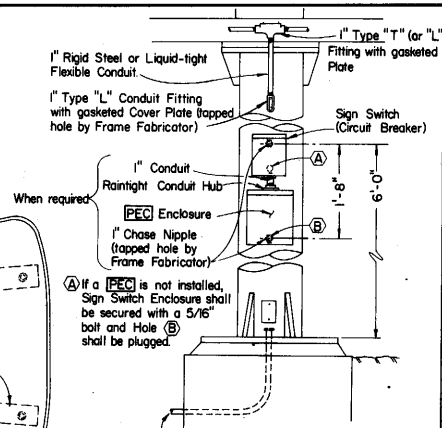
AFTER BENDING (SIDE VIEW)

FIXTURE MOUNTING BRACKET

NOTE: Mounting Bracket shall be either hot dipped galvanized or cadmium-plated.

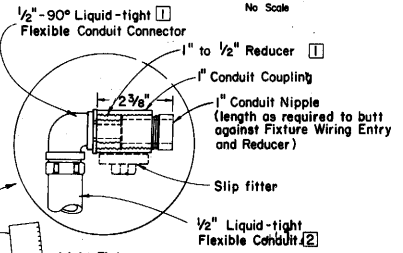
NOTE: In the event the location of the Fixture restricts the proper operation of the Safety Railing, adjustment of the Fixture location shall be as directed by the Engineer.

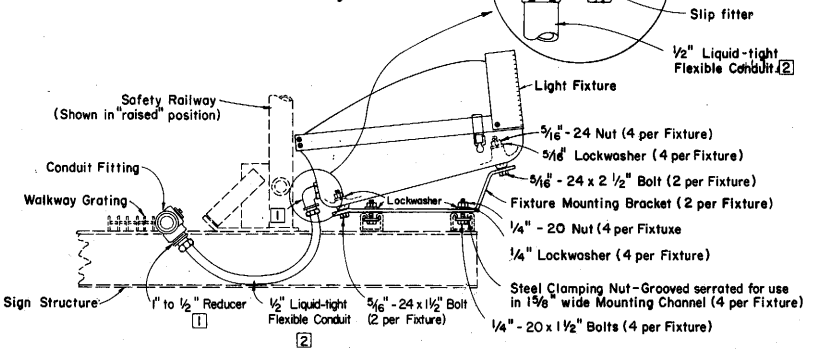




TYPICAL CONDUIT AND SIGN CONTROL INSTALLATION

No Scale





LIGHT FIXTURE MOUNTING DETAIL

No Scale

NOTE: All bolts, nuts, washers and other hardware shall be SAE grade 5 and cadmium plated.

1 Indicates hardware not required on LIGHTWEIGHT type signs.

2 Use 1" liquid-tight flexible conduit on LIGHTWEIGHT type signs and omit loop in conduit.

LENGTH OF PANEL (FEET)	NUMBER OF FIXTURES (EACH)	FIXTURE SPACING (INCHES) SEE NOTE NO. 1	LAMP SIZE (WATTS)	SIGN LOAD (WATTS)
5	1	30	100	131
6		36		
7		42	175	216
8		48		
9		54		
10	2	24:72	100	262
11		26:80		
12		28:88		
13		30:96	175	432
14		36:96		
15		40:100		
16		44:104		
17		48:108		
18		52:112		
19		56:116		
20		60:120		
21		64:124		
22		68:128		
23	3	38:100		648
24		41:103		
25		44:106		
26		47:109		
27		50:112		
28		53:115		
29		56:118		
30		59:121		
31		62:124		
32		65:127		
33	4	39:106		864
34		42:108		
35		45:110		
36		48:112		
37		51:114		
38		54:116		
39		57:118		
40		60:120		
41		63:122		
42		66:124		
43	5	46:106		1080
44		48:108		
45		50:110		
46		52:112		
47		54:114		
48		56:116		

NOTES: 1. The first number listed is the dimension from the edge of the sign panel to the center of the end-most fixture. The second number listed is the dimension between centers of successive fixtures.

2. Where adjacent sign panels are spaced 1' or less the combination of these panels (and spaces) shall be considered a single panel.

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MERCURY SIGN LIGHTING EQUIPMENT

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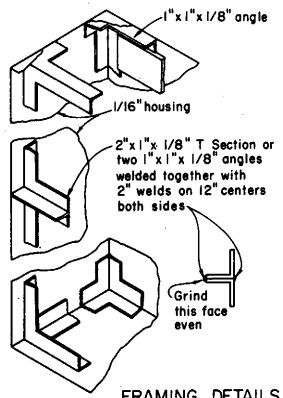
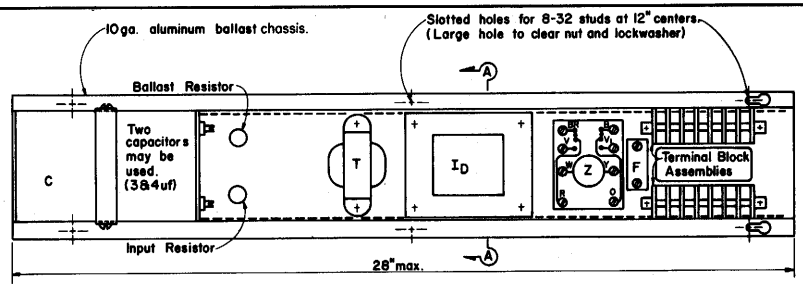
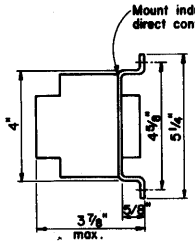


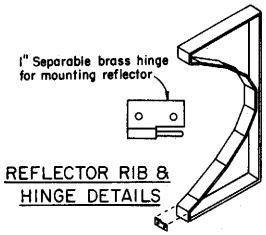
FRAMING DETAILS



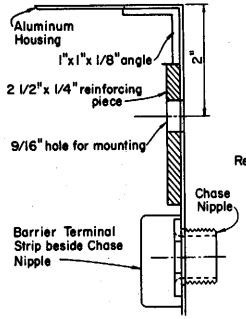
BALLAST CHASSIS COMPONENT LAYOUT



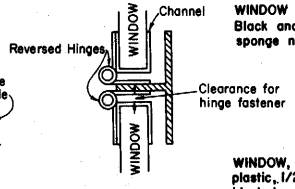
SECTION A-A



REFLECTOR RIB & HINGE DETAILS

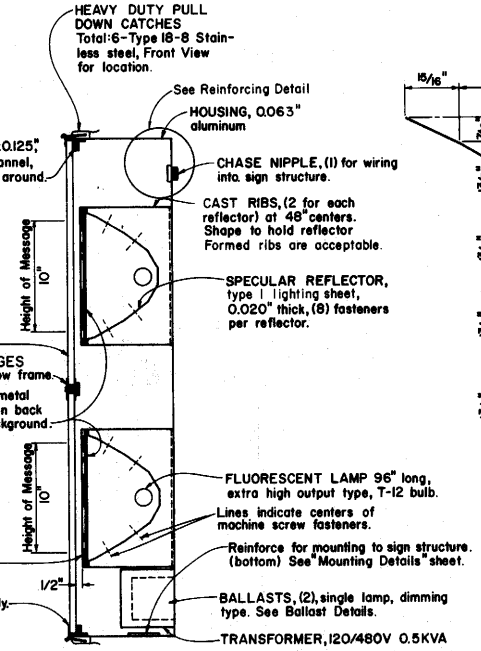


REINFORCING DETAILS

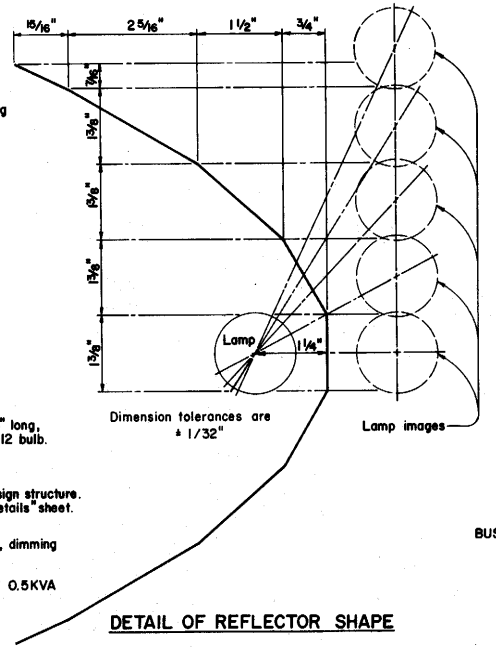


HINGE DETAIL

FRONT VIEW OF SIGN UNIT



CROSS-SECTION OF SIGN



DETAIL OF REFLECTOR SHAPE

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

CHIEF, OFFICE OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 11210

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STATE OF CALIFORNIA
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EXTINGUISHABLE MESSAGE SIGN 10" LETTERS

ES-27A

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

CHIEF, OFFICE OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER No. 11210

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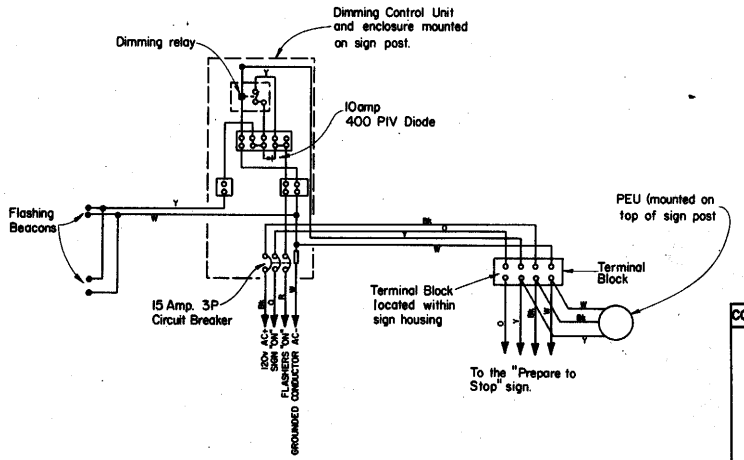
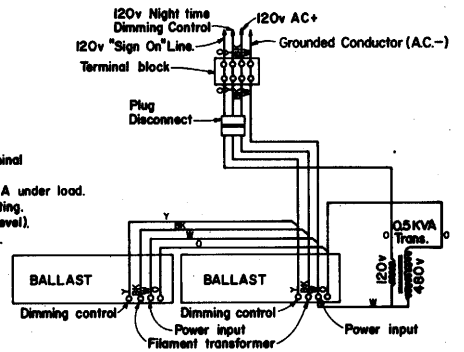


CONTROL CIRCUITS FROM CONTROLLER CABINET

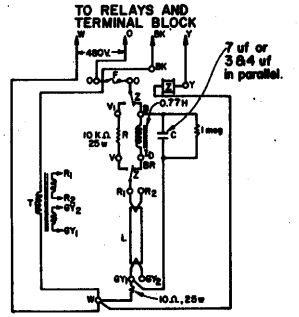
CONDUCTOR COLORS	
R -	Red
O -	Orange
Y -	Yellow
G -	Green
B -	Blue
V -	Violet
BK -	Black
W -	White
BR -	Brown
GY -	Gray

WIRING NOTES & SYMBOLS

- O Indicates point on terminal block (Letter at terminal indicates color of wires terminated there).
- T Heater transformer, windings R & GY, 4.0v at 1.25A under load.
- C Power factor correction capacitor, 660v AC rating.
- R Resistor (Ballast) 30ma. (for nighttime dimmed level).
- I_D Inductor (Ballast) 1400ma. (for daytime high level).
- Z Relay, DPDT, for dimming control (120v Coil)
- F Fuse, 8/10Amp., 250v, 13/32"D x 1 1/2"L, slow-blowing type.



POWER AND CONTROL DIAGRAM



BALLAST WIRING DIAGRAM

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EXTINGUISHABLE MESSAGE SIGN 10" LETTERS

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

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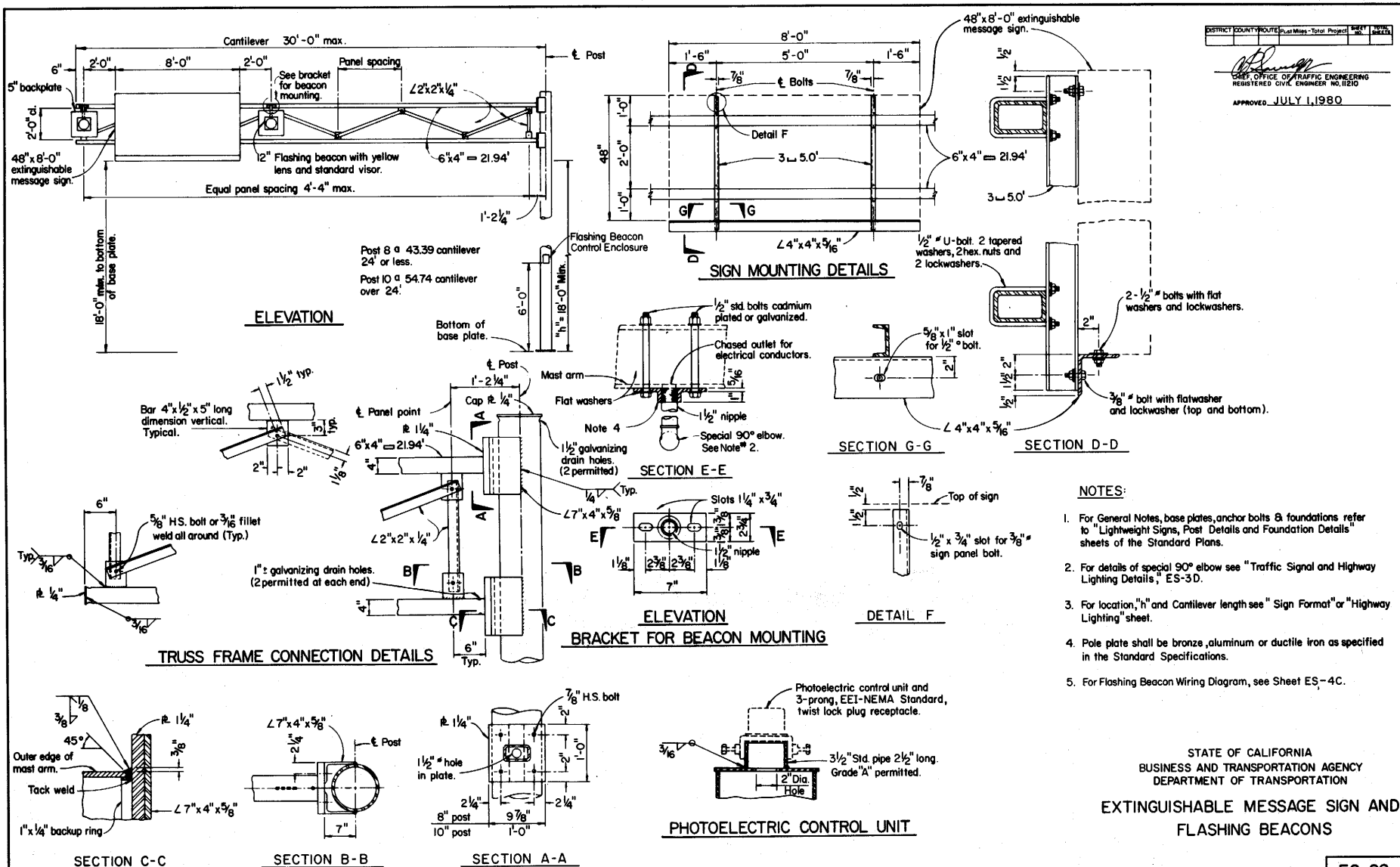
APPROVED JULY 1, 1980



NOTES:

1. For General Notes, base plates, anchor bolts & foundations refer to "Lightweight Signs, Post Details and Foundation Details" sheets of the Standard Plans.
2. For details of special 90° elbow see "Traffic Signal and Highway Lighting Details," ES-3D.
3. For location, "h" and Cantilever length see "Sign Format" or "Highway Lighting" sheet.
4. Pole plate shall be bronze, aluminum or ductile iron as specified in the Standard Specifications.
5. For Flashing Beacon Wiring Diagram, see Sheet ES-4C.

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EXTINGUISHABLE MESSAGE SIGN AND FLASHING BEACONS

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—NOTES—

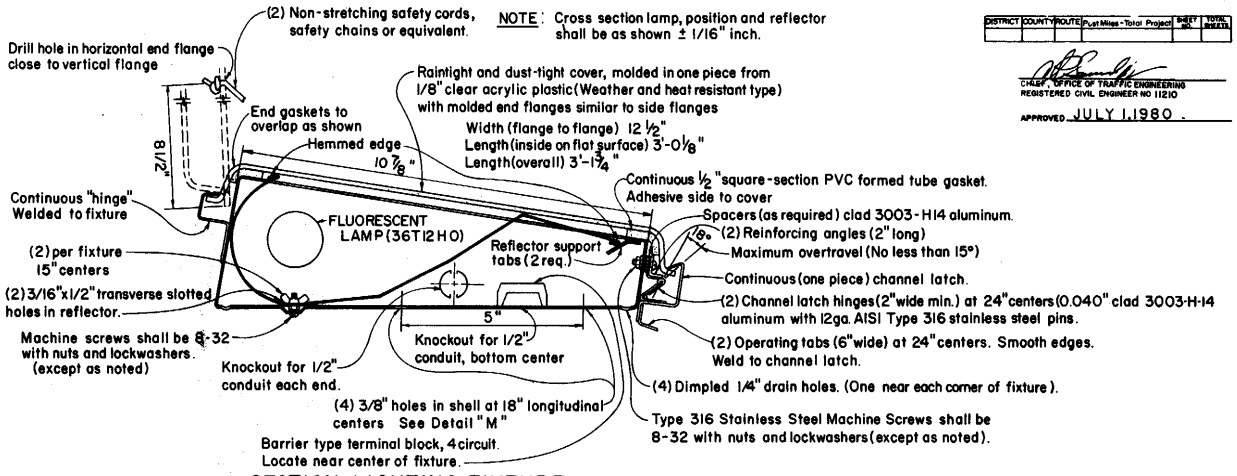
1. Wiring between ballast box and nearest fixture and between fixtures shall be run in 1/2" liquid-tight flexible conduit.
2. Conduit shall be secured to nearest member using one-hole galvanized malleable iron or steel straps at 5 foot maximum centers and brass machine screws tapped into the member.
3. Ballasts and terminal boards shall be marked with legible symbols. Conductors shall be tagged and their identification marked on the corresponding terminal on the terminal board as shown on the Typical Fixture Wiring Diagram.
4. At the option of the Contractor, a cover and gaskets meeting the requirements for the cover of the 72" fluorescent sign lighting fixture (ES-31) may be supplied.
5. Ballasts shall be one, two or three lamp types as required, rated at 800 ma.
6. Each ballast shall be fused with a 1 1/4" x 1/4" slow-blow glass tube fuse.
7. Fuseholder shall be a panel mounted type, with screw type finger knob.
8. At the option of the Contractor, the fixture may be supplied with an integral ballast. The ballast box will not be required when fixtures with integral ballasts are supplied.

NOTE: Cross section lamp, position and reflector shall be as shown ± 1/16" inch.

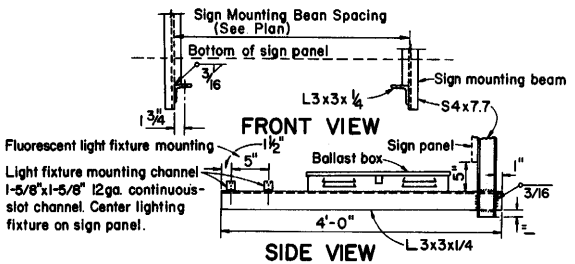
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO 11210

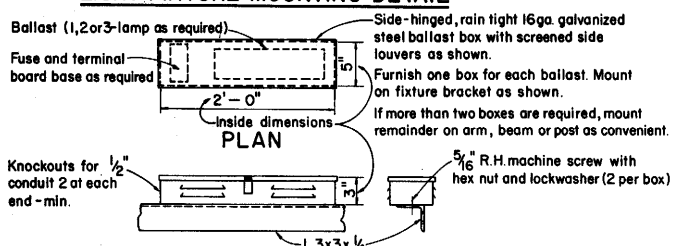
APPROVED JULY 1, 1980



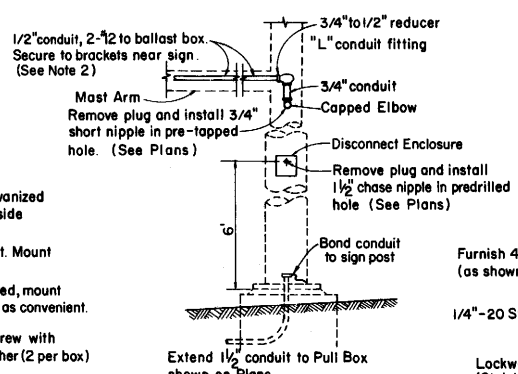
SECTION-LIGHTING FIXTURE



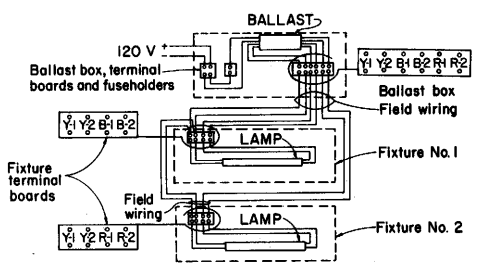
LIGHT FIXTURE MOUNTING DETAIL



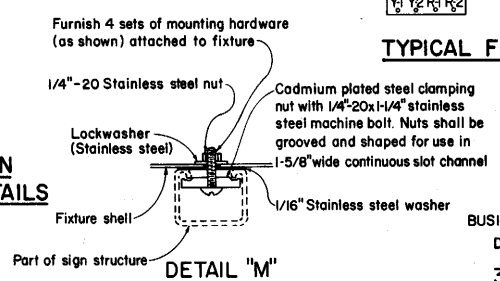
BALLAST BOX DETAILS



TYPICAL WIRING AND SIGN SWITCH INSTALLATION DETAILS



TYPICAL FIXTURE WIRING DIAGRAM (TWO LAMP)



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
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

36" FLUORESCENT SIGN LIGHTING EQUIPMENT

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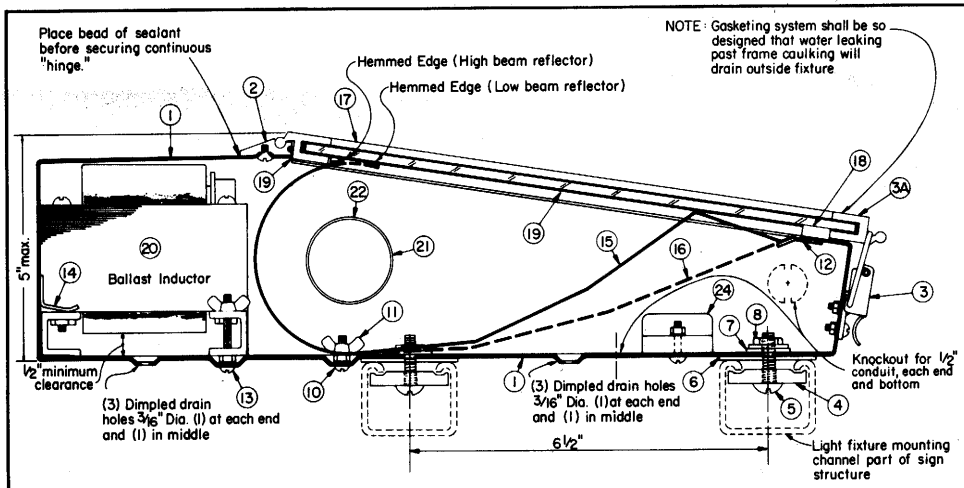
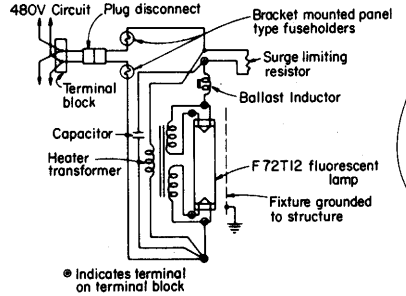
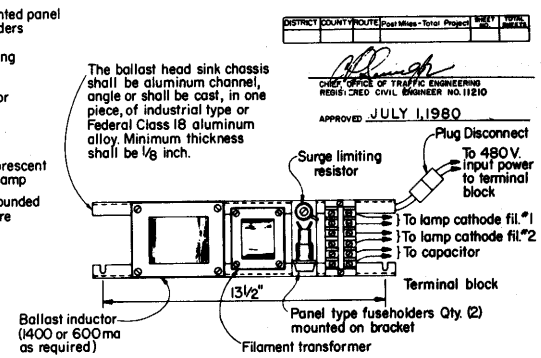


SECTION - LIGHTING FIXTURE



WIRING DIAGRAM



NOTE: Capacitor shall be strapped to housing shell with 1/4 inch clearance between capacitor and bottom of housing shell.

TOP VIEW OF BALLAST

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

CHIEF, OFFICE OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 11210

APPROVED JULY 1, 1980

NOTES

1. Cross section, lamp position and reflector shape shall be as shown ± 1/16".
2. Details of design are typical. Variation may be accepted, if fuctionally equal to details shown.
3. Lower windings of inductor shall be painted with waterproof electrical enamel.

ITEM	PART NAME	QTY.	REMARKS
1.	HOUSING SHELL	1	Max. length 6'-2". Shall have a clean, well finished appearance. No painting reqd.
2.	CONTINOUS "HINGE"	1	Extruded anodized aluminum with soft neoprene strip gasket. Attach to housing shell using 8-32 (min.) mach. screws
	Channel Latch Components		
3	PULL-DOWN CATCH	3	Attach to housing shell using 8-32 (min) mach. screws.
3A	EXTRUDED FRAME	1	All sides
	Mounting Hardware		
4	CLAMPING NUT	6	Cadmium plated steel clamping nut grooved and serrated for use in 1 5/8" wide mounting channel.
5	CLAMPING BOLT	6	1/4-20 x 1 1/4" machine bolt. Install at 34" centers in 3/8" holes in housing shell.
6	BOTTOM WASHER	6	1/16" Washer
7	FLAT AND LOCK WASHERS	6	
8	TIGHTENING NUT	6	1/4-20 Nut
	Reflector Mounting Hardware		
10	STUD, NUT & LOCKWASHER	2	8-32 (min) machine screw.
11	WING NUT	2	8-32 (min) machine screw.
12	SUPPORT TAB	3	0.064" Thick 2" wide at 24" centers.

ITEM	PART NAME	QTY.	REMARKS
	Ballast Mounting Hardware		
13	STUD NUT, LOCKWASHER AND WINGNUT	2	8-32 (min) machine screw. See top views.
14	RETAINING CLIP	2	0.064" Thick 1" wide each end of ballast channel. Weld to housing.
	Reflectors		
15	HIGH-BEAM	1	0.020" (min) thickness, length = 69". Use for signs over 70" in vertical dimension. Transverse slotted holes (3/16" X 1/2") for reflector studs.
16	LOW-BEAM	1	0.020" (min) thickness, length = 69". Use for signs 70" and smaller in vertical dimension. Traverse slotted holes (3/16" X 1/2") for reflector studs.
17	COVER	1	1/8" clear acrylic plastic (weather & heat resistant type)
18	LONGITUDINAL GASKET	2	Continuous 1/2" square-section PVC formed tube. Adhesive side to cover.
19	END GASKET	2	Continuous 1/2" square-section PVC formed tube. Adhesive side to cover.
20	BALLAST & CAPACITOR	1	Locate at center of housing.
21	LAMPHOLDER	2	Mount on end of housing using gasketed sealing washers & machine screws.
22	LAMP	1	
23	FOLDING COVER SUPPORT ARMS	2	Locking type. Each end on outside (not shown).
24	FIELD WIRING TERMINAL BLOCK	1	Secure to housing shell with studs, nut & lockwasher at one end.

BALLAST DATA (480-Volt)

Component	Low Beam Fixture (600ma)(100w)	High Beam Fixture (1400ma)(190w)
Inductance	1.70H (±10%)	0.77H (±10%)
Capacitor	3 µf	7 or 8 µf
Heater Transformer	480/3.6V (±10%) at 1.25A for each secondary winding.	
Fuse 13/32" X 1 1/2" Slow-Blowing Type	1A	2A
Surge Limiting Resistor	25Ω @ 10 watts min	10Ω @ 20 watts min

FUSE DATA
120/240-VOLT BALLASTS

	120-V	240-V
HIGH BEAM 1500 MA	5A	3A
LOW BEAM 800 MA	3A	2A

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

72" FLUORESCENT SIGN LIGHTING EQUIPMENT

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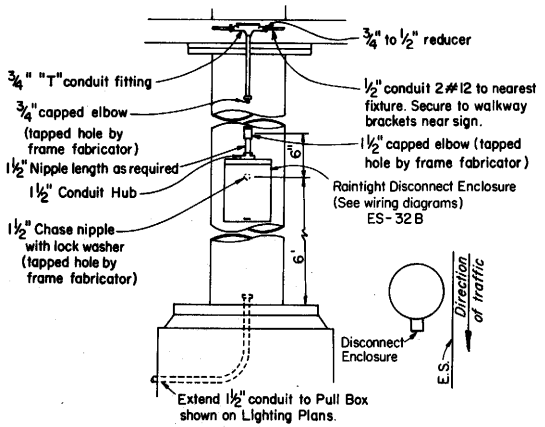
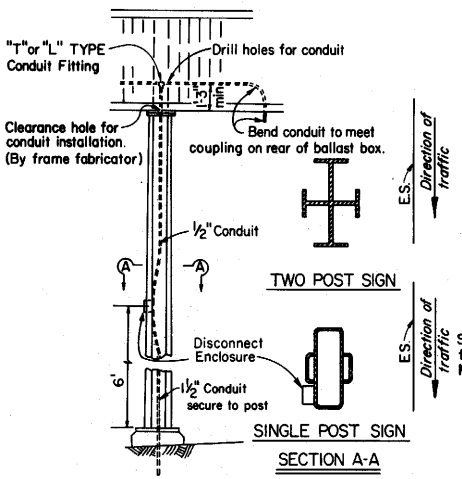
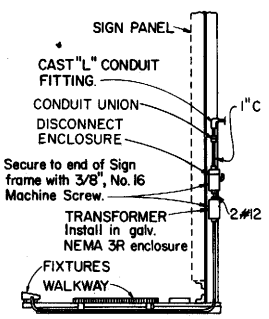


TYPICAL CONDUIT AND SIGN CONTROL INSTALLATION FOR ROUND POST



TYPICAL CONDUIT AND SIGN CONTROL INSTALLATION FOR BEAM POST

Looking at approaching traffic



TYPICAL DETAIL BRIDGE MOUNTED SIGN

SERIES TO MULTIPLE TRANSFORMER SIZES

NUMBER OF FIXTURES		TRANSFORMER SIZE. (VA)
HIGH BEAM	LOW BEAM	
–	1	125
1	2	250
–	3	350
2	4	500
3	5-6	700
4	7-8	900
5	9-10	1100
6	11-12	1300
7	13-14	1500

MULTIPLE TO MULTIPLE TRANSFORMER SIZES

NUMBER OF FIXTURES		TRANSFORMER SIZE. (KVA)
HIGH BEAM	LOW BEAM	
1-4	1-7	1
5-9	8-16	2
10-14	17-24	3

INSTALLATION DATA FOR 72" SIGN LIGHTING FIXTURE WITH INTEGRAL BALLASTS

LENGTH OF PANEL (FEET)	NUMBER OF FIXTURES (EA)	CONSECUTIVE SPACING FROM LEFT EDGE OF PANEL TO CENTER OF FIXTURES (INCHES)	480V SIGN LOAD (WATTS)		120V OR 240V SIGN LOAD (WATTS)	
			HB Fixture Panel Height 80-120 Inches	LB Fixture Panel Height 40-70 Inches	HB Fixture Panel Height 80-120 Inches	LB Fixture Panel Height 40-70 Inches
10	1	60	195	106	200	140
11	1	66	195	106	200	140
12	2	36.5 74	390	212	400	280
13	2	39 78	390	212	400	280
14	2	42 84	390	212	400	280
15	2	45 90	390	212	400	280
16	2	47.5 97	390	212	400	280
17	2	51 102	390	212	400	280
18	3	36.5 74 74	585	318	600	420
19	3	38 76 76	585	318	600	420
20	3	40 80 80	585	318	600	420
21	3	42 84 84	585	318	600	420
22	3	44 88 88	585	318	600	420
23	3	46 92 92	585	318	600	420
24	4	36.5 74 74 74	780	424	800	560
25	4	37.5 75 75 75	780	424	800	560
26	4	39 78 78 78	780	424	800	560
27	4	40.5 81 81 81	780	424	800	560
28	4	42 84 84 84	780	424	800	560
29	4	43.5 87 87 87	780	424	800	560
30	4	45 90 90 90	780	424	800	560
31	5	38 74 74 74 74	975	530	1000	700
32	5	38 77 77 77 77	975	530	1000	700
33	5	40.5 79 79 79 79	975	530	1000	700
34	5	42 81 81 81 81	975	530	1000	700
35	5	42 84 84 84 84	975	530	1000	700
36	5	44 86 86 86 86	975	530	1000	700
37	6	37 74 74 74 74 74	1170	636	1200	840
38	6	38 76 76 76 76 76	1170	636	1200	840
39	6	39 78 78 78 78 78	1170	636	1200	840
40	6	40 80 80 80 80 80	1170	636	1200	840
41	6	41 82 82 82 82 82	1170	636	1200	840
42	6	42 84 84 84 84 84	1170	636	1200	840
43	7	36.5 74 74 74 74 74	1365	742	1400	980
44	7	37 75 76 76 76 75	1365	742	1400	980
45	7	39 77 77 77 77 77	1365	742	1400	980
46	7	39 79 79 79 79 79	1365	742	1400	980
47	7	39 81 81 81 81 81	1365	742	1400	980

NOTE:

If the length of sign panel is not listed in the table, the number of fixtures to be provided shall be the number specified for the next larger increment of panel length in the table. Spacing of fixtures shall be as designated by the Engineer.

NOTES

1. Wiring between fixtures shall be run in 1/2" liquid tight flexible metal conduit.
2. Flexible conduit shall be secured to the nearest walkway bracket using one-hole galvanized malleable iron or steel straps and brass machine screws tapped into the bracket.
3. See Standard Plans for Overhead Signs and Frame Juncture Details for photoelectric unit installation.

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

CHIEF, OFFICE OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 11210

APPROVED July 1, 1980

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

FLUORESCENT SIGN LIGHTING EQUIPMENT

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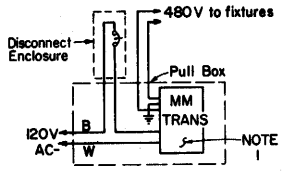
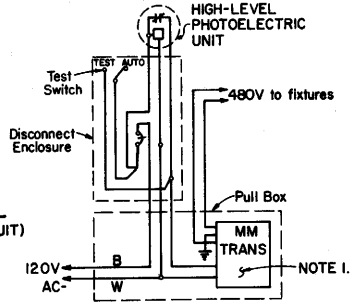
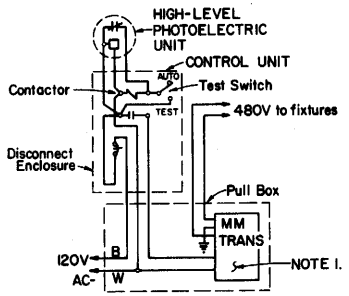


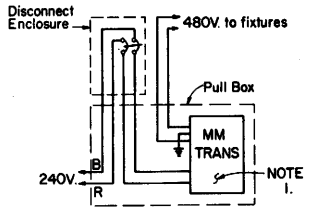
TYPE SC-1 SIGN CONTROL
(FOR 120-VOLT SWITCHED SIGN CIRCUIT)



TYPE SC-2 SIGN CONTROL
(FOR 120-VOLT UNSWITCHED SIGN CIRCUIT)



TYPE SC-3 SIGN CONTROL
(FOR 120-VOLT UNSWITCHED SIGN CIRCUIT)

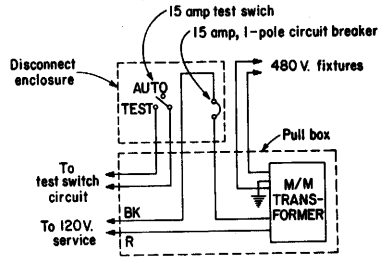


TYPE SC-4 SIGN CONTROL
(FOR 240-VOLT SWITCHED SIGN CIRCUIT)

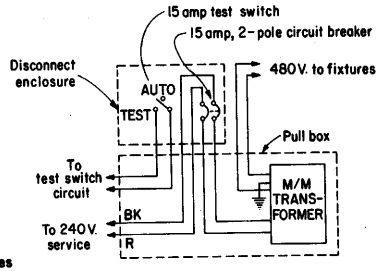
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 11210

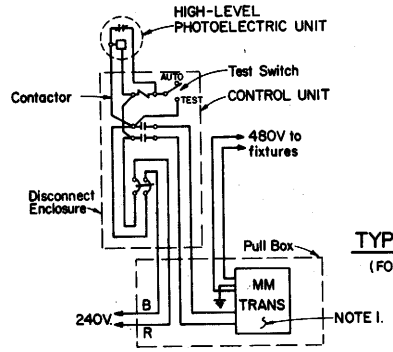
APPROVED July 1, 1980



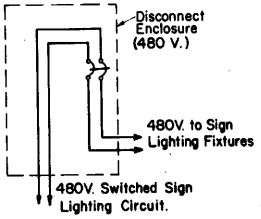
TYPE SC-9 SIGN CONTROL
(FOR 120-VOLT SWITCHED SIGN CIRCUIT)



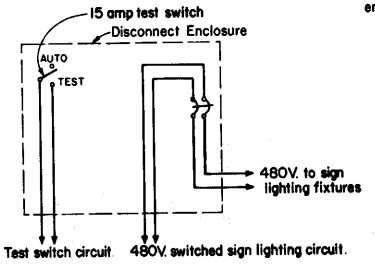
TYPE SC-8 SIGN CONTROL
(FOR 240-VOLT SWITCHED SIGN CIRCUIT)



TYPE SC-5 SIGN CONTROL
(FOR 240-VOLT UNSWITCHED SIGN CIRCUIT)



TYPE SC-6 SIGN CONTROL
(FOR 480-VOLT LIGHTING CIRCUIT)



TYPE SC-7 SIGN CONTROL
TO BE MOUNTED ON SIGN STRUCTURE

NOTES:

1. Unless otherwise shown, multiple-multiple transformers are not required where 120-volt circuits are to supply 120-volt ballasts or where 240-volt circuits are to supply 240-volt ballasts.
2. Where sign lighting load is less than 2.5Kw., No. 12 conductors may be installed between the circuit breaker and adjacent pull box.

CIRCUIT BREAKER SIZES

NUMBER OF FIXTURES		SIZE (AMPERES)		
HIGH BEAM	LOW BEAM	120V	240V	480V
1 - 4	1 - 7	15	15	15
5 - 9	8 - 16	20	15	15
10 - 14	17 - 24	30	15	15

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

FLUORESCENT SIGN LIGHTING EQUIPMENT

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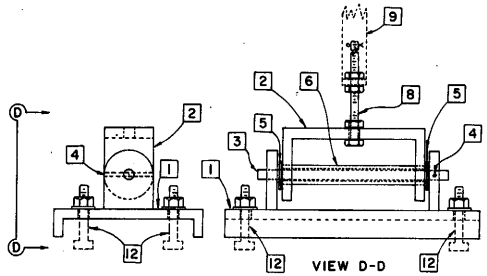
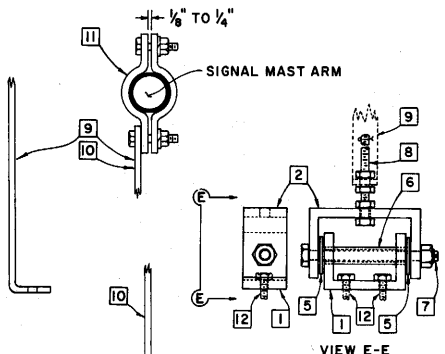
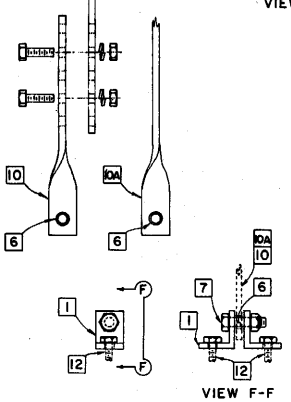
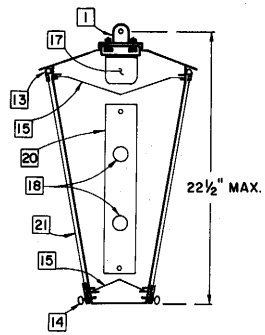
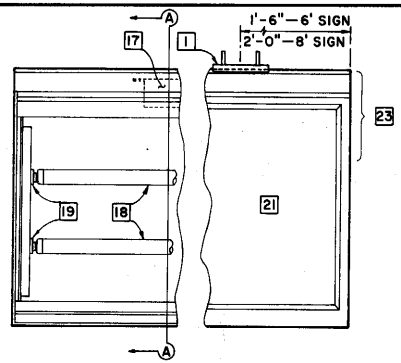




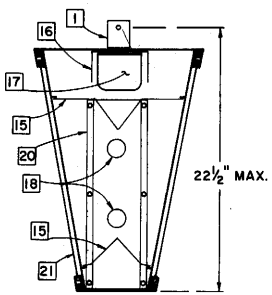


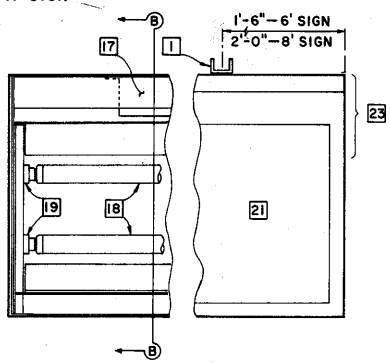
MOUNTING ASSEMBLY OPTIONS



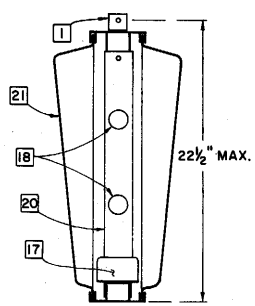


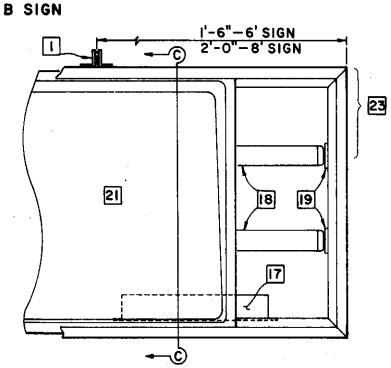
TYPE A SIGN



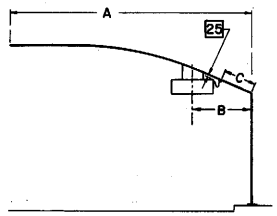


TYPE B SIGN



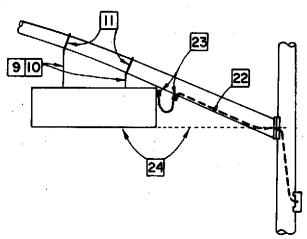


TYPE C SIGN



A	B 6' SIGN	B 8' SIGN	C
15	5'-2"	6'-2"	1'-3"
18	5'-3"	6'-3"	1'-4"
20	5'-3"	6'-3"	1'-4"
25	9'-1"		5'-6"
30	9'-6"	10'-6"	6'-0"
35	10'-6"	11'-6"	7'-0"
40	12'-6"	13'-6"	9'-0"
45	12'-6"	13'-6"	9'-0"

SIGN PLACEMENT



SIGN MOUNTING

CHIEF, OFFICE OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 11210

APPROVED JULY 1, 1980

NOTES

1—LOWER MOUNTING ASSEMBLY, WITH GASKET.
2—UPPER MOUNTING ASSEMBLY.
3—ROD, 1/2-INCH, STAINLESS OR PLATED STEEL.
4—LOCKING PIN, STEEL.
5—FLAT WASHER, STAINLESS STEEL.
6—BUSHING, BRONZE.
—FULL LENGTH
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.

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION
INTERNALLY ILLUMINATED STREET NAME SIGN

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