

## **SECTION 18 – BRIDGE SEISMIC RETROFIT AND STRENGTHENING**

### **INTRODUCTION**

The purpose of a Seismic Retrofit project is to modify a bridge to survive a seismic event that could otherwise cause it to fail catastrophically. A Bridge Strengthening project is designed to increase the “Permit Load” of a given structure, usually steel. This is the maximum vehicular load the structure is allowed to carry without potential damage. Bridge Strengthening and Retrofits use three types of materials: reinforced concrete, structural steel and composites. These additions could be as simple as bearing seat extensions, cable restrainers, column wraps and shear keys, to the more complex work of adding piles to existing abutment or bent foundations. It is possible to have retrofit/strengthening work occurring concurrently on the same steel structure.

Memo to Designers 20-4 “SEISMIC RETROFIT GUIDELINES FOR BRIDGES IN CALIFORNIA” provides requirements and guidelines for bridge seismic retrofitting policies and procedures used by Caltrans. Bridge Design Aids Section 14-5 “EXAMPLE SEISMIC RETROFIT DETAILS” was created to support those guidelines with basic details. However, these examples are intended for illustration purposes only and significant modification may be required for them to be applied to a specific structure.

The detailer will need to create current as-built base drawings that reflect all modifications to the structure, to truthfully illustrate the existing bridge as it is today.

There are two ways to do this:

1. Access the BIRIS System to retrieve “as-built” plans you can use to draw dimensionally correct base details for your bridge. For bridges with steel superstructures, look for “Shop Plans”. These are highly detailed fabrication drawings that dimension and locate every piece of steel used.

2. You can use existing Microstation .dgn drawings of your project bridge, if available, from the Falcon Document Management System. These may need to be adjusted to suit your current circumstance; levels, line fonts, weights and colors. Verify the drawing accuracy. If the Microstation source .dgns are not AS-BUILT records, you will need to update them based on Biris System As-builts. If updates are necessary, you will still see significant time saving over starting from scratch. Check existing details for compliance with current practices and standards.

Strengthening and Retrofit details will be applied to most of the existing plan types, Abutments, Bents, Typical Sections, Girder Layouts and related Sections/Elevations. Refer to these sections of BRIDGE DESIGN DETAILS as required. Drawing scale plays an important role in modification detailing. The detailer must determine what scale gives the best results. Look at the smallest item to be shown, usually fasteners, to determine what depth of detail is required. It may not be necessary to show fully detailed bolts/nuts when a hole or a drill-point symbol can suffice. In some cases, the Engineer may want to show the “Grip” dimension of bolts shown in section. See BDD 18 Figure 18-11.4. Dimensioning may control scale, so be aware of minimum dimensions to be shown.

The detail examples that follow show retrofit strategies that have been used previously. However, these details are not meant to limit the creativity of the designer or detailer. Each bridge retrofit is potentially unique, as the examples of past retrofits will demonstrate.

## HISTORY

The 1971 San Fernando earthquake was one of the most important in the development of modern seismic design and retrofitting practices for bridges. This Magnitude 6.7 earthquake of February 9, 1971 at 6:07 am caused 53 deaths and an estimated damage of nearly \$1 billion in 1971 dollars.

The Loma Prieta earthquake of October 17, 1989 at 5:04 pm, pacific daylight time, occurred near three large modern cities-San Jose, San Francisco and Oakland. This Magnitude 7.1 earthquake was felt from Los Angeles north to the Oregon State line, and east to western Nevada. It was the largest to occur in the San Francisco Bay area since the great San Francisco earthquake of 1906.

The Northridge earthquake of January 17, 1994, occurred at 4:31 am and resulted in about 65 deaths and over 5,000 injuries. This magnitude 6.7 earthquake strongly affected the northern parts of Los Angeles and the San Fernando Valley and surrounding areas in southern California. It was the most costly single natural disaster in the history of the United States. Damage estimates are in the range of \$20 billion. This earthquake caused serious damage and failures to critical transportation systems, widespread disruption of utilities and other lifelines.

Future earthquakes in California are inevitable. They represent a clear and continuing danger to our population and economy. Every Californian is affected by the occurrence of a major earthquake, whether expressed as direct damage, indirect loss of utilities, increased taxation, or reduced economic activity. Recent scientific research tells us that there is a high probability of a major earthquake in both Southern and Northern California.

The earthquakes above and others, caused the development of, and continue to drive the most ambitious public safety program ever devised.

Caltrans and The Office of Earthquake Engineering are dedicated to protecting the traveling public by providing new bridge design and retrofit practices that are 'state-of-the-art'. The following details and examples will give the Structural Design Technician the guidance to produce clear and concise retrofit contract plans.

## **GUIDELINES FOR SEISMIC RETROFITS**

**18.1.0 GENERAL PLAN** See “GENERAL PLAN” Section 3 of Bridge Design Details.

The “GENERAL PLAN” is the sheet where all retrofit locations and types are shown. There is a ‘Legend’ with symbols defining the various types. It may be difficult to show any significant level of detail on the ‘PLAN VIEW’ as most retrofit work is done inside the cells of the superstructure, which requires the use of dashed line-work. The ‘ELEVATION’ view is the choice for most of the work pertaining to the columns or footings. The ‘TYPICAL SECTION’ should be taken in an advantageous location to aid in showing the most information possible, but this may cause the ‘TYPICAL SECTION’ to be less typical and more specific. If this is the case, use a section-cut identifier to locate the section and label accordingly.

There are many configurations and combinations of retrofit methods. Depending on scale, these could be shown as simple graphic representations, or symbols that refer back to a ‘LEGEND’ for a verbal description. Generally a retrofit project doesn’t change the ‘foot-print’ of a bridge unless there are foundation modifications. However, there is the ultimate retrofit, a total bridge replacement based on seismic criteria. Engineers have done detailed analysis and have deemed the existing structure is too costly to bring up to current seismic standards by retrofit. The project may become a ‘replace’ or new structure, using stage construction practices. For ‘GENERAL PLAN’ examples see, BDD Figure 18-3.1 and 3.2.

There may be additional work on the bridge deck. This work could include adding manholes for permanent access to the interior of the structure, joint seal work, barrier rail up-grades, overlays, etc. This would create a need for lane shifts or closures. The District will provide traffic handling plans. Check with your designer for the location of Temporary Railing, (TYPE K), for more information on the use of Temporary Railing, (TYPE K), see BDD 17.1.0 and Figure 17-13 and 17-15.

### **18.1.1 DEPENDENT DIMENSION AND USE OF THE PLUS/MINUS SYMBOL**

The following is excerpted from MEMOS TO DESIGNERS 9-1:

*“Whenever work entails modifications of an existing structure or is tied to an existing structure for layout, it is important to account for possible dimensional discrepancies between the actual existing structure and the as-built plans for that structure.*

*To accomplish this, all dimensions of the new work that are dependent on the dimensions of the existing structure (dimensions which tie to any feature of the existing structure) shall be indicated as approximate by the addition of a  $\pm$  (plus/minus symbol) following that dependent dimension. The dependent dimensions shown on the plans must be sufficient to enable quantity calculations for both PS&E and bidding purposes and must reflect the accuracy to which the dimensions of the existing structure are known. However, the Contractor must be made responsible for field measuring the existing structure before commencing work. The Microstation cell “verify” from the most current release of the “stcel.cel” (US Customary Units) library shall be used for this purpose and shall be placed on and only on sheets of plans where the work to be performed is dependant on his determining the controlling field dimensions.”*

**NOTE:  
THE CONTRACTOR SHALL VERIFY ALL  
CONTROLLING FIELD DIMENSIONS  
BEFORE ORDERING OR FABRICATING  
ANY MATERIAL.**

Suggested placement of the above cell is at the lower right hand corner or bottom edge near the title block of the subject plan sheet. The plus/minus symbol is available on your keyboard as an alternate keystroke in Microstation. See BDD Figure 18-3.1, 3.2 and others for the use of plus/minus dimensions.

### **18.2.0 DECK CONTOURS.** See Section 4 of Bridge Design Details

Deck Contours are not required on retrofit projects. Confirm with your designer.

**18.3.0 FOUNDATION PLAN** See “FOUNDATION PLAN” Section 5 of Bridge Design Details.

Structures Preliminary Investigations Branch (PI) will usually provide the base Foundation Plan sheet. Seismic Retrofits do pose some logistical problems. Standard procedure would have a request for a Foundation Plan base map made early in the project schedule so any Bridge surveys that need to be done are finished in a timely manor. For a retrofit project, it is possible that the need for a Foundation Plan would not become apparent until the designer has completed some of the analysis. It's unlikely that adequate time would be available to provide a 'project specific' foundation plan. There are ways to get around this. PI usually keeps copies of previously used plans on file. It will probably be a base map that covers a very large area, but you could extract what you need and build your own foundation plan. You may also be able to find an existing contract plan set of your structure that has a .dgn plan sheet you could copy and modify to suit the current project. Whichever way you proceed; verify the accuracy of the layout. The designer should visit the site during the design process. If so, see if photographs have been taken. Photographs are a good way to verify the current site conditions. Should the inclusion of a true 'FOUNDATION PLAN' become impractical, a 'LIMITS OF EXACVATION AND BACK FILL FOR PAYMENT' detail (or details) specific to the footing being detailed may be adequate for showing the grade/elevation data and allowing the calculation of 'QUANTITIES'. See BDD Figure 18-8.2

Accuracy standards for locating an existing footing for retrofit may not need to be as stringent because you're modifying a footing that already exists. However, be as accurate as possible when locating existing physical features such as roadways and curbs, buildings, above and below ground utilities and fence lines that may interfere with your design. Discuss this with your designer early. See BDD Figure 18-4.2

Once you have a satisfactory "FOUNDATION PLAN", locate retrofitted foundations as indicated but do not dimension size, as this will be shown elsewhere. On projects with super-structure work **only**, a “FOUNDATION PLAN” may not be required. Confirm with your designer.

#### **18.4.0 ABUTMENTS** See “ABUTMENTS/WINGWALLS” Section 6 of Bridge Design Details.

The types of retrofits used on cast in place reinforced concrete bridges with diaphragm type abutments are:

- Shear Keys
- Abutment Tie-downs

The types of retrofits used on cast-in-place reinforced concrete bridges with seat type abutments are:

- Seat Extenders
- Shear Keys
- Abutment tie-downs

Structures with above mentioned abutments and either pre-cast or cast-in-place ‘I’-girders could have:

- Diaphragm Modifications

The types of retrofits used on structures with steel superstructure and concrete abutments are:

- Shear Keys
- Seat Extenders
- Bearing Conversions with Pedestals
- Abutment Tie-downs

Note the example “ABUTMENT SEAT EXTENDER RETROFIT” BDA 14-5.5 shown here as BDD Figure 18-1.4.

In addition to regular abutment plans and sections, CONCRETE REMOVAL DETAILS may be required. On the existing structure these show limits of removal of unwanted substructure concrete, above and below grade. These details require dimensions for quantity take-off. There may be existing reinforcement exposed. This reinforcement should be labeled: “*Existing exposed reinforcement to remain undamaged.*” There may also be details showing the connection of the existing structure to the new retrofit components. These are DOWEL PLACEMENT DETAILS. These include views with callouts to indicate the number of dowels required and dowel pattern spacing to be used. These details should be dimensioned appropriately for quantity take-off.

For examples showing some of the above-mentioned retrofit techniques, see BDD Figures 18-5.1 thru 18-5.6.

### **18.4.1 APPROACH SLABS**

Some Seismic Retrofits will require an EQ (10) retrofit approach slab on an existing abutment. In some cases, a paving notch must be added or the existing modified. In the XS sheets, or standard drawings, there are specialized retrofit details showing this modification. Unless the Engineer has a different design, reference the approach slab. Draw the paving notch extension as part of your abutment details and dimension the linear limits on the ABUTMENT LAYOUT for QUANTITIES, but do not specify dimensions or reinforcement. See XS sheets “SECTION 3-BRIDGE STRUCTURE APPROACHES” for ‘STRUCTURE APPROACH TYPE EQ (10)’ XS3-150e

**18.5.0 BENTS** See “BENTS” Section 7 of Bridge Design Details.

Bent caps usually involve cable or rod type restrainers, used on cast-in-place concrete, pre-cast concrete girders or steel girders with an independently poured concrete diaphragm. Views necessary to show coring will be required. There may be portions of concrete added to form bolsters or blocks. There may also be details showing how the existing structure and the new retrofit components are connected. These are DOWEL PLACEMENT DETAILS. Views with callouts adequate to indicate the number of dowels required and pattern spacing will be shown. These details should be dimensioned appropriately for quantity take-off. For examples, see BDD Figures 18-6.1 thru 18-6.3.

For a structure with steel girders, there will be steel brackets attached to the bottom flange of the girder as a connection point for restrainer cables or rods. Complete details for fabrication of these brackets will be required with suitable welding symbols and dimensions for quantity take off. See BDD Figures 18-11.2 thru 18-11.13, also “GUIDELINES FOR SEISMIC RETROFITS AND STRENGTHENINGS” page 15.

A means of accessing the interior of a box girder structure must be provided when using these types of restrainers. Soffit openings are the preferred type. In some cases, a deck opening may be a better choice. There are typical details available for these situations, see BDD Figures 18-2.2 (xs1-310). Note that due to the close proximity of a hinge to a related bent, some restrainer types may involve both, requiring suitable details. **See BDD**

### **18.5.3 HINGE DETAILS**

#### **18.5.1 COLUMNS**

Retrofits applied to single columns only are usually a steel casing or a Composite (Fiberglass/Epoxy) wrap. See “STANDARD PLANS” xs7-010e and rx7-810E for these.

Retrofits applied to multiple columns may use various types of retrofit techniques. BDD Figure 18-1.2 (BDA 14-5.4) shows an in-fill wall detail. There may also be details showing how the existing structure and the new retrofit components are connected. These are DOWEL PLACEMENT DETAILS. See **BDD 18.5.0 BENTS** above. For examples showing other configurations, see BDD Figures 18-7.4, 7.5 and 7.6.

### **18.5.2 FOOTINGS**

Footings usually involve the addition of concrete to the perimeter and the addition of piles. These modifications could require plans and elevations of sufficient scale to indicate complex rebar placement. Show the footing “PLAN” and “PILE LAYOUT” with suitable dimensions for QUANTITIES. There may be coring of existing concrete for tie-downs and rod anchors.

CONCRETE REMOVAL DETAILS may be required. On the existing footing these show limits of removal of unwanted substructure concrete. These details require dimensions for quantity take-off. There may be existing reinforcement exposed. This reinforcement should be labeled: “*Existing exposed reinforcement to remain undamaged.*” There may also be details showing how the existing structure and the new retrofit components are connected. These are DOWEL PLACEMENT DETAILS. These include views with callouts to indicate the number of dowels required and dowel pattern spacing to be used. These details should be dimensioned appropriately for quantity take-off. For example, see BDD Figures 18-8.1 to 18-8.4.

When your project has a footing retrofit or any work requiring substructure modifications, add the sheet “LIMITS OF PAYMENT FOR EXCAVATION AND BACKFILL” xs7-310e. See BDD Figure 18-2.3.

The configuration of the restrainer tie-downs, anchor rods and associated parts may be of specific design. As such, complete details of all hardware must be detailed for QUANTITIES and for fabrication. Again, adequate dimensions are essential. See BDD Figures 18-8.5 thru 8.10. Welding symbols come into play, as well. The SDT should develop a working understanding of the use of welding symbols as defined in the American Welding Society publication “STANDARD SYMBOLS FOR WELDING, BRAZING AND NONDESTRUCTIVE EXAMINATION” AWS A2.4: 2007. Microstation has tools for creating accurate welding symbols quickly. See BDD 18-11.2 and 11.3.

Note the new pile type added to the footings and provide the appropriate details as required.

### **18.5.3 HINGE DETAILS**

Hinges, along with Bents, are one of the most intensive retrofit components of a bridge structure. The Hinge is one part that may have Retrofit hardware included in the original plans. Bridge Design Aids “EXAMPLE SEISMIC RETROFIT DETAILS” BDA 14-5.4 (BDD Figure 18-1.3) shows the “PIPE SEAT EXTENDER & CABLE RESTRAINER DETAIL” example. This basic guideline for retrofit work is applied to an existing structure. Note the examples shown as BDD 18-2.5 and 2.6, “CABLE RESTRAINER UNIT-TYPE 2” combination cable restrainer and pipe seat extender is a two sheet set for use new construction. In either case, the GIRDER/HINGE LAYOUT would show the locations of the restrainer units. Remember, you may not need to show the portions of the structure that have no bearing on the retrofits. Use break indicators to remove un-needed distance between the Hinge centerline and the related Bent centerline. Use a dimension line with break to show correct distance between the two. Locate/dimension all access openings and cross-reference to the correct details. See BDD Figures 18-9.1, 9.2 and 18-10.1 thru 10.6

In addition to regular Hinge plans and sections, CONCRETE REMOVAL DETAILS may be required. On the existing structure these show limits of removal of unwanted superstructure concrete. These details need to show dimensions for quantity take-off. There may be existing reinforcement exposed. This reinforcement should be labeled: “*Existing exposed reinforcement to remain undamaged.*” There may also be details showing how the existing structure and the new retrofit components are connected.. These are DOWEL PLACEMENT DETAILS. These include views with callouts to indicate the number of dowels required and dowel pattern spacing to be used. These details should be dimensioned appropriately for quantity take-off.

### **18.6.0 TYPICAL SECTIONS** See “TYPICAL SECTION” Section 8 of “Bridge Design Details”

In retrofit detailing of structures, a true TYPICAL SECTION sheet may not be recommended. It is more likely an identified ‘SECTION/ELEVATION’ taken in a specific location, maximized to show the most detail about the retrofit would be more informative. See BDD Figure 18-6.1 and 18-7.2.

### **18.7.0 GIRDER LAYOUTS** See “GIRDER LAYOUT” Section 9 of “Bridge Design Details”

Retrofit locations are shown on this sheet. It may be possible to omit portions of the structure not relevant to the current installation. Identify retrofit types placed on centerlines and provide location dimensions as required. Show a North Arrow for each plan

Avoid too much depth of detail on small-scale plans. Use sheet references to guide the reader to the correct details. See BDD Figure 18-9.1 and 9.2.

### **18.8.0 RETROFIT HARDWARE FABRICATION**

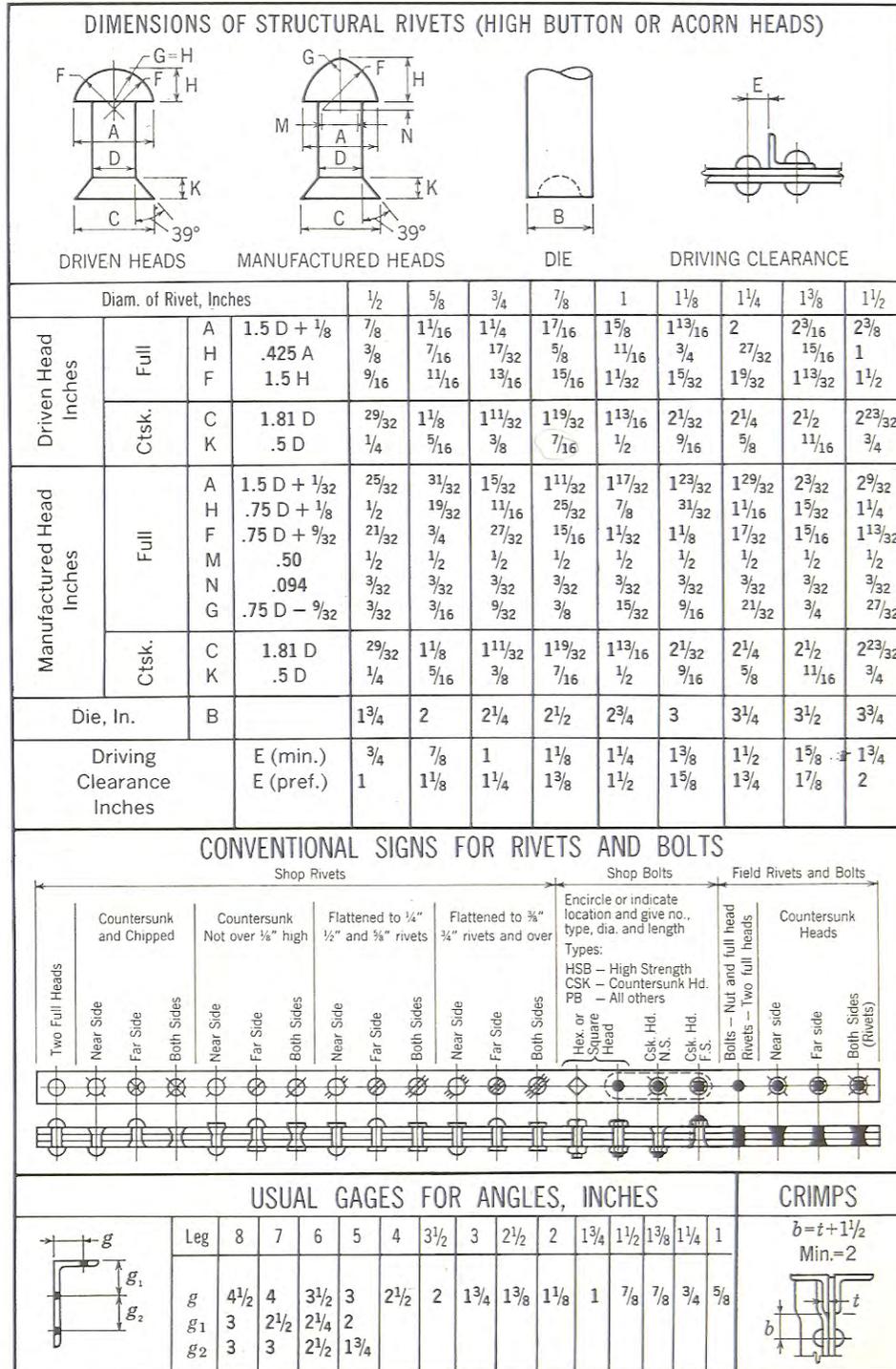
LAYOUT sheets may show location and application of the finished product, but these sheets are where all the brackets, mounting plates and rod anchors, etc. are detailed for quantities and assembly. All parts must be described clearly with dimensions for fabrication. If you have multiple bracket sizes or types they must all have discrete dimensions. Avoid showing detailed fasteners unless assembly, tool clearance issues or the scale of the detail supports their use. The use of a ‘drill-point’ symbol or hole labeled for the correct size fastener may be adequate. The “RECTANGULAR” and “POLAR” ARRAY tools in Microstation are ideal for placing drilling patterns based on using a symbol from a cell library. For more information on fastener usage, see “MANUAL OF STEEL CONSTRUCTION-LRFD” Vol. II, Connections Part 8. Note the Table 8-2 on page 8-11 shows the dimensions of high strength bolts and nuts. These dimensions allow accurate fasteners to be drawn. Table 8-4 on page 8-13 and Table 8-5 on page 8-14 have the clearance dimensions listed for the most common bolt/nut diameters.

Today most steel connections are bolted or welded. If your project requires the detailing of older steel structures for retrofit, rivets may need to be detailed in an as-built configuration. Note the illustration, Figure 18A on page 14 of “BDD GUIDELINES FOR RETROFITS” from the “MANUAL OF STEEL CONSTRUCTION” (AISC) circa 1980, provides all the necessary data to reproduce accurate rivets.

Along with the use of rivets, are the steel beams they hold together. Some older steel structures have beam and column shapes that are no longer manufactured. Modern guidebooks, such as “STRUCTURAL SHAPES” from Bethlehem Steel Corp and “STRUCTURAL STEEL SHAPES” by United States Steel Corp do not have the dimensions for the older members. The publication “IRON AND STEEL BEAMS 1873 TO 1952” from the “American Institute of Steel Construction” (AISC) is a historical reference handbook, that will provide the data needed when detailing older steel shapes. The TECHNICAL REFERENCE CENTER has a copy available for checkout. For other manuals and publications cited here, inquire in your Branch or group.

The source of the information to create dimensionally correct as-builts for steel structures are shop plans. Note the example BDD Figure 18-11.1. Shop plans dimension of every piece of steel needed to fabricate the bridge component shown. The “Bridge Inspection Records Information System” (BIRIS) should have what you need. Reading shop plans could be difficult. Dimensions may be unreadable, forcing the SDT to calculate them from other related dimensions.

Note the examples shown as BDD Figures 18-11.1 thru 18-11.13. These illustrate a broad range of retrofit hardware applications.



AMERICAN INSTITUTE OF STEEL CONSTRUCTION

Figure 18A

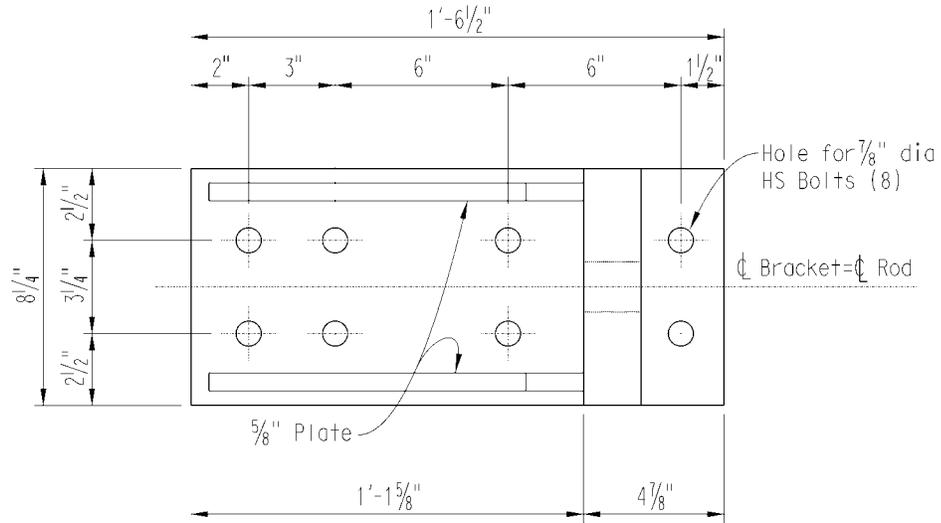


Figure 18B

A typical Plan View of a Rod Bracket.

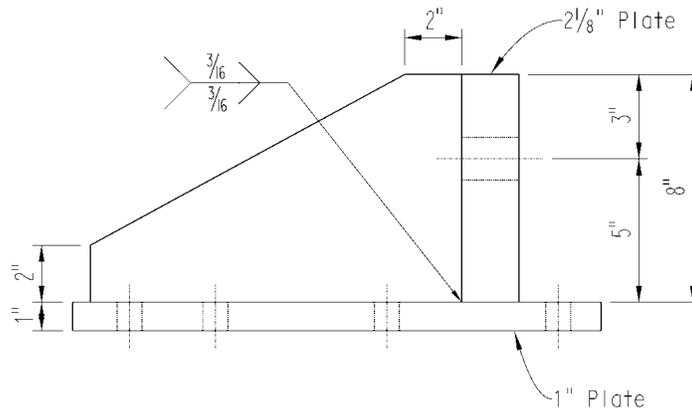


Figure 18C

A typical Elevation View of a Rod Bracket.

The above bracket could be applied to strengthenings and retrofits. They could have multiple rod configurations and have different rod diameters. Cable restrainer systems use the same basic bracket as well.



## LIST OF EXAMPLES – SECTION 18

Basic Retrofit Examples From “BRIDGE DESIGN AIDS” (14-5.2 thru 14-5.5):  
Examples Figures 18-1.1, 1.2, 1.3 and 1.4

XS Sheets “INDEX TO XS SHEETS”  
“SECTION 1-BRIDGE SUPERSTRUCTURE xs1-310 DECK AND SOFFIT OPENINGS”  
“SECTION 7 – BRIDGE SIESMIC” (Complete):  
Examples Figures 18-2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, and 2.9

General Plans:  
Example Figures 18-3.1 and 3.2

Foundation Plans:  
Examples Figures 18-4.1 and 4.2

Abutment Details:  
Examples Figures 18-5.1, 5.2, 5.3, 5.4, 5.5 and 5.6

Bent/Pier Cap Details:  
Examples Figures 18-6.1, 6.2 and 6.3

Column Details:  
Examples Figures 18-7.1, 7.2, 7.3, 7.4, 7.5 and 7.6

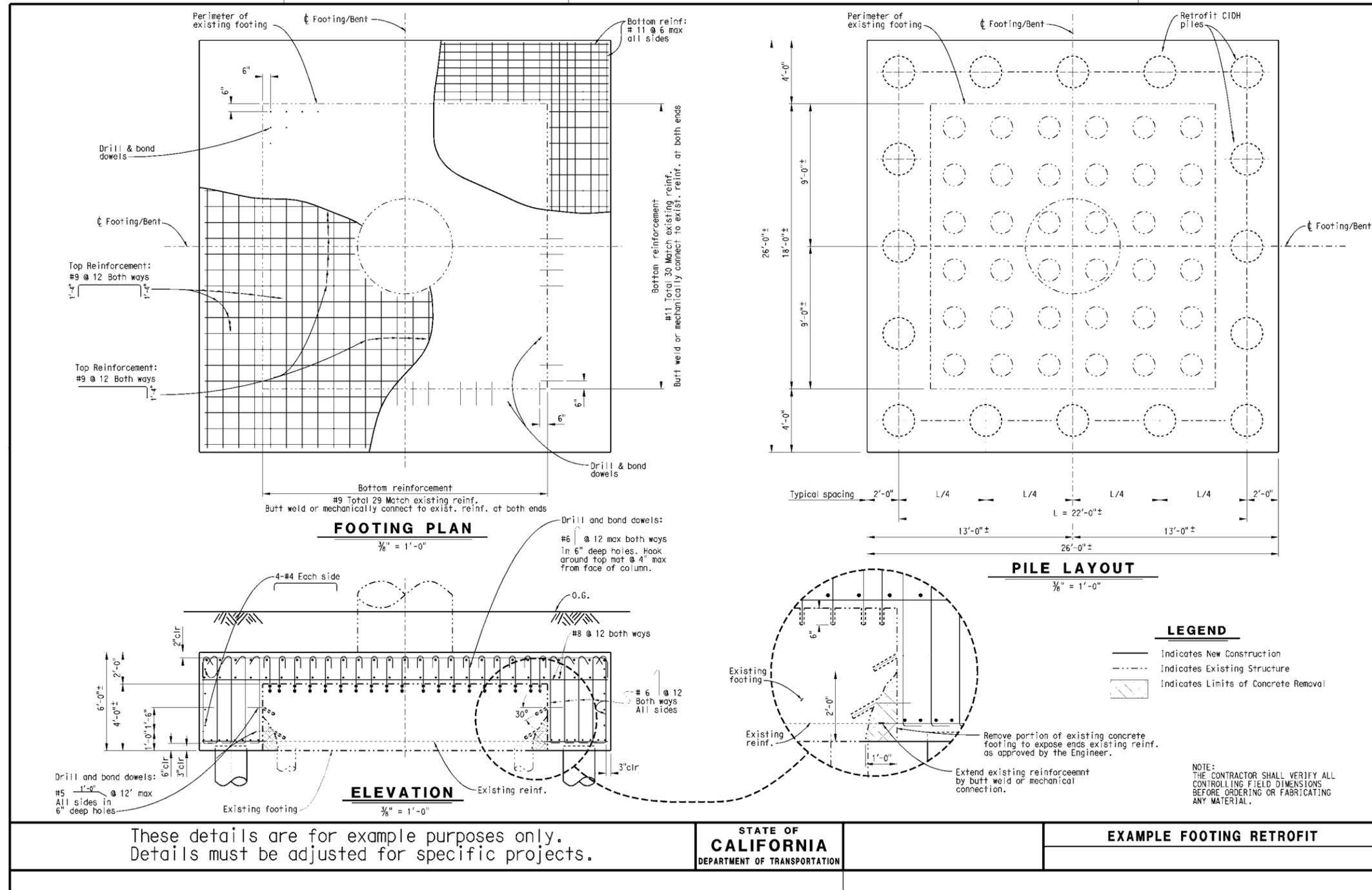
Footing Details:  
Examples Figures 18-8.1, 8.2, 8.3, 8.4, 8.5, 8.6, 8.7, 8.8, 8.9 and 8.10

Girder Layouts:  
Examples Figures 18-9.1 and 8-9.2

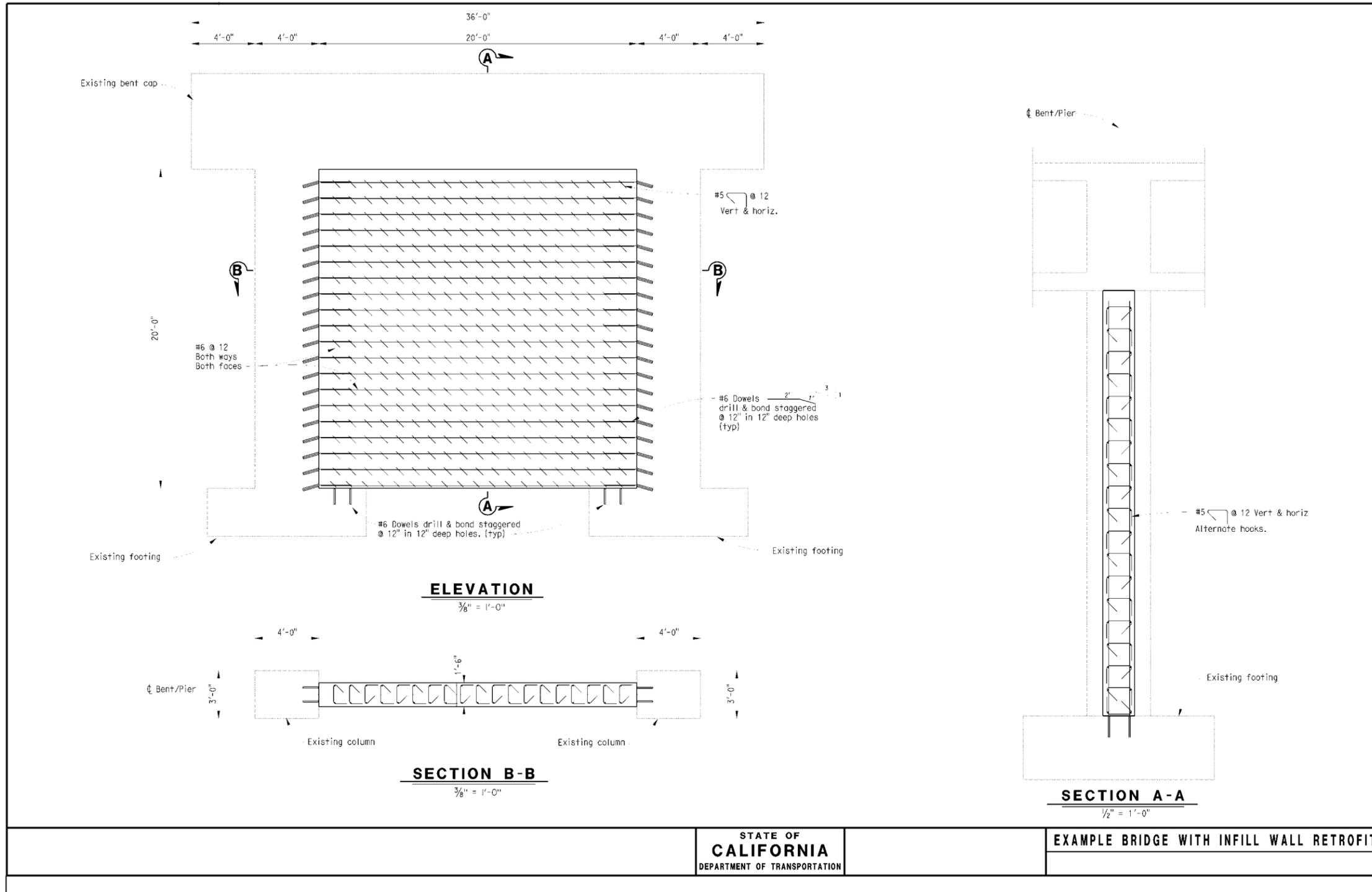
Hinge Details:  
Examples Figures 18-10.1, 10.2, 10.3, 10.4, 10.5 and 10.6

Steel Details:  
Examples Figures 18-11.1, 11.2, 11.3, 11.4, 11.5, 11.6, 11.7, 11.8, 11.9, 11.10, 11.11, 11.12  
And 11.13

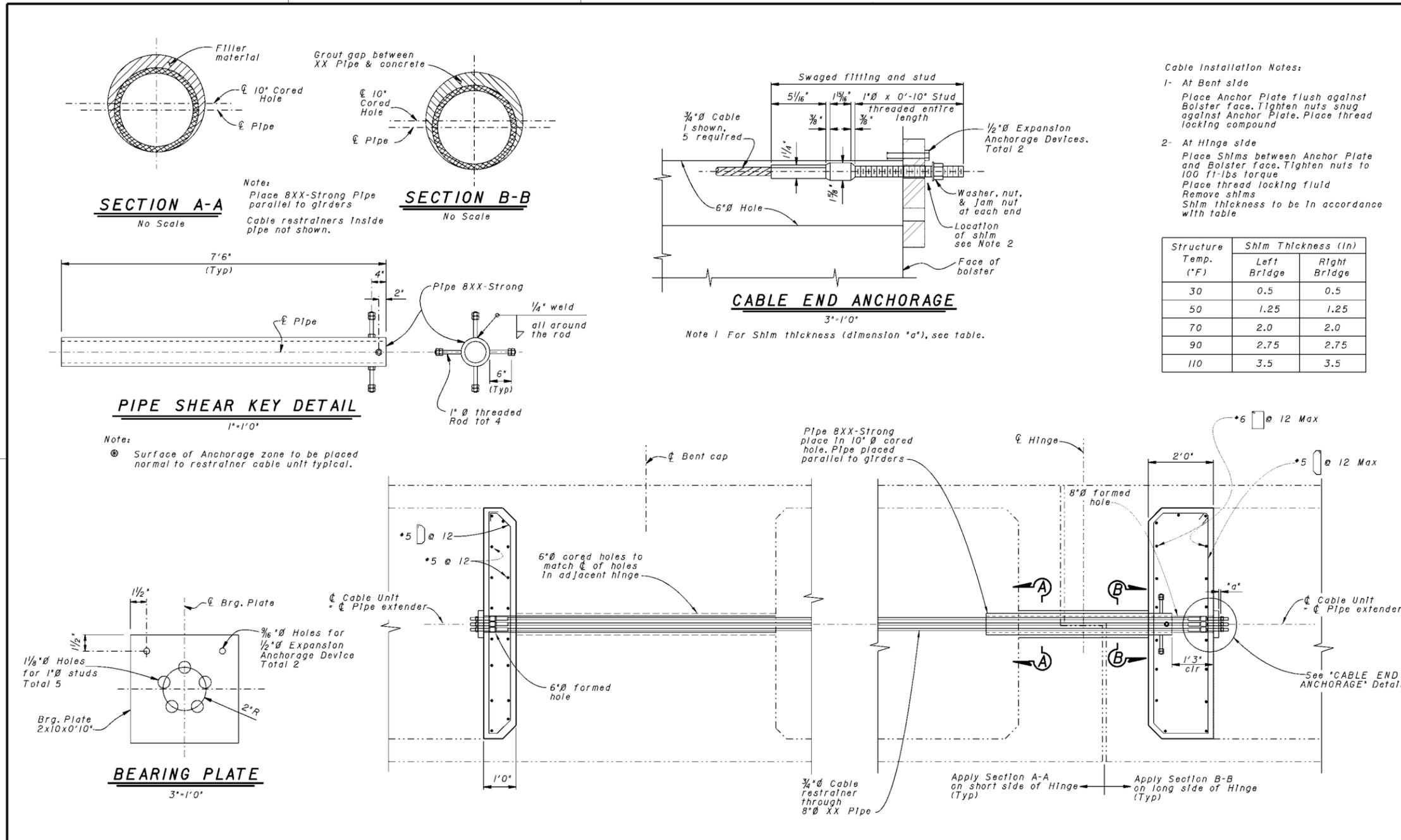
The following 4 sheets are extracted from BRIDGE DESIGN AIDS Section 14-5. They support MEMOS TO DESIGNERS Section 20-4 with basic guideline details



BDA 14-5.2



BDA 14-5.3

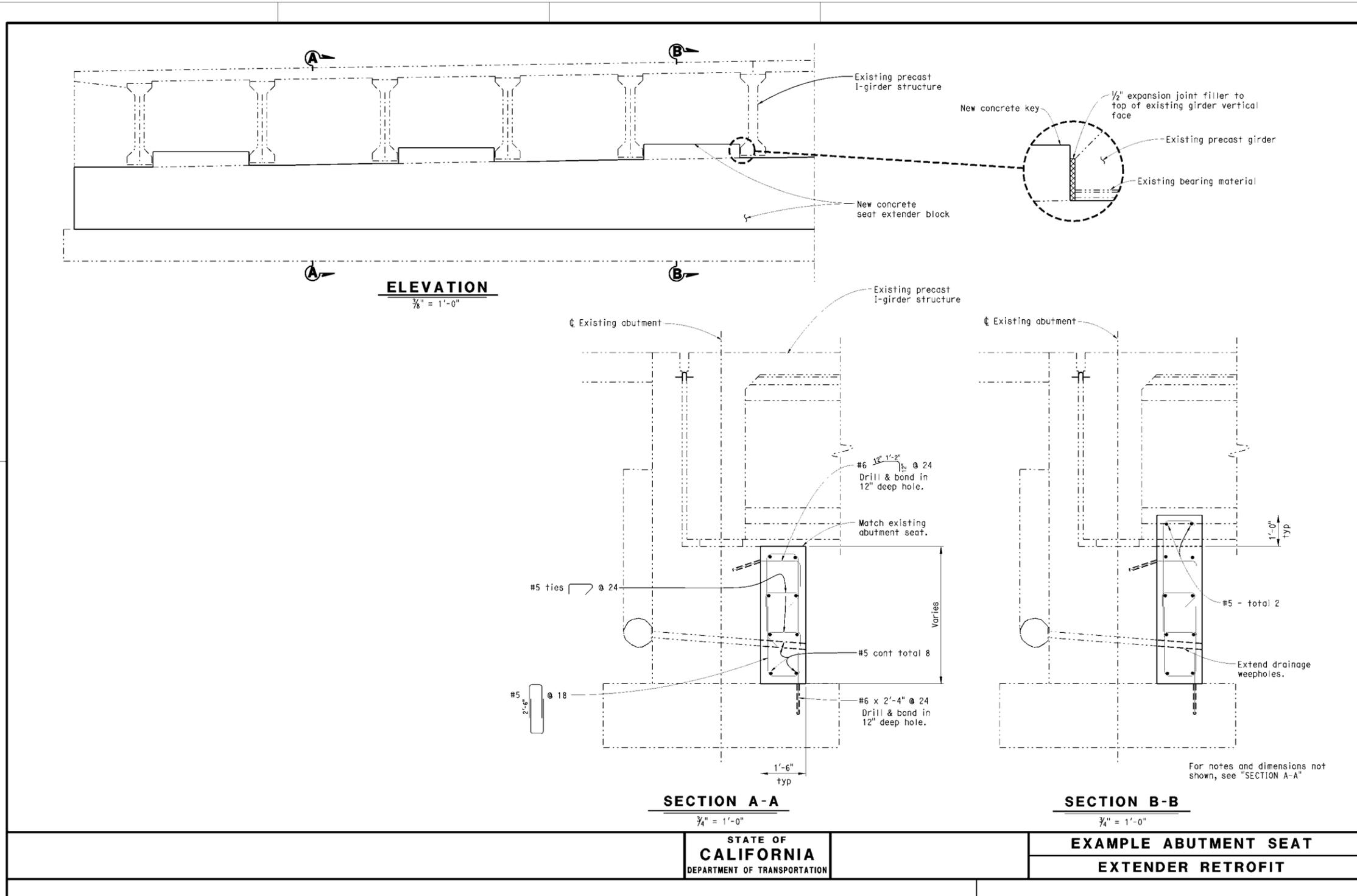


STATE OF CALIFORNIA  
DEPARTMENT OF TRANSPORTATION

EXAMPLE PIPE SEAT EXTENDER & CABLE RESTRAINER DETAIL

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BDA 14-5.4



BDA 14-5.5



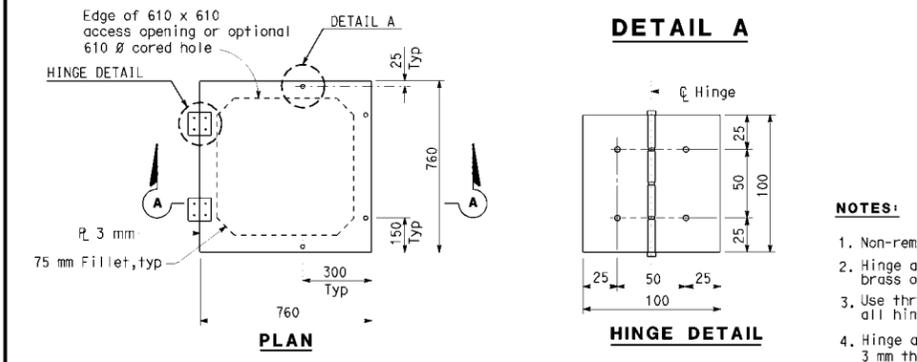
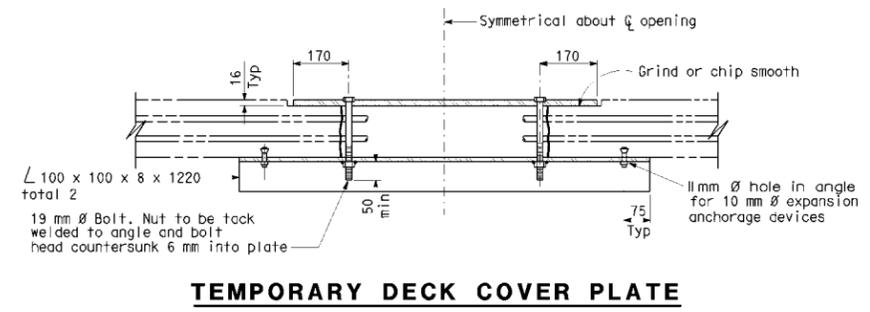
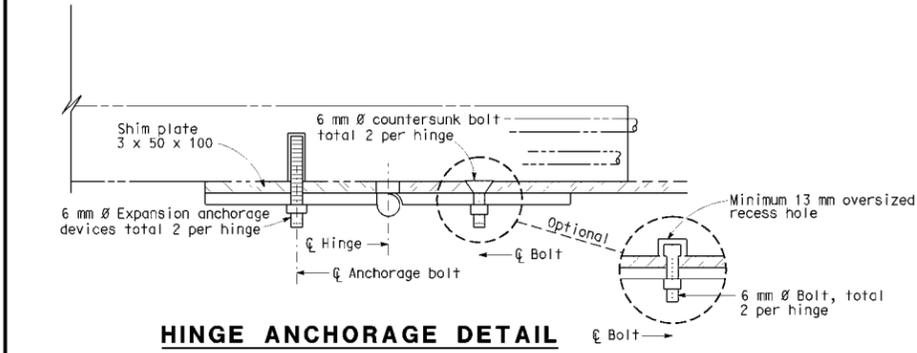
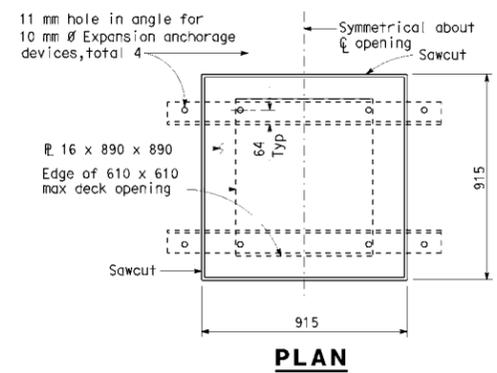
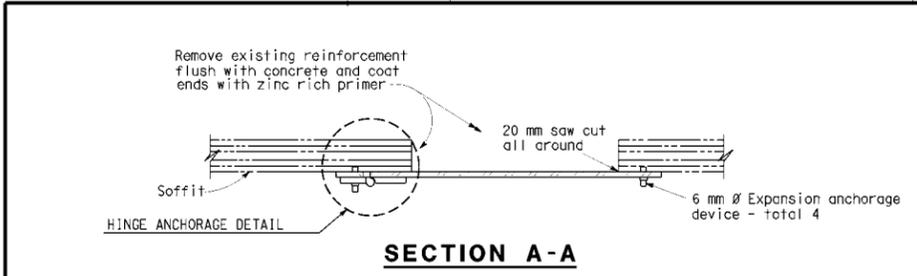
DIST.	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED ENGINEER - CIVIL

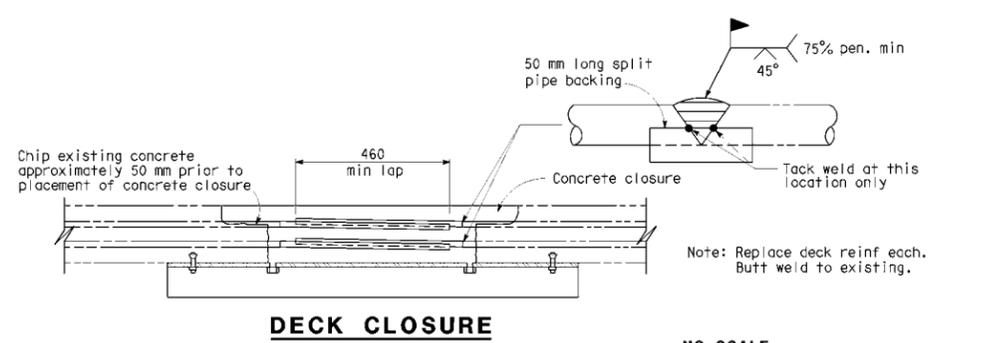
PLANS APPROVAL DATE

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

Please see "BRIDGE DESIGN DETAILS", "SECTION 1 - GENERAL DETAILING" pages 1-16.1, 16.2, and 16.3 for proper handling of bridge standard detail sheets (xs).



- NOTES:**
1. Non-removable pin in hinge.
  2. Hinge assembly to be galvanized, brass or stainless steel.
  3. Use thread locking system for all hinge nuts.
  4. Hinge assembly to be minimum 3 mm thick.



NO SCALE  
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

STANDARD DRAWING				STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION		DIVISION OF ENGINEERING SERVICES		BRIDGE NO.		KILOMETER POST		DECK AND SOFFIT OPENINGS	
RELEASE DATE	4/4/97	DESIGN BY	PAT HIPLEY	CHECKED BY	ROBIN ROGERSON	RELEASED BY							
TITLE NO.	xs1-310	DETAILS BY	R. YEE	CHECKED BY	PAT HIPLEY								
		SUBMITTED BY	RAY ZELINSKI	DRAWING DATE	10/92								

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (EPOCH/DATE) STATE ONLY

DATE PLOTTED = 12 JAN 2009 10:22

USER NAME = draclay

CU EA

91-310.dgn

This 'xs' sheet provides the necessary information for adding access to interior of a concrete box girder structure. Note that this sheet, xs1-310 is listed in "SECTION 1 - BRIDGE SUPERSTRUCTURE" and not in "SECTION 7 - BRIDGE SEISMIC".

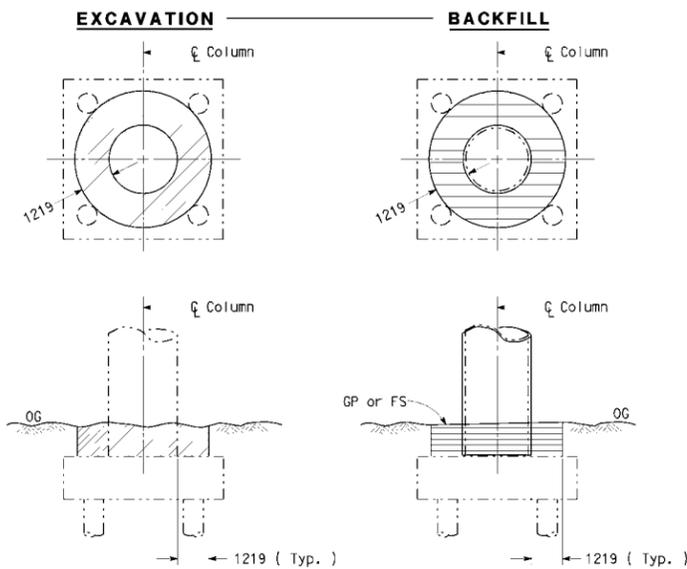


DIST.	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED ENGINEER - CIVIL

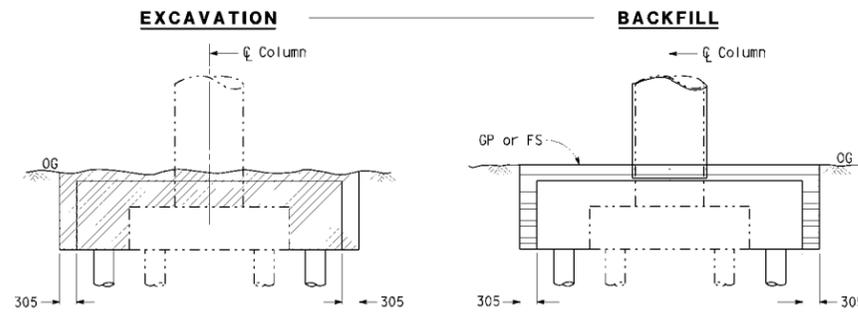
PLANS APPROVAL DATE

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**COLUMN CASING ONLY**

Note: Circular column shown. Rectangular, square or oval columns similar.

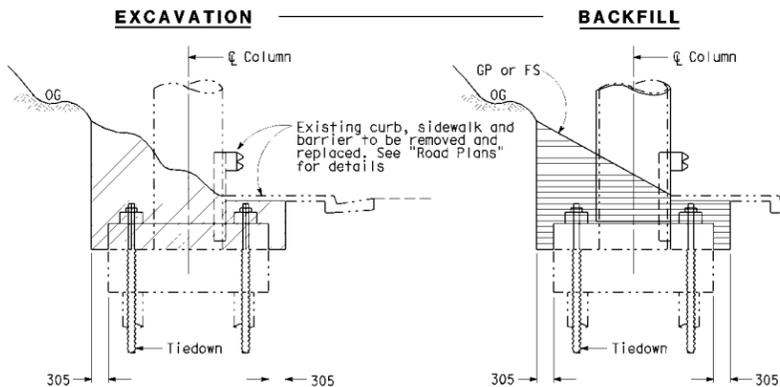
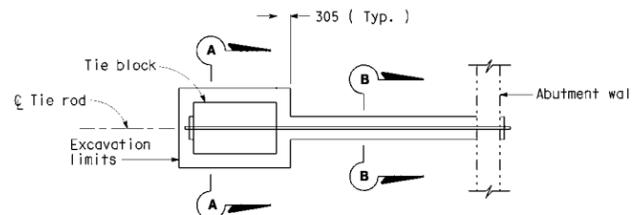


**COLUMN CASING & FOOTING RETROFIT**

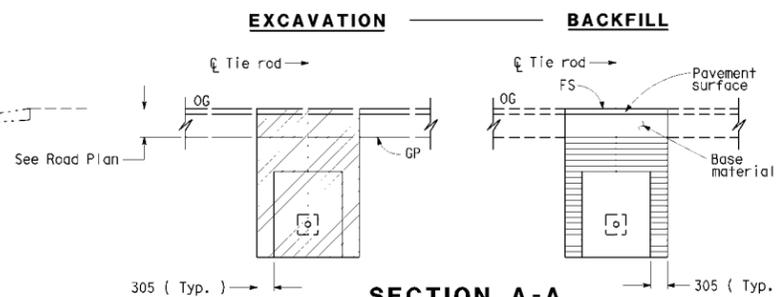
- LEGEND**
- Indicates existing structure
  - Indicates new construction
  - ▨ Indicates structure excavation
  - ▨ Indicates structure backfill

**ABBREVIATIONS**

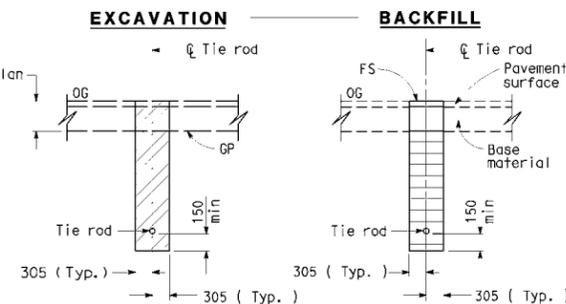
- OG Original ground
- FS Planned finished surface
- GP Planned graded plane



**BENT FOOTING TIE-DOWNS**



**SECTION A-A**



**SECTION B-B**

NO SCALE  
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

STANDARD DRAWING				
RELEASE DATE	DESIGN BY	CHECKED BY	DESIGNED BY	RELEASED BY
9/3/92	R. YEE	R. YEE	R. YEE	R. YEE
FILE NO.	DETAILS BY	CHECKED BY	DESIGNED BY	RELEASED BY
xs7-310	R. J. ZELINSKI	R. J. ZELINSKI	R. J. ZELINSKI	R. J. ZELINSKI
	SUBMITTED BY	DRAWING DATE	DESIGN DATE	DESIGN DATE
		4/92		

STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES	BRIDGE NO.	
		KILOMETER POST	

EARTHQUAKE RETROFIT PROJECT	
LIMITS OF PAYMENT FOR EXCAVATION AND BACKFILL LIMITS	
DISREGARD PRINTS BEARING EARLIER REVISION DATES	REVISION DATES (EPOCH/DATE) STATE ONLY
CU EA	SHEET 1 OF 1

When you have modification to bent footings, this sheet must be included in the plan set. See BDD 18-3.0.

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

REGISTERED ENGINEER - CIVIL  
PLANS APPROVAL DATE: \_\_\_\_\_  
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APPROACH SLAB TRANSVERSE CONTACT JOINT		
STRUCTURE SKEW	AC APPROACH PAVEMENT	PCC APPROACH PAVEMENT
< 20°	Parallel to face of paving notch	Parallel to face of paving notch
20° - 45°	Parallel to face of P N use (Detail A)	Stagger lines 24' to 36' apart
> 45°	Parallel to face of P N use (Detail A)	Stagger at each lane line

**PLAN**  
1"=10'

**STRUCTURE APPROACH - END STAGGER DETAIL**  
No Scale

**SEAT TYPE ABUTMENT SECTION A-A**  
1/4"=1'-0"

Note: Seat Type Abutment shown, for Diaphragm Type Abutment, see "Abutment Tie Details".

**EDGE ANGLE DETAIL**  
1/2"=1'-0"

**9" PAVING NOTCH**

**12" PAVING NOTCH**

**DIAPHRAGM TYPE ABUTMENT ABUTMENT TIE DETAILS**  
3/4"=1'-0"

**DETAIL B**  
1/2"=1'-0"

\*(TO BE USED WITH TYPE 25 OR TYPE 27 CONCRETE BARRIER)

**SECTION C-C**  
3/4"=1'-0"

\*(TO BE USED WITH TYPE 732 OR TYPE 736 CONCRETE BARRIER)

**NOTES:**

- For details not noted or shown, see Structure Plans. Adjust bar reinforcement to clear a sawcut for sealed joint, when required.
- For transverse contact joint with new PCC paving, refer to Standard Plan P10.
- Longitudinal construction joints, when permitted by the Engineer, shall be located on lane lines.
- End angle or plate at beginning of barrier transition, end of wing wall or end of structure approach as applicable.
- At the contractor's option, approach slab transverse reinforcement may be placed parallel to paving notch. Spacing of transverse reinforcement is measured along roadway.
- For drainage details, see Structure Plans.

<b>STANDARD DRAWING</b>				<b>STATE OF CALIFORNIA</b>		<b>DIVISION OF ENGINEERING SERVICES</b>		<b>BRIDGE NO.</b>	
DATE: 3/14/05	DESIGN: M. TRAFFALIS	CHECKED: E. THORKILDSEN	RELEASED BY:	<b>DEPARTMENT OF TRANSPORTATION</b>		<b>ENGINEERING SERVICES</b>		<b>MILE POST</b>	
FILE NO: xs3-150e	DETAILS: R. YEE	CHECKED: E. THORKILDSEN	DATE: 8/92	<b>SECTION 7 - BRIDGE SEISMIC</b>		<b>SECTION 3 - BRIDGE STRUCTURE APPROACH</b>		<b>STRUCTURE APPROACH TYPE EQ(10)</b>	
DATE PLOTTED = 12 JAN 2009				ORIGINAL SCALE IN INCHES FOR REDUCED PLANS		CU EA		DISREGARD PRINTS BEARING EARLIER REVISION DATES	

This 'xs' sheet provides the necessary information for adding an approach slab to a project structure. Note that this sheet, xs3-150e is listed in "SECTION 3 - BRIDGE STRUCTURE APPROACH" and not in "SECTION 7 - BRIDGE SEISMIC".

**TYPE A**

**TYPE B**

**LONGITUDINAL HINGE RESTRAINER**

Disc spring (Bent side) see "Cable Restrainer Unit-Type 2 Details" sheet (Retrofit construction shown)

19 mm Ø Cable

63 mm Ø Galv.std. pipe. See "Restrainer Unit-Details" sheet

**CABLE UNIT**

A = 6 mm elastomeric bearing pad

25 mm Ø x 300 mm stud (Threaded entire length)

Swaged fitting and stud

**NOTES:**

Restrainer units to be on tangent alignment. Anchor nuts shall not be set until 30 days following completion of prestressing for CIP prestressed bridges. See other sheets for location and number of longitudinal and vertical hinge restrainers, and table of joint openings. Contractor may install restrainers in horizontal arrangement with approval of the Engineer. The location shall be in the middle 1/3 depth of the structure. An alternative is to place restrainers in two horizontal layers, equally located above and below the mid structure depth. The number of restrainers in each layer shall not differ by more than one.

\* Dimension maybe adjusted to clear reinforcement

**SECTION A-A**

**SECTION A-A ( ALTERNATIVE )**

**SECTION C-C**

Note: Slope to match sloping exterior girders.

**DETAIL - BAR B**

**ELEVATION**

**SECTION**

**VERTICAL RESTRAINER**

NO SCALE

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

**END ANCHORAGE DETAILS AT HINGE OR CAP PART PLAN**

STANDARD DRAWING				STATE OF CALIFORNIA		DIVISION OF ENGINEERING SERVICES		BRIDGE NO.	
RELEASE DATE	4/20/98	DESIGN BY	G.H. DEGENKOLB	CHECKED BY	PAT HIPLEY	RELEASED BY		KILOMETER POST	
FILE NO.	xs7-410	DETAILS BY	R. YEE	CHECKED BY	PAT HIPLEY			<b>CABLE RESTRAINER UNIT - TYPE 2</b>	
		SUBMITTED BY	R.J. ZELINSKI	DRAWING DATE	4/98				

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS: 0 10 20 30 40 50 60 70 80 90 100  
 DISREGARD PRINTS BEARING EARLIER REVISION DATES  
 USER NAME: draclay  
 DATE PLOTTED: 05 JAN 2009 TIME PLOTTED: 14:23  
 FILE: xs7-410.dgn

This sheet xs7-410 and its companion xs7-420 provide details for the installation of cable restrainer system at time of new construction.

**BENT SIDE**  
(Retrofit construction shown)

**HINGE SIDE**  
(Retrofit construction shown)

**CABLE UNIT**

64 mm Ø galvanized standard steel pipe. Deviation in alignment of pipe shall not be more than 6 mm per 1.2 m of length of pipe after concrete is placed. Pipe shall be supported at all ends.

**ADJUSTMENT END**  
(New construction shown)

**END VIEW**

**PLAN**

**DISC SPRINGS AND WASHERS**  
"All dimensions in mm, except as noted"

L* (m)	DISC SPRING					STEEL SPHERICAL WASHER			THICK WASHER		
	ID	OD	t	H	COLOR CODE	ID	OD	Nom. thick.	ID	OD	t**
0 - 7.6	25	50	1.6	3.3	WHITE	30	57	13	26	50	6.3
7.7 - 9.7	25	50	2.0	3.4	RED	30	57	13	26	50	6.3
9.8 - 11.5	25	50	2.4	3.6	BLUE	30	57	13	26	50	6.3
11.6 - 13.7	31	63	2.5	4.5	YELLOW	33	64	13	29	57	6.3

\*For length L (m), see "Cable Restrainer Unit - Type 2" sheet    \*\*Minimum value

NOTE: All OD and ID dimensions for washers and disc springs shall meet the dimensional tolerances for hardened steel washers, ASTM F436

**RESTRAINER UNIT INSTALLATION PROCEDURE**

**NEW CONSTRUCTION:**

1. Install Cable Yield Indicator, spherical washers, disc springs, nut and washers on the hinge side of restrainers as shown in "Adjustment End" detail. Disc springs shall be installed front to front as shown in "Disc Spring" detail.
2. Place only nut and washer on bent side of restrainers. Place thread locking system on bent side stud prior to installing nut and washers, and prior to setting the cable.
3. Tighten nut on the cable from the adjustment end of restrainer until the disc springs collapse and there is no disc gap remaining between the discs. The cable should be approximately straight with no sag.
4. See Item 5 of Retrofit Construction.

**RETROFIT CONSTRUCTION:**

1. Install disc springs on bent side of cable system using spherical washers to align discs to stud. Discs shall be installed front to front as shown in "Disc Spring" detail. Install Cable Yield Indicator, spherical washers, nut and washer on the hinge side of restrainers as shown in "Cable Unit" detail.
2. If existing retrofit cables are being reused, 300 mm studs shall be installed.
3. Place thread locking system on bent side stud prior to installing nut and washers, and prior to setting the cable.
4. Tighten the cable from hinge side of restrainer until the disc springs at the opposite end collapse, and there is no disc gap remaining between the discs. The cable should be approximately straight with no sag.
5. Place thread locking system on hinge side stud after tightening the cable, but before backing off the nut. Back off the nut at hinge side a distance equal to maximum additional amount that the hinge joint is expected to open, relative to existing ambient conditions, as shown on the plans for movement rating.

NOTE: If the cable needs to be secured from turning while tightening, use double nut locking technique on the stud to protect the threads.

**NO SCALE**  
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

**HINGE DETAIL**

**SECTION A-A**

**SECTION B-B**  
(Single spring)

**AS INSTALLED ON STUD**

**CABLE YIELD INDICATOR**

All dimensions are before galvanizing except as noted.

**DISC SPRING**

Note: For dimensions not shown, see table

**NOTES:**

- A. The ends of pipe shall be covered or capped to prevent concrete and debris from entering the pipe until hinge concrete is placed.
- B. Care should be taken to align the pipes on each side of the hinge.
- C. All ends of pipes must be flush with or slightly recessed from the concrete. The inside edges of the pipes must be smooth to prevent fraying of cables.

**STANDARD DRAWING**

DATE: 4/20/98	DESIGN: S. SAHS	CHECKED: R.J. ZELINSKI	RELEASED BY:
FILE NO: xs7-420	DETAILS: R. YEE	CHECKED: R.J. ZELINSKI	DRAWING DATE: 4/98
SUBMITTED BY: R.J. ZELINSKI		OFFICE: C-100	

STATE OF CALIFORNIA  
DEPARTMENT OF TRANSPORTATION

DIVISION OF ENGINEERING SERVICES

BRIDGE NO. \_\_\_\_\_  
KILOMETER POST \_\_\_\_\_

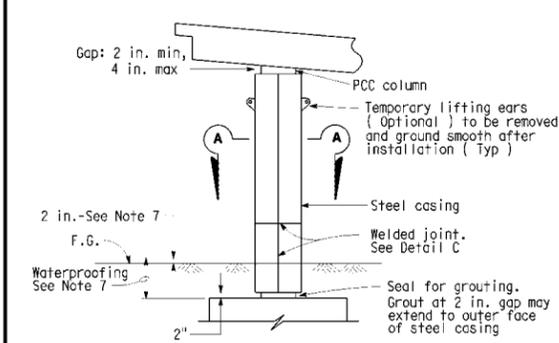
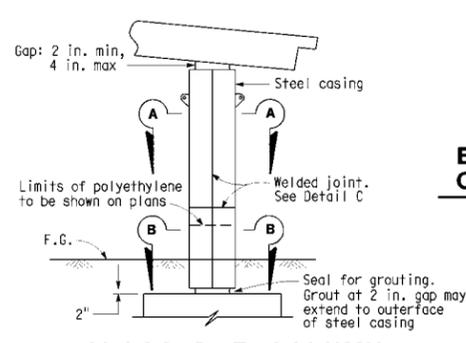
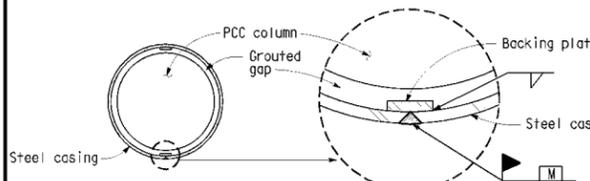
**CABLE RESTRAINER UNIT - TYPE 2 DETAILS**

DISSEMINATE EARLIER REVISION DATES

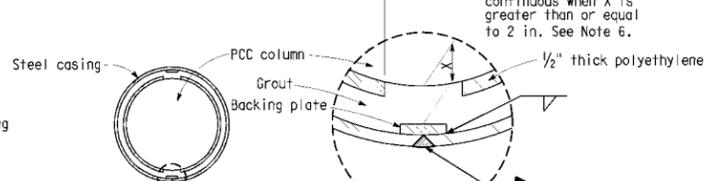
CU EA

DATE PLOTTED = 05 JAN 2009    TIME PLOTTED = 13:26

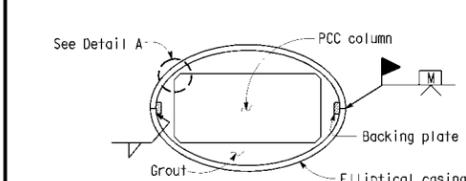
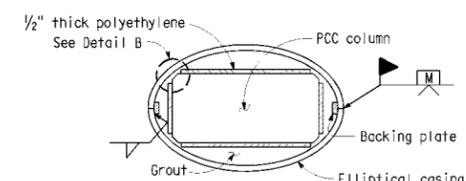
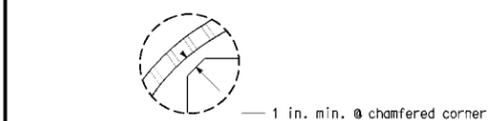
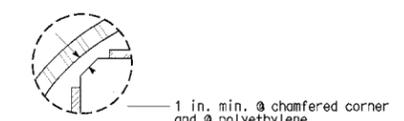
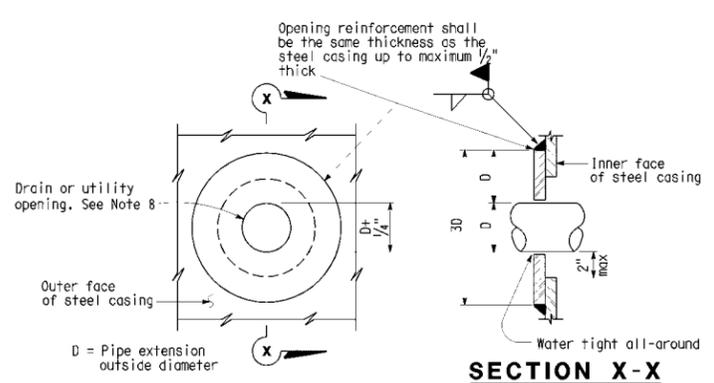
USERNAME = draley    137-420.dgn


**CLASS F COLUMN**

**CLASS P/F COLUMN**

**SECTION A-A  
ROUND COLUMN**

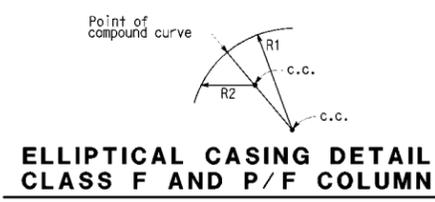
Minimum inside diameter of steel casing = 1/2" greater than nominal column diameter for Class F and 2 1/2" for Class P/F


**SECTION B-B  
ROUND COLUMN**

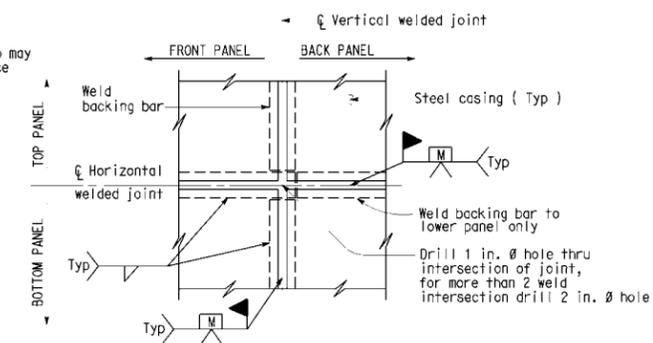
Minimum inside diameter of steel casing = 2 1/2" greater than nominal column diameter for Class P/F.


**SECTION A-A  
RECTANGULAR COLUMN**

**SECTION B-B  
RECTANGULAR COLUMN**

**DETAIL A**

**DETAIL B**

**CASING OPENING**

Note: Opening reinforcement required for drain or utility openings larger than 4 in.


**ELLIPTICAL CASING DETAIL  
CLASS F AND P/F COLUMN**

Radii R1 and R2 to be determined by the Contractor subject to the approval of the Engineer


**( TWO WELDED INTERSECTION JOINT )  
DETAIL C**
**NOTES:**

- 1) For varying thickness steel casing inside surface to remain flush. Minimum clearance from PCC column to casing shall be maintained.
- 2) Appropriate injection nozzles to be provided on casing, but removed and ground flush following completion of grouting operation.
- 3) All voids between steel casing and polyethylene (Class P/F), and steel casing and PCC column (Class F) to be filled with grout.
- 4) Location and number of vertical and horizontal welds to be determined by the Contractor, and subject to the approval of the Engineer. The location of casing welds are for illustration. No skip welds allowed.
- 5) Circular steel casing to be 1/4" thick minimum for casings with a 4'-4" diameter or less; all other steel casings to be 3/8" thick unless noted differently on contract plans. Backing plates to be the same thickness as casing up to maximum 1/2" thick.
- 6) Contractor shall remove 12 in. polyethylene strip behind backing plate if backing plate is closer than 2" from face of column.
- 7) Waterproof limits for steel casings. Typical for Classes "F" and "P/F".
- 8) For pipe extensions, opening shall be no more than 1/4" greater than the pipe extension diameter. For other openings, the opening diameter to be determined by the Engineer.

NO SCALE

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

REGISTERED ENGINEER - CIVIL

PLANS APPROVAL DATE

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STANDARD DRAWING				STATE OF CALIFORNIA		DIVISION OF ENGINEERING SERVICES		BRIDGE NO.		KILOMETER POST		STEEL COLUMN CASINGS	
DESIGNER	DESIGNED BY	CHECKED BY	DATE	APPROVED BY	DATE	PROJECT NO.	SECTION	POST MILE	POST MILE	POST MILE	POST MILE	SHEET	OF
BRIAN MARGNEY	R. YEE	PAT HIPLEY	8/93	R. J. ZELINSKI									
FILE NO.	DATE	BY	DATE	OFFICE CHECK									
rxs7-010e		R. J. ZELINSKI	8/93										
STRUCTURES DESIGN DETAIL SHEET (ENGLISH) (REV. 10/26/05)				ORIGINAL SCALE IN INCHES FOR REDUCED PLANS				CU EA		DISREGARD PRINTS BEARING EARLIER REVISION DATES			
				0 1 2 3						REVISION DATES (PRELIMINARY STAGE ONLY)			
										DATE PLOTTED = 05 DEC 2008 TIME PLOTTED = 11:10			

**SECTION A-A**      **SECTION B-B**

**SECTION A-A**      **SECTION B-B**

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS

REGISTERED CIVIL ENGINEER    DATE

PLANS APPROVAL DATE

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**E-Glass/Carbon Notes:**

- Each composite section shall be wrapped using continuous fabric not less than 2'-0" in height. All wraps of continuous weave shall be terminated a minimum of 12" past the starting point of the initial wrap. Subsequent wraps shall be started (butted) at the ending point of the last wrap.
- All cut edges shall be sealed with epoxy.

**System 2/Carbon Notes:**

- Pre-preg carbon jacket shall be completely cured by elevated temperature.
- Pre-preg carbon fiber spools shall contain continuous strands not less than 100' in length.

**General Notes:**

- For hexagonal or octagonal columns use composite thickness specified in "Rectangular Column" table.
- Remove any sharp corners to 1/2" radius minimum.
- All materials shall be protected from moisture.
- Drainage opening reinforcement shall be of the same material used for the column casing.
- The casing thickness shall taper evenly the full length of the transition zone.
- The composite casing shall adhere firmly to all surfaces of the existing column.
- All joints and seams shall be feathered smooth with compatible filler over a minimum 6" band.
- Alternate continuous layer with local circular patch of openings.

**LEGEND**

--- Indicates Existing Structure

— Indicates New Construction

*t1, t2* Denotes Minimum Thickness of completed "SYSTEM 2" Carbon Jacket (excluding coatings)

*N1, N2* Denotes minimum number of layers

**SYSTEM 1**

**E-GLASS: FIBER VOLUME = 35% min**

ROUND COLUMN, NUMBER OF LAYERS (MIN)		
COLUMN DIAMETER	N1	N2
12"	4	2
24"	7	4
36"	11	6
48"	14	7
60"	17	9
72" Max	21	11

RECTANGULAR COLUMN, NUMBER OF LAYERS (MIN)		
COLUMN WIDTH	N1	N2
12"	6	3
24"	11	6
36" Max	16	8

**SYSTEM 2**

**CARBON: FIBER VOLUME = 50% min**

ROUND COLUMN, MINIMUM THICKNESS		
COLUMN DIAMETER	t1	t2
12"	0.04	0.04
24"	0.08	0.04
36"	0.11	0.06
48"	0.15	0.08
60"	0.18	0.09
72" Max	0.22	0.11

RECTANGULAR COLUMN, MINIMUM THICKNESS		
COLUMN WIDTH	t1	t2
12"	0.06	0.03
24"	0.11	0.06
36" Max	0.16	0.08

**SYSTEM 5, 6, 7 & 8**

**CARBON: FIBER VOLUME = ??? min**

ROUND COLUMN, NUMBER OF LAYERS (MIN)		
COLUMN DIAMETER	N1	N2
12"	3	3
24"	6	3
36"	9	5
48"	11	6
60"	14	7
72" Max	17	9

RECTANGULAR COLUMN, NUMBER OF LAYERS (MIN)		
COLUMN WIDTH	N1	N2
12"	5	3
24"	9	5
36" Max	13	7

**E-GLASS/CARBON OPENING**

**SECTION C-C**

**SECTION D-D**

**SYSTEM 2/CARBON OPENING**

**STANDARD DRAWING**

RELEASE DATE	DESIGN BY PAT HIPLEY	CHECKED BY JIM GUTIERREZ	RELEASED BY
FILE NO. <b>xs7-210e</b>	DETAILS BY DAVE RADLEY	CHECKED BY JIM GUTIERREZ	
	SUBMITTED BY LI-HONG SHENG	OFFICE CHIEF	

STRUCTURES DESIGN STANDARD DRAWING SHEET (ENGLISH) (REV.10/25/05)

**STATE OF CALIFORNIA**

**DEPARTMENT OF TRANSPORTATION**

**DIVISION OF ENGINEERING SERVICES**

BRIDGE NO. \_\_\_\_\_

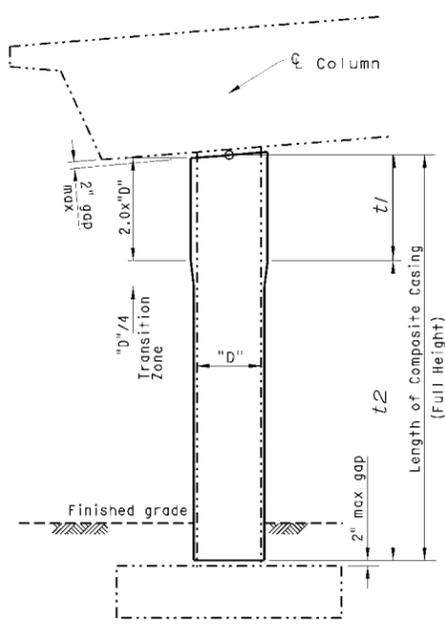
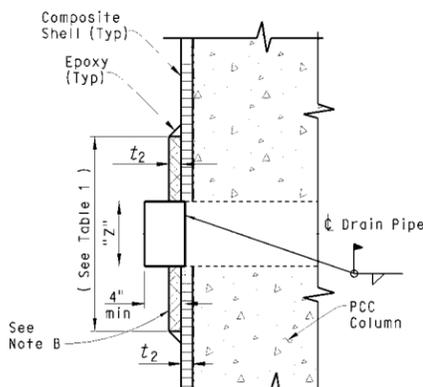
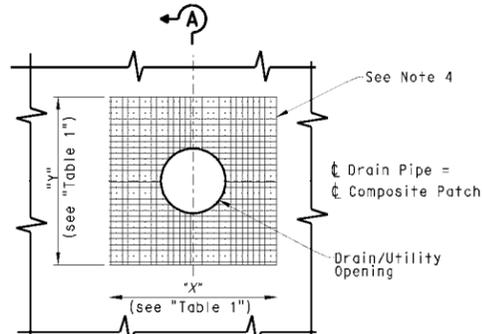
POST MILE \_\_\_\_\_

**COMPOSITE COLUMN CASING**

NO SCALE

CU EA

DISSEMINATE PRINTS BEARING EARLIER REVISION DATES


**COLUMN RETROFIT**  
NO SCALE

**SECTION A-A**  
NO SCALE

**E-GLASS OPENING**  
NO SCALE

**GENERAL NOTES**

1. Prefabricated composite shells shall be fitted to the column to accommodate super elevation and drain openings.
2. Prefabricated shells shall be adhered to every surface of the column and adjacent shell with on-site mixed 2-part epoxy resin.
3. All prefabricated composite shells shall be butted vertically.
4. Drainage opening reinforcement shall be the same material used for the column casing with modified fiber orientation.
5. All cut edges shall be sealed with epoxy.
6. For column heights less than  $5 \times D$ , use constant thickness full height of  $t_1$ .
7. All materials shall be protected from moisture.
8. The casing thickness shall taper evenly the full length of the transition zone using epoxy.
9. Construction of the casing shall be such that all gaps, interior and exterior of the casings are filled with epoxy.

**LEGEND**

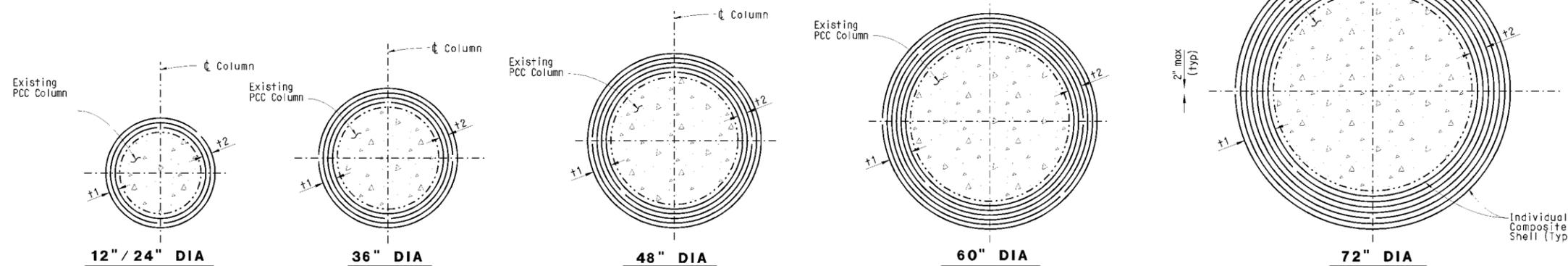
- Indicates Existing Structure
- Indicates New Construction
- $t_1, t_2$  Denotes Amount of Epoxy Vinyl Ester Shells

COLUMN DIA	"X" & "Y" EQUALS
12"	"Z"+14"
24"	"Z"+14"
36"	"Z"+20"
48"	"Z"+26"
60"	"Z"+32"
72"	"Z"+38"

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS

REGISTERED CIVIL ENGINEER DATE \_\_\_\_\_  
 PLANS APPROVAL DATE \_\_\_\_\_  
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COLUMN DIA	INDIVIDUAL SHELL THICKNESS	NO. OF SHELLS $t_1$	NO. OF SHELLS $t_2$
12"	.10"	3	3
24"	.10"	4	3
36"	.10"	5	3
48"	.10"	6	3
60"	.10"	7	4
72"	.10"	8	4

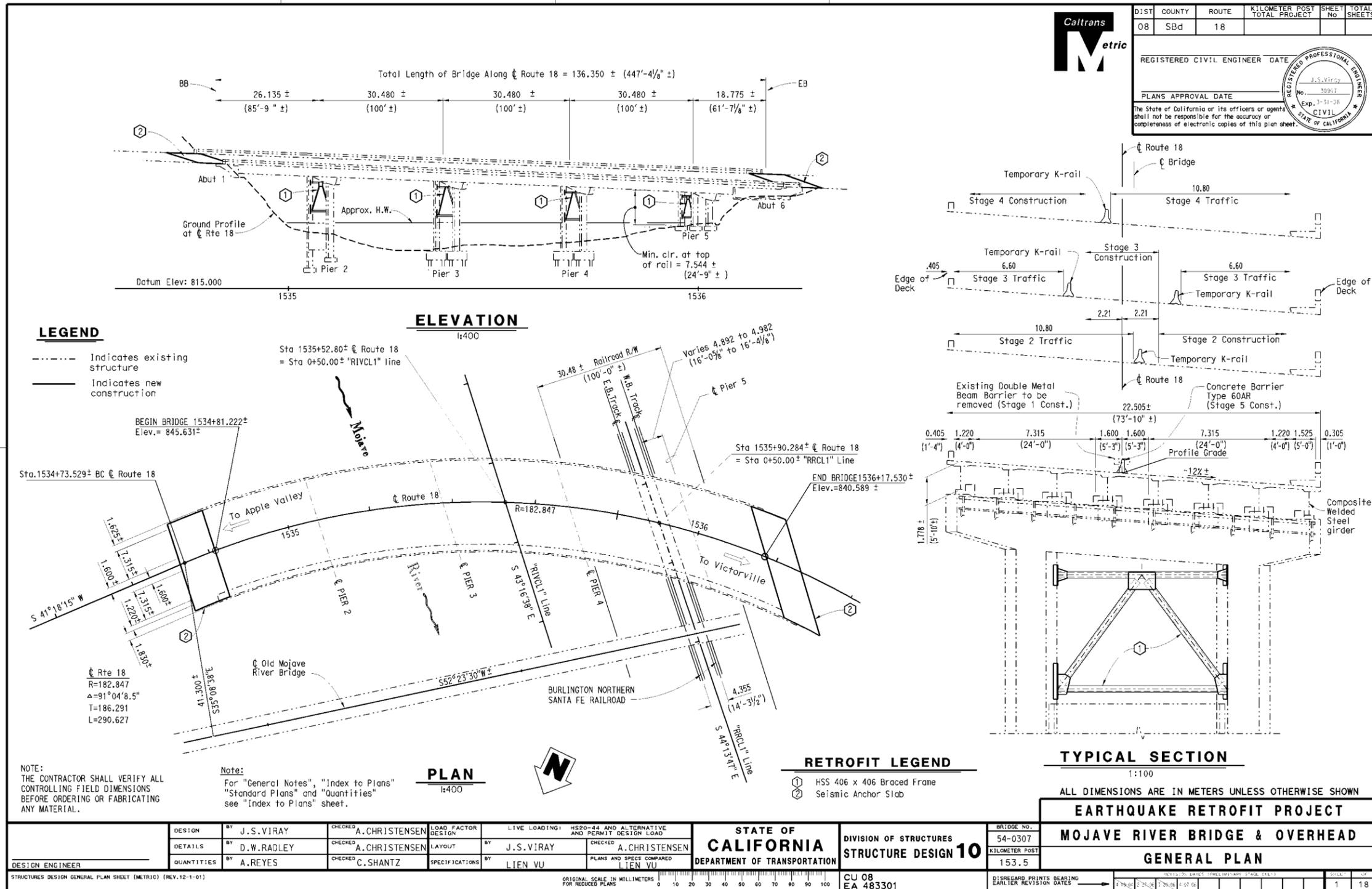

**PREFABRICATED COMPOSITE SHELLS ON CONCRETE COLUMN**  
NO SCALE

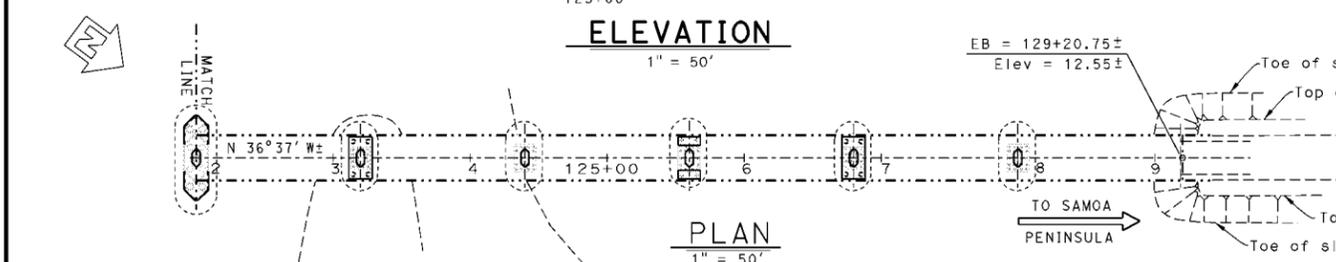
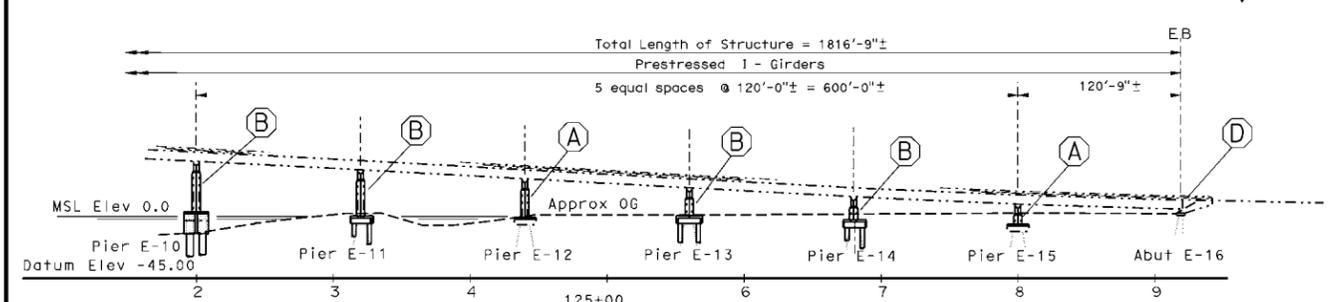
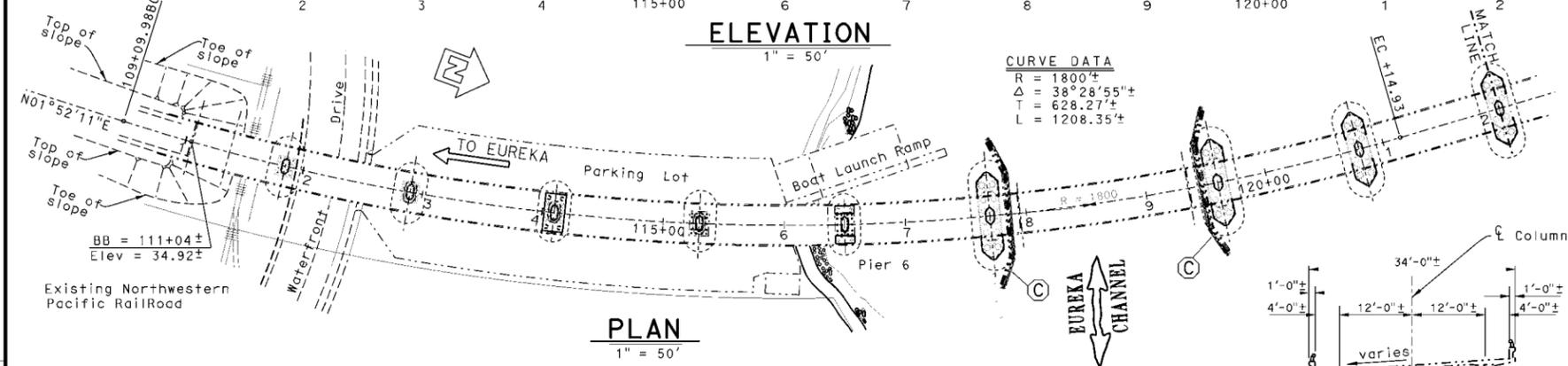
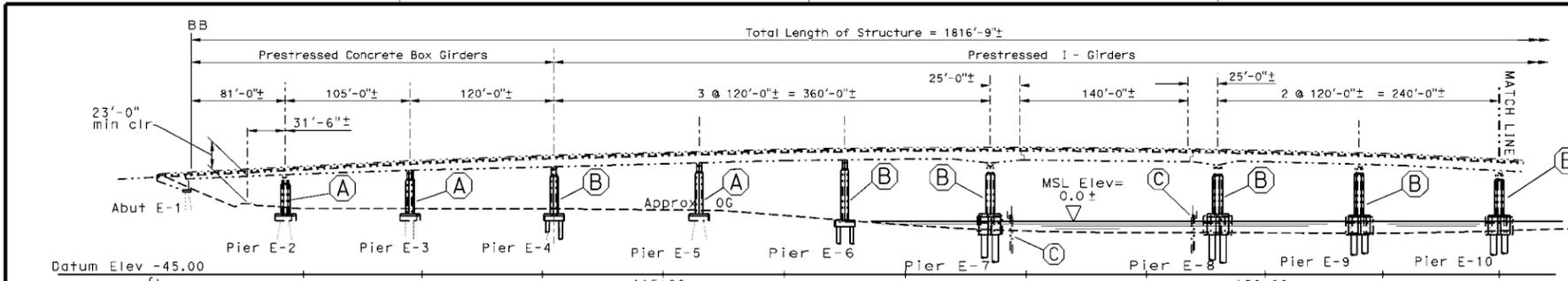
STANDARD DRAWING				STATE OF CALIFORNIA		DIVISION OF ENGINEERING SERVICES		BRIDGE NO.		
RELEASE DATE	DESIGN BY PAT HIPLBY	CHECKED BY JIM GUTIERREZ	RELEASED BY	DEPARTMENT OF TRANSPORTATION		ENGINEERING SERVICES		POST MILE		
FILE NO. xs7-810e	DETAILS BY DAVE RADLEY	CHECKED BY JIM GUTIERREZ						COMPOSITE COLUMN SYSTEM 4		
SUBMITTED BY LI-HONG SHENG			OFFICE CHIEF	CU EA		DISREGARD PRINTS BEARING EARLIER REVISION DATES		REVISION DATES		
STRUCTURES DESIGN STANDARD DRAWING SHEET (ENGLISH) (REV. 10/25/05)			ORIGINAL SCALE IN INCHES FOR REDUCED PLANS		0 1 2 3		SHEET OF		FILE => P:\s7-810e.dgn	

The following two pages show examples of "GENERAL PLANS". Through the use of Legends they clearly indicate and describe the retrofit work to be done. See "BRIDGE DESIGN DETAILS SECTION 1-GENERAL PLANS"

Note the first page shows the installation of a seismic anchor slab that encroaches on both lanes of traffic. This requires the use of "STAGE CONSTRUCTION" practices. For more information on "STAGE CONSTRUCTION" see "BRIDGE DESIGN DETAILS SECTION 17-WIDENINGS".

This structure over crosses railroad right-of-way. The "GENERAL PLAN" will be submitted the railroad operator, and as this was a metric project the details are dimensioned in U.S. Customary units as well as metric. See "BDD SECTION 12-RAILROADS"



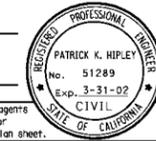


DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
01	HUM	255			

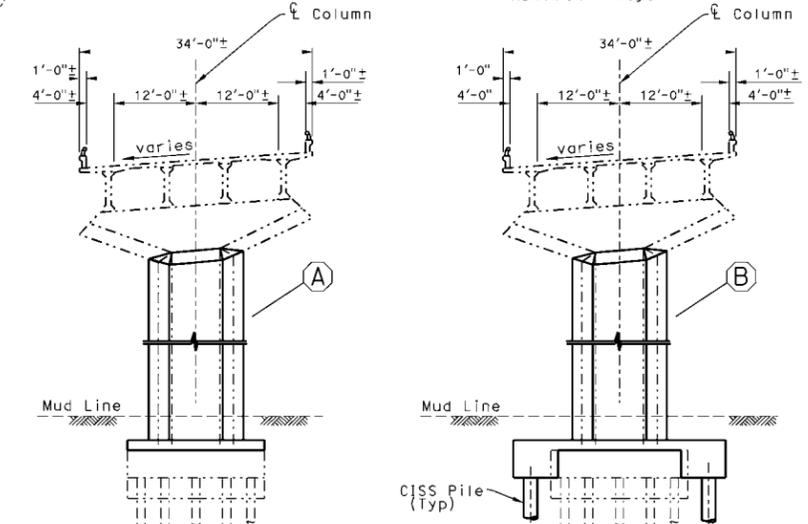
REGISTERED ENGINEER - CIVIL

PLANS APPROVAL DATE

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- LEGEND**
- Indicates Existing Structure
  - Indicates New Construction
  - Indicates Area of Retrofit Work
  - (A) Indicates Concrete Column Casing with Footing Overlay
  - (B) Indicates Concrete Column Casing with Footing Overlay & Piling
  - (C) Indicates Removal of Dolphin Piles & Fender
  - (D) Indicates addition of Abutment Keys



**TYPICAL SECTION**  
1" = 10'

NOTE:  
THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

DESIGN	BY Fadel Alameddine 11-98	CHECKED Garry Tolen 11-98	LOAD FACTOR DESIGN	LIVE LOADING: HS20-44 AND ALTERNATIVE AND PERMIT DESIGN LOAD	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	ENGINEERING SERVICE CENTER	BRIDGE NO.	EARTHQUAKE RETROFIT PROJECT NO.601A EUREKA CHANNEL BRIDGE GENERAL PLAN
DETAILS	BY Ralph Nakaoka 12-99	CHECKED Pat Hipley 12-99	LAYOUT	BY Ralph Nakaoka		OFFICE OF EARTHQUAKE ENGINEERING	04-230	
QUANTITIES	BY Jaroslav Simek 08-00	CHECKED Garry Tolen 08-00	SPECIFICATIONS	BY		PLANS AND SPECS COMPLIANT	Fadel Alameddine	

DESIGN ENGINEER

STRUCTURES DESIGN GENERAL PLAN SHEET (ENGLISH) (REV.1/21/98)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS

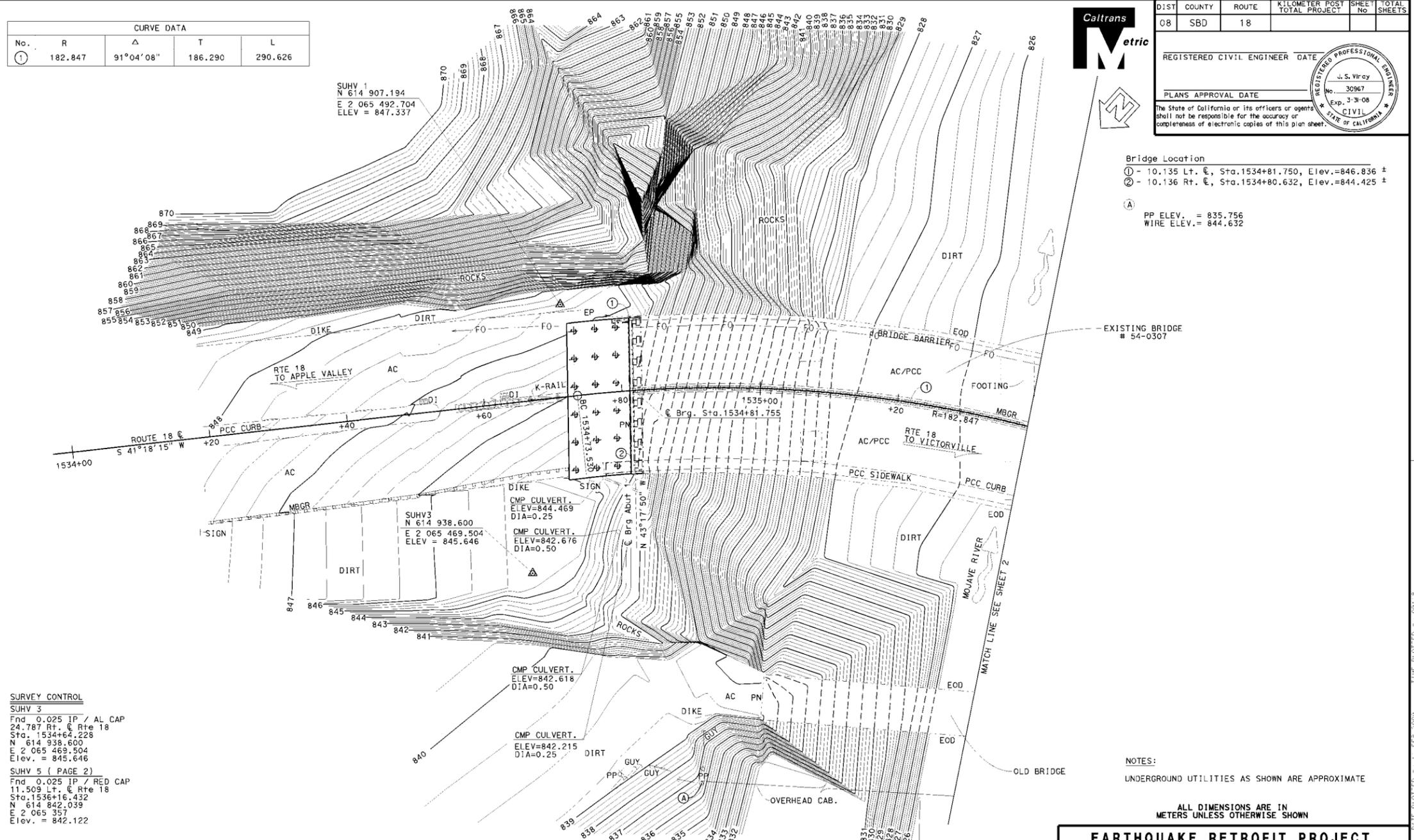
CU 01221  
EA 296701  
FILE => 03\_gpeurek.dgn

REVISION DATES (PRELIMINARY STAGE ONLY)		SHEET	OF
0-15-98	0-23-00	3	59

DATE PLOTTED => 13-JAN-2009 TIME PLOTTED => 14:55 USERNAME => dfg007

CURVE DATA				
No.	R	Δ	T	L
1	182.847	91°04'08"	186.290	290.626

SUHV 1  
 N 614 907.194  
 E 2 065 492.704  
 ELEV = 847.337



**SURVEY CONTROL**  
 SUHV 3  
 Fnd 0.025 IP / AL CAP  
 24.787 Rt. @ Rte 18  
 Sta. 1534+64.228  
 N 614 938.600  
 E 2 065 469.504  
 Elev. = 845.646  
 SUHV 5 (PAGE 2)  
 Fnd 0.025 IP / RED CAP  
 11.509 Lt. @ Rte 18  
 Sta. 1536+16.432  
 N 614 842.039  
 E 2 065 337  
 Elev. = 842.122

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
08	SBD	18			

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF ELECTRONIC COPIES OF THIS PLAN SHEET.

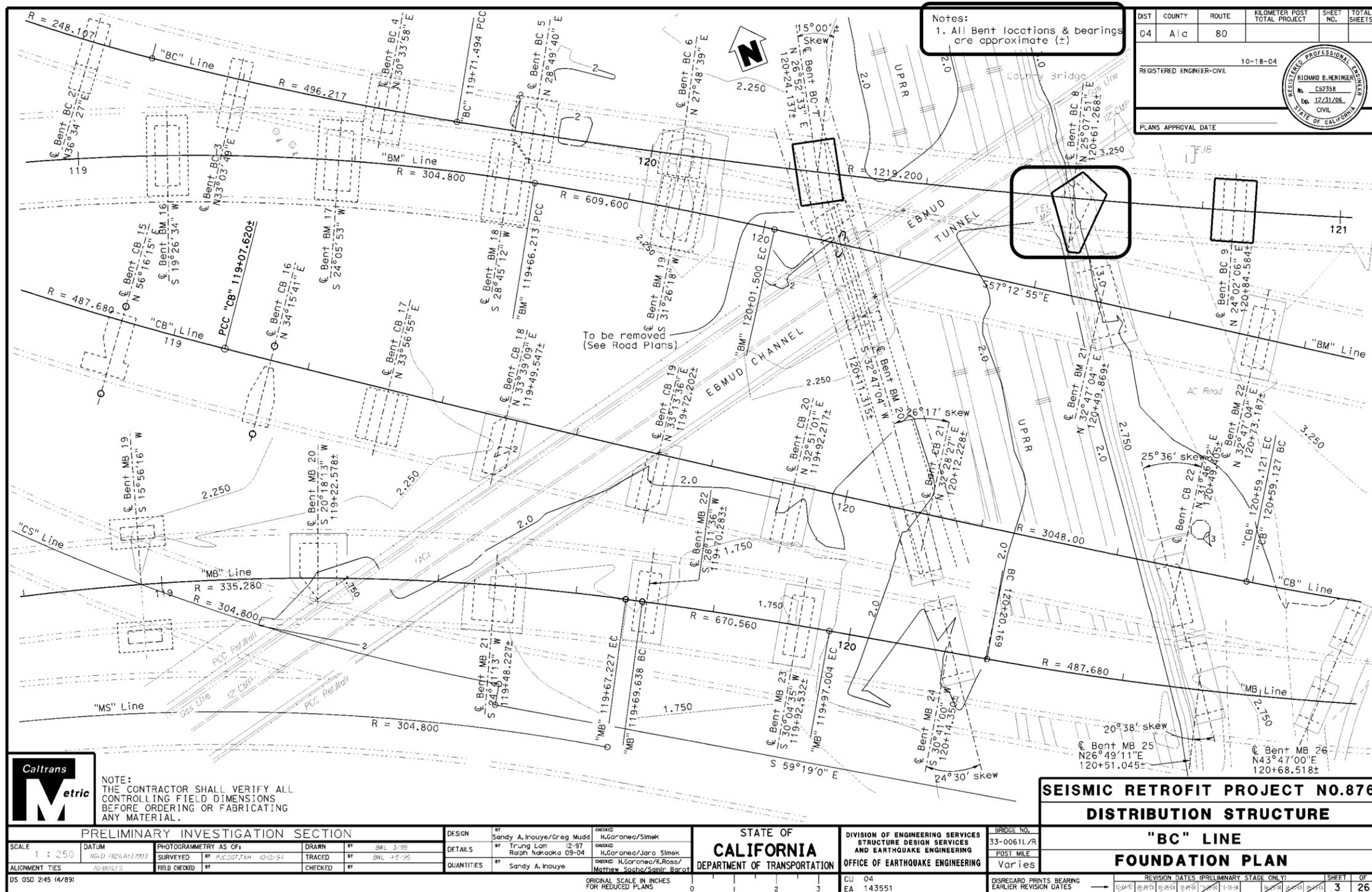
**Bridge Location**  
 ① - 10.135 Lt. @, Sta. 1534+81.750, Elev. = 846.836 ±  
 ② - 10.136 Rt. @, Sta. 1534+80.632, Elev. = 844.425 ±

PP ELEV. = 835.756  
 WIRE ELEV. = 844.632

NOTES:  
 UNDERGROUND UTILITIES AS SHOWN ARE APPROXIMATE

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

<b>PRELIMINARY INVESTIGATION SECTION</b>				DESIGN BY J.S. VIRAY	CHECKED A. CHRISTENSEN	<b>STATE OF CALIFORNIA</b> DEPARTMENT OF TRANSPORTATION DIVISION OF STRUCTURES STRUCTURE DESIGN	BRIDGE NO. 54-0307	<b>EARTHQUAKE RETROFIT PROJECT</b>	
SCALE VERT. DATUM NGVD 29	PHOTOGRAMMETRY AS OF:		DETAILS BY D. WOOTEN	CHECKED A. CHRISTENSEN	KILOMETER POST 153.5		<b>MOJAVE RIVER BRIDGE &amp; OVERHEAD FOUNDATION PLAN NO. 1</b>		
1:250	HORIZ. DATUM NAD 83	SURVEYED BY T. PHUNG 12/05	DRAFTED BY M. SADAGHIANI 01/06	CHECKED C. SHANTZ					
ALIGNMENT TIES DIST. TRAV. SHEETS		FIELD CHECKED BY L. MANABO 12/05	CHECKED BY L. MANABO 01/06	QUANTITIES BY A. REYES	CHECKED C. SHANTZ	CU 08-222 EA 483301	ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100		SHEET 3 OF 18 DATE PLOTTED 01/11/06



Note the odd shape of the footing referred to as "Bent BC 8". It's obvious that serious constraints were driving the original design of this footing. The seismic retrofit was also required to follow those same controlling factors. In this situation the actual mathematical location, bearing and station value of the footing, may not be as important as the footings relationship to fixed physical features near it. In this case a tunnel and a railroad right-of-way controlled the shape of the retrofitted footing. See "BDD SECTION 18 GUIDELINES FOR SEISMIC RETROFITS, 18.3.0 FOUNDATION PLAN."

Also, Note 1 indicates the controlling stations and bearing values are plus/minus. For more information on the use of plus/minus dimensions see, "BDD SECTION 18 GUIDELINES FOR SEISMIC RETROFITS, 18.1.1 DEPENDANT DIMENSION AND THE USE OF THE PLUS/MINUS SYMBOL" Be aware of utility lines. A 24" diameter utility is generally shown on plans a single line, relying proper call-outs and as-built readability for identification.

Note the following two pages indicate an Anchor Pile/Head Restrainer system applied to a diaphragm abutment. This type of retrofit requires access to the interior of the superstructure, thus the need for the "SOFFIT ACCESS DOOR ASSEMBLY" details. See "BDD SECTION 18 GUIDELINES FOR SEISMIC RETROFITS, 18.4.0 ABUTMENTS"

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
06					

REGISTERED ENGINEER - CIVIL

PLANS APPROVAL DATE

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**ABUTMENT PLAN**  
1/4" = 1'-0"

Remove existing reinforcement flush with concrete and coat ends with zinc rich primer

**SECTION A-A**  
No Scale

**HINGE ANCHORAGE DETAIL**  
No Scale

**DETAIL A**  
No Scale

**NOTES:**

1. Non-removable pin in hinge.
2. Hinge assembly to be galvanized, brass, or stainless steel.
3. Use thread locking system for all hinge nuts.
4. Hinge assembly to be minimum 1/8" thick.

**HINGE ANCHORAGE DETAIL**  
No Scale

**PLAN**  
No Scale

**HINGE DETAIL**  
No Scale

**SOFFIT ACCESS DOOR ASSEMBLY**

Note: Soffit access door opening direction to be determined by the Engineer

NOTE: THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

DESIGN	BY C.J. Sims 10/95	CHECKED R. J. Morin 1-96	<b>STATE OF CALIFORNIA</b> DEPARTMENT OF TRANSPORTATION	BRIDGE NO.	EARTHQUAKE RETROFIT PROJECT NO. SR 382
DETAILS	BY Janice Fujii 10/95	CHECKED R. J. Morin 1-96		50-297R/L	MILLUX ROAD OVERHEAD
QUANTITIES	BY M. Koduntle 3-96	CHECKED R. J. Morin 3-96		30.8	ABUTMENT PLAN

DS 050 239 (CADD 9/95)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS

CU 06  
EA 376211

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY)

1	2	3	4	5	6	7	8	9	10

SHEET 2 OF 6

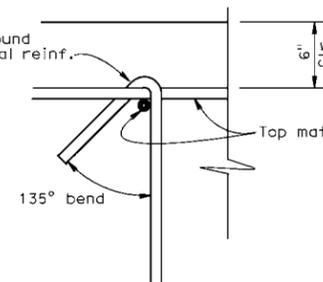
DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
06					

REGISTERED ENGINEER - CIVIL

PLANS APPROVAL DATE



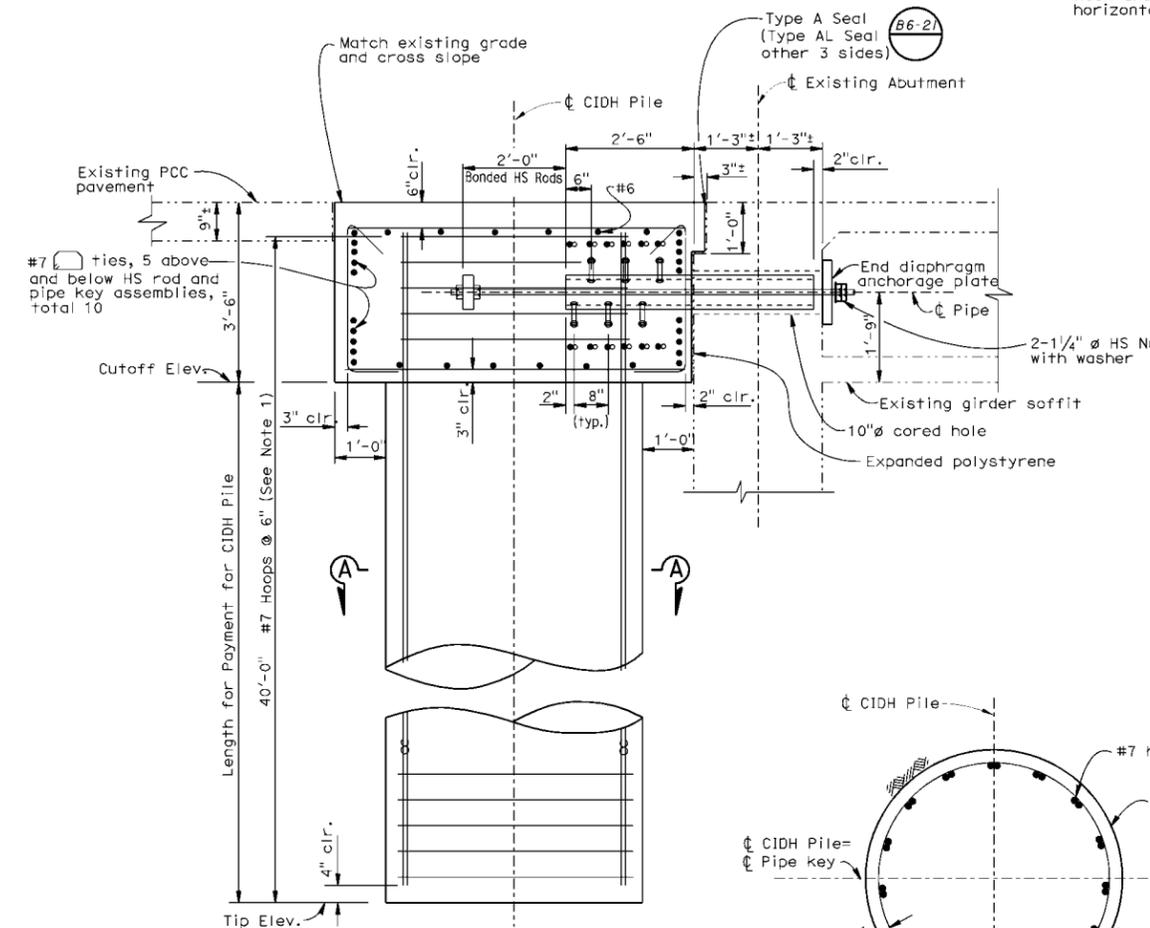
The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.



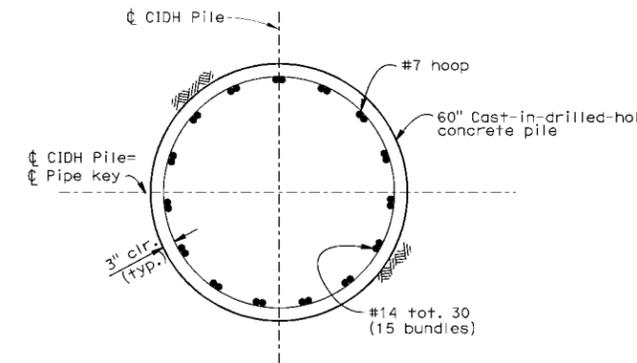
**TIE BAR DETAIL**  
No Scale



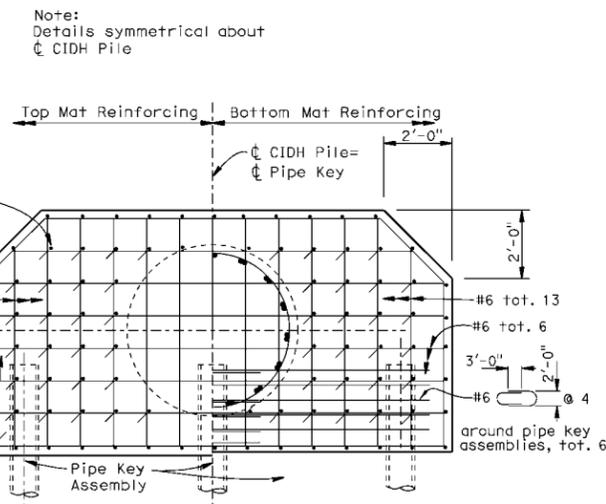
**BUTT WELDED CONTINUOUS HOOP**



**ANCHOR HEAD SECTION**  
3/4" = 1'-0"



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



**ANCHOR HEAD PLAN**  
1/2" = 1'-0"

NOTE:  
THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

Notes:  
1. Adjust hoop spacing to accommodate pipe key assembly.  
2. ∞ indicates bundled bar

Note:  
Adjust main vertical reinforcement to accommodate pipe key assembly.

**EARTHQUAKE RETROFIT PROJECT NO. SR 382**  
**MILLUX ROAD OVERHEAD**  
**CIDH ANCHOR PILE DETAILS NO. 1**

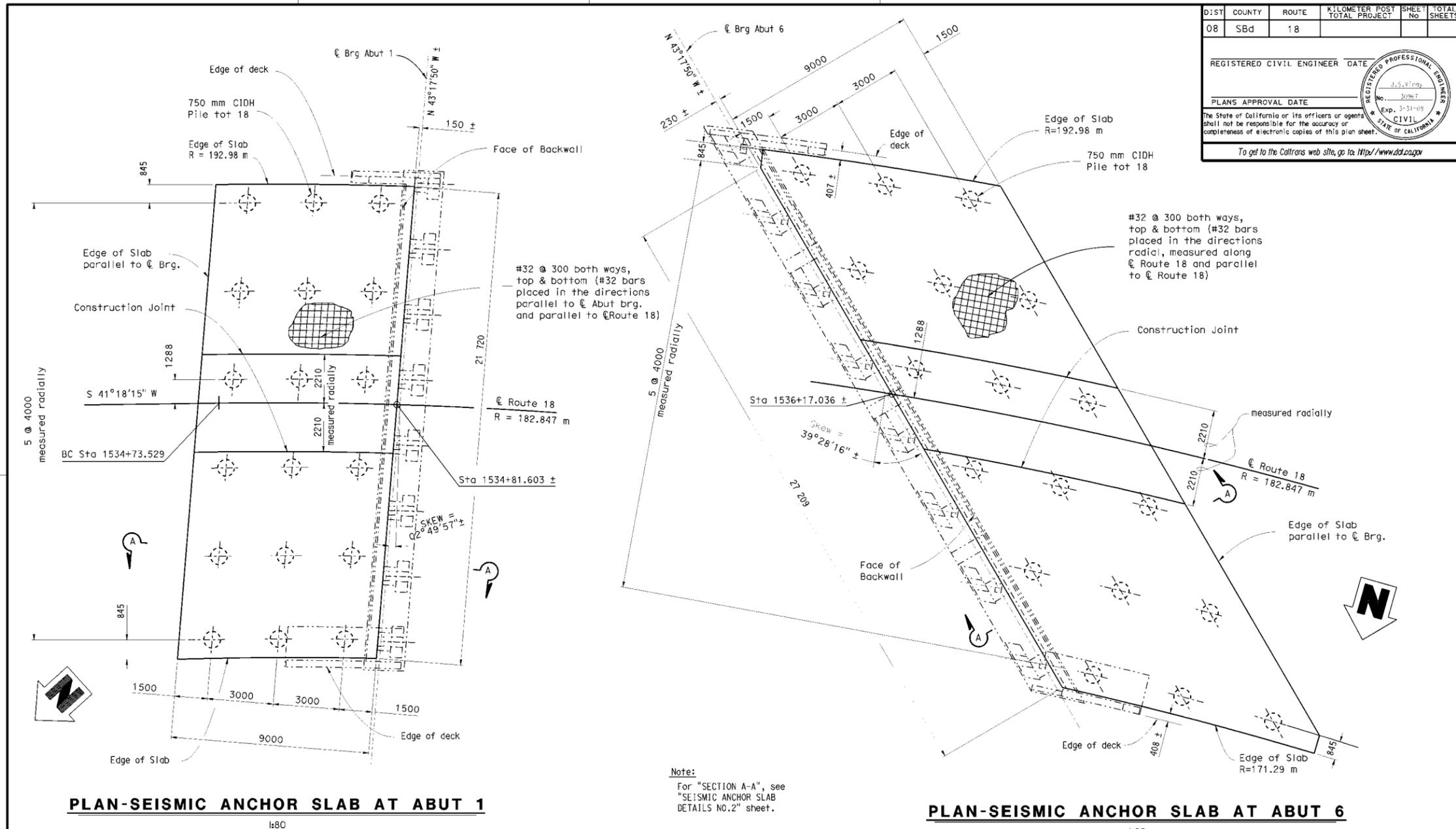
DESIGN	BY C. J. Sims II/95	CHECKED R. J. Morin I-96
DETAILS	BY Janice Fujii II/95	CHECKED R. J. Morin I-96
QUANTITIES	BY M. Koduntlie 3-96	CHECKED R. J. Morin 3-96

**STATE OF CALIFORNIA**  
**DEPARTMENT OF TRANSPORTATION**  
**DIVISION OF STRUCTURES**  
**STRUCTURE DESIGN 5**

BRIDGE NO.	50-297R/L
POST MILE	30.8

CU 06	EA 376211	DISREGARD PRINTS BEARING EARLIER REVISION DATES	DATE PLOTTED = 04-FEB-2009	TIME PLOTTED = 12:51	SHEET 3	TOTAL SHEETS 6
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Note that this example refers directly to the "FOUNDATION PLAN" example shown as Figure 18-4.1. Using standard practice, the Anchor Slab has been located by station indicating its relationship to the existing structure. The example below has all the data necessary to layout the Anchor Slabs and produce accurate quantities.



DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
08	SBd	18			

REGISTERED CIVIL ENGINEER	DATE
J.S. Viray	
PLANS APPROVAL DATE	
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To get to the Caltrans web site, go to: <a href="http://www.dot.ca.gov">http://www.dot.ca.gov</a>	

**PLAN-SEISMIC ANCHOR SLAB AT ABUT 1**

**PLAN-SEISMIC ANCHOR SLAB AT ABUT 6**



DESIGN	BY J.S. Viray	CHECKED A. Christensen
DETAILS	BY D. Wooten	CHECKED A. Christensen
QUANTITIES	BY A. Reyes	CHECKED C. Shantz

**STATE OF CALIFORNIA**  
DEPARTMENT OF TRANSPORTATION

DIVISION OF ENGINEERING SERVICES  
STRUCTURE DESIGN  
**DESIGN BRANCH 10**

BRIDGE NO.	54-0307
KILOMETER POST	153.5

**EARTHQUAKE RETROFIT PROJECT**  
**MOJAVE RIVER BRIDGE & OVERHEAD**  
**SEISMIC ANCHOR SLAB DETAILS NO. 1**

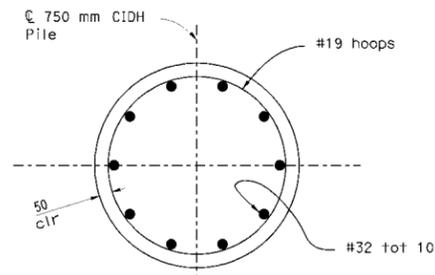
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS

CU 08  
EA 483301

© BREASARD PRINTING BEARING EARLIER REVISION DATES

STRUCTURES DESIGN DETAIL SHEET (METRIC) (REV. 03-17-04)



**SECTION C-C**  
1:10

**Notes:**

1. All hoops are "Ultimate" butt spliced continuous.
2. No splices are allowed in main CIDH pile reinforcement.

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
08	SBd	18			

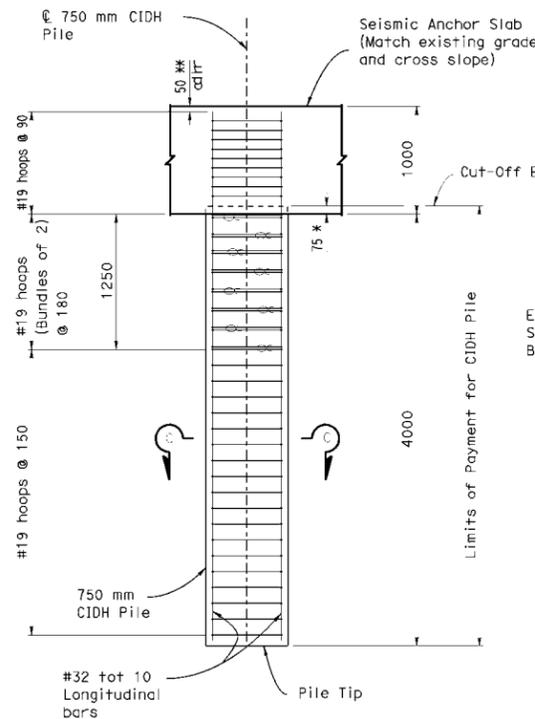
  

REGISTERED CIVIL ENGINEER	DATE
J.S. Viray	
No. 30267	
Exp. 3-31-08	
REGISTERED PROFESSIONAL ENGINEER CIVIL STATE OF CALIFORNIA	

PLANS APPROVAL DATE \_\_\_\_\_

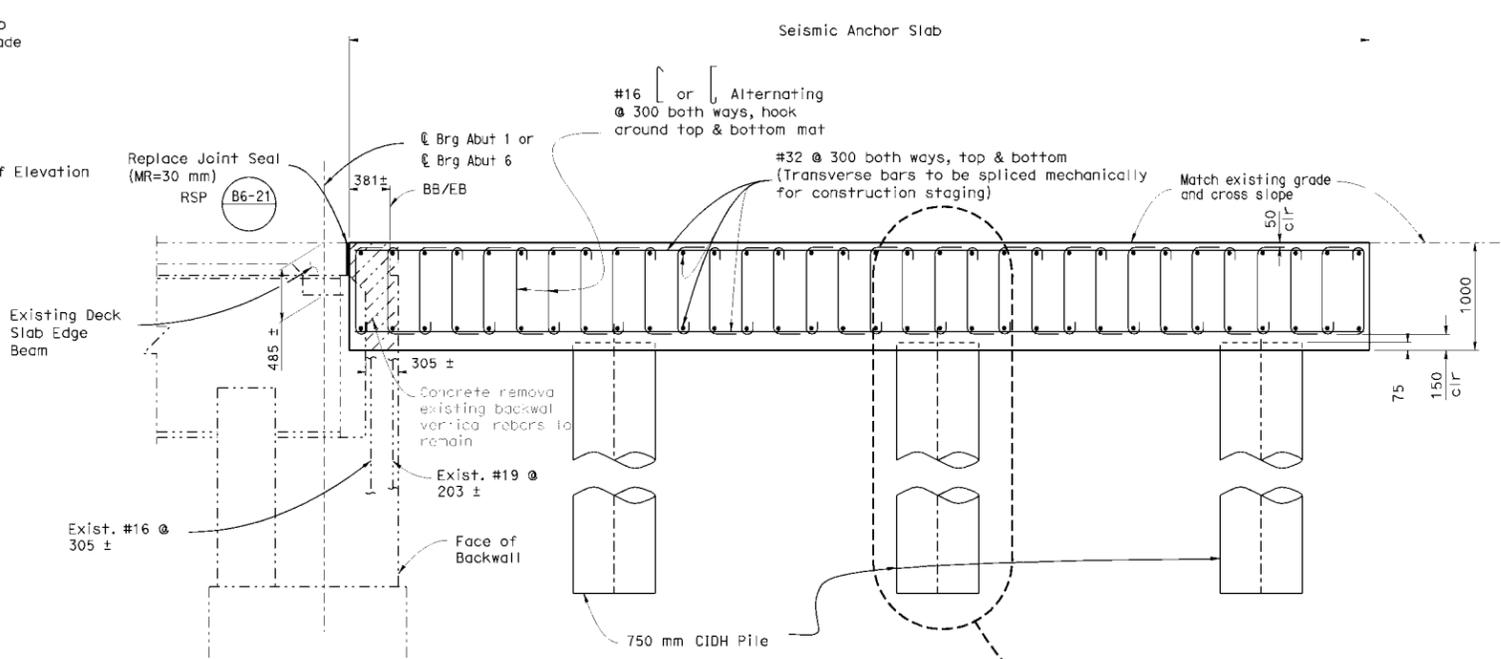
The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

To get to the Caltrans web site, go to: <http://www.fdot.gov>



**DETAIL B**  
1:25

\* Measured along  $\phi$  pile  
\*\* Each longitudinal bar



**SECTION A-A**  
1:25

\* Measured along  $\phi$  pile  
\*\* Each longitudinal bar

Indicates Concrete Removal



DESIGN	BY J.S. Viray	CHECKED A. Christensen
DETAILS	BY D. Wooten	CHECKED A. Christensen
QUANTITIES	BY A. Reyes	CHECKED C. Shantz

**STATE OF CALIFORNIA**  
DEPARTMENT OF TRANSPORTATION

DIVISION OF ENGINEERING SERVICES  
STRUCTURE DESIGN  
**DESIGN BRANCH 10**

BRIDGE NO.	54-0307
KILOMETER POST	153.5

**EARTHQUAKE RETROFIT PROJECT**  
**MOJAVE RIVER BRIDGE & OVERHEAD**  
**SEISMIC ANCHOR SLAB DETAILS NO. 2**

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS  
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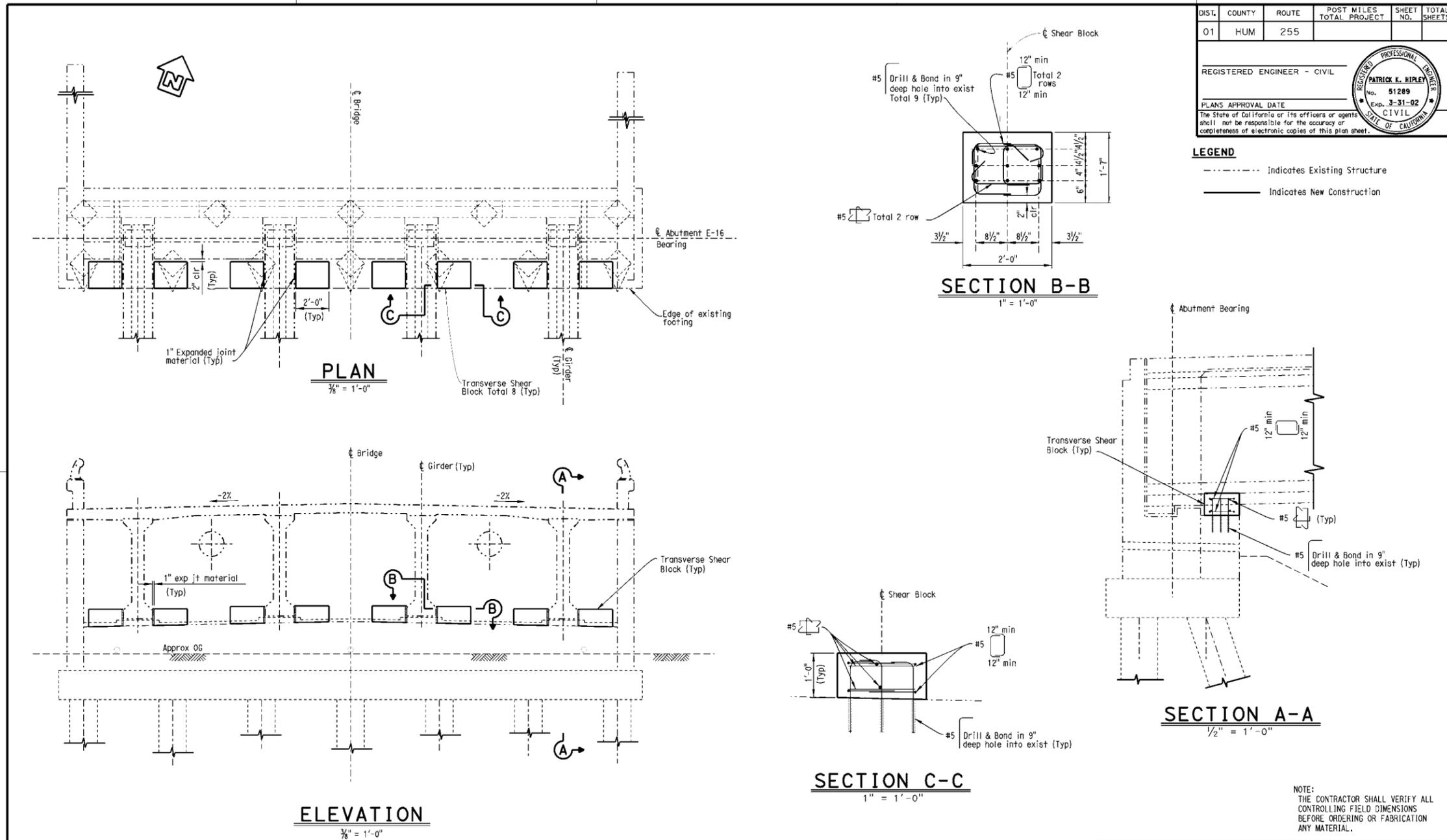
CU 08  
EA 483301

©3 BREARD PRINTS BEARING EARLIER REVISION DATES

DATE	BY	REVISION
2/20/08	A. Reyes	1
		2
		3
		4
		5
		6
		7
		8
		9
		10

STRUCTURES DESIGN DETAIL SHEET (METRIC) (REV. 03-17-04)

This example shows a relatively simple retrofit of adding shear blocks to a precast I-Girder abutment.

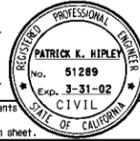


DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
01	HUM	255			

REGISTERED ENGINEER - CIVIL

PLANS APPROVAL DATE

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**LEGEND**

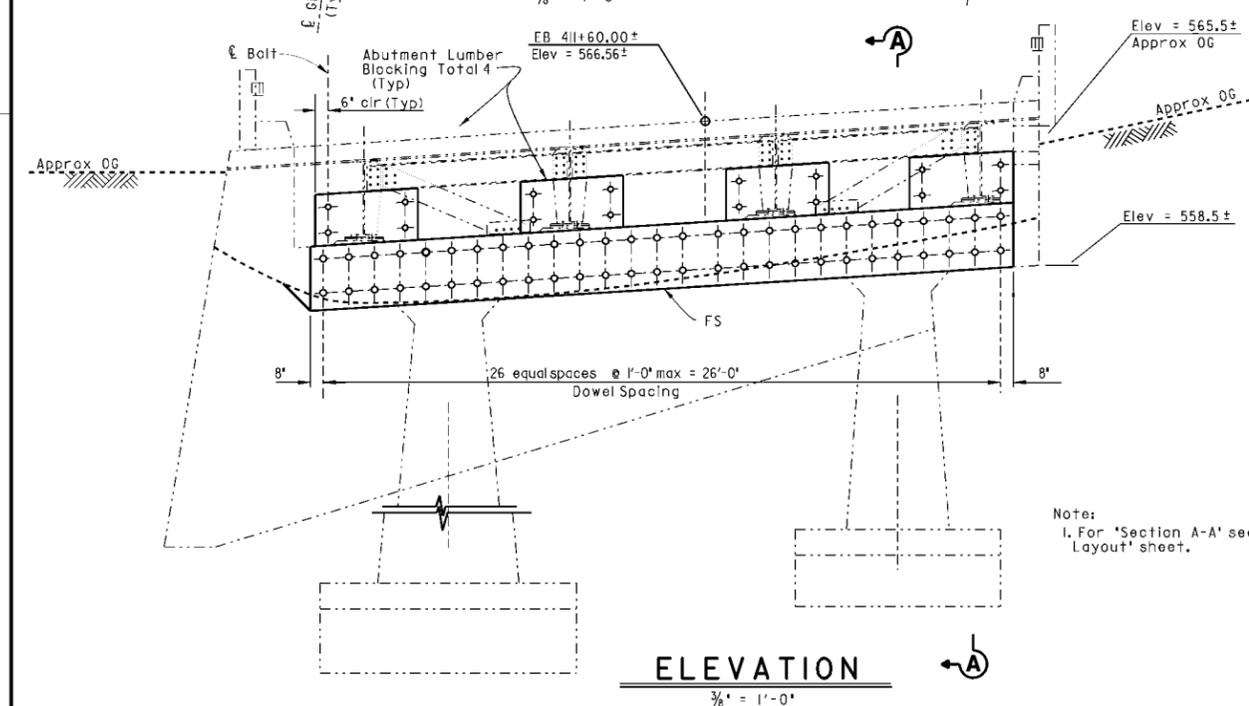
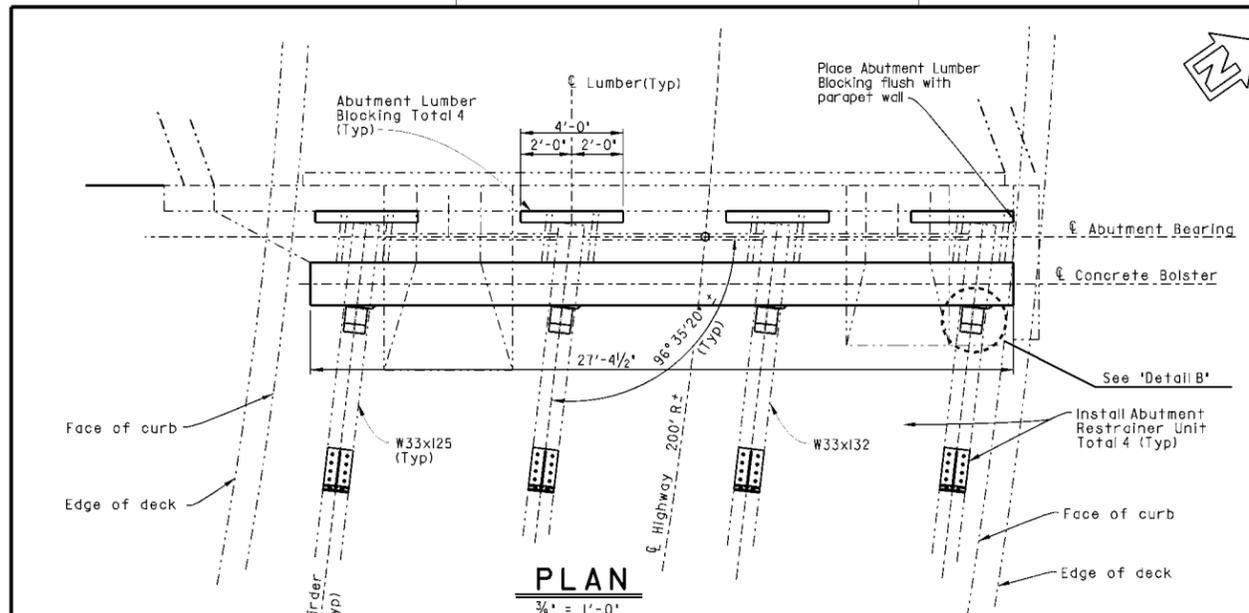
----- Indicates Existing Structure

————— Indicates New Construction

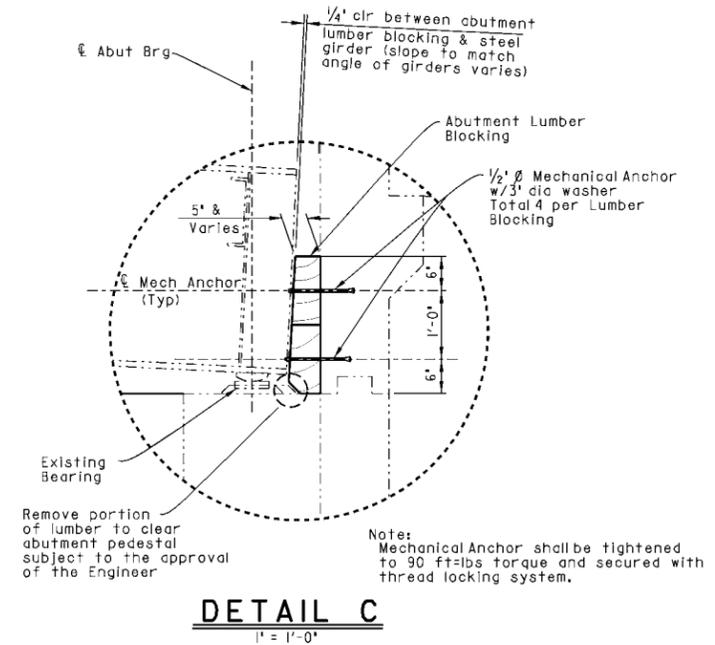
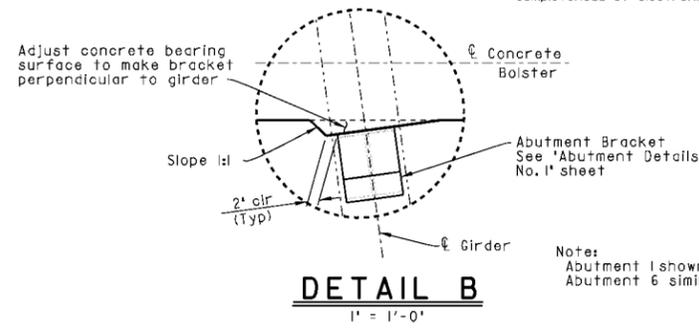
NOTE:  
THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

DESIGN BY <b>Pat Hipley</b> CHECKED <b>Garry Tolén</b>		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION		ENGINEERING SERVICE CENTER OFFICE OF EARTHQUAKE ENGINEERING S		BRIDGE NO. 04-230 POST MILE 0.2		<b>EARTHQUAKE RETROFIT PROJECT NO.601A</b> <b>EUREKA CHANNEL BRIDGE</b> <b>ABUTMENT E-16 DETAILS 1</b>	
DETAILS BY <b>Ralph Nakaoka</b> 2-99 CHECKED <b>Pat Hipley</b>		QUANTITIES BY <b>Pat Hipley</b> 8-00 CHECKED <b>Garry Tolén</b> 8-00		ORIGINAL SCALE IN INCHES FOR REDUCED PLANS		CU 01221 EA 296701		SHEET 4 OF 59	

DATE PLOTTED = 11-FEB-2003  
 FIVE PLOTTED = 11-FEB-2003  
 DATE PLOTTED = 11-FEB-2003  
 FIVE PLOTTED = 11-FEB-2003



**LEGEND**  
 - - - - - Indicates Existing Structure  
 \_\_\_\_\_ Indicates New Construction



Note:  
1. For 'Section A-A' see 'Abutment 1 Layout' sheet.

NOTE:  
THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
05					

REGISTERED ENGINEER - CIVIL

PLANS APPROVAL DATE



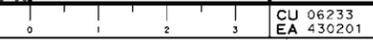
The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

**EARTHQUAKE RETROFIT PROJECT NO. 775**

BRIDGE NO.	44-0035
POST MILE	43.12
<b>CASTRO CANYON BRIDGE</b>	
<b>ABUTMENT 6 LAYOUT</b>	
DESIGNER	CU 06233
CHECKER	EA 430201
DATE PLOTTED	11 MAR 2009
TIME PLOTTED	1:31:29
DISREGARD PRINTS BEARING EARLIER REVISION DATES	
SHEET	3
TOTAL SHEETS	15

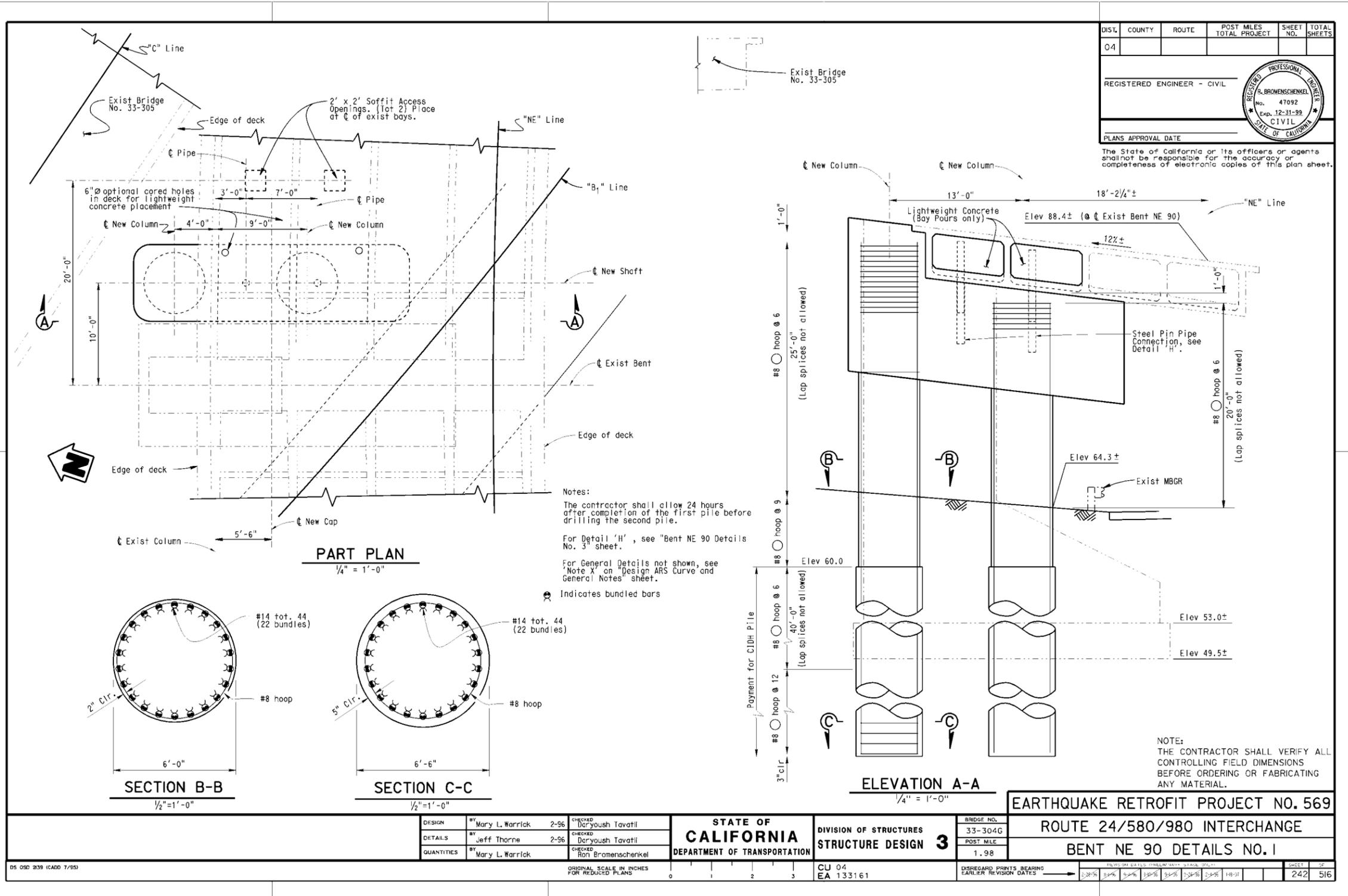
DS 09D 239 (CAD 10/95)

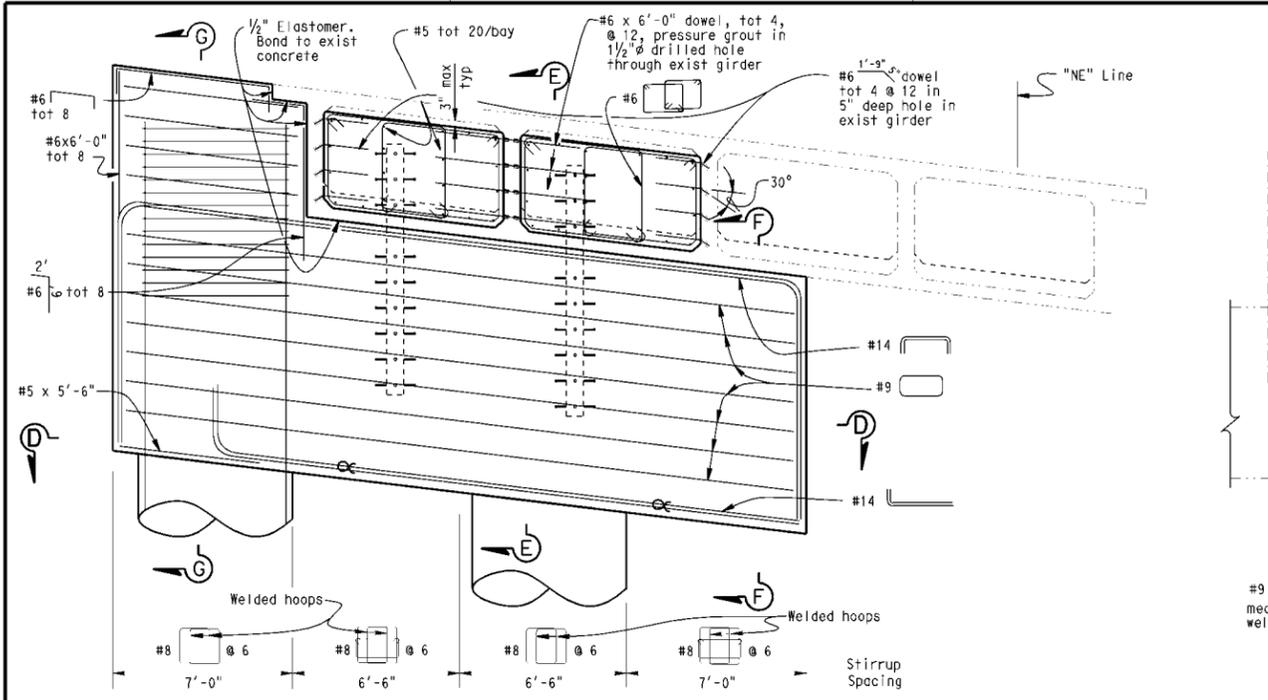
ORIGINAL SCALE IN INCHES FOR REDUCED PLANS



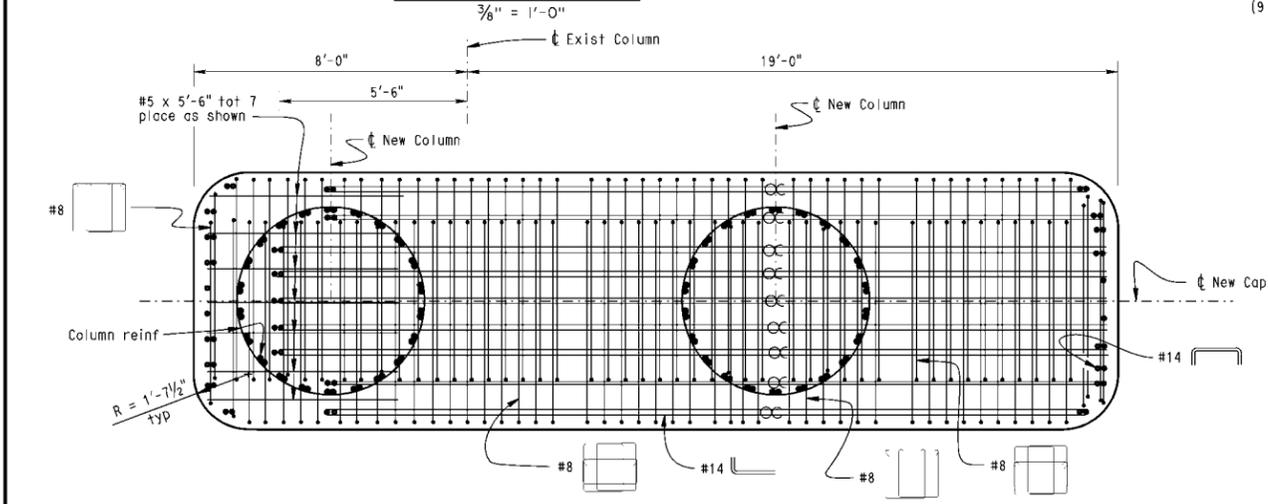
USER NAME = 430201 95548102LV1.DGN  
03500-06.dgn

This example illustrates a very extreme retrofit strategy. The addition of a “bent like” structure, with CIDH piles for support.

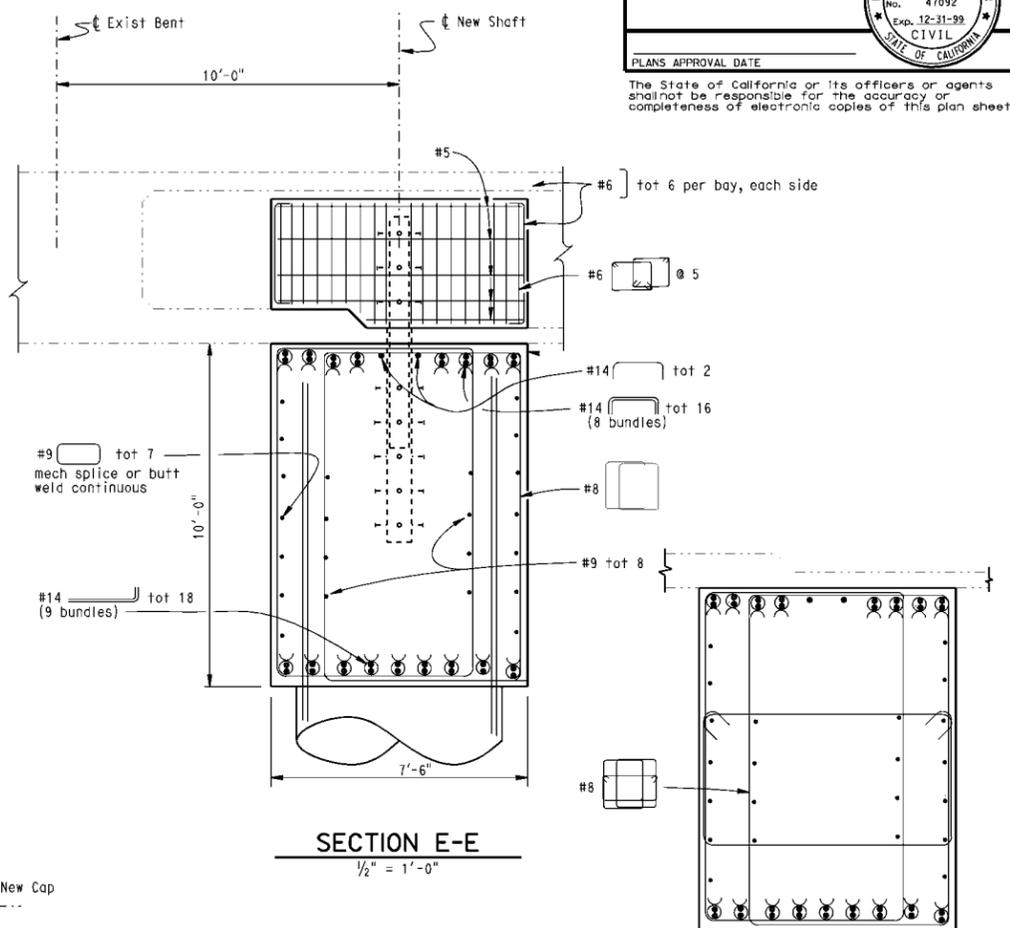




**PART ELEVATION**  
3/8" = 1'-0"



**SECTION D - D**  
1/2" = 1'-0"



**SECTION E-E**  
1/2" = 1'-0"

**SECTION F-F**  
1/2" = 1'-0"

Note:  
 Indicates bundled bars  
 For 'Section G-G', see 'Bent NE 90 Details No. 3' sheet.  
 For details not shown, see 'Section E - E'

NOTE:  
 THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
04					

REGISTERED ENGINEER - CIVIL

PLANS APPROVAL DATE \_\_\_\_\_

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DESIGN BY Mary L. Warrick 2-96		CHECKED Daryoush Tavah	<b>STATE OF CALIFORNIA</b> DEPARTMENT OF TRANSPORTATION	DIVISION OF STRUCTURES STRUCTURE DESIGN <b>3</b>	BRIDGE NO. 33-304G	<b>EARTHQUAKE RETROFIT PROJECT NO. 569</b> ROUTE 24/580/980 INTERCHANGE BENT NE 90 DETAILS NO. 2
DETAILS BY Jeff Thorne 2-96		CHECKED Daryoush Tavah			POST MILE 1.98	
QUANTITIES BY Mary L. Warrick		CHECKED Ron Bromenschenkel				

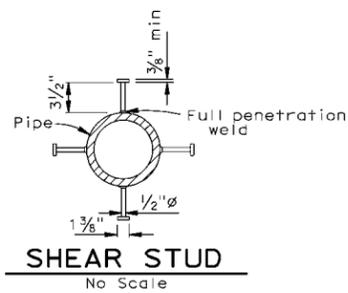
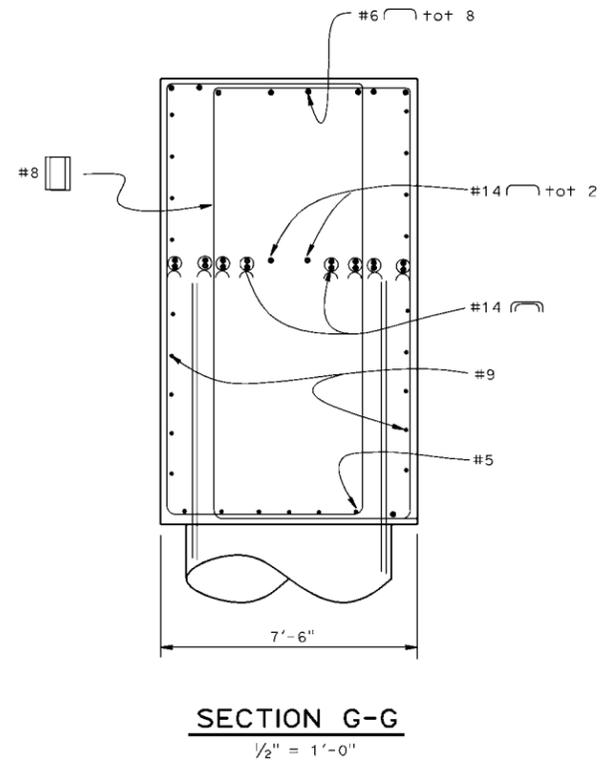
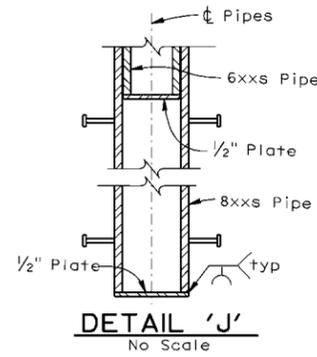
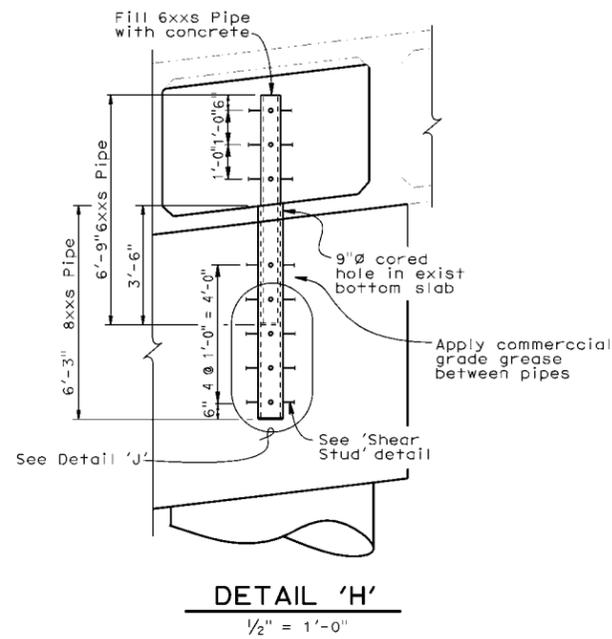
CU 04 EA 133161

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS

0 1 2 3

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES: 11/20/07, 07/20/07, 05/20/07, 03/20/07, 01/20/07, 11/06, 08/06, 05/06, 03/06, 01/06, 11/05, 09/05, 07/05, 05/05, 03/05, 01/05, 11/04, 09/04, 07/04, 05/04, 03/04, 01/04, 11/03, 09/03, 07/03, 05/03, 03/03, 01/03, 11/02, 09/02, 07/02, 05/02, 03/02, 01/02, 11/01, 09/01, 07/01, 05/01, 03/01, 01/01, 11/00, 09/00, 07/00, 05/00, 03/00, 01/00, 11/99, 09/99, 07/99, 05/99, 03/99, 01/99, 11/98, 09/98, 07/98, 05/98, 03/98, 01/98, 11/97, 09/97, 07/97, 05/97, 03/97, 01/97, 11/96, 09/96, 07/96, 05/96, 03/96, 01/96, 11/95, 09/95, 07/95, 05/95, 03/95, 01/95, 11/94, 09/94, 07/94, 05/94, 03/94, 01/94, 11/93, 09/93, 07/93, 05/93, 03/93, 01/93, 11/92, 09/92, 07/92, 05/92, 03/92, 01/92, 11/91, 09/91, 07/91, 05/91, 03/91, 01/91, 11/90, 09/90, 07/90, 05/90, 03/90, 01/90, 11/89, 09/89, 07/89, 05/89, 03/89, 01/89, 11/88, 09/88, 07/88, 05/88, 03/88, 01/88, 11/87, 09/87, 07/87, 05/87, 03/87, 01/87, 11/86, 09/86, 07/86, 05/86, 03/86, 01/86, 11/85, 09/85, 07/85, 05/85, 03/85, 01/85, 11/84, 09/84, 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DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
04					

REGISTERED ENGINEER - CIVIL



PLANS APPROVAL DATE

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

NOTE:  
THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

**EARTHQUAKE RETROFIT PROJECT NO. 569**

DESIGN	BY Mary L. Warrick	CHECKED 2-96 Deryoush Tavah
DETAILS	BY Jeff Thorne	CHECKED 2-96 Deryoush Tavah
QUANTITIES	BY Mary L. Warrick	CHECKED Rori Bromenschenkel

STATE OF CALIFORNIA  
DEPARTMENT OF TRANSPORTATION  
DIVISION OF STRUCTURES  
STRUCTURE DESIGN **3**

BRIDGE NO.	33-304G
POST MILE	1.98

ROUTE 24/580/980 INTERCHANGE  
BENT NE 90 DETAILS NO. 3

DS 05D 239 (CADD 7/95)	ORIGINAL SCALE IN INCHES FOR REDUCED PLANS	0 1 2 3	CU 04 EA 133161	DISREGARD PRINTS BEARING EARLIER REVISION DATES	<table border="1"> <tr> <td>1/25%</td> <td>1/50%</td> <td>1/75%</td> <td>1/100%</td> <td>1/150%</td> <td>1/200%</td> <td>1/300%</td> <td>1/400%</td> <td>1/500%</td> </tr> </table>	1/25%	1/50%	1/75%	1/100%	1/150%	1/200%	1/300%	1/400%	1/500%	SHEET 244 OF 516
1/25%	1/50%	1/75%	1/100%	1/150%	1/200%	1/300%	1/400%	1/500%							

Here we have much simpler retrofit, the application of steel jackets to round columns. Note there is an existing TYPE 50 barrier that must be modified. Again, Concrete Removal Details are shown. The chart provides necessary elevations that allow lengths of specific jackets to be calculated for quantities and fabrication.

**ELEVATION**  
1/4" = 1'-0"

(Bents 5, 6, 8, 10, 11 & 12)

**ELEVATION**

**PLAN**

NOTE: Details are symmetrical about  $\bar{C}$  Bridge.

**LIMITS OF PAYMENT FOR CONCRETE BARRIER  
REMOVAL & RECONSTRUCTION @ BENT 8**

No Scale

Bent No.	Station	Elev A	Elev B	Elev C	Dimension D	Dimension E	Elev F
5	383+93.21±	22.15±	19.47±	-3.5±	16'-10"±	16'-10"±	1.4±
6	384+62.54±	26.26±	23.56±	-4.0±	16'-10"±	16'-10"±	3.0±
7	385+31.87±	28.69±	25.99±	+1.0±	16'-10"±	16'-10"±	7.6±
8	385+85.34±	29.40±	26.71±	0.0±	16'-11 3/4"±	17'-0"±	3.1±
9	386+54.68±	28.90±	26.15±	-3.0±	16'-10 1/2"±	16'-10 1/2"±	4.1±
10	387+24.01±	26.65±	23.95±	-1.5±	16'-10"±	16'-10"±	3.3±
11	387+93.34±	22.90±	20.20±	-0.5±	16'-10"±	16'-10"±	3.9±
12	388+62.68±	18.84±	16.15±	-0.5±	16'-10"±	16'-10"±	3.3±

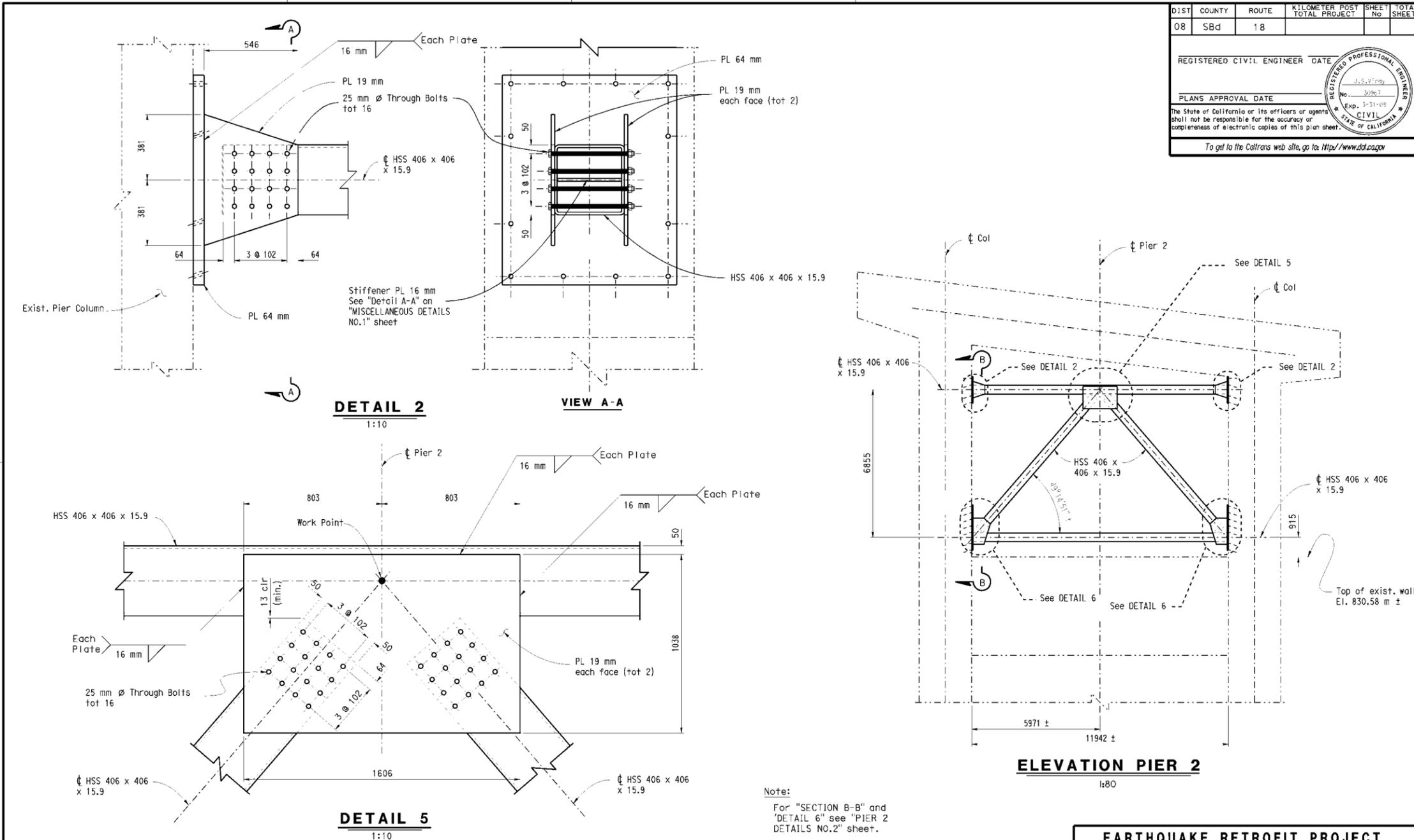
**FOOTING PLAN**  
1/4" = 1'-0"

(Bents 5, 6, 8, 10, 11 & 12)

NOTE: THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

DESIGN BY Yong Pil Kim II-95	CHECKED Don Lee II-95	<b>STATE OF CALIFORNIA</b>	DIVISION OF STRUCTURES
DETAILS BY Roberto Lim 7-94	CHECKED Don Lee II-95	<b>DEPARTMENT OF TRANSPORTATION</b>	STRUCTURE DESIGN <b>8</b>
QUANTITIES BY Yong Pil Kim II-95	CHECKED Joseph Downing II-95	CU 10203 EA 438421	

<b>SEISMIC RETROFIT PROJECT NO. 731</b>			
<b>WALNUT STREET OVERCROSSING</b>			
<b>BENT DETAILS NO. 2</b>			
BRIDGE NO. 23-109	POST MILE R7.2	SHEET 4	TOTAL SHEETS 11



DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
08	Sbd	18			

REGISTERED CIVIL ENGINEER	DATE
J.S. Viray	3/26/07
PLANS APPROVAL DATE	
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To get to the Caltrans web site, go to: <http://www.dot.ca.gov>

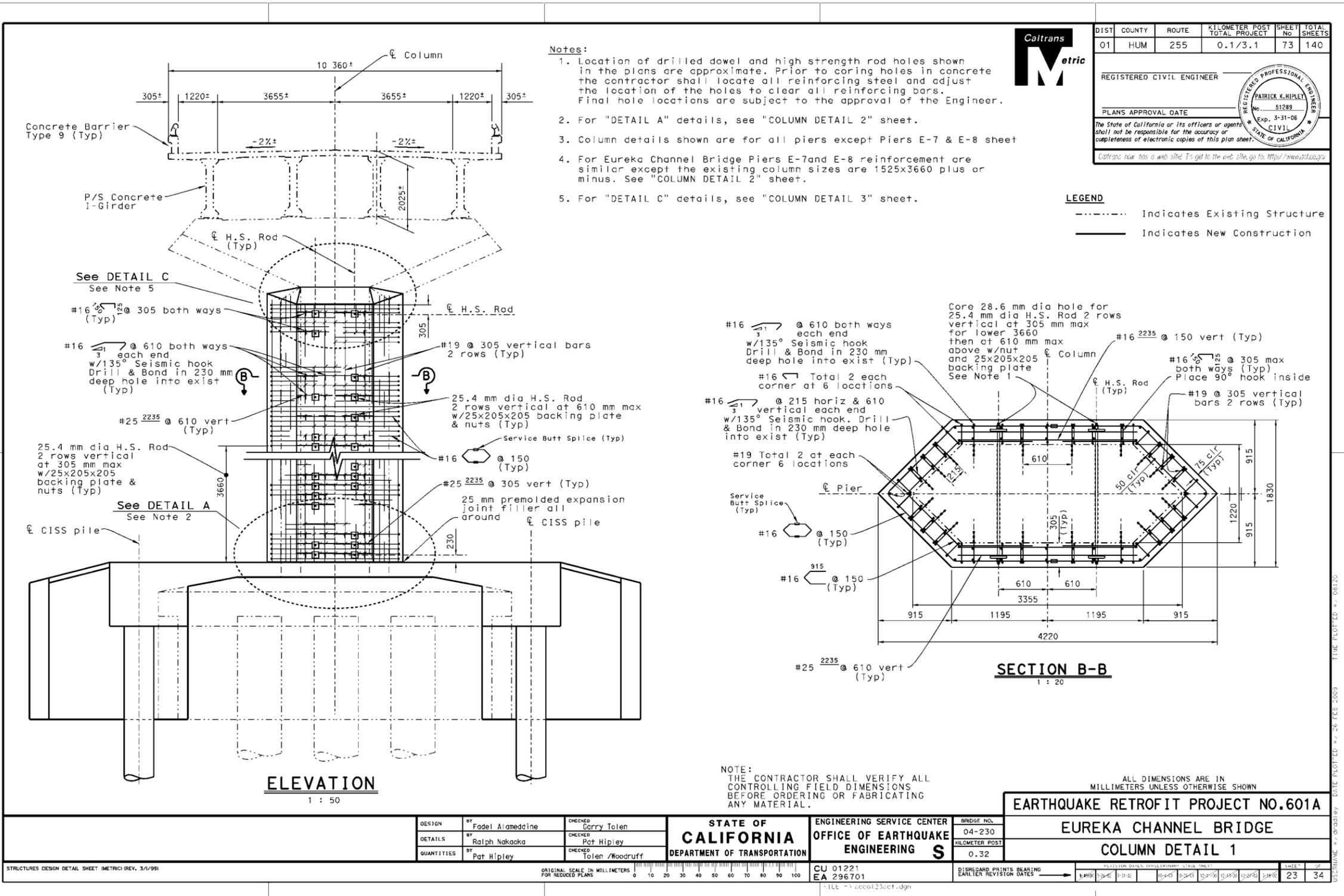
The next two pages support a pier retrofit. This retrofit uses a steel 'braced frame' as opposed to a concrete in-fill wall to tie the columns together. See Figure 18-1.2 (BDA 14-5.3)

	DESIGN BY J.S. Viray	CHECKED A. Christensen	<b>STATE OF CALIFORNIA</b> DEPARTMENT OF TRANSPORTATION <b>DESIGN BRANCH 10</b>	BRIDGE NO. 54-0307	<b>EARTHQUAKE RETROFIT PROJECT</b> <b>MOJAVE RIVER BRIDGE &amp; OVERHEAD</b> <b>PIER 2 DETAILS NO.1</b>	
	DETAILS BY D. Wooten	CHECKED A. Christensen		KILOMETER POST 153.5		
	QUANTITIES BY A. Reyes	CHECKED C. Shantz		CU 08 EA 483301	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN DESIGN BRANCH 10 BRIDGE NO. 54-0307 KILOMETER POST 153.5 FILE: 540307.D31*07.cgn	SHEET 7 OF 15 STRUCTURES DESIGN DETAIL SHEET (METRIC) (REV.03-17-04)

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS





- Notes:
1. For "DETAIL A" location see "COLUMN DETAIL 1" sheet.
  2. For clarity footing reinforcement not shown.
  3. Precast concrete skirt not shown.



DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
01	HUM	255	0.1/3.1	74	140

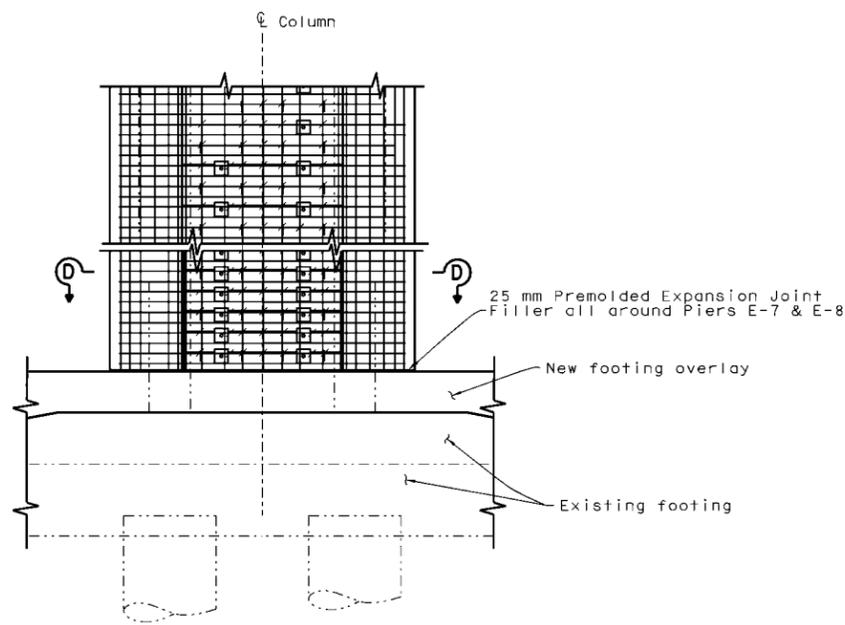
  

01-02-01	REGISTERED CIVIL ENGINEER
11-25-02	PLANS APPROVAL DATE
The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.	

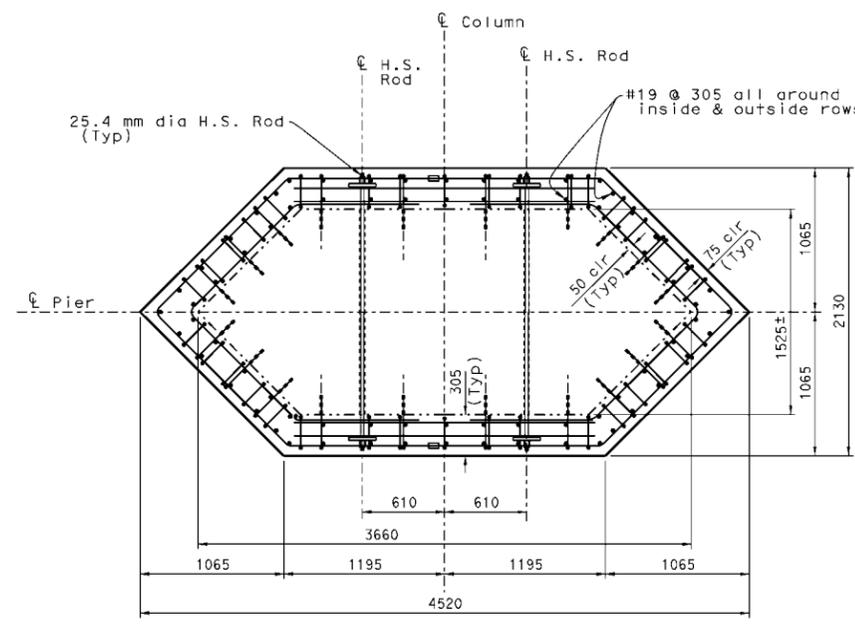
Caltrans now has a web site. To get to the web site, go to: <http://www.ctd.ca.gov>

**LEGEND**

- Indicates Existing Structure
- Indicates New Construction



(E-7 & E-8 ONLY)  
**DETAIL A**  
1 : 40



**SECTION D-D**  
1 : 20

Note:  
For additional reinforcement bar details, see "SECTION B-B" in "COLUMN DETAIL 1" sheet.

NOTE:  
THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

**EARTHQUAKE RETROFIT PROJECT NO.601A**

**EUREKA CHANNEL BRIDGE**

**COLUMN DETAIL 2**

DESIGN	BY Fadel Alameddine	CHECKED Carry Tolon
DETAILS	BY Ralph Nakaaka	CHECKED Pat Hipley
QUANTITIES	BY Pat Hipley	CHECKED Tolon / Roadruff

**STATE OF CALIFORNIA**  
DEPARTMENT OF TRANSPORTATION

ENGINEERING SERVICE CENTER  
OFFICE OF EARTHQUAKE ENGINEERING

BRIDGE NO.	04-230
KILOMETER POST	0.32

CU 01221  
EA 296701

REGARD PRINTS BEARING EARLIER REVISION DATES

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

DATE PLOTTED = 26 FEB 2009 TIME PLOTTED = 7:08:18



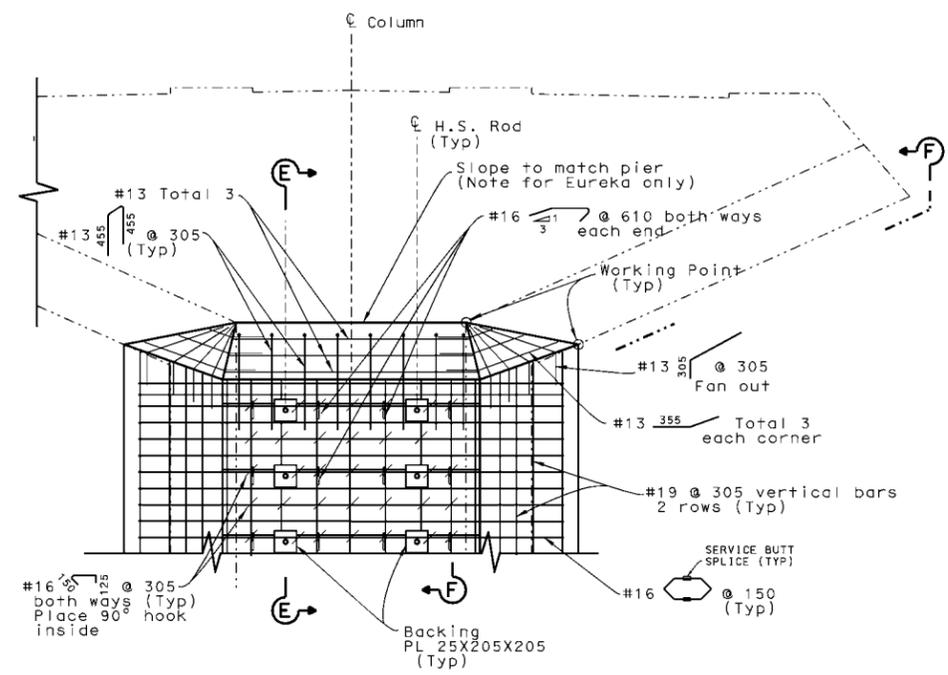
DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No.	TOTAL SHEETS
01	HUM	255	0.1/3.1	75	140

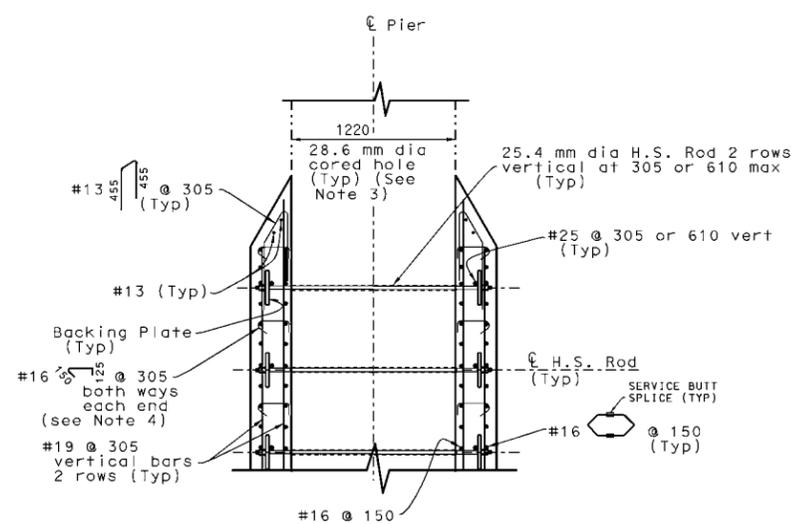
REGISTERED CIVIL ENGINEER	
PLANS APPROVAL DATE	
<small>The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.</small>	

Caltrans now has a web site. To get to the web site, go to <http://www.dot.ca.gov>

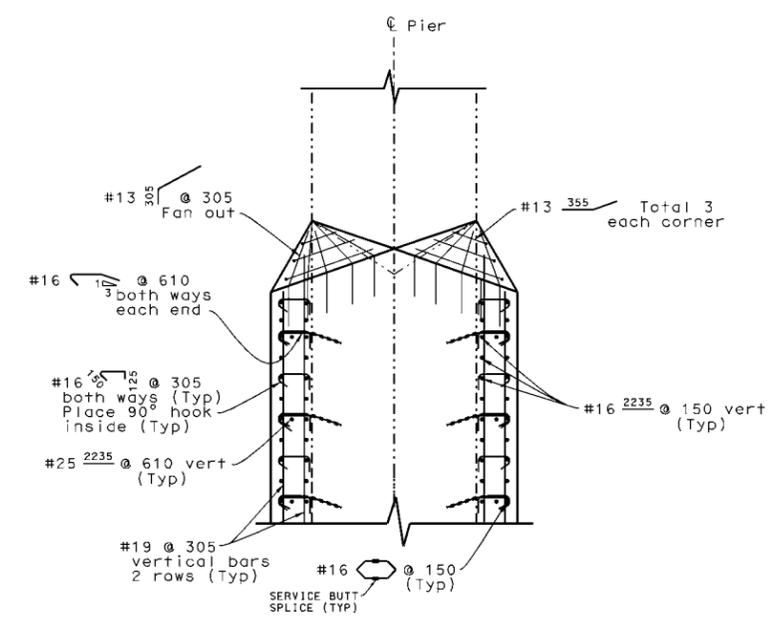
- Notes:
1. For "DETAIL C" location see "COLUMN DETAIL 1" sheet.
  2. For clarity not all reinforcement are indentified, see "ELEVATION" view on "COLUMN DETAIL 1" sheet for these details
  3. 1525 plus or minus is for column size at Eureka E-7 & E-8 only.
  4. Adjust #16 hooks to sides of plates in those locations.



**DETAIL C**  
1 : 25



**SECTION E-E**  
1 : 20



**SECTION F-F**  
1 : 20

**LEGEND**  
 - - - - - Indicates Existing Structure  
 \_\_\_\_\_ Indicates New Construction

NOTE:  
THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

DESIGN BY Fadel Alameddine	CHECKED Garry Tolen	<b>STATE OF CALIFORNIA</b> <b>DEPARTMENT OF TRANSPORTATION</b>	ENGINEERING SERVICE CENTER	BRIDGE NO. 04-230	<b>EARTHQUAKE RETROFIT PROJECT NO.601A</b> <b>EUREKA CHANNEL BRIDGE</b> <b>COLUMN DETAIL 3</b>
DETAILS BY Ralph Nakaoka	CHECKED Pat Hipley		OFFICE OF EARTHQUAKE ENGINEERING	KILOMETER POST 0.32	
QUANTITIES BY Pat Hipley	CHECKED Tolen/Woodruff				

STRUCTURES DESIGN DETAIL SHEET (METRIC) REV. 3/1/99

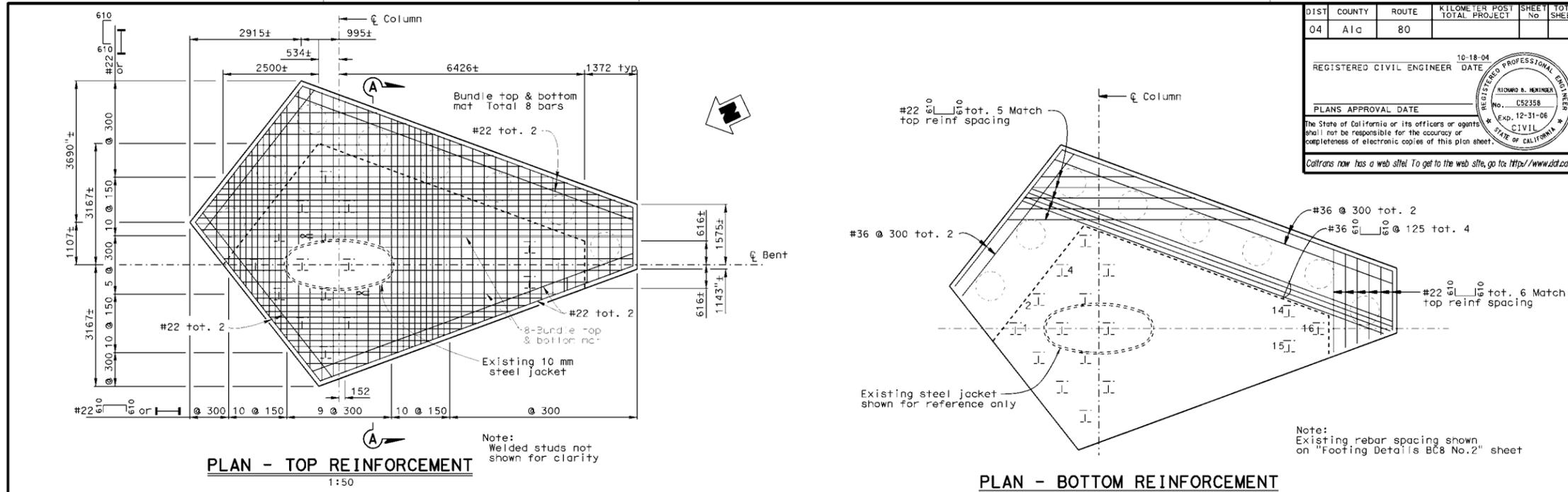
ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS  
0 10 20 30 40 50 60 70 80 90 100

CU 01221  
EA 296701

DISREGARD PRINTS BEARING EARLIER REVISION DATES

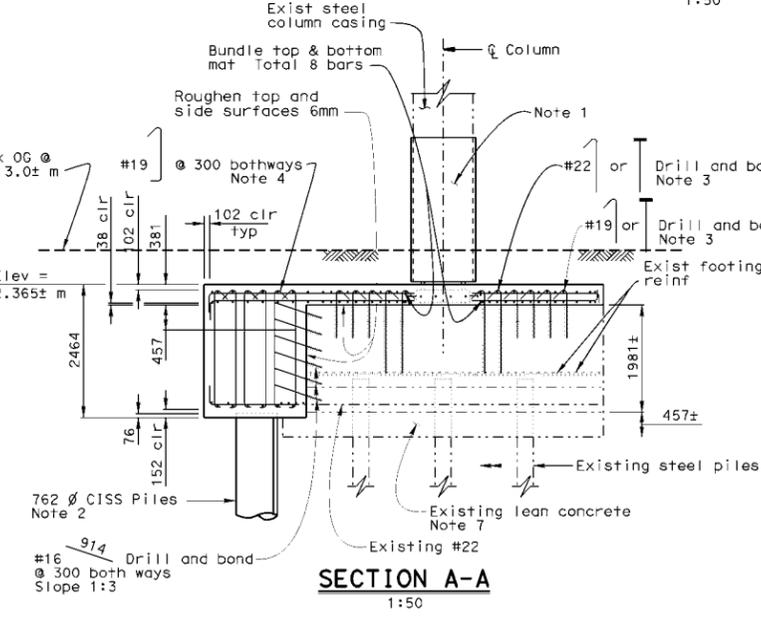
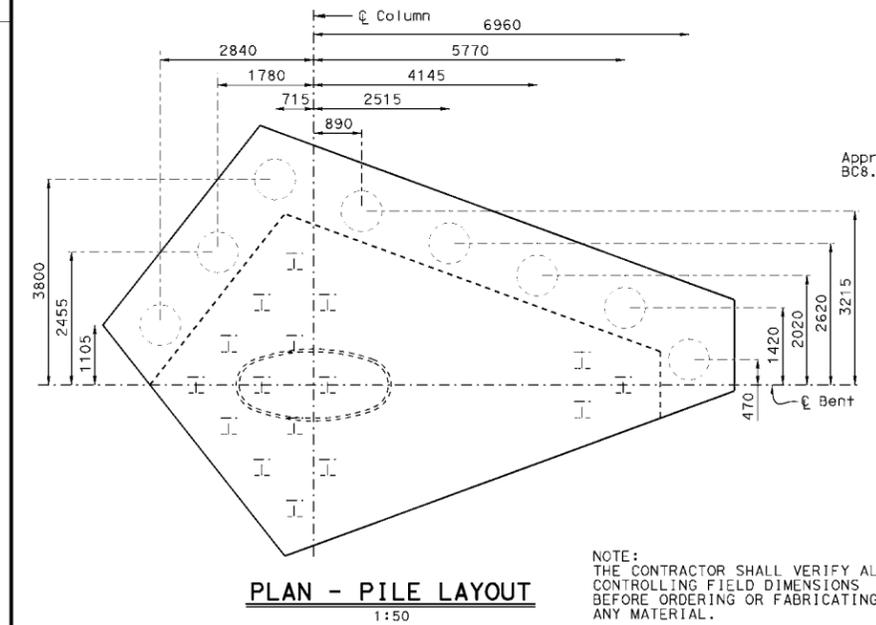
REVISION DATES (PRELIMINARY - STATE ONLY)	DATE	BY	DESCRIPTION
25	3/1/09	PH	ISSUE FOR CONSTRUCTION

DATE PLOTTED BY: 26 FEB 2009 TIME PLOTTED BY: 0109



DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
04	Alameda	80			

REGISTERED CIVIL ENGINEER DATE 10-18-04  
 PLANS APPROVAL DATE  
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 Caltrans now has a web site. To get to the web site, go to: <http://www.ctd.ca.gov>



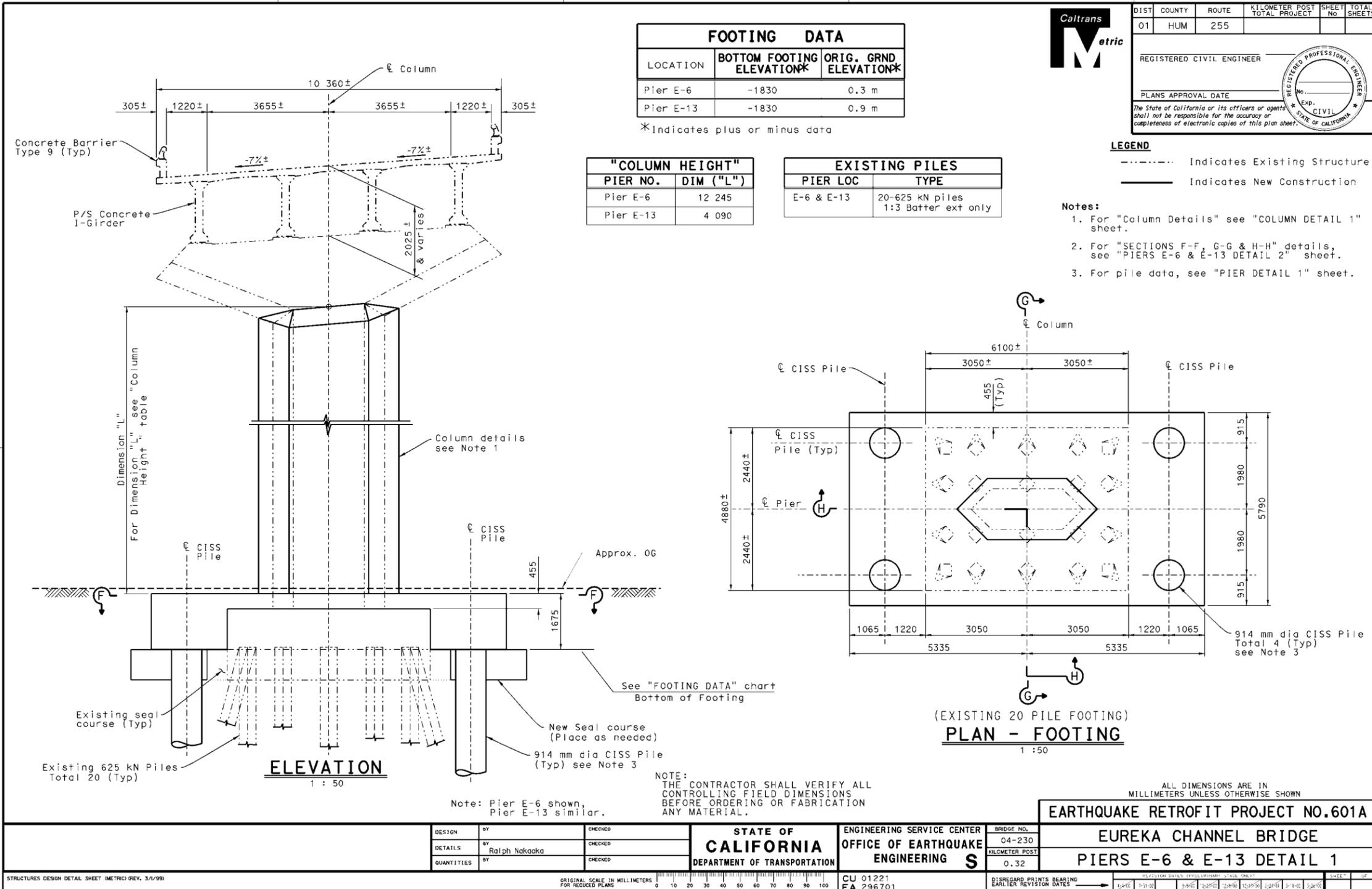
- LEGEND**
- Indicates Existing Structure
  - Indicates New Construction
- Notes:**
- For existing column casing modifications, see "Column Casing Details No. 1" and "No. 2" sheet.
  - For CISS pile details, see "CISS Pile Data" sheet.
  - The stirrup shall be hooked around top bar of mat.
  - The stirrup shall be hooked around top and bottom mats closest to the concrete surface. Alternate hooks.
  - Indicates T-headed reinforcement.
  - Remove existing lean concrete as required to drive piles.
  - Dowel spacing may be adjusted to avoid existing 38 mm Ø x 1600 mm HS threaded rods (with 203 x 203 x 5mm plate washers) if encountered.
  - For footing and pile details not shown, see "FOOTING DETAILS BC8".
  - Verify location of existing perimeter 12 BP53 steel H piles numbers 1, 2, 4, 14, 15 and 16.

Note "SECTION A-A" provides much information on 'Drill and Bond Dowel'. The option of using standard dowels with hooks or "T-Headed" dowels is indicated. This helps open up congested areas of reinforcement.

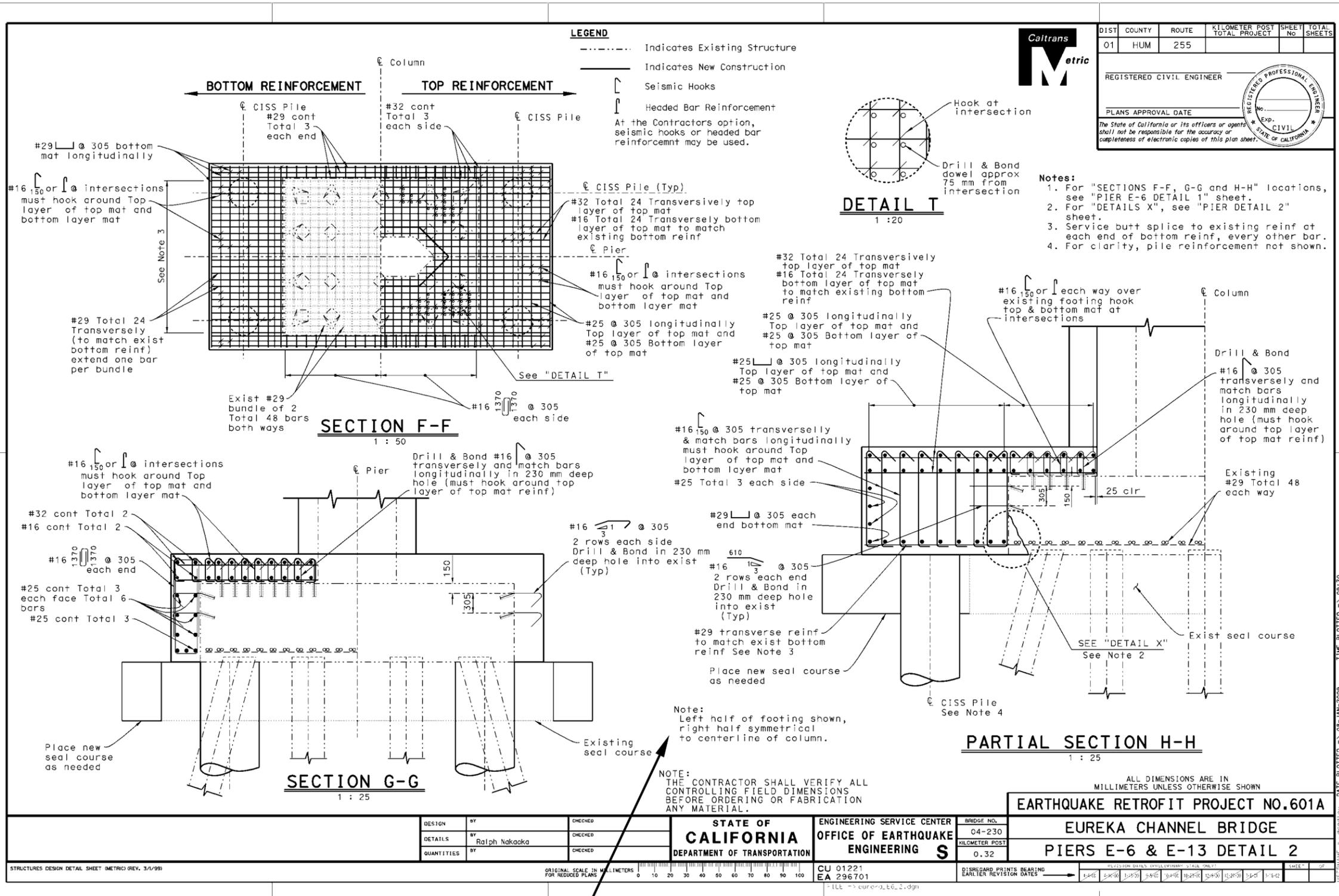
Note the "FOUNDATION PLAN" shown as BDD 18-4.2. These footing details provide the necessary dimensions for what is a very complex design. Take a moment to read the 'NOTES', and find this footing has been retrofitted on a previous project.

	DESIGN	BY Sandy Inouye/Greg Mudd	CHECKED Heather Goronea/Simek	STATE OF CALIFORNIA	DIVISION OF ENGINEERING SERVICES	BRIDGE NO. 53-0061L/R	
	DETAILS	BY K. Christopher M. Lane/Eric Halstrom	CHECKED H. Goronea/Jarc Simek	DEPARTMENT OF TRANSPORTATION	STRUCTURE DESIGN SERVICES AND EARTHQUAKE ENGINEERING	KILOMETER POST Varies	
QUANTITIES	BY S. Inouye/Greg Mudd	CHECKED H. Goronea/Kevin Ross/Walter Socha/Samir Barakat		CU EA			
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN						STRUCTURES DESIGN DETAIL SHEET (METRIC) (REV.03-17-04)	





This sheet shows a retrofitted footing/column combination. The column work is referenced but is detailed elsewhere. The column is shown with a 'cut' line that allows a reference dimension to be used. The chart "COULMN HEIGHT" contains the location specific values. This allows the similarity of the footing to override the dissimilarity of the column, thus this one sheet covers 2 bent locations. The "NOTES" describe the various sheets with supporting details.



These details support the previous page shown as BDD 18-8.3. Note the "LEGEND" shows an option for hooks or headed bars.

Note "SECTION F-F", uses a technique that allows the one detail to describe to 2 levels of reinforcement. This is used often on footing plans/sections.

"PARTIAL SECTION H-H" uses the footings symmetry to an advantage in that only half of the footing need be detailed, citing the indicated note, the other half is assumed to be identical.

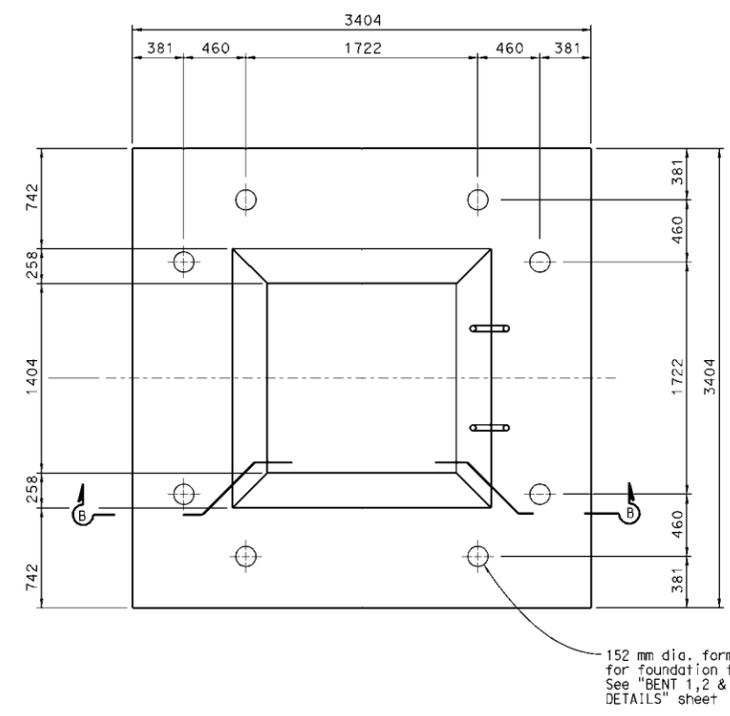


DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No.	TOTAL SHEETS
02	But	70			

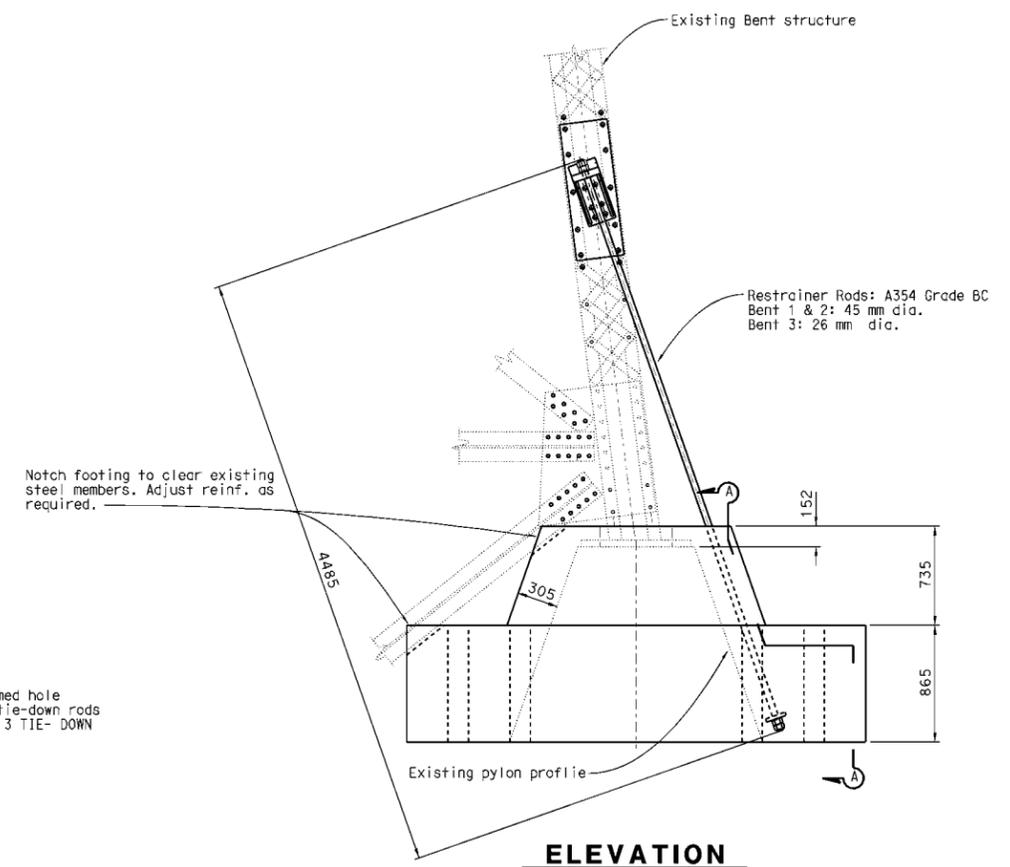
REGISTERED CIVIL ENGINEER

PLANS APPROVAL DATE

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**PLAN**  
1:20



**ELEVATION**  
1:20

**BENT 1 NORTH PYLON  
BENT 2 NORTH & SOUTH PYLON  
BENT 3 NORTH & SOUTH PYLON**

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

DESIGN	BY Steve Mitchell	CHECKED Joe Siemers
DETAILS	BY David Rodley	CHECKED Samad Hamoud
QUANTITIES	BY Samad Hamoud	CHECKED Ariel Reyes

STATE OF CALIFORNIA  
DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES  
STRUCTURE DESIGN 10

BRIDGE NO.	12-0038	PULGA BRIDGE, NORTH FORK FEATHER RIVER
KILOMETER POST	66.0	BENT PYLON FOOTING DETAILS NO.1

CU 02  
EA 3016U1

DISREGARD PRINTS BEARING EARLIER REVISION DATES	REVISION DATES (MILLIMETERS) STATE ONLY	SHEET	45	60
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The first of five related examples, show a footing tie-down retrofit. The details for this design will involve reinforced concrete and structural steel. There are existing steel as-built base drawings that will need to be created. See "BDD SECTION 18 GUIDELINES FOR SEISMIC RETROFITS, 18.5.2 FOOTINGS." And "BDD SECTION 18 GUIDELINES FOR SEISMIC RETROFITS, 18.8.0 RETROFIT HAREWARE AND FABRICATION." SDT should determine early on the application of retrofit types on similar locations as this could affect the way the base details are produced. Where possible the use of rotating and/or mirroring of details should be considered.



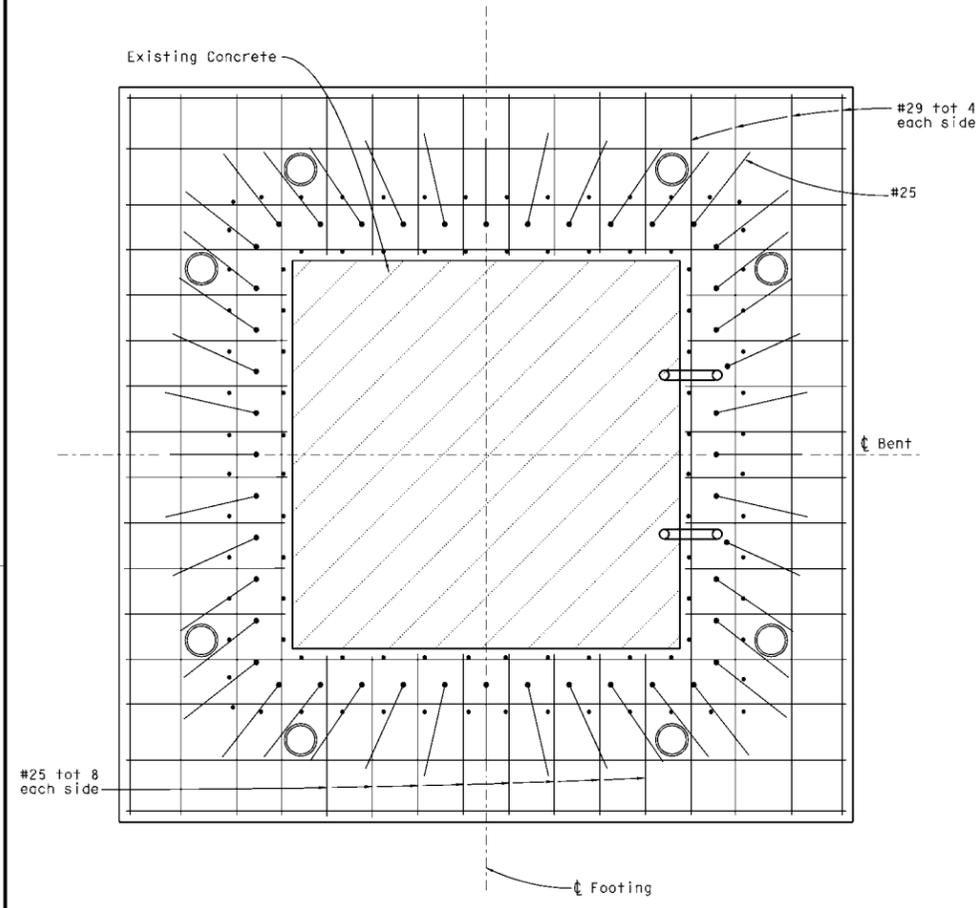
DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No.	TOTAL SHEETS
02	But	70			

REGISTERED CIVIL ENGINEER

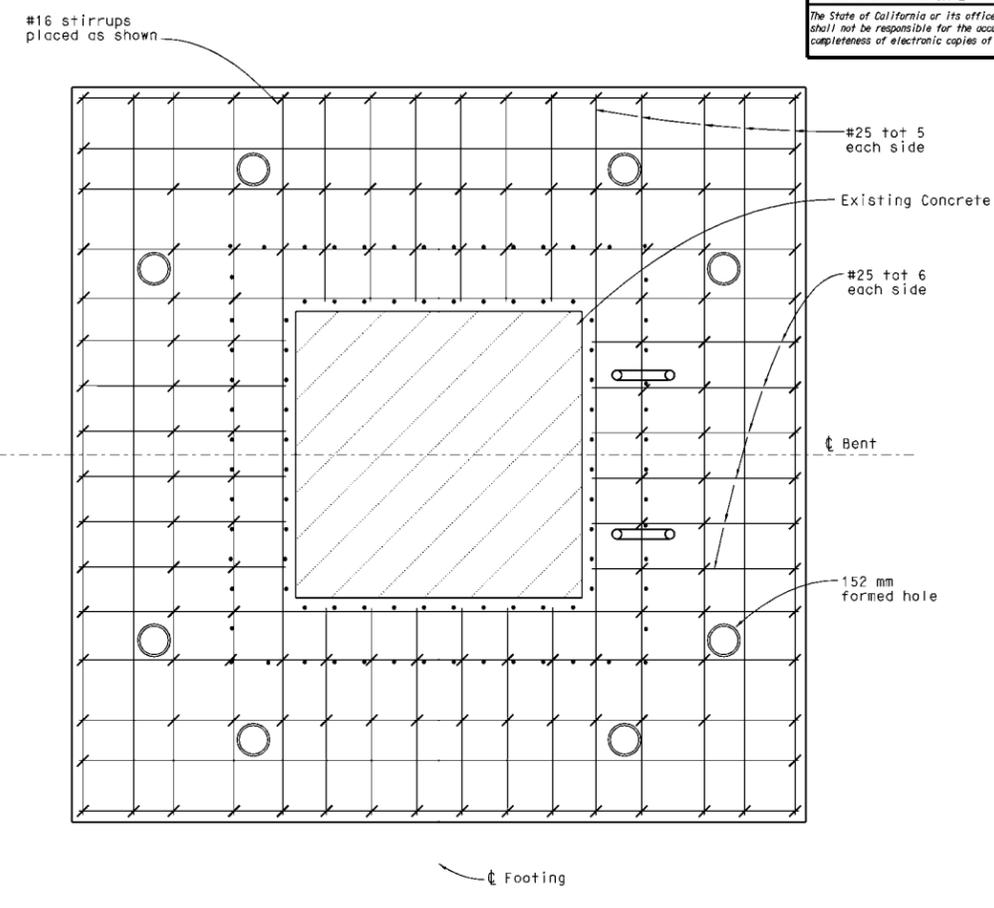
PLANS APPROVAL DATE

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REGISTERED PROFESSIONAL ENGINEER  
Steve Mitchell  
No. 39781  
Exp. 12-31-05  
CIVIL  
STATE OF CALIFORNIA



**BOTTOM REINFORCEMENT**  
1:12.5



**TOP REINFORCEMENT**  
1:12.5

**BENT 1 NORTH PYLON**  
**BENT 2 NORTH & SOUTH PYLON**  
**BENT 3 NORTH & SOUTH PYLON**

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

DESIGN	BY Steve Mitchell	CHECKED Joe Siemers
DETAILS	BY David Rodley	CHECKED Samad Hamoud
QUANTITIES	BY Samad Hamoud	CHECKED Ariel Reyes

STATE OF CALIFORNIA  
DEPARTMENT OF TRANSPORTATION  
DIVISION OF STRUCTURES  
STRUCTURE DESIGN 10

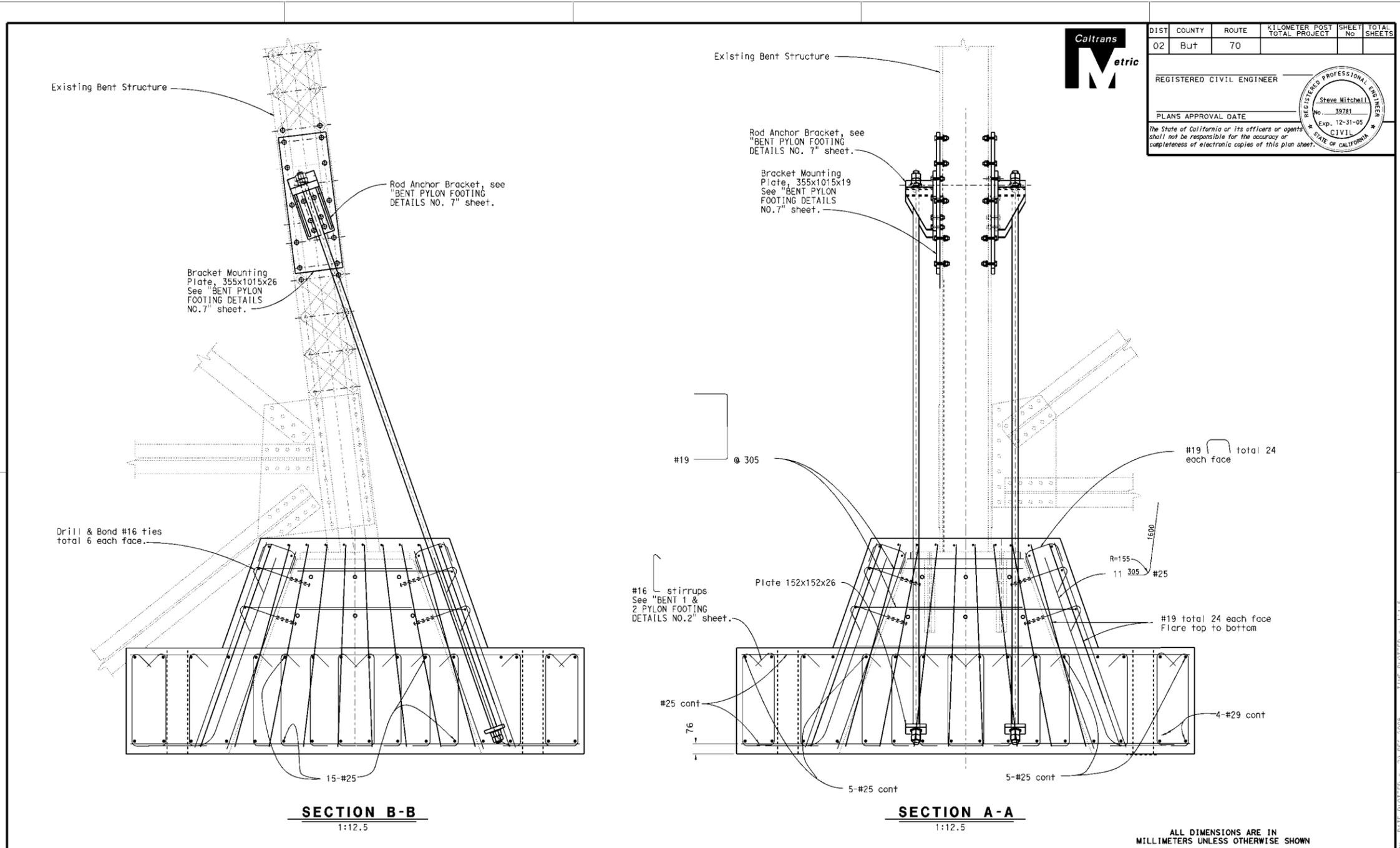
BRIDGE NO.	12-0038	PULGA BRIDGE, NORTH FORK FEATHER RIVER
KILOMETER POST	66.0	
BENT PYLON FOOTING DETAILS NO.2		

CU 02  
EA 3016U1

DISREGARD PRINTS BEARING EARLIER REVISION DATES	REVISION DATES (MILLIMETERS) STATE ONLY	SHEET	46	60
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This example uses concrete to encase the existing footing and provide locations for foundation tie-down rods.



DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
02	But	70			

REGISTERED CIVIL ENGINEER

Steve Mitchell  
No. 39781  
Exp. 12-31-05  
CIVIL  
STATE OF CALIFORNIA

PLANS APPROVAL DATE

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**SECTION B-B**  
1:12.5

**SECTION A-A**  
1:12.5

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

DESIGN	BY Steve Mitchell	CHECKED Joe Siemers
DETAILS	BY David Rodley	CHECKED Samad Hamoud
QUANTITIES	BY Samad Hamoud	CHECKED Ariel Reyes

STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF STRUCTURES	BRIDGE NO. 12-0038	PULGA BRIDGE, NORTH FORK FEATHER RIVER
	STRUCTURE DESIGN 10	KILOMETER POST 66.0	

STRUCTURES DESIGN DETAIL SHEET (METRIC REV. 3/4/99)

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS

CU 02  
EA 3016U1  
-1LL -- pulga.py.0103.dgn

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (MILEY/INCH) SCALE ONLY	SHEET	OF
	47	60

DATE PLOTTED = 29 DEC 2008 TIME PLOTTED = 1:15



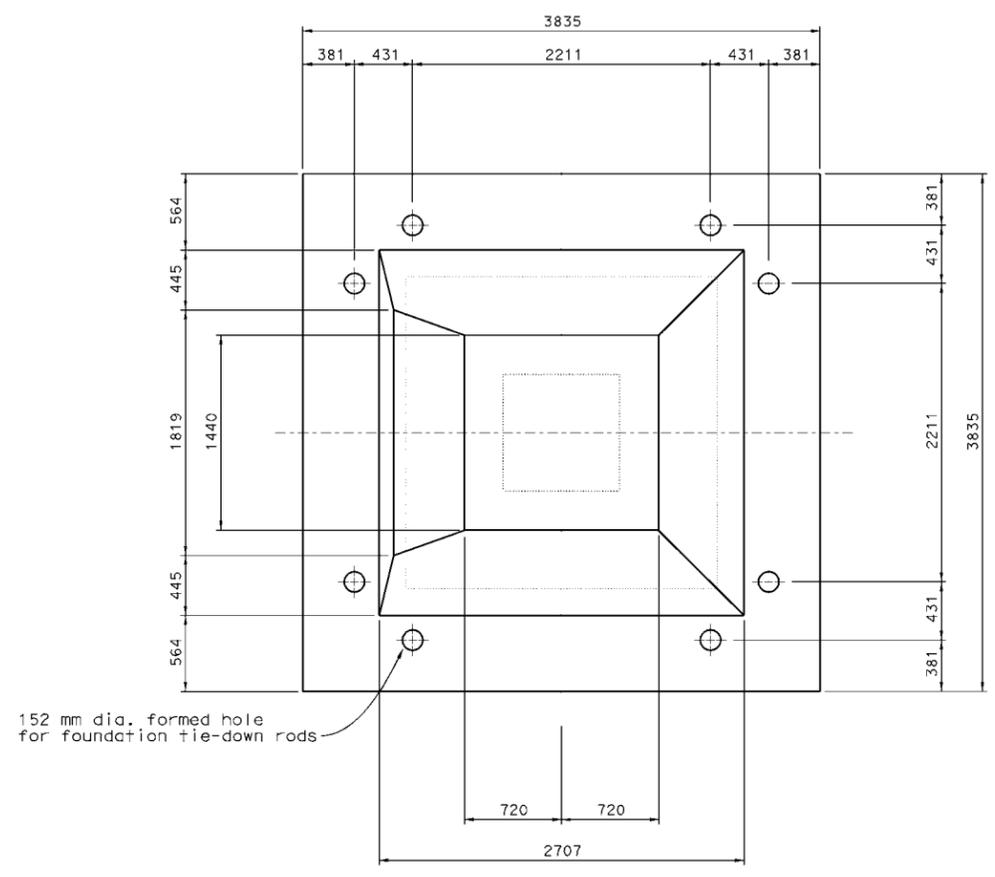
DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No.	TOTAL SHEETS
02	But	70			

REGISTERED CIVIL ENGINEER

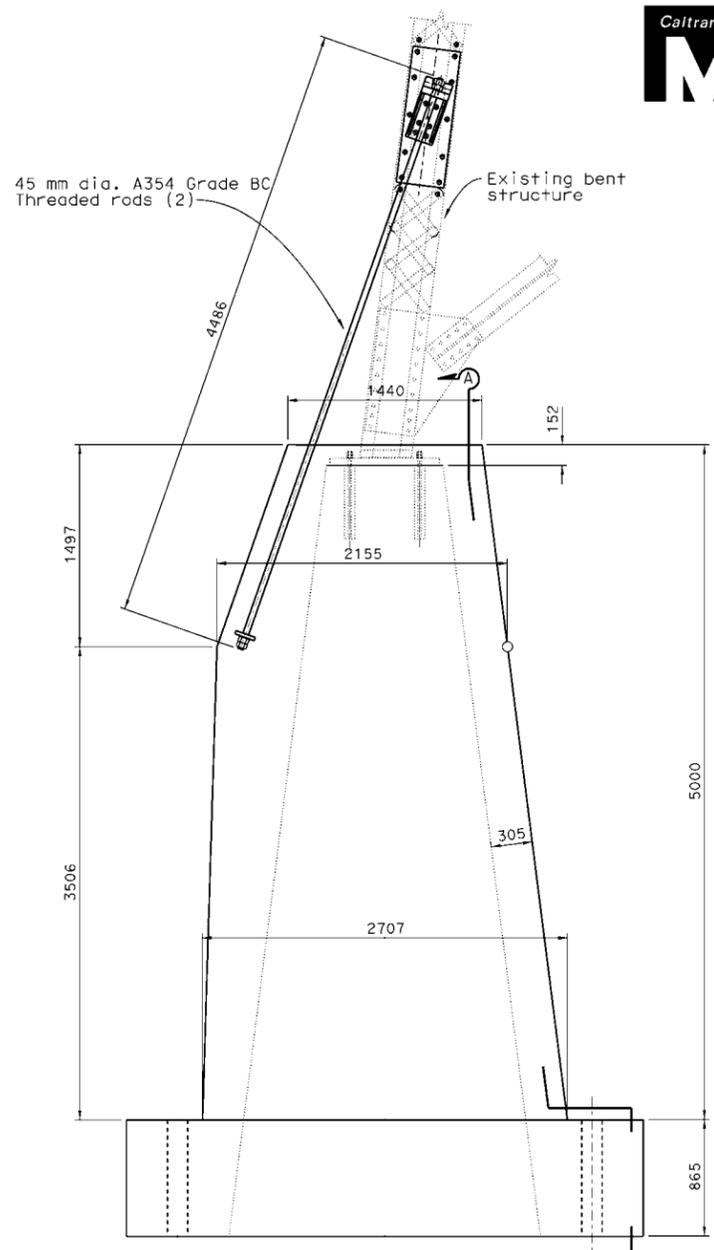
PLANS APPROVAL DATE

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REGISTERED PROFESSIONAL ENGINEER  
 Steve Mitchell  
 No. 39781  
 Exp. 12-31-05  
 CIVIL  
 STATE OF CALIFORNIA



**PLAN**  
1:20



**ELEVATION**  
1:20

NOTE:  
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ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

**BENT 1 SOUTH PYLON**

DESIGN	BY Steve Mitchell	CHECKED Joe Siemers
DETAILS	BY David Radley	CHECKED Samad Hamoud
QUANTITIES	BY Samad Hamoud	CHECKED Ariel Reyes

STATE OF CALIFORNIA  
DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES  
STRUCTURE DESIGN 10

BRIDGE NO.	12-0038	PULGA BRIDGE, NORTH FORK FEATHER RIVER
KILOMETER POST	66.0	

CU 02  
EA 3016U1

DISREGARD PRINTS BEARING EARLIER REVISION DATES	REVISION DATES (MILLIMETERS) STATE ONLY	SHEET	48	59
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DATE PLOTTED = 29 DEC 2008 TIME PLOTTED = 1:13



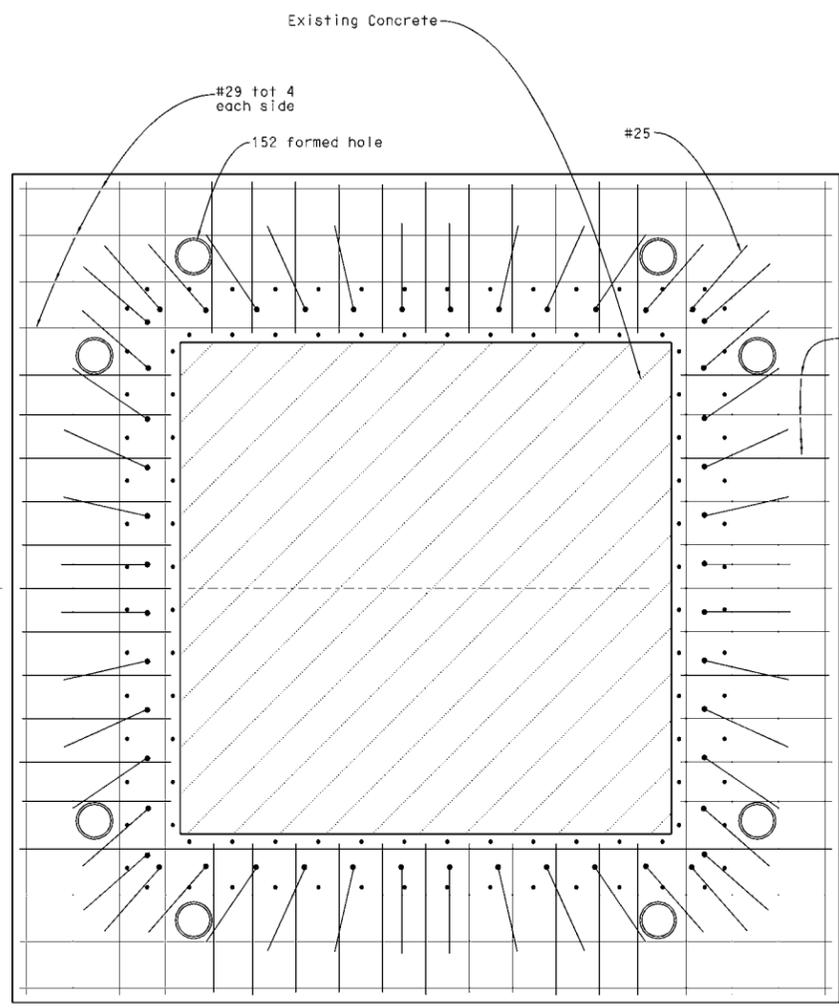
DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
02	But	70			

REGISTERED CIVIL ENGINEER

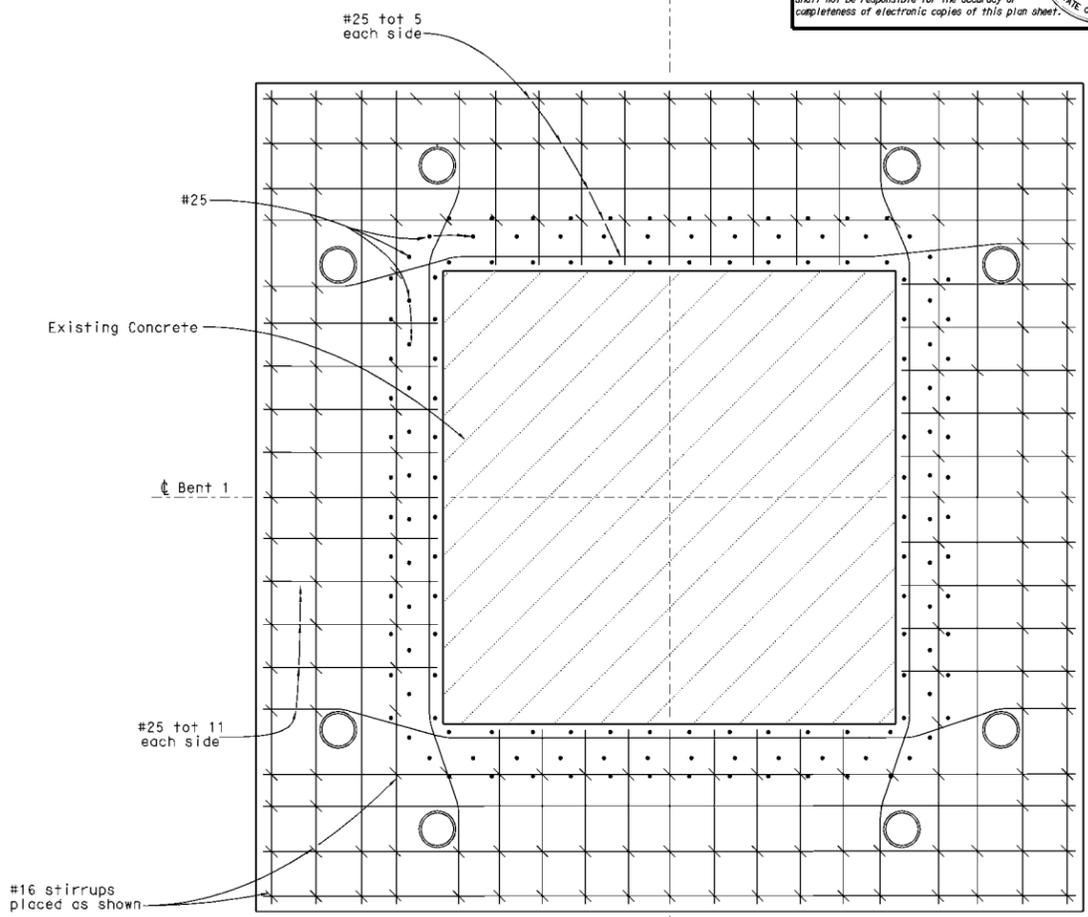
Steve Mitchell  
No. 39781  
Exp. 12-31-05  
CIVIL  
STATE OF CALIFORNIA

PLANS APPROVAL DATE

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**BOTTOM REINFORCEMENT**  
1:12.5



**TOP REINFORCEMENT**  
1:12.5

NOTE:  
THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

DESIGN	BY Steve Mitchell	CHECKED Joe Siemers
DETAILS	BY David Radley	CHECKED Samad Hamoud
QUANTITIES	BY Samad Hamoud	CHECKED Ariel Reyes

STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF STRUCTURES STRUCTURE DESIGN 10	BRIDGE NO. 12-0038	PULGA BRIDGE, NORTH FORK FEATHER RIVER	
		KILOMETER POST 66.0		BENT PYLON FOOTING DETAILS NO.5

CU 02  
EA 3016U1  
-ILT -- pulga.py.0105.dgn

DISREGARD PRINTS BEARING EARLIER REVISION DATES	REVISION DATES (EFFECTIVE DATE) (SCALE ONLY)	SHEET 49 OF 60
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ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS  
0 10 20 30 40 50 60 70 80 90 100

DATE PLOTTED = 29 DEC 2008 TIME PLOTTED = 12:12



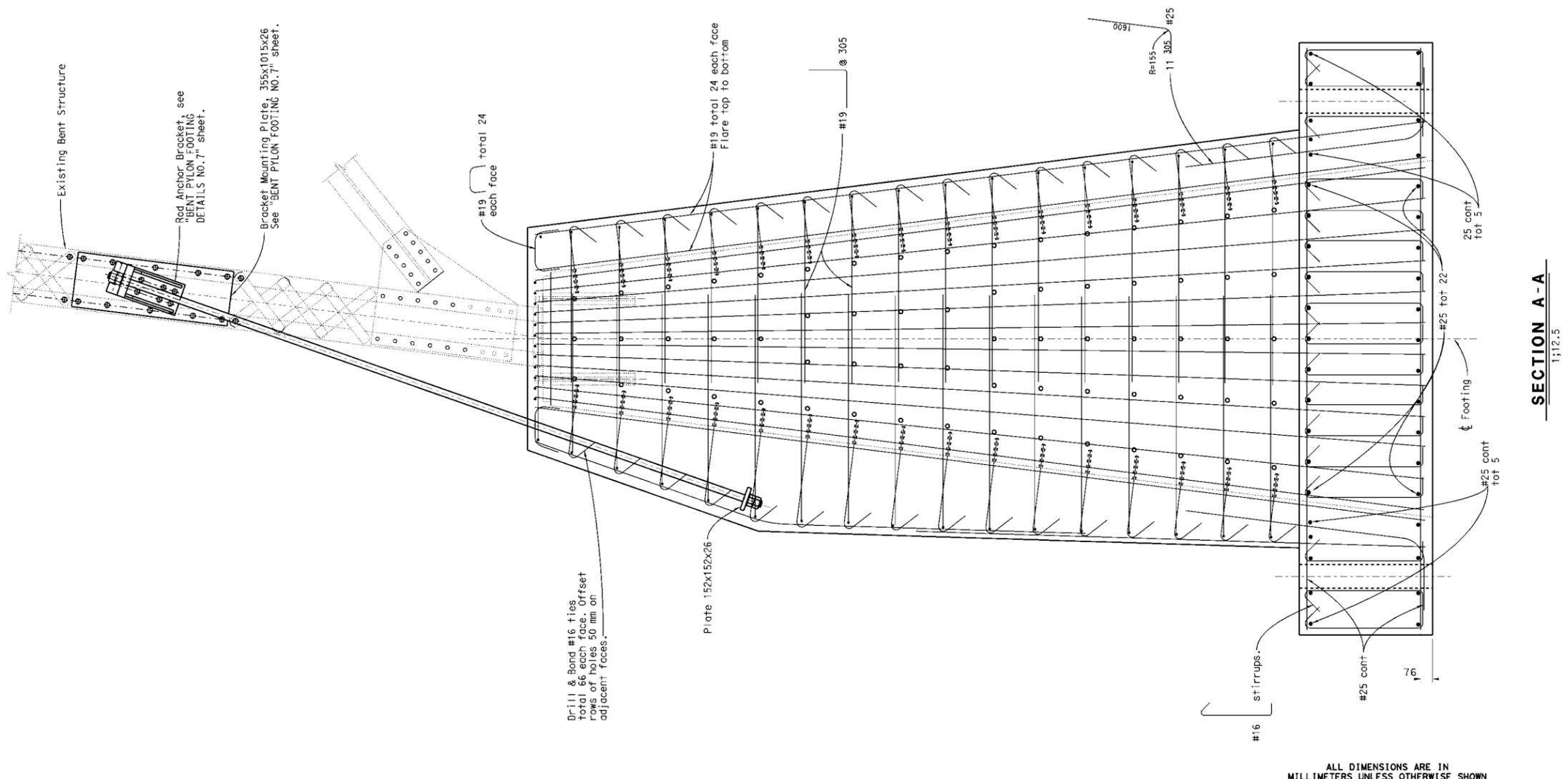
DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No.	TOTAL SHEETS
02	But	70			

REGISTERED CIVIL ENGINEER

PLANS APPROVAL DATE

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REGISTERED PROFESSIONAL ENGINEER  
Steve Mitchell  
No. 39781  
Exp. 12-31-05  
CIVIL  
STATE OF CALIFORNIA



DESIGN	BY Steve Mitchell	CHECKED Joe Siemens
DETAILS	BY David Rodley	CHECKED Samad Homoud
QUANTITIES	BY Samad Homoud	CHECKED Ariel Reyes

<b>STATE OF CALIFORNIA</b> DEPARTMENT OF TRANSPORTATION		DIVISION OF STRUCTURES <b>STRUCTURE DESIGN 10</b>	BRIDGE NO. 12-0038	<b>PULGA BRIDGE, NORTH FORK FEATHER RIVER</b>
			KILOMETER POST 66.0	<b>BENT PYLON FOOTING DETAILS NO. 6</b>

STRUCTURES DESIGN DETAIL SHEET (METRIC) REV. 3/1/99

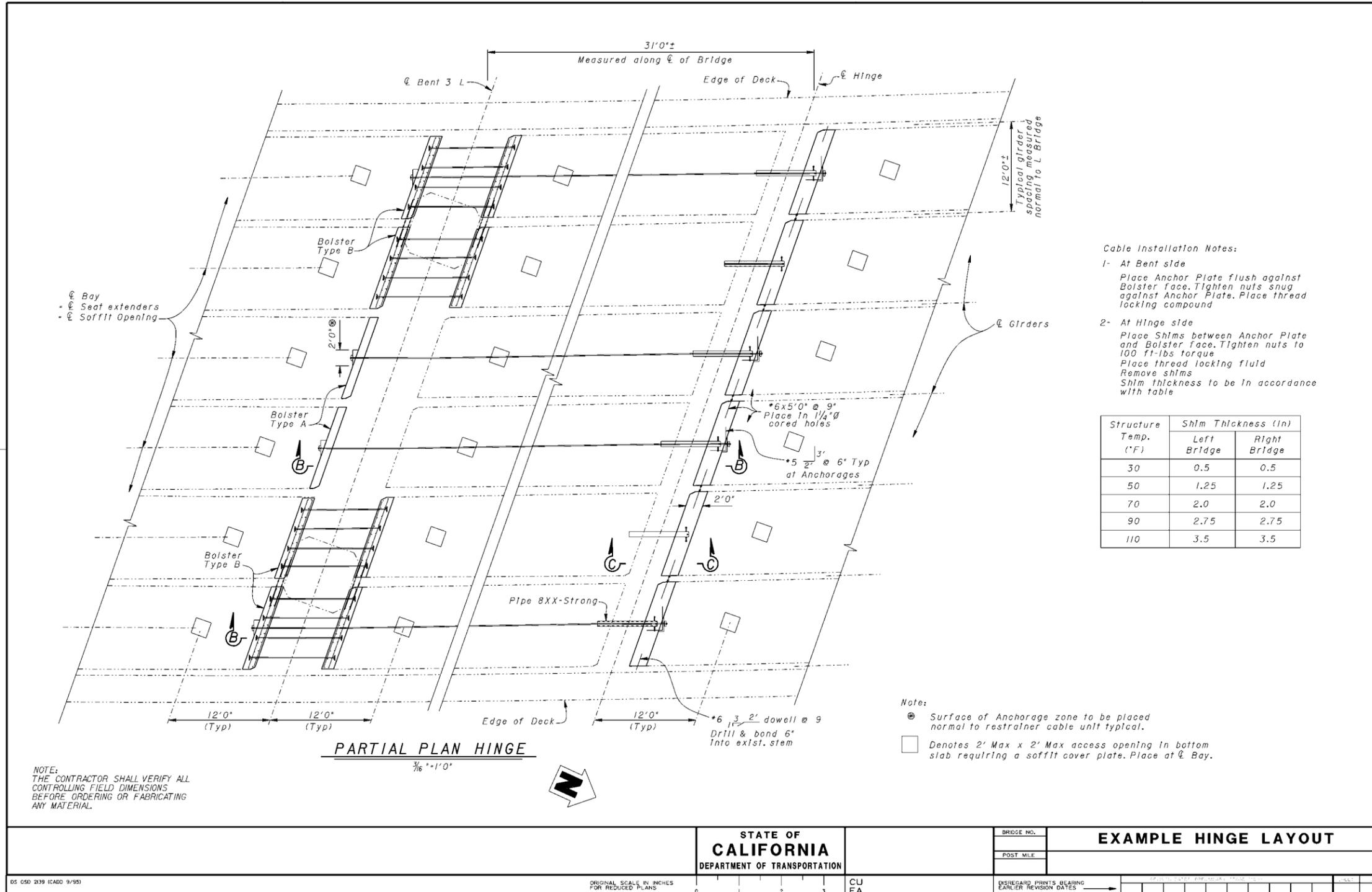


CU 02  
EA 3016U1  
111 pulga.pj.096.dgn

DISREGARD PRINTS BEARING EARLIER REVISION DATES	REVISION DATES (MILLIMETER) STATE ONLY	SHEET	OF
		50	60

DATE PLOTTED = 29 DEC 2008 TIME PLOTTED = 12:58 USER:RUMME PJ 096.DGN

The rotation of details as shown here is not ideal. But this likely the only method that will yield the best end result. The bar shapes are clear and at a scale sufficient for quantities and constructability.

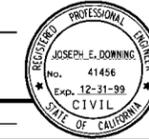


NOTE:  
Locate the soffit openings to align with the existing openings or to be determined by the Engineer. For details, see "Deck & Soffit Openings" sheet.

- LEGEND**
- Indicates Existing Structure
  - Indicates New Construction
  - Indicates Soffit Opening
  - ⊕ Indicates Pipe Seat Extender with concrete bolsters
  - Indicates Remove and Replace Soffit Concrete, see "DECK AND SOFFIT OPENINGS" sheet

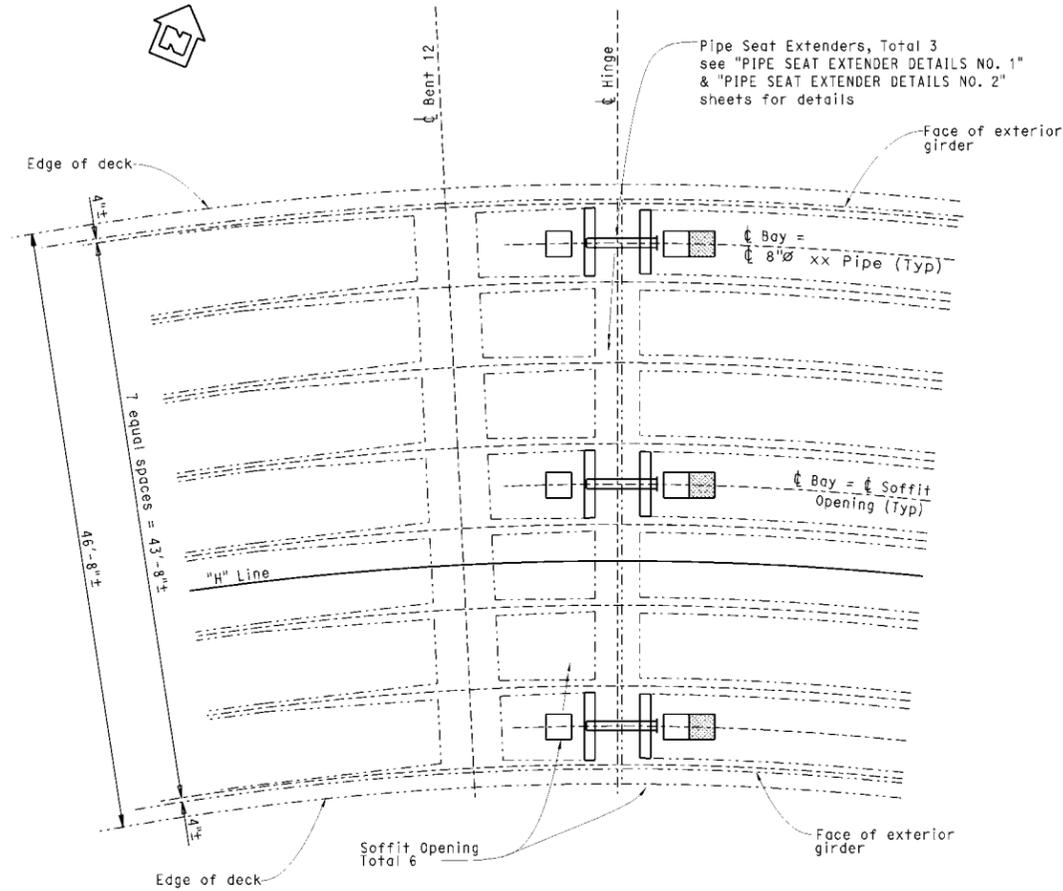
DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
10					

REGISTERED ENGINEER - CIVIL

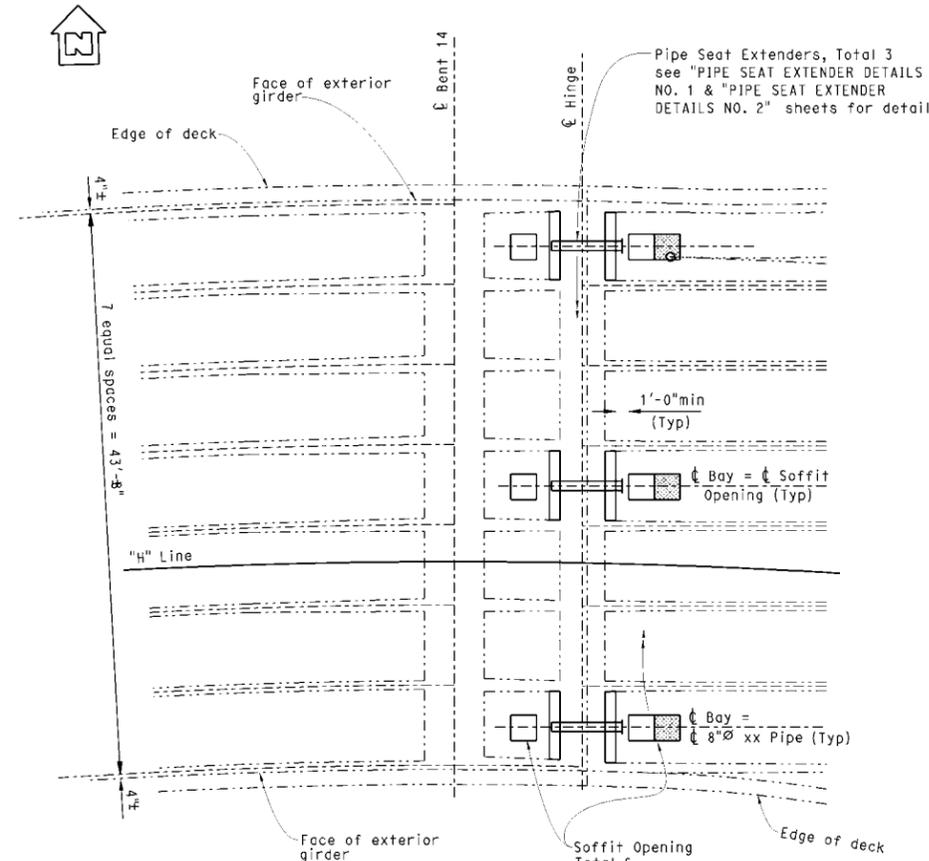


PLANS APPROVAL DATE

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**HINGE 3 - PART PLAN**  
3/16" = 1'-0"



**HINGE 4 - PART PLAN**  
3/16" = 1'-0"

NOTE:  
THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

SEISMIC RETROFIT PROJECT NO. 731

DESIGN	BY: Yong Pil Kim	II-95	CHECKED: Don Lee	II-95
DETAILS	BY: Ralph Nakaoka/R. Lim	6-94	CHECKED: Don Lee	II-95
QUANTITIES	BY: Yong Pil Kim	II-95	CHECKED: Joseph Downing	II-95

STATE OF CALIFORNIA  
DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES  
STRUCTURE DESIGN 8

BRIDGE NO.	23-109
POST MILE	R7.2

WALNUT STREET OVERCROSSING  
HINGE DETAILS NO. 2

DS OSD 239 (CAD 9/95)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS

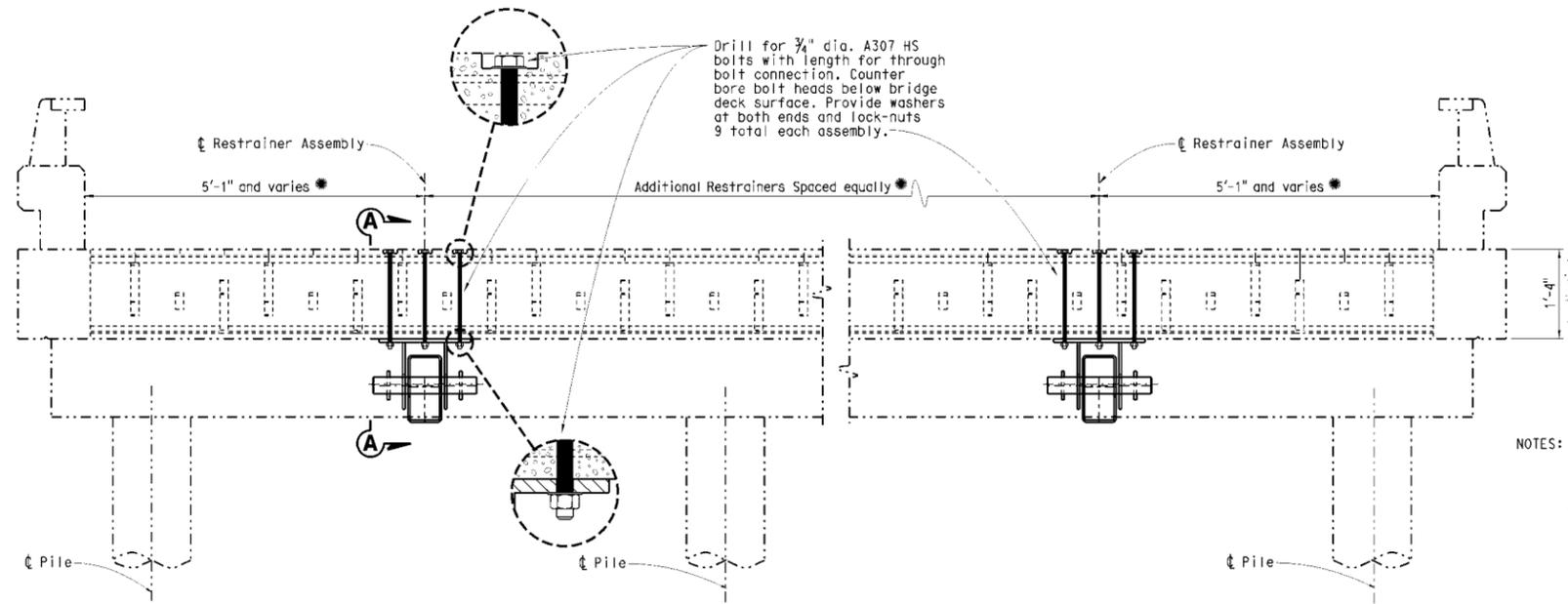


CU 10203  
EA 438421

DISREGARD PRINTS BEARING EARLIER REVISION DATES  
USERNAVE => dr'34 by 07\_n'ngal\_de=2.cgr

REVISION	DATE	BY	DESCRIPTION
1			
2			
3			
4			
5			
6			
7			

DATE PLOTTED = 14 JAN 2009  
TIME PLOTTED = 14:52



**TYPICAL SECTION AT HINGE**  
1" = 1'-0"

\* Anchor bolts must clear mounting bars on existing hinge assembly as well as existing longitudinal reinforcement.

Drill for 3/4" dia. A307 HS bolts with length for through bolt connection. Counter bore bolt heads below bridge deck surface. Provide washers at both ends and lock-nuts 9 total each assembly.

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS

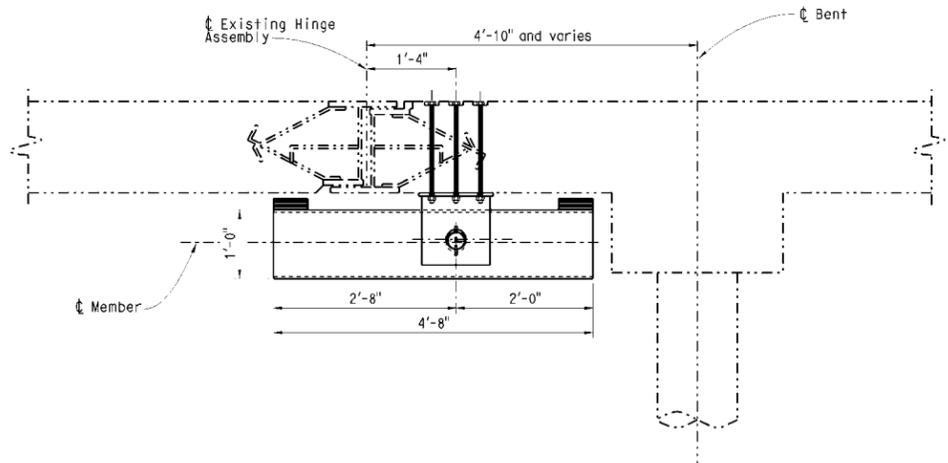
REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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Caltrans now has a web site! To get to the web site, go to: <http://www.dot.ca.gov>

- NOTES:
1. Extender capacity = 30k at center of cantilever end.
  2. Minimum slab thickness = 16 "



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

NOTE:  
THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

STANDARD DRAWING				STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES	BRIDGE NO.	POST MILE	SLAB HINGE RESTRAINER DETAILS NO.1
DRAWING DATE	DESIGN BY R.C. Niffen	CHECKED L. Duan	APPROVAL, RECOMMENDED BY					
FILE NO. <b>xs-XXXe</b>	DETAILS BY D.W. Radley	CHECKED L. Duan	DESIGN SUPERVISOR					

STRUCTURES DESIGN STANDARD DRAWING SHEET (ENGLISH) (REV. 2/4/05)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS

0 1 2 3

DISREGARD PRINTS BEARING EARLIER REVISION DATES

15-10-05

SHEET 1 OF 1

Note that the restrainer system shown here as fig 18-10.1 and the following page fig 18-10.2 are drawn in a Standard Plan border. At the time of publication of BDD 18 "SIEMIC RETRFITS AND STRENGTHENINGS" these pages had not been approved. They were included as examples in anticipation of xs status. Once approved, they will be relocated to the xs example group with any updates required.

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS

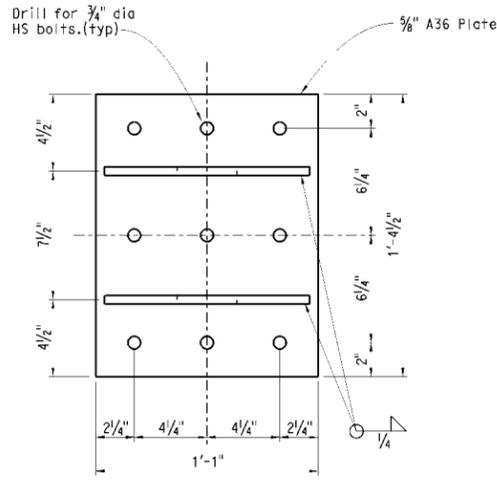
  

REGISTERED CIVIL ENGINEER	DATE
PLANS APPROVAL DATE	

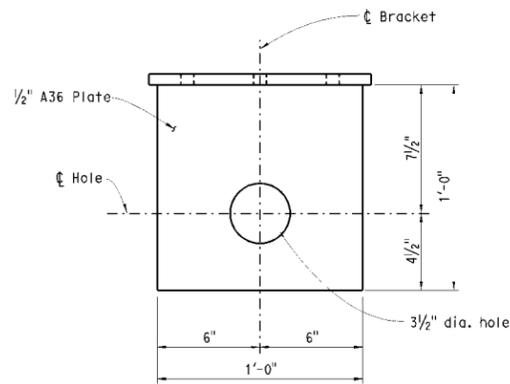
REGISTERED PROFESSIONAL ENGINEER  
No. \_\_\_\_\_  
Exp. X  
CIVIL  
STATE OF CALIFORNIA

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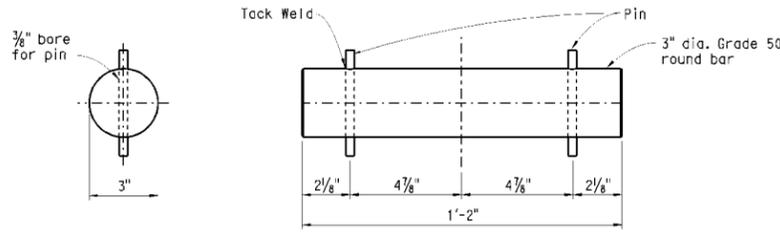
**PLAN VIEW**



**SIDE VIEW**

**BRACKET**

3"=1'-0"

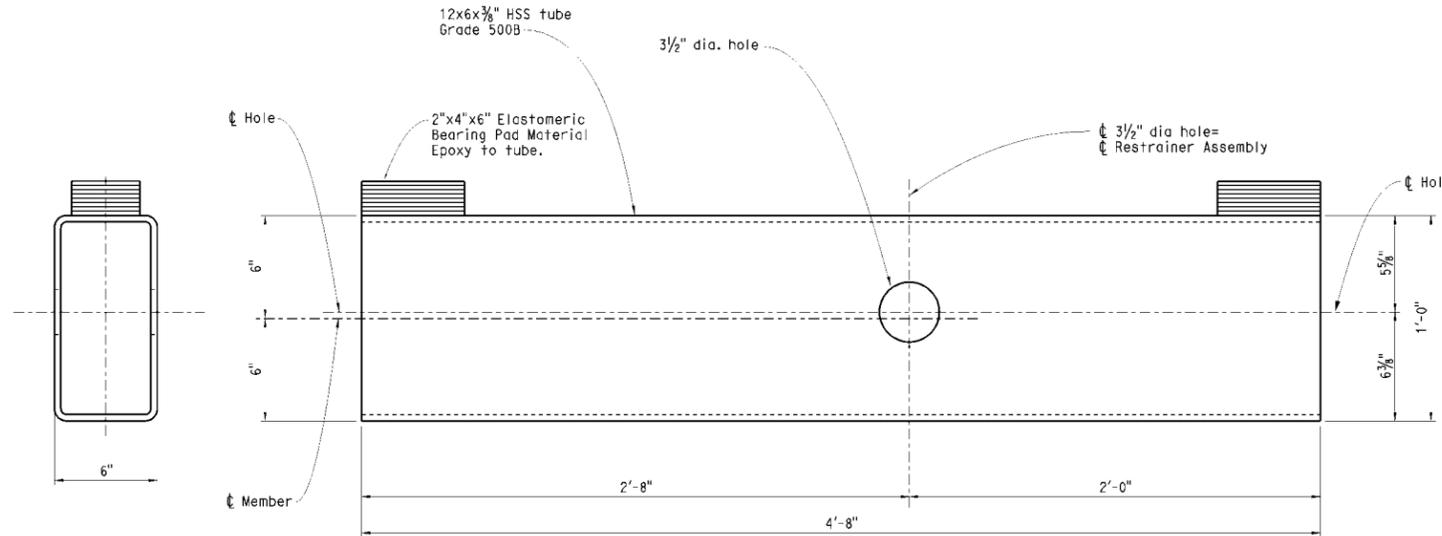


**END VIEW**

**SIDE VIEW**

**PIN**

4"=1'-0"



**END VIEW**

**SIDE VIEW**

**SUPPORT TUBE**

3"=1'-0"

NOTE:  
THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

STANDARD DRAWING			
DRAWING DATE	DESIGN BY R.C. Niffen	CHECKED BY L. Duan	APPROVAL/RECOMMENDED BY
FILE NO. xs-XXXe	DETAILS BY D.W. Radley	CHECKED BY L. Duan	DESIGN SUPERVISOR
SUBMITTED BY			

**STATE OF CALIFORNIA**  
DEPARTMENT OF TRANSPORTATION

**DIVISION OF ENGINEERING SERVICES**

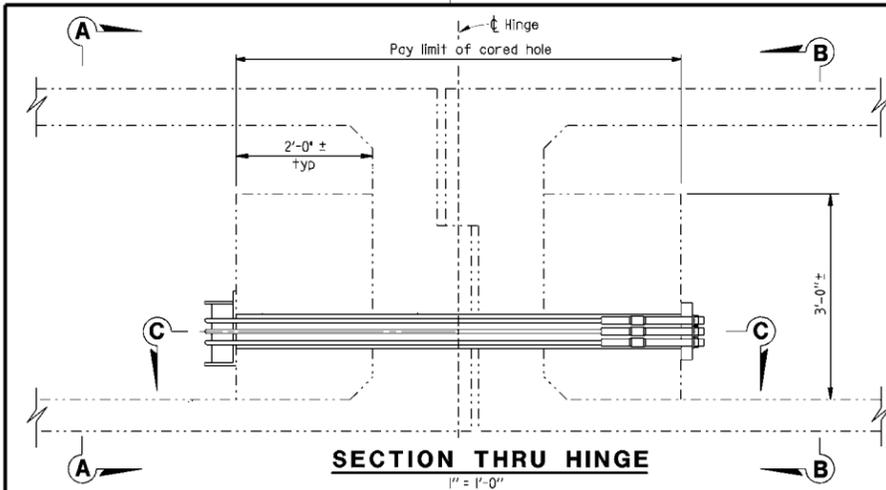
BRIDGE NO. \_\_\_\_\_  
POST MILE \_\_\_\_\_

**SLAB HINGE RESTRAINER DETAILS NO.2**

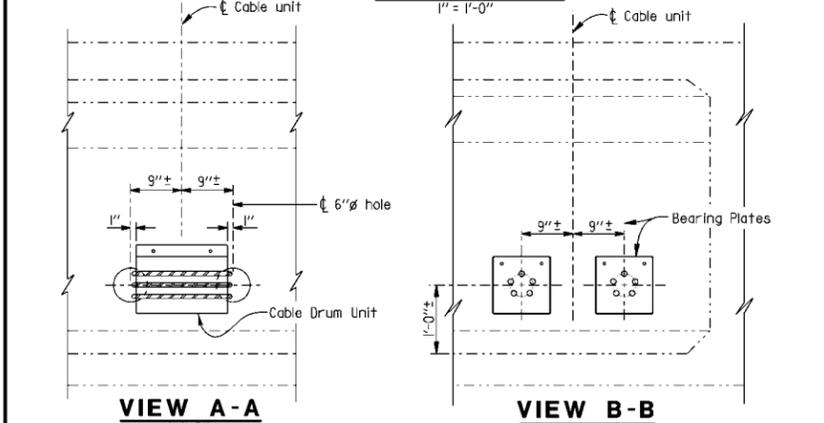
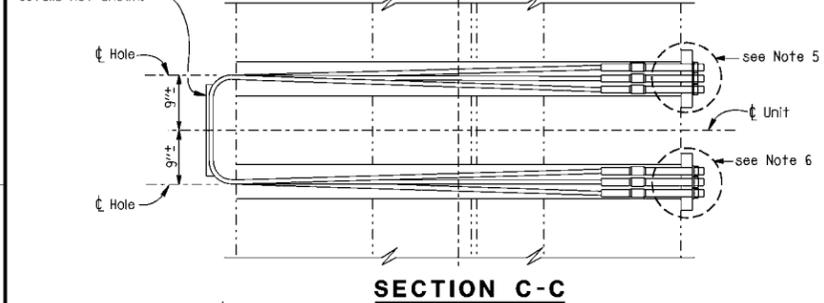
CU EA

REVISION DATE	BY	DESCRIPTION

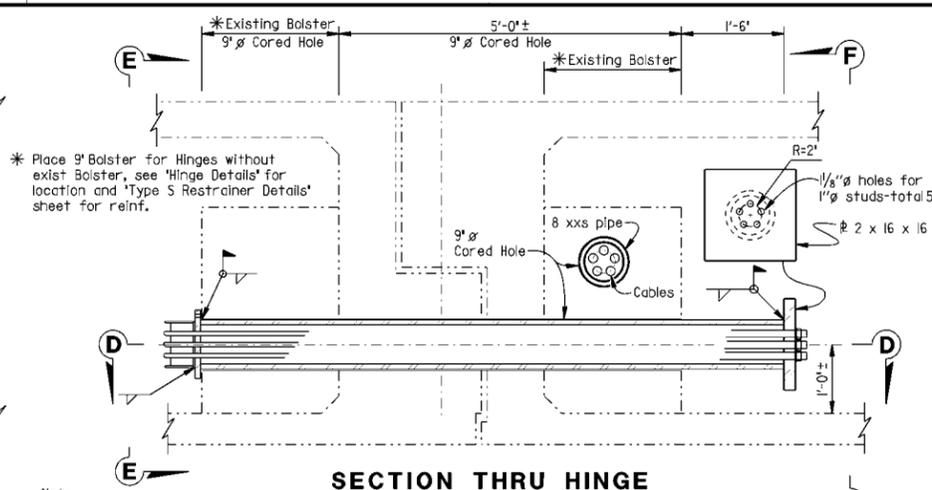
DATE PLOTTED = 05 DEC 2008  
USER NAME = j.papadimitriou



Cable Drum Unit, see 'End Anchorage Details' sheet for details not shown.

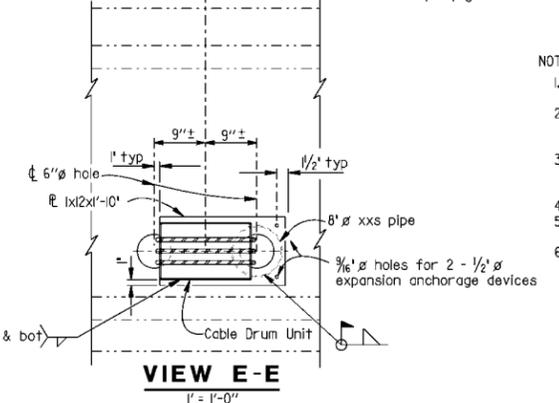
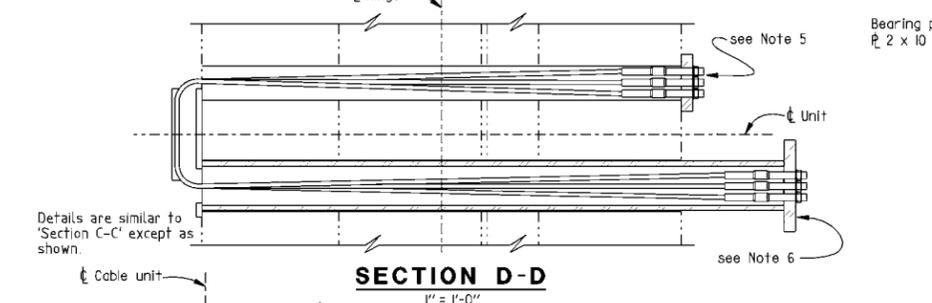


**TYPE C RESTRAINER WITHOUT PIPE**



\* Place 9" Bolster for Hinges without exist Bolster, see 'Hinge Details' for location and 'Type S Restrainer Details' sheet for reinf.

Note: Details similar to 'Type C Restrainer Without Pipe' except as noted.



**TYPE C RESTRAINER WITH PIPE**

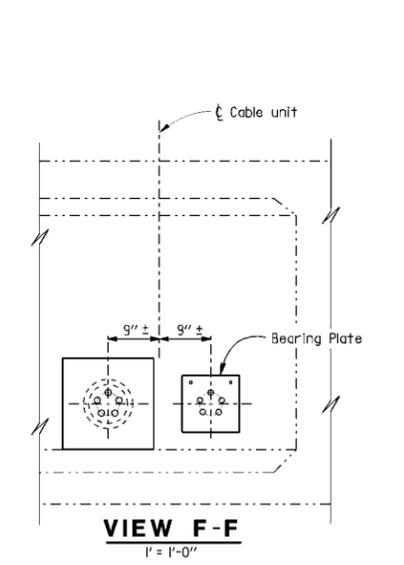
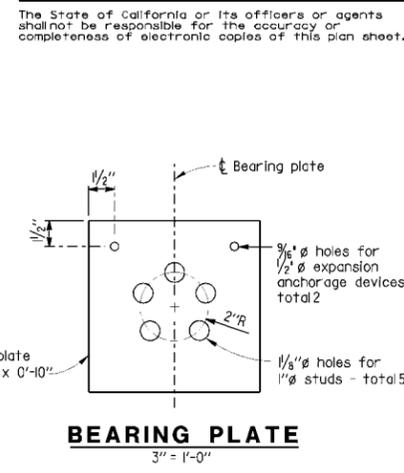
- NOTES:
1. Restrainer units to be placed normal to hinge except as shown.
  2. The contractor shall verify all controlling field dimensions before fabricating any material.
  3. For General Details not shown, see 'Note X' on 'Design ARS Curve & General Notes' sheets.
  4. Exist. longitudinal restrainer not shown.
  5. See 'Cable End Anchorage Details, Type A' on 'End Anchorage Details' sheet.
  6. See 'Cable End Anchorage Details, Type B' on 'End Anchorage Details' sheet.

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
04					

REGISTERED ENGINEER - CIVIL

PLANS APPROVAL DATE

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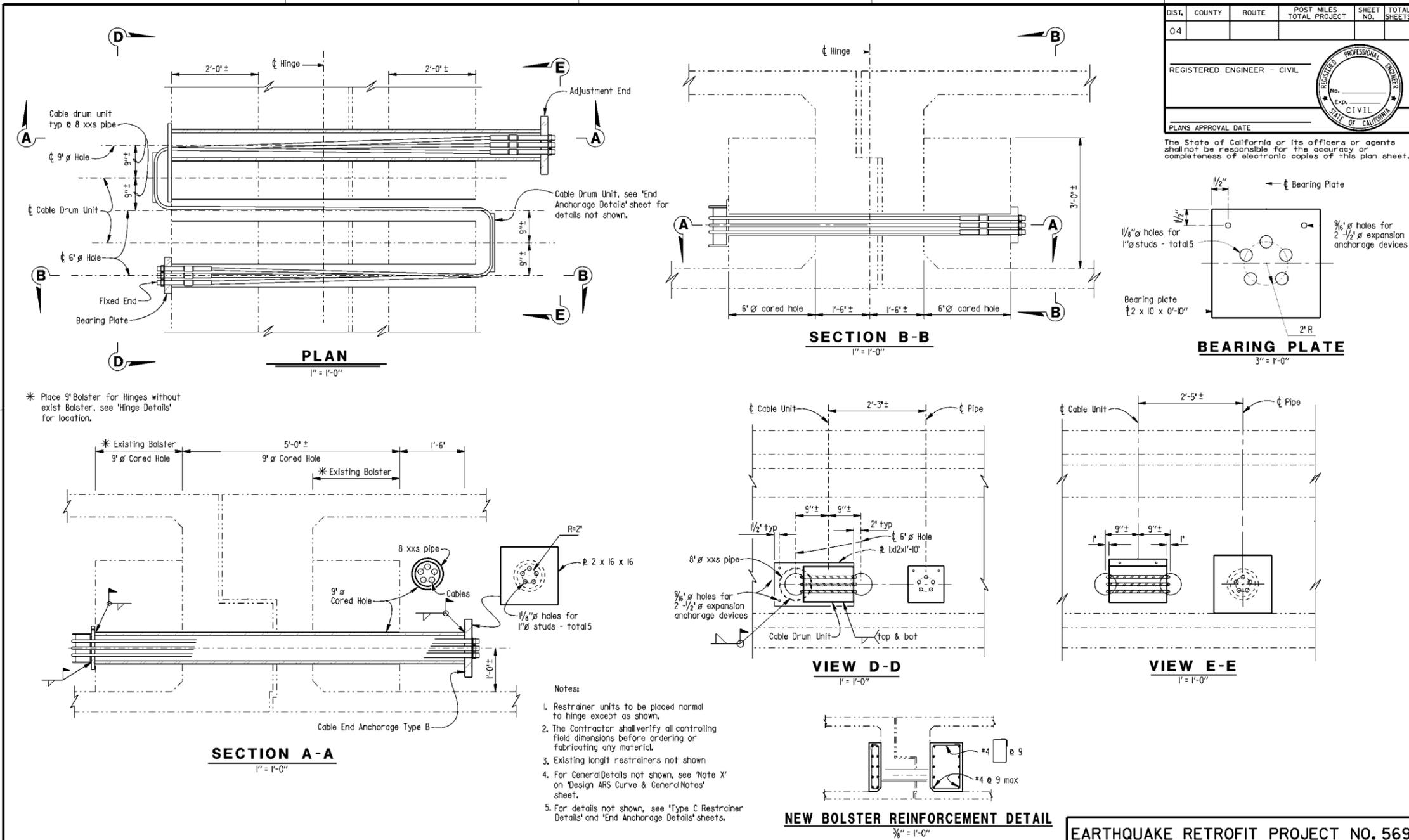
DESIGN BY Peter S Lee			CHECKED Ron Bromenschenkel	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	BRIDGE NO. varies	EARTHQUAKE RETROFIT PROJECT NO. 569 ROUTE 24/580/980 INTERCHANGE TYPE C RESTRAINER DETAILS	
DETAILS BY md			CHECKED Ron Bromenschenkel		DIVISION OF STRUCTURES STRUCTURE DESIGN 3		POST MILE varies
QUANTITIES BY Peter S Lee			CHECKED Mary L Warrlok		CU 04 EA 133161		

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS

DISREGARD PRINTS BEARING EARLIER REVISION DATES

DATE PLOTTED: 09 MAR 2009  
TIME PLOTTED: 07:43

USER:AVE => d:\31 by RestrainerC1.dgn



DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
04					

REGISTERED ENGINEER - CIVIL

PLANS APPROVAL DATE

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

\* Place 9" Bolster for Hinges without exist Bolster, see 'Hinge Details' for location.

DESIGN	BY Peter S Lee	CHECKED Ron Bromenschenkel	BRIDGE NO.	varies
DETAILS	BY nd	CHECKED Ron Bromenschenkel	POST MILE	varies
QUANTITIES	BY Peter S Lee	CHECKED Mary L Warrick		

STATE OF CALIFORNIA  
DIVISION OF STRUCTURES  
DEPARTMENT OF TRANSPORTATION  
STRUCTURE DESIGN 3

CJ 04  
EA 133161

EARTHQUAKE RETROFIT PROJECT NO. 569  
ROUTE 24/580/980 INTERCHANGE  
TYPE S RESTRAINER DETAILS

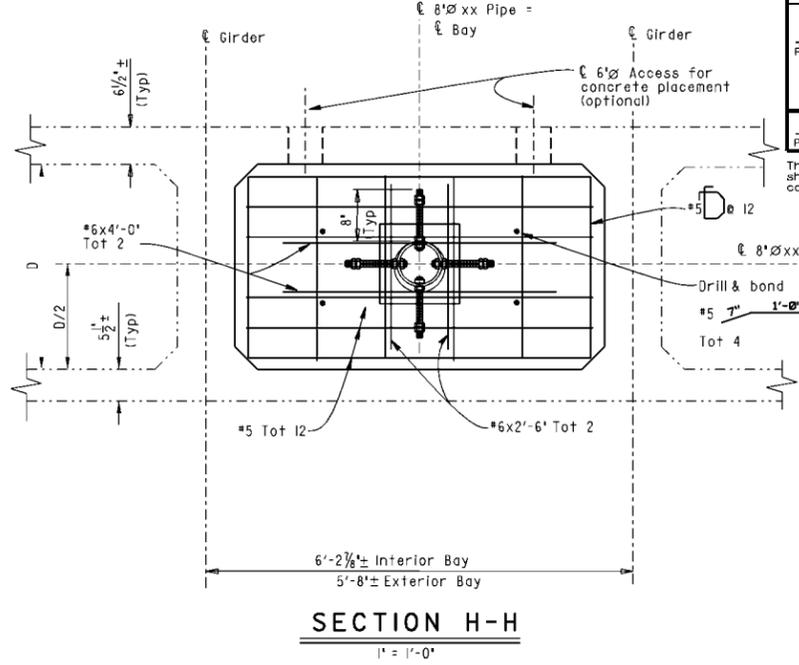
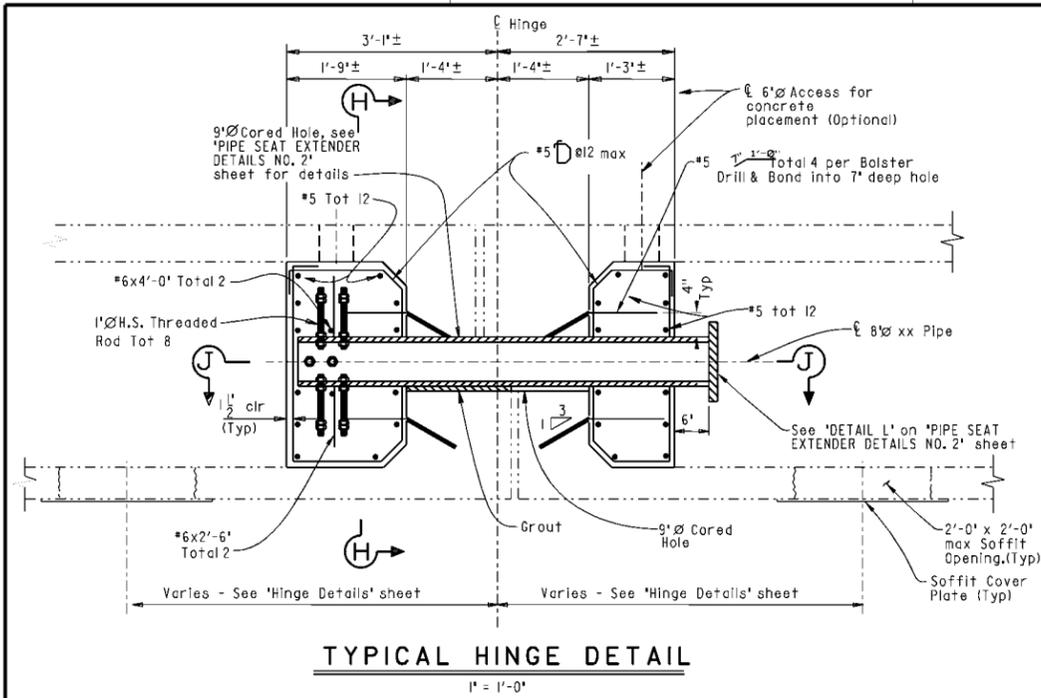
DATE: 21.01.09  
TIME: 11:00 AM  
FILE: 18-10.4 - 05293

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY)

432 516

USE: HAVE => draw by tyce\_s.cgn



DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
10					

REGISTERED ENGINEER - CIVIL

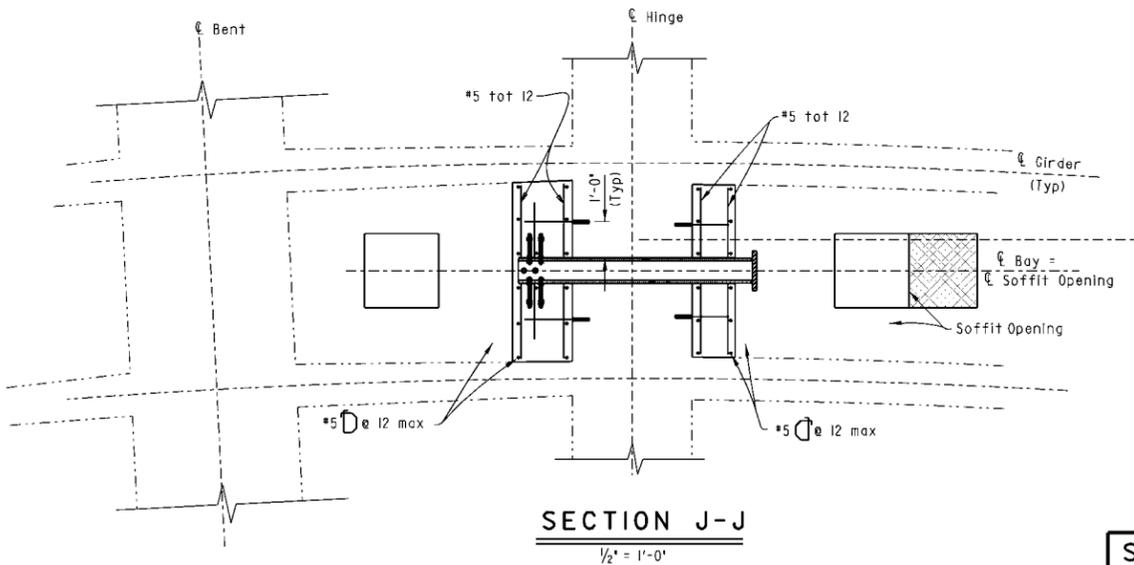


PLANS APPROVAL DATE

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Note: Orient Anchor Bolts as directed by Engineer.

NOTES:  
1. For pipe seat extender details, see 'DETAIL L' on 'PIPE SEAT EXTENDER DETAILS NO. 2' sheet.  
2. For soffit opening details, see 'DECK AND SOFFIT OPENINGS' sheet.

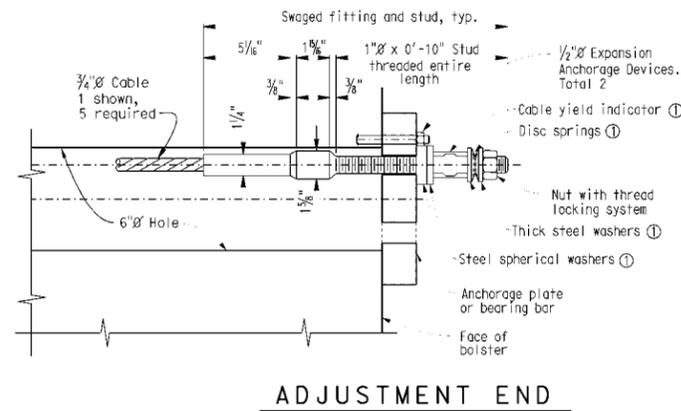
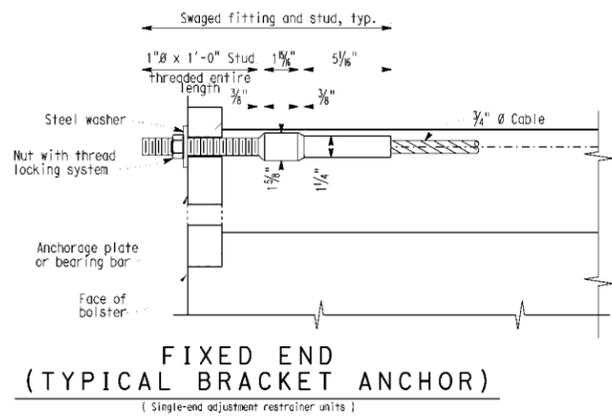


LEGEND:  
Indicates Remove and Replace Soffit Concrete, see 'DECK AND SOFFIT OPENINGS' sheet

NOTE: THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

DESIGN BY: Yong Pil Kim II-95 CHECKED: Don Lee II-95				BRIDGE NO. 23-109		<b>SEISMIC RETROFIT PROJECT NO. 731</b>	
DETAILS BY: Ralph Nakaoka/R. Lim 10-94 CHECKED: Don Lee II-95				POST MILE R7.2		<b>WALNUT STREET OVERCROSSING</b>	
QUANTITIES BY: Yong Pil Kim II-95 CHECKED: Joseph Downing II-95				STRUCTURE DESIGN 8		<b>PIPE SEAT EXTENDER DETAILS NO. 1</b>	
ORIGINAL SCALE IN INCHES FOR REDUCED PLANS				CU 10203 EA 438421		SHEET 8 OF 11	

DATE PLOTTED = 13 MAR 2009 TIME PLOTTED = 11:42



**CABLE END ANCHORAGE**  
3"=1'0"

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

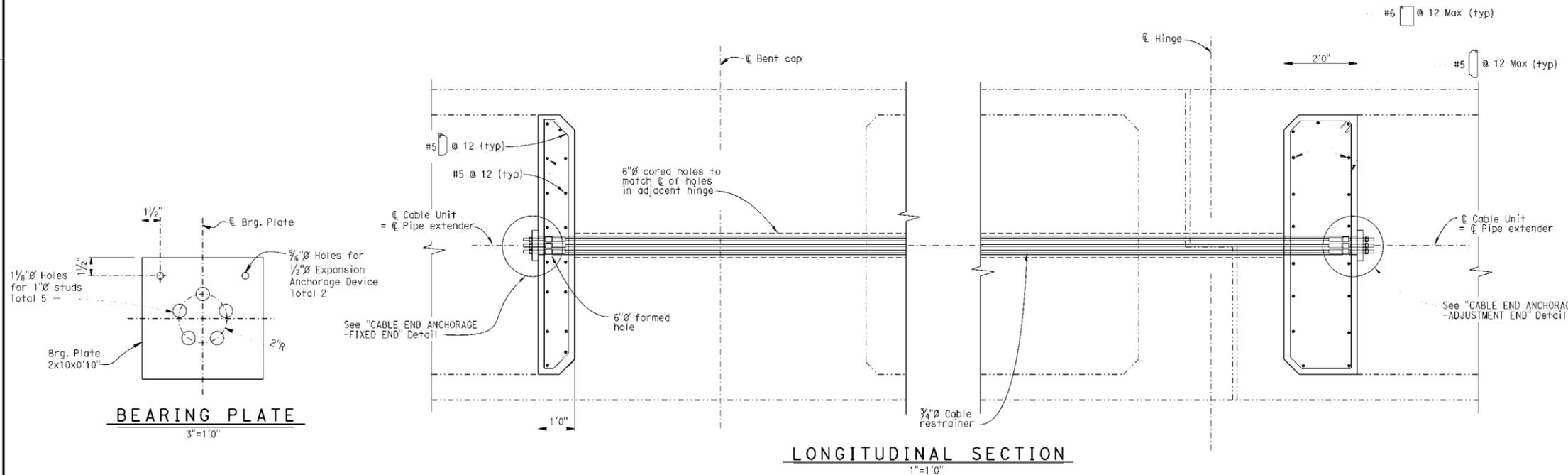
REGISTERED CIVIL ENGINEER DATE \_\_\_\_\_

PLANS APPROVAL DATE \_\_\_\_\_

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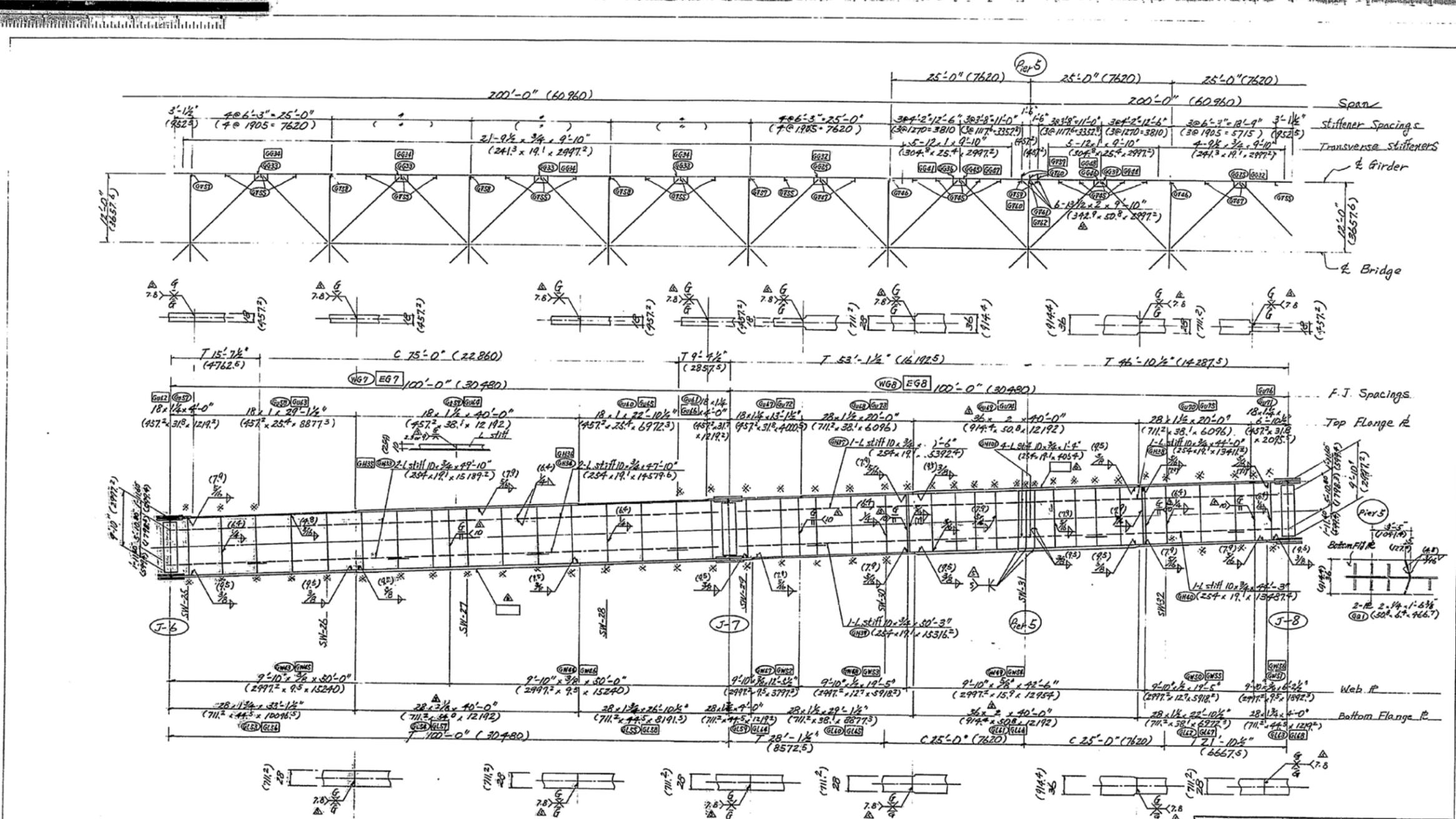
To get to the Caltrans web site, go to: <http://www.dot.ca.gov>

① For dimensions and installation procedure, see "RESTRAINER UNIT-ADJUSTMENT END DETAILS" sheet xs-110e-2

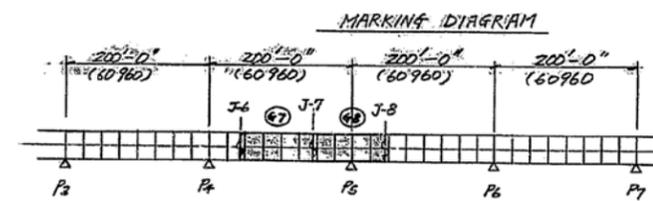


STANDARD DRAWING				STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES	BRIDGE NO. X	POST MILE X	X
DATE X/X/08	DESIGNED BY X	CHECKED BY X	APPROVED BY X					
PROJECT NO. x07-XXX6	CONTRACT NO. X	REVISION NO. X	REVISION DESCRIPTION X	ORIGINAL SCALE IN INCHES FOR REDUCED PLANS	CU X EA X	DISREGARD PRINTS BEARING EARLIER REVISION DATES		DATE

This is a shop plan sheet. You will find all dimensions and notes necessary to fabricate the girder shown. All welding symbols and supporting diagrams, plus inventory control data. Note the readability of this page. This is a print of a BIRIS .pdf made from very high quality shop drawing. Most shop plans are not this clean. When the SDT becomes involved with project needing data from a highly obscured shop plan, consult with your SDT 3 for help.



MARK DATE	DESCRIPTION	BY	CHK
9/5/76	LOCATION OF RESEARCH SAMPLE	M.M.	H.K.
9/5/76	IDENTIFICATION NO. OF WELDING PROXIMITY	M.M.	H.K.
9/5/76	WIDTH OF BEARING STIFFER CHANGE	M.M.	H.K.



MARK DATE	DESCRIPTION	BY	CHK
9/5/76	CHANGE OF PLATE THICKNESS	T.T.	H.K.

- 注意事項
- 一般注意事項は別図「GENERAL NOTES」を参照。
  - ※印欄のT-stiffは、75mm比薄板とする。
  - ( ) の表示はmmを示す。

- Notes
- See D.W.G. GENERAL NOTE 1. as to general regards.
  - Welding connection T-stiff with flange is not required at parts.
  - Values in parenthesis indicate mm units.

CONTRA COSTA AND SACRAMENTO COUNTIES, NEAR ANTIPOCH, FROM 0.5-MILE SOUTH TO 2.9MILES NORTH OF CONTRA COSTA-SACRAMENTO COUNTY LINE, DISTRICT 04, ROUTE 84.

FOR STATE OF CALIFORNIA  
DEPARTMENT OF TRANSPORTATION  
SAN JOAQUIN RIVER BRIDGE SUPRSTRUC  
CUSTOMER: PETER KIEWIT SON'S I

**MAIN GIRDER (#) (K)**

STEEL STRUCTURE DEPARTMENT	BRIDGE NO. 24-09
BRIDGE DESIGNING SECTION	CONTRACT NO. 04-151884
APPROVED <i>[Signature]</i>	SCALE 1/4" = 1'-0" 1/8" = 1'-0"
APPROVED <i>[Signature]</i>	DATE SEPT. 17 '76
CHECKED <i>[Signature]</i>	
DESIGNED <i>[Signature]</i>	LVG NO. 6
DRAWN <i>[Signature]</i>	

MITSUBISHI HEAVY INDUSTRIES, LTD.

240413	5
1	1
2	1
3	1
4	1
5	1
6	1
7	1
8	1
9	1
10	1
11	1
12	1
13	1
14	1
15	1
16	1
17	1
18	1
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20	1
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36	1
37	1
38	1
39	1
40	1
41	1
42	1
43	1
44	1
45	1
46	1
47	1
48	1
49	1
50	1

# AMERICAN WELDING SOCIETY

Typical Welding Symbols		
<b>Double-Fillet Welding Symbol</b>  Omission of length indicates that weld extends between abrupt changes in direction or as dimensioned	<b>Chain Intermittent Fillet Welding Symbol</b>  Pitch (distance between centers) of increments Length of increments Size (length of leg)	<b>Staggered Intermittent Fillet Welding Symbol</b>  Pitch (distance between centers) of increments Length of increments Size (length of leg)
<b>Plug Welding Symbol</b>  Included angle of countersink Pitch (distance between centers) of welds Size (diameter of hole at root) Depth of filling in inches (omission indicates filling is complete)	<b>Back Welding Symbol</b>  Back weld 2nd operation 1st operation	<b>Backing Welding Symbol</b>  Backing weld 1st operation 2nd operation
<b>Spot Welding Symbol</b>  Size or strength Number of welds Pitch Process RSW	<b>Stud Welding Symbol</b>  Size Pitch Number of studs	<b>Seam Welding Symbol</b>  Size or strength Increment length Pitch Process RSEW
<b>Square-Groove Welding Symbol</b>  Weld size Root opening	<b>Single-V Groove Welding Symbol</b>  Depth of bevel Root opening Groove angle Weld size	<b>Double-Bevel-Groove Welding Symbol</b>  Weld size Weld size Arrow points toward member to be prepared
<b>Symbol with Backgouging</b>  Depth of bevel Back gouge	<b>Flare-V-Groove Welding Symbol</b>  Weld size	<b>Flare-Bevel-Groove Welding Symbol</b>  Weld size
<b>Multiple Reference Lines</b>  1st operation on line nearest arrow 2nd operation 3rd operation	<b>Complete Penetration</b>  Indicates complete joint penetration regardless of type of weld or joint preparation CJP	<b>Edge Flange Welding Symbol</b>  Radius Weld size Height above point of tangency
<b>Flash or Upset Welding Symbol</b>  Process reference FW	<b>Melt-Thru Symbol</b>  Root reinforcement	<b>Joint with Backing</b>  'R' Indicates backing removed after welding
<b>Joint with Spacer</b>  Double bevel groove	<b>Flush Contour Symbol</b> 	<b>Convex Contour Symbol</b> 

\* It should be understood that these charts are intended only as shop aids. The only complete and official presentation of the standard welding symbols is in A2.4.

# AMERICAN WELDING SOCIETY

Basic Welding Symbols and Their Location Significance									
Location Significance	Fillet	Plug or Slot	Spot or Projection	Stud	Seam	Back or Backing	Surfacing	Flange Corner	Flange Edge
Arrow Side									
Other Side				Not Used			Not Used		
Both Sides		Not Used	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
No Arrow Side or Other Side Significance	Not Used	Not Used		Not Used		Not Used	Not Used	Not Used	Not Used

Location Significance	Groove							Scarf for Brazed Joint
	SQUARE	V	Bevel	U	J	Flare-V	Flare-Bevel	
Arrow Side								
Other Side								
Both Sides								
No Arrow Side or Other Side Significance		Not Used	Not Used					

Supplementary Symbols						Location of Elements of a Welding Symbol		
Weld-All Around	Field Weld	Melt-Thru	Consumable Insert	Backing Spacer	Contour			
					Flush	Convex	Concave	

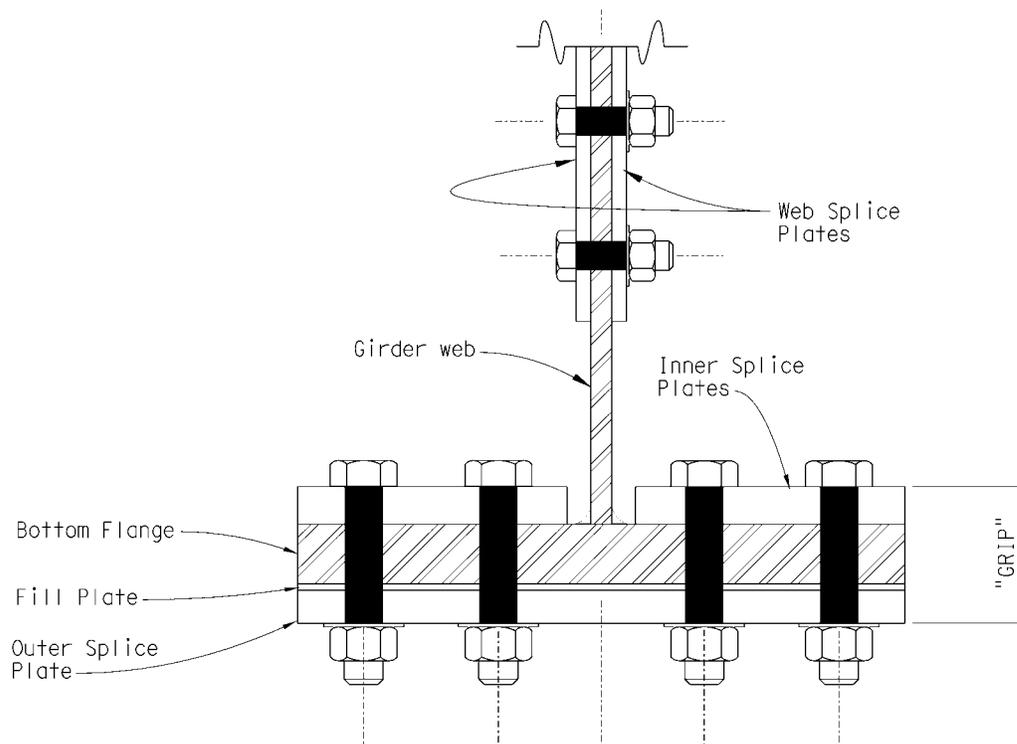
Basic Joints Identification of Arrow Side and Other Side Joint			
Butt Joint	Corner Joint	T-Joint	Lap Joint

Edge Joint	Process Abbreviations
	Where process abbreviations are to be included in the tail of the welding symbol, reference is made to Table 1, Designation of Welding and Allied Processes by Letters, of ANSI/AWS A2.4-92.

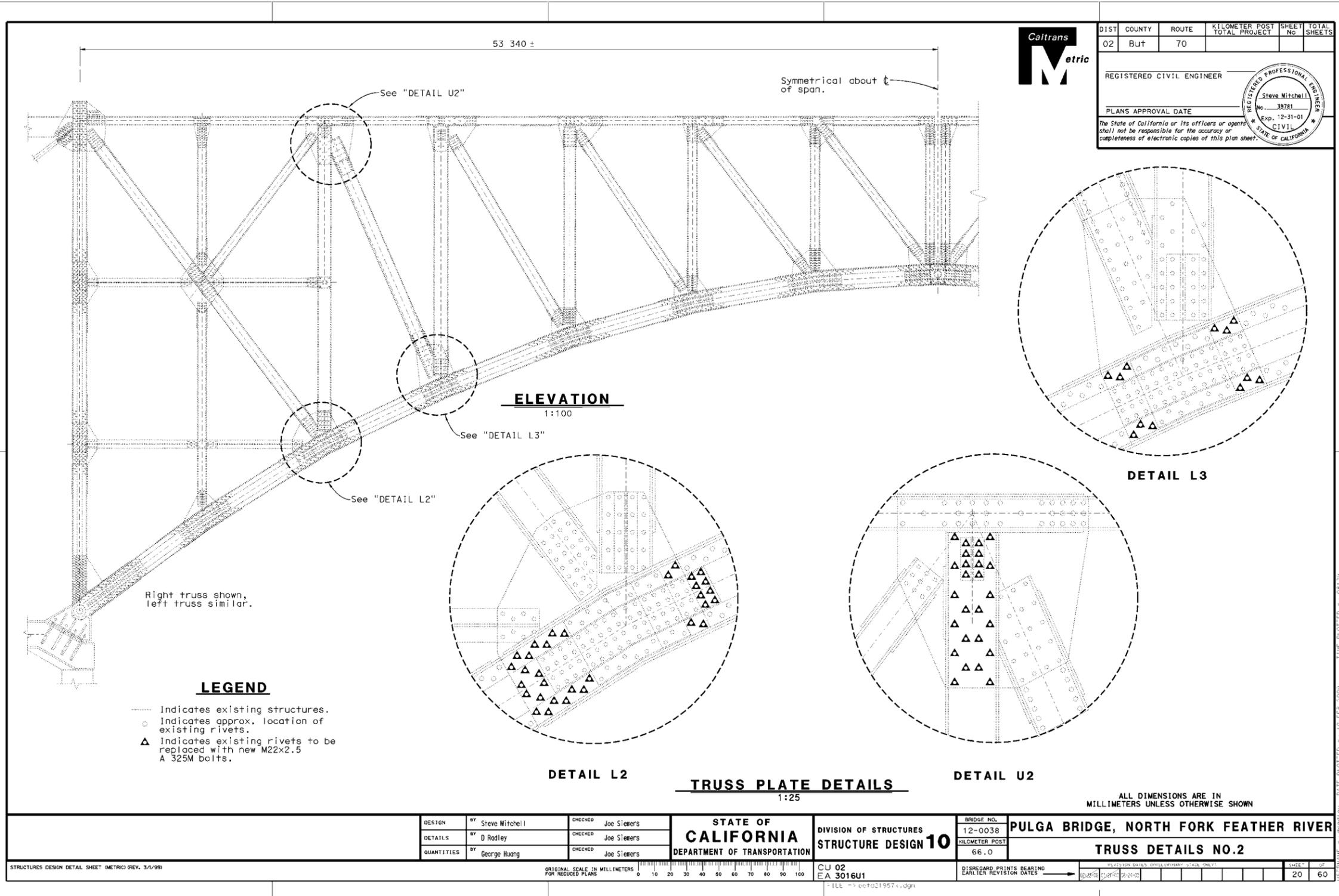
American Welding Society  
 550 N.W. Lejeune Rd., P.O. Box 351040  
 Miami, Florida 33135



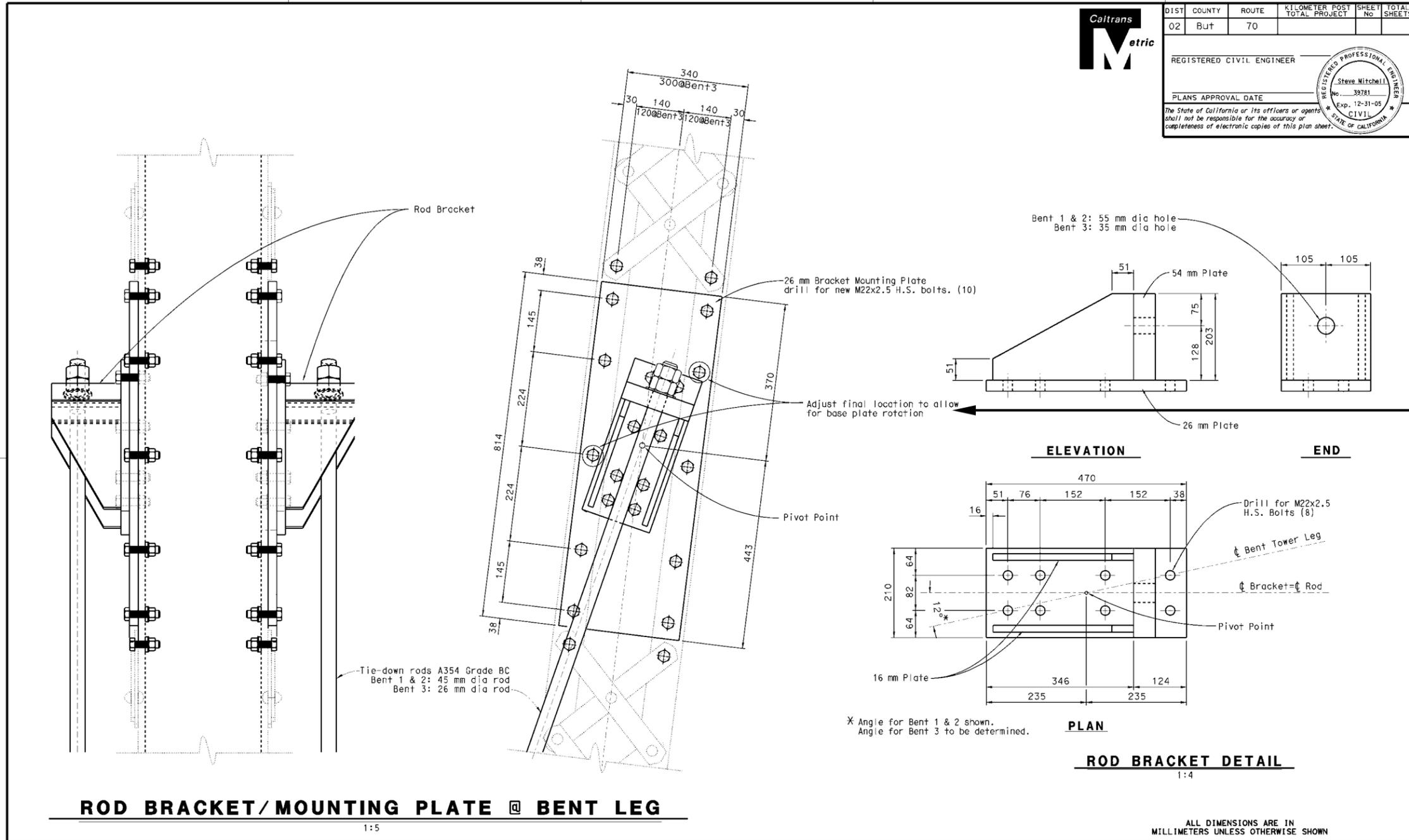
Example Figure 18-11.4

Note the illustration above. The dimension line on the right refers to the “*total thickness of all connected material, exclusive of washers*” (AISC “Manual of Steel Construction”) as the “grip”. The technique of using a solid black filled shape for the body of the bolts shown allows the grip to be easily described. The grip dimension is a quantity item that must be gathered for each bolt length. The engineer should provide information on diameter, washers etc. There are considerations for length: bolts 5” and less are available in ¼” increments and above 5”, ½” increments. Also, thread length is another variable to be noted. The Structural Design Technician should have a basic understanding of the illustration of bolted connections as they apply to steel/retrofit detailing. If layout dimensions are needed, the AISC “Manual of Steel Construction” Section 8 pages 8 thru 25 will be of interest.

Microstation has fasteners detailed in the cell library “steel”. Remember, it may not be necessary to show repetitious patterns of fully detailed bolt heads or nuts if a hole or a drill-point symbol will suffice.



This sheet reflects a concept of replacing selected rivets with High Strength Bolts, a retrofit strategy that works for both Seismic and Strengthening applications. Note the 'LEGEND' indicates symbols for each size of new bolt required (only one in this instance). See BDD Sec.1 for guidelines on using 'dropout' line work. The time for development of this as-built base detail would seem considerable, but when you see the "Symmetrical About Centerline of Span" and the "Right Truss Shown Left Truss Similar" notes the time savings by rotating and/or mirroring the details become significant. Also, extracting the blow-ups of the connection details is quick and simple.



DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No.	TOTAL SHEETS
02	But	70			

REGISTERED CIVIL ENGINEER

PLANS APPROVAL DATE

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REGISTERED PROFESSIONAL ENGINEER  
Steve Mitchell  
No. 39781  
Exp. 12-31-05  
CIVIL  
STATE OF CALIFORNIA

Note this example is the final detail sheet in 7-sheet sequence, see BDD 18-8.5 thru 18-8.10. The 'ROD BRACKET DETAIL' has all the dimensions required to produce a 'Shop Plan' that Caltrans will receive from the fabricator. The designer will compare our details with the shop plan for accuracy, and return them as "Approved" or reject them if he/she finds errors that must be corrected.

Installation of this bracket has fit up issues. Note the 2 bolt locations marked with the 'Adjust final location to allow for base plate rotation' note. The accuracy of the detail being only as good as the as-built/shop plan source dimensions, compared to the actual field dimensions, there appears to be an interference with the placement of the bracket base plate and using existing rivet locations. Since the brackets' final position (angle) is controlled by the rod angle, the final locations of these bolts may need adjusting in the field. The SDT should be able note these problem areas and suggest alternatives

**ROD BRACKET/MOUNTING PLATE @ BENT LEG**

1:5

**ROD BRACKET DETAIL**

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

DESIGN	BY Steve Mitchell	CHECKED Joe Siemers	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	BRIDGE NO.	12-0038	PULGA BRIDGE, NORTH FORK FEATHER RIVER BENT PYLON FOOTING DETAILS NO.7
DETAILS	BY David Rodley	CHECKED Samad Hamoud		STRUCTURE DESIGN	10	
QUANTITIES	BY Samad Hamoud	CHECKED Ariel Reyes		KILOMETER POST	66.0	

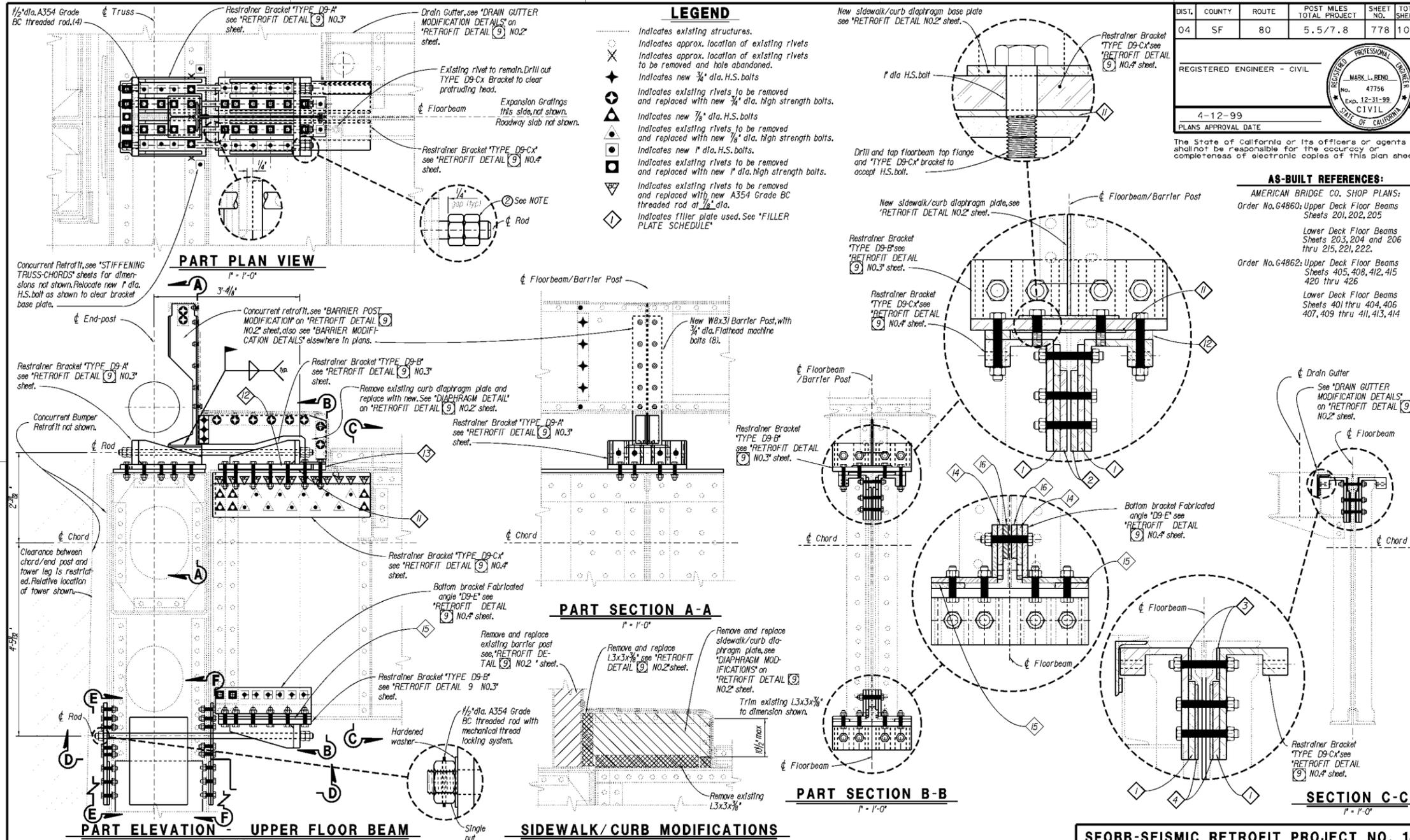
CU 02  
EA 3016U1

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (MILLI-METERS) STATE ONLY

51	60
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DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
04	SF	80	5.5/7.8	778	1049

REGISTERED ENGINEER - CIVIL  
 4-12-99  
 PLANS APPROVAL DATE

PROFESSIONAL ENGINEER  
 MARK L. BEND  
 No. 47756  
 Exp. 12-31-99  
 CIVIL  
 STATE OF CALIFORNIA

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**AS-BUILT REFERENCES:**

AMERICAN BRIDGE CO. SHOP PLANS:  
 Order No. G4860: Upper Deck Floor Beams Sheets 201, 202, 205  
 Lower Deck Floor Beams Sheets 203, 204 and 206 thru 215, 221, 222.  
 Order No. G4862: Upper Deck Floor Beams Sheets 405, 408, 412, 415 420 thru 426  
 Lower Deck Floor Beams Sheets 401 thru 404, 406 407, 409 thru 411, 413, 414

DESIGN BY B. Tanaka			CHECKED R. Rashad	BRIDGE NO. 34-0003	SF0BB-SEISMIC RETROFIT PROJECT NO. 18	
DETAILS BY D. Radley			CHECKED R. Rashad	POST MILE 5.3/7.7	WEST SPAN STIFFENING TRUSS-FLOOR BEAMS	
QUANTITIES BY S. Hoo			CHECKED S. Ead		RETROFIT DETAIL 9 NO.1	

STATE OF CALIFORNIA  
 DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES  
 STRUCTURE DESIGN 10

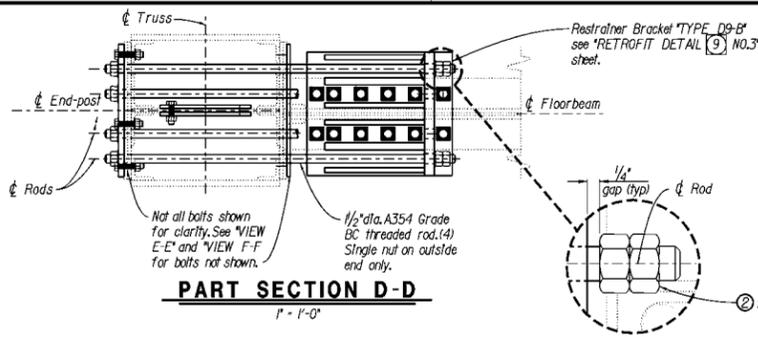
CU 04228  
 EA 0435U1

DISREGARD PRINTS BEARING EARLIER REVISION DATES

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS

0 1 2 3

SHEET 676 OF 940



**NOTES:**

- Thread Locking System shall be used on all fasteners that the Engineer determines can not be physically torqued to specification.
- Set gap on one end of rod as shown. For double nuts at both ends tighten nuts against each other to 300 FT. LBS. torque.

For double nuts/single nut and anchor plate combination, thread rod into anchor plate to set gap at bracket end and torque to 300 FT. LBS. then torque double nuts as above.

PLATE #	DIMENSIONS	QUANTITY
1	See Note	2
2	1/16" x 8 7/8" x 2'-9"	2
3	5/16" x 2 3/8" x 0'-3 1/2"	2
4	1/4" x 2 3/8" x 0'-8 1/4"	2
5	1/4" x 1'-0 1/2" x 2'-5 1/2"	1
6	1 3/8" x 2 3/4" x 2'-1 1/2"	2
7	1 5/8" x 3 1/2" x 0'-11"	1
8	3/4" x 7 1/2" x 2'-2 3/8"	2
9	3/4" x 4 9/16" x 2'-1 1/2"	2
10	3/4" x 4 9/16" x 2'-2 3/8"	2

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
04	SF	80	5.5/7.8	779	1049

REGISTERED ENGINEER - CIVIL

4-12-99  
PLANS APPROVAL DATE

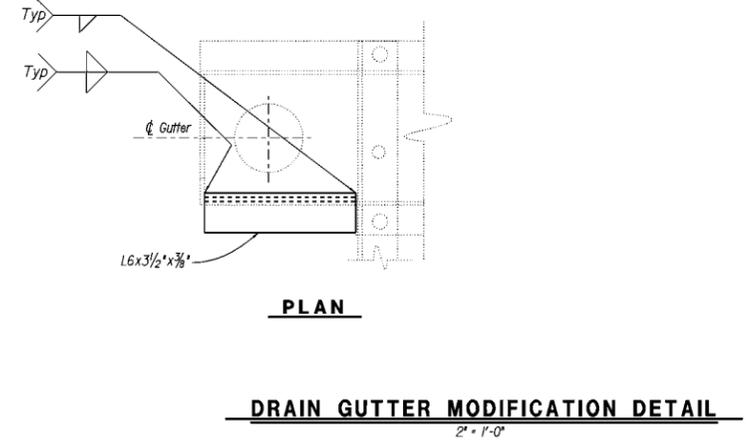
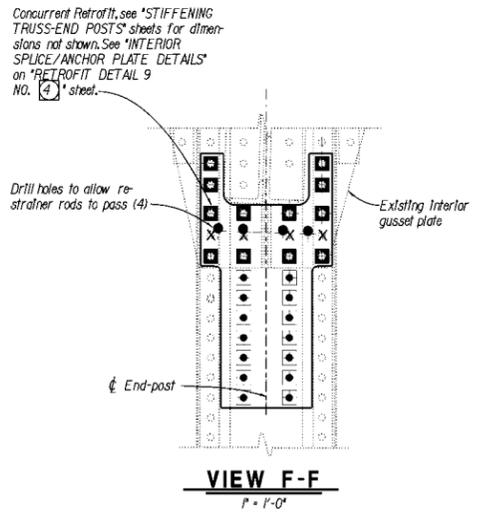
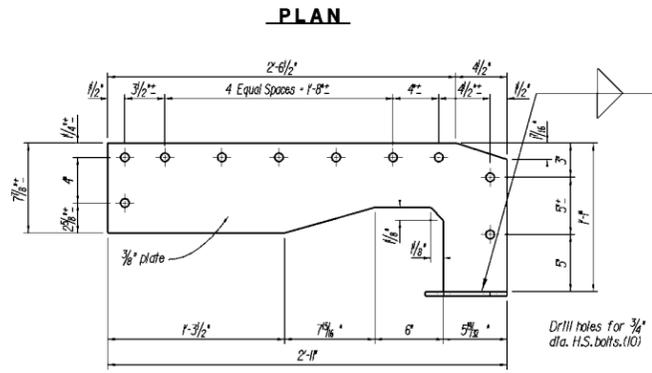
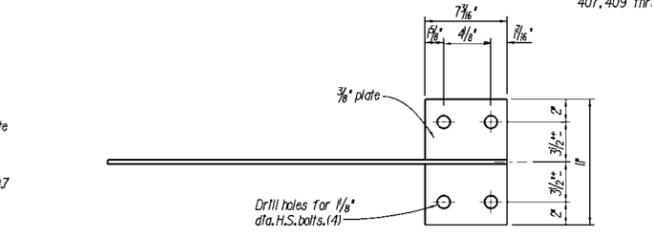
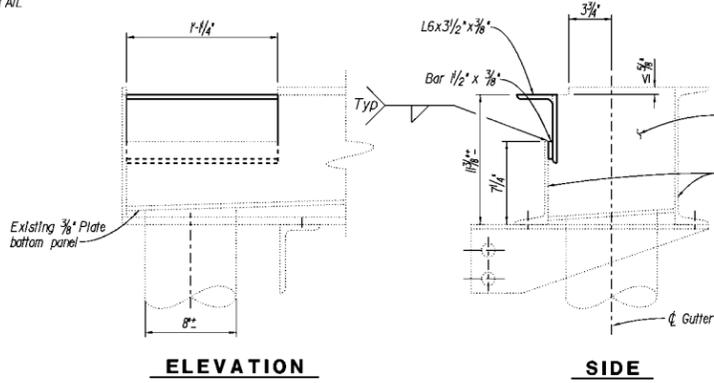
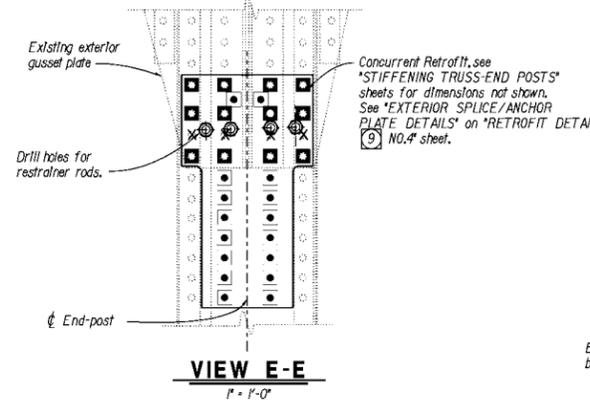
PROFESSIONAL ENGINEER  
MARK L. BEND  
No. 47756  
Exp. 12-31-98  
CIVIL  
STATE OF CALIFORNIA

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**AS-BUILT REFERENCES:**

- AMERICAN BRIDGE CO. SHOP PLANS:  
Order No. G4860: Upper Deck Floor Beams Sheets 201, 202, 205  
Lower Deck Floor Beams Sheets 203, 204 and 206 thru 215, 221, 222.  
Order No. G4862: Upper Deck Floor Beams Sheets 405, 408, 412, 415 420 thru 426  
Lower Deck Floor Beams Sheets 401 thru 404, 406 407, 409 thru 411, 413, 414

**NOTE:**  
1. For dimensions not listed, see "FILLER PLATE" on "RETROFIT DETAIL 9" NO. 3 sheet.



NOTE: THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

**SFOBB-SEISMIC RETROFIT PROJECT NO. 18**

DESIGN BY	B. Tanaka	CHECKED	R. Rashed	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	BRIDGE NO.	34-0003
DETAILS BY	D. Radley	CHECKED	R. Rashed		DIVISION OF STRUCTURES	STRUCTURE DESIGN 10
QUANTITIES BY	S. Hao	CHECKED	S. Ead		POST MILE	5.3/7.7

<b>WEST SPAN STIFFENING TRUSS-FLOOR BEAMS</b>	
<b>RETROFIT DETAIL 9 NO. 2</b>	
CU 04228	EA 0435U1
DISREGARD PRINTS BEARING EARLIER REVISION DATES	DATE PLOTTED: 01-11-09
SHEET 677	940



DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
04	SF	80	5.5/7.8	781	1049

REGISTERED ENGINEER - CIVIL

4-12-99  
PLANS APPROVAL DATE

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

Concurrent Retrofit, see "STIFFENING TRUSS-END POSTS" sheets for dimensions not shown. For location of "SPLICE/ANCHOR PLATE" see "VIEW E-E" and "VIEW F-F" on "RETROFIT DETAIL" NO.2 sheet.

### FILLER PLATE

2'-1-0"

**FABRICATED ANGLE "D9-E"**

2'-1-0"

All plate 3/4" thick unless otherwise shown.

### EXTERIOR SPLICE/ANCHOR PLATE

2'-1-0"

**INTERIOR SPLICE/ANCHOR PLATE**

2'-1-0"

Concurrent Retrofit, see "STIFFENING TRUSS-END POSTS" sheets for dimensions not shown. For location of "SPLICE/ANCHOR PLATE" see "VIEW E-E" and "VIEW F-F" on "RETROFIT DETAIL" NO.2 sheet.

### BRACKET TYPE "D9-C"

3'-1-0"

All plate 3/4" thick unless otherwise shown. Seal weld all open joints.

### SFOBB-SEISMIC RETROFIT PROJECT NO. 18

#### WEST SPAN STIFFENING TRUSS-FLOOR BEAMS

#### RETROFIT DETAIL 9 NO.4

DESIGN	BY B. Tanaka	CHECKED R. Rashed	STATE OF CALIFORNIA DIVISION OF STRUCTURES DEPARTMENT OF TRANSPORTATION <b>STRUCTURE DESIGN 10</b>	BRIDGE NO.	34-0003
DETAILS	BY D. Radley	CHECKED R. Rashed		POST MILE	5.3/7.7
QUANTITIES	BY S. Hao	CHECKED S. Ead			

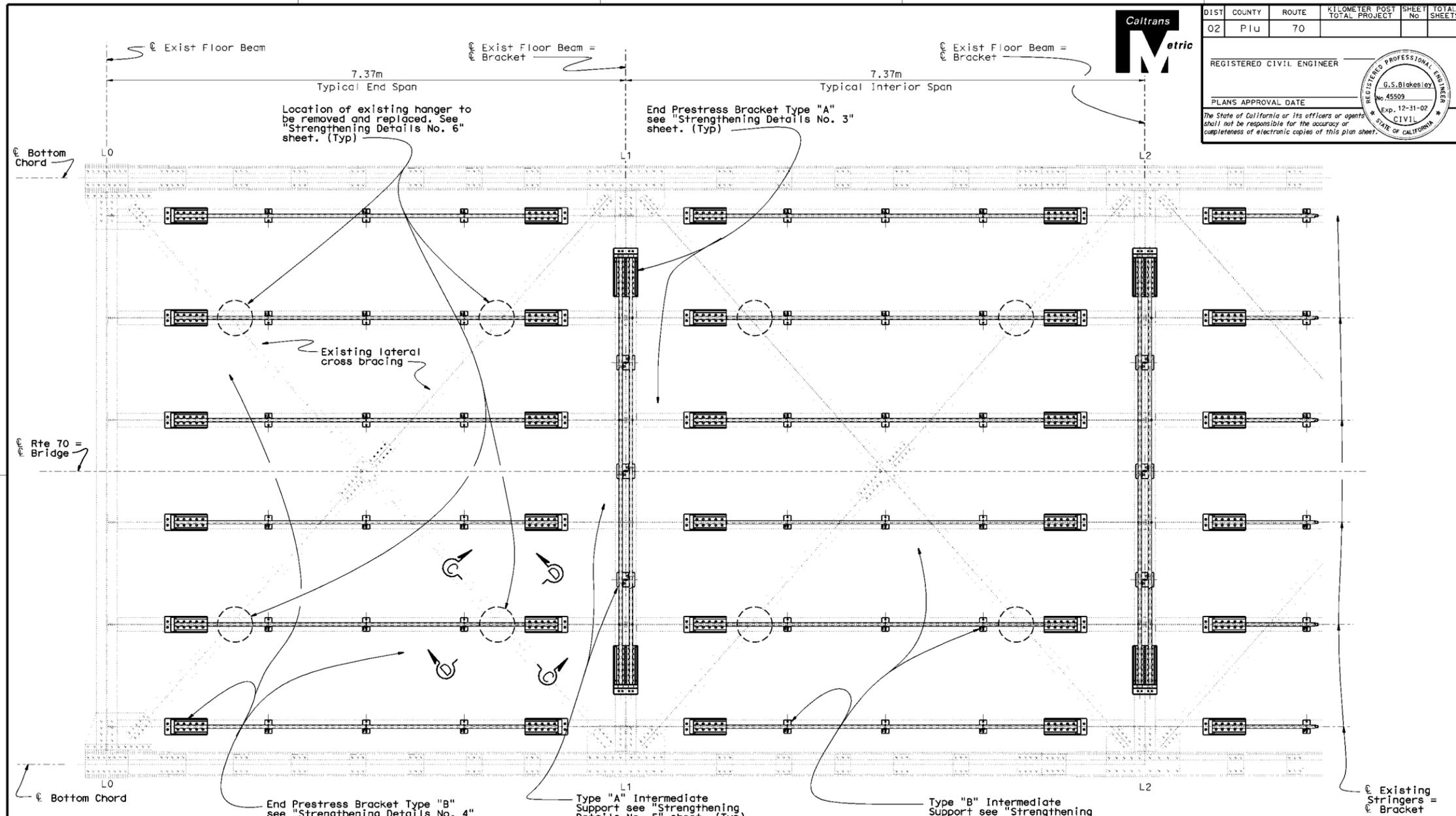
DS 050 239 (CAD 9/95)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS

CU 04228  
EA 0435U1

DISREGARD PRINTS BEARING EARLIER REVISION DATES

SHEET 679 OF 940



DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
02	PLU	70			

REGISTERED CIVIL ENGINEER  
 G.S. Blakesley  
 No. 45509  
 Exp. 12-31-02  
 CIVIL  
 STATE OF CALIFORNIA

PLANS APPROVAL DATE \_\_\_\_\_  
 The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

NOTE:  
 THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

Note: See "Strengthening Details No. 4" sheet for Prestressing Notes

**TYPICAL FLOOR SYSTEM**

1:25

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

DESIGN BY Gerrard Hight CHECKED Greg Thornton DETAILS BY Jeff Thorne CHECKED Greg Thornton QUANTITIES BY A. Bagde CHECKED A. Ankir			<b>STATE OF CALIFORNIA</b> DEPARTMENT OF TRANSPORTATION		DIVISION OF STRUCTURES <b>STRUCTURE DESIGN 1</b>		BRIDGE NO. 09-0004 KILOMETER POST 11.3		<b>BRIDGE ACROSS NORTH FORK</b> <b>FEATHER RIVER AT TOBIN</b> <b>STRENGTHENING DETAILS NO. 1</b>		
STRUCTURES DESIGN DETAIL SHEET (METRIC REV. 3/4/99) ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS				CU 02 EA 3016U1		REGARD PRINTS BEARING EARLIER REVISION DATES		SHEET 4 OF 31		DATE PLOTTED: 12-30-08 TIME PLOTTED: 14:35	



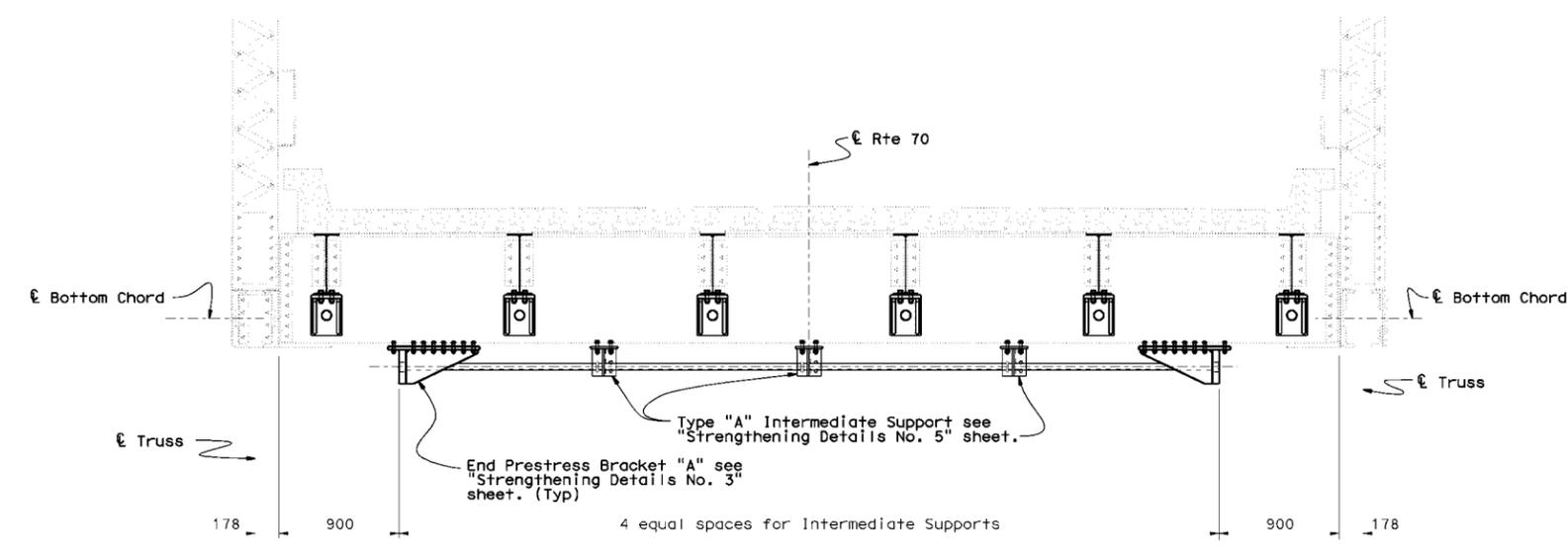
DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No.	TOTAL SHEETS
02	Plu	70			

REGISTERED CIVIL ENGINEER

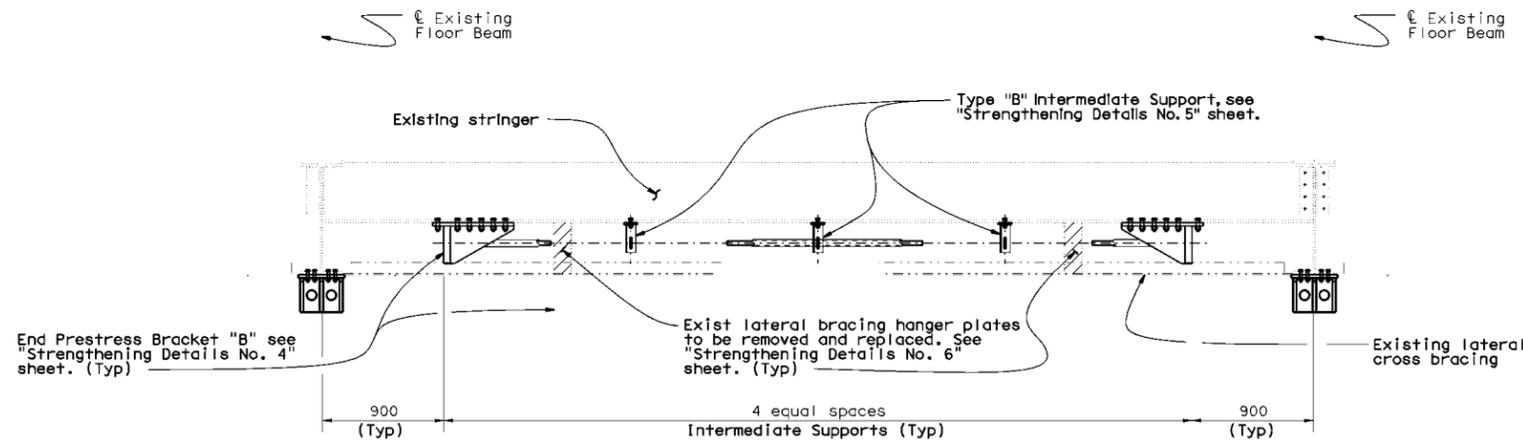
PLANS APPROVAL DATE

*The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.*

REGISTERED PROFESSIONAL ENGINEER  
G.S. Blakeley  
No. 45509  
Exp. 12-31-02  
CIVIL  
STATE OF CALIFORNIA



**TYPICAL FLOOR BEAM SECTION**  
1:20



**TYPICAL STRINGER ELEVATION**  
1:20

NOTE:  
THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

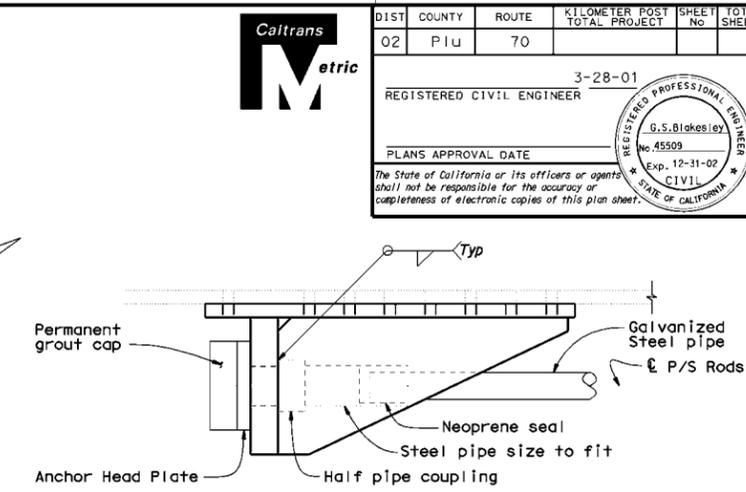
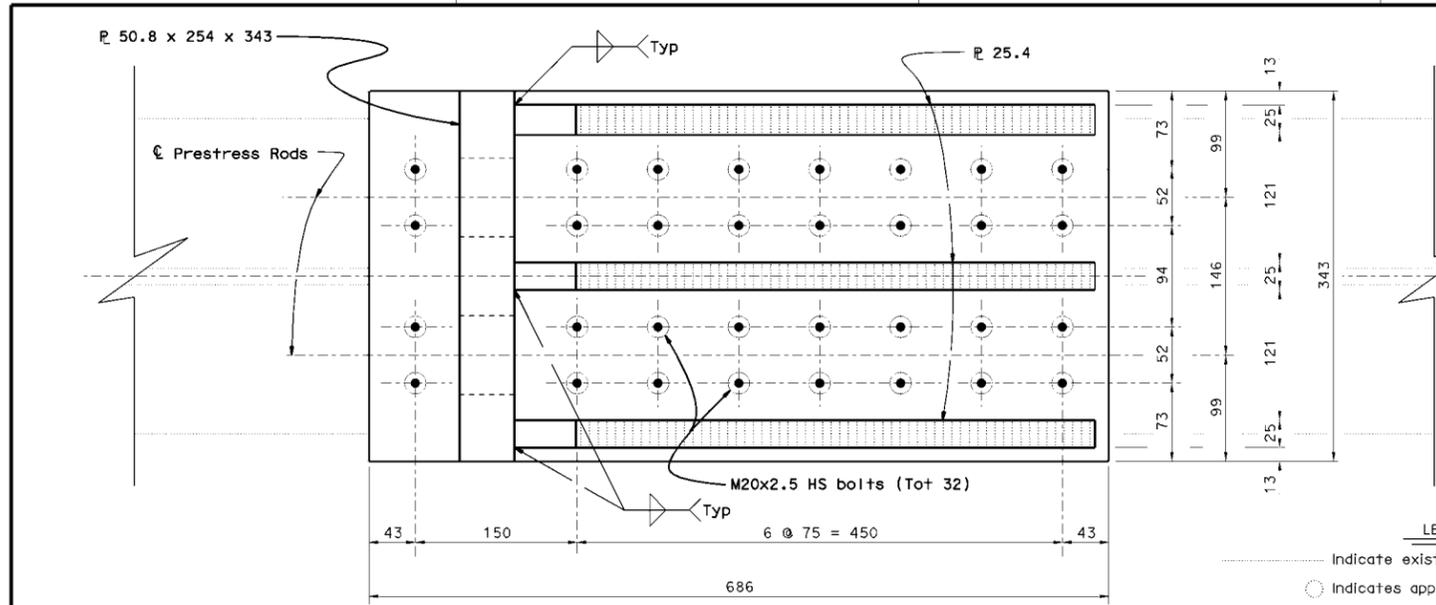
DESIGN BY Gerrard Hight	CHECKED Greg Thornton	<b>STATE OF CALIFORNIA</b> DEPARTMENT OF TRANSPORTATION	BRIDGE NO. 09-0004	<b>BRIDGE ACROSS NORTH FORK</b>	
DETAILS BY Jeff Thorne	CHECKED Greg Thornton		STRUCTURE DESIGN 1	<b>FEATHER RIVER AT TOBIN</b>	
QUANTITIES BY A. Bagde	CHECKED A. Ankir			<b>STRENGTHENING DETAILS NO. 2</b>	

CU 02 EA 3016U1

DISREGARD PRINTS BEARING EARLIER REVISION DATES

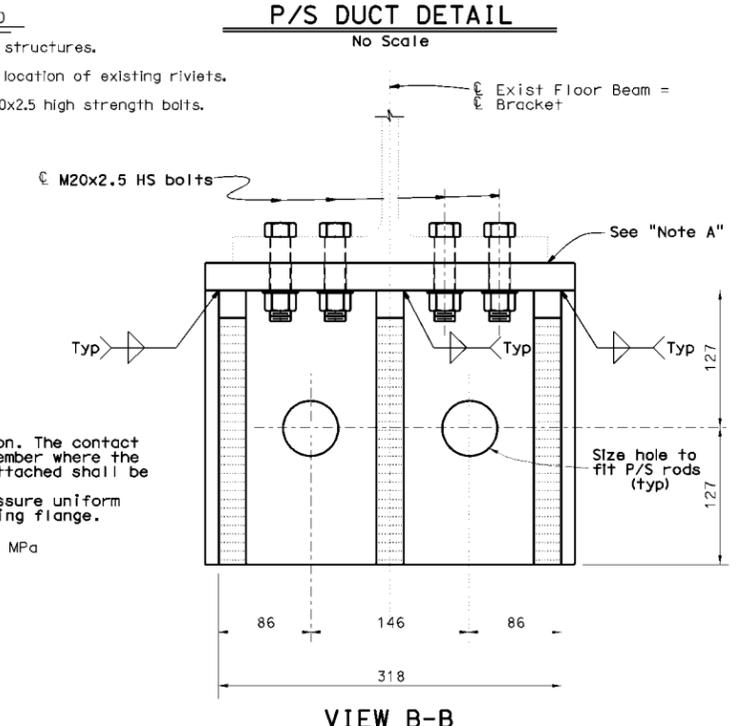
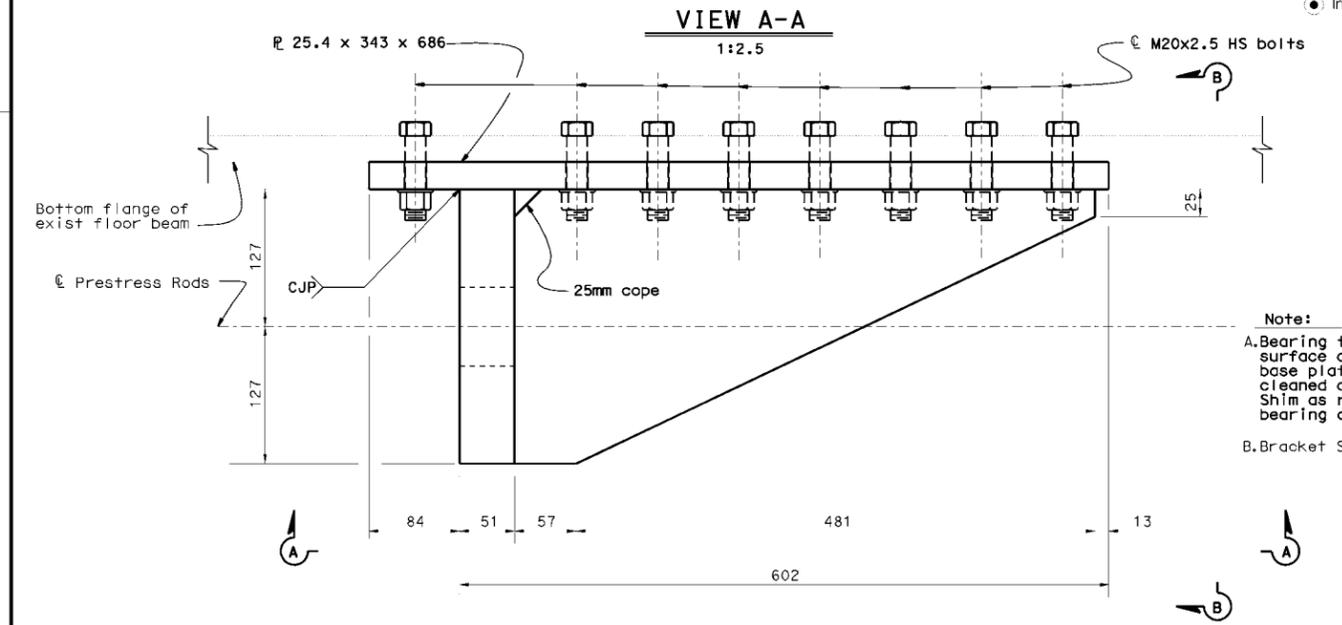
REVISION DATES (MILLIMETERS) STATE ONLY	SHEET 5 OF 31
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DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No.	TOTAL SHEETS
02	Plu	70			

3-28-01  
REGISTERED CIVIL ENGINEER  
G.S. Blakeley  
No. 45509  
Exp. 12-31-02  
CIVIL  
STATE OF CALIFORNIA



NOTE:  
THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

Note:  
A. Bearing type connection. The contact surface of existing member where the base plate is to be attached shall be cleaned and primed. Shim as required to assure uniform bearing against existing flange.  
B. Bracket Steel -  $F_y = 345 \text{ MPa}$

DESIGN BY: Gerrard Hight		CHECKED: Greg Thornton		<b>STATE OF CALIFORNIA</b> DEPARTMENT OF TRANSPORTATION DIVISION OF STRUCTURES STRUCTURE DESIGN 1	BRIDGE NO. 09-0004	BRIDGE ACROSS NORTH FORK	
DETAILS BY: Elliott/Thorne 12-98		CHECKED: Greg Thornton			KILOMETER POST 11.3	FEATHER RIVER AT TOBIN	
QUANTITIES BY: A. Bagde		CHECKED: A. Ankir			STRENGTHENING DETAILS NO. 3		

STRUCTURES DESIGN DETAIL SHEET (METRIC) REV. 3/1/99 ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS

CU 02 EA 3016U1 DISREGARD PRINTS BEARING EARLIER REVISION DATES

DATE PLOTTED: 1/14/08