



# ELEPHANT HEAD ROAD BRIDGE OVER THE SANTA CRUZ RIVER

## SUPERSTRUCTURE REPLACEMENT



### GENERAL DESCRIPTION OF PROJECT

REMOVE EXISTING PRECAST INVERTED CHANNEL BEAMS AND REPLACE WITH NEW PRECAST BOX BEAMS, CONSTRUCT COMPOSITE CONCRETE DECK, DECK JOINTS, CONCRETE BARRIER, METAL RAILING, REPAIR EXISTING PIER CAPS.

PROJECT NUMBER  
**4RTEHB**

PIMA COUNTY BOARD OF SUPERVISORS

SHARON BRONSON, CHAIR, DISTRICT 3

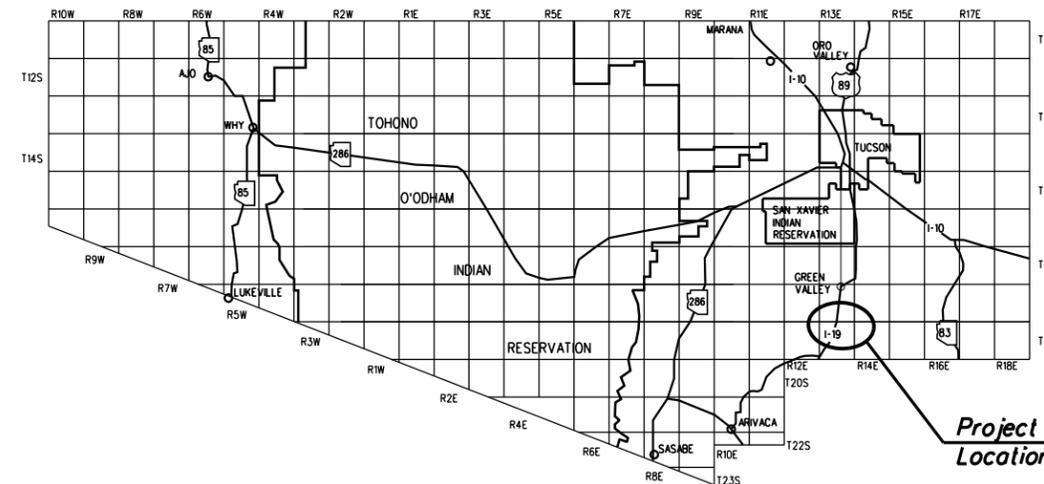
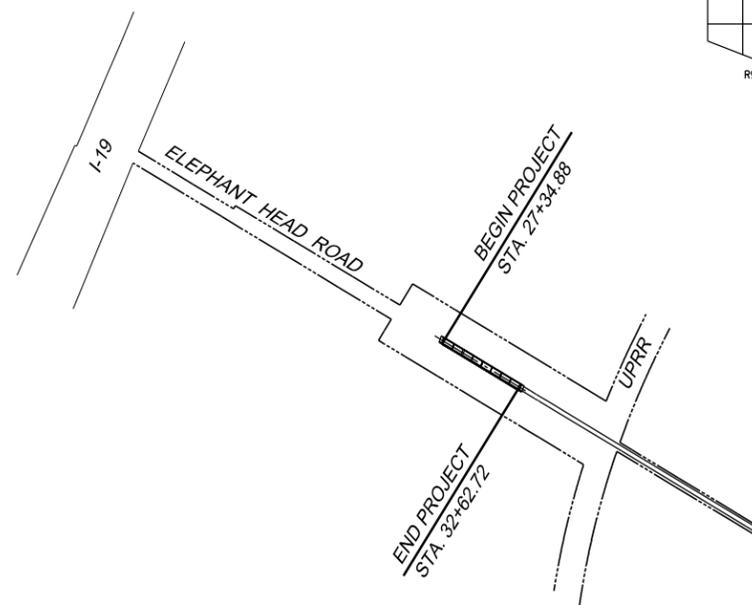
ALLY MILLER, DISTRICT 1    RICHARD ELIAS, DISTRICT 5

RAMON VALADEZ, DISTRICT 2    RAY CARROLL, DISTRICT 4

THIS PROJECT IS LOCATED WITHIN SUPERVISOR DISTRICT 4

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Location Map  
NOT TO SCALE

Section 29  
T-19-S, R-13-E,  
G & S R B & M  
Pima County, Arizona

**PRELIMINARY  
FOR INFORMATION ONLY  
JULY 20, 2015**

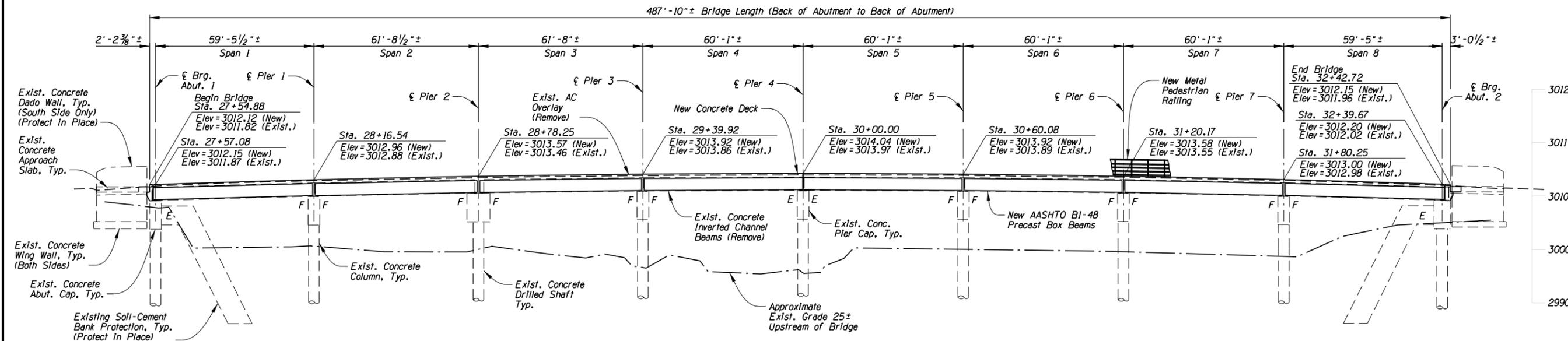
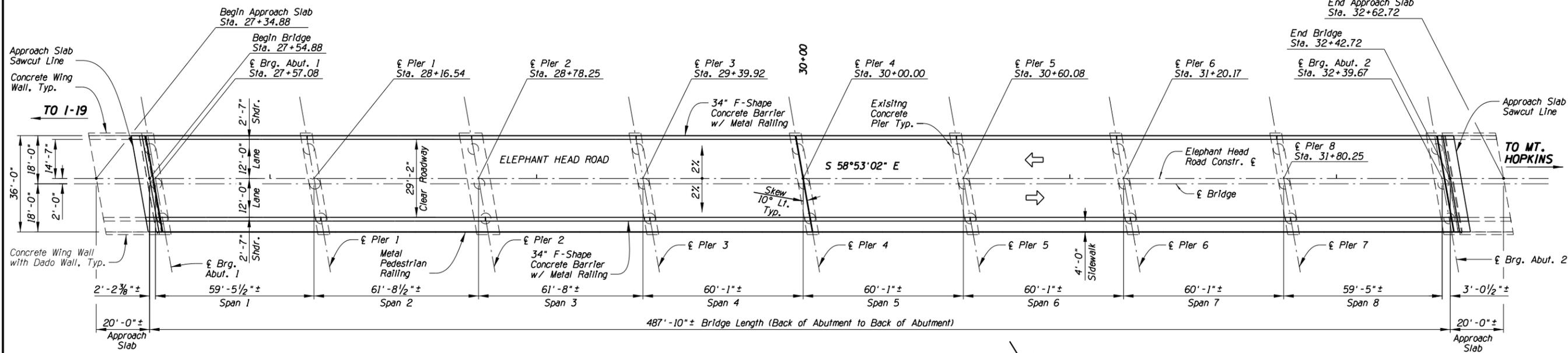
Pima County Department of Transportation  
201 N. Stone Ave. 4th floor    Tucson, Arizona 85701  
Phone Number: 724-6410  
Priscilla S. Cornello, P.E. Director

|                           |            |                  |                 |             |   |                          |                 |             |                                      |                           |
|---------------------------|------------|------------------|-----------------|-------------|---|--------------------------|-----------------|-------------|--------------------------------------|---------------------------|
|                           | <b>No.</b> | <b>Revisions</b> | <b>Engineer</b> | <b>Date</b> | JULY 2015<br>PRELIMINARY<br>NOT FOR<br>CONSTRUCTION<br>OR RECORDING | <b>Reviewed by</b>       | <b>Engineer</b> | <b>Date</b> | Approved: _____ 20__<br><br>Director |                           |
|                           | <b>No.</b> | <b>As Built</b>  | <b>Engineer</b> | <b>Date</b> |   | <b>Mgr. Trans Engr.</b>  |                 |             |                                      | <b>Mgr. Traffic Engr.</b> |
|                           |            |                  |                 |             |   | <b>Mgr. Field Engr.</b>  |                 |             |                                      |                           |
|                           |            |                  |                 |             |   | <b>Mgr. WMM</b>          |                 |             |                                      |                           |
|                           |            |                  |                 |             |   | <b>Mgr. Tucson Water</b> |                 |             |                                      |                           |
| <b>Project No. 4RTEHB</b> |            |                  |                 |             |   | <b>Sheet No. 1 of 20</b> |                 |             | <b>Page No. 1 of 20</b>              |                           |

Project ID: 0000000258562  
Client Number: 02145  
Pentable: plotcmdr.tbl  
Plotdriver: COTPMkpl\_V8hal\_B&W.plt



Elephant Head Road Bridge - Over Santa Cruz River - Project No. 4RTEHB



**LEGEND**  
 E = Expansion Joint  
 F = Fixed/Pinned Joint

**PRELIMINARY FOR INFORMATION ONLY**  
 JULY 20, 2015

Priscilla S. Cornelia, P.E., Director  
 Pima County Department of Transportation  
 Project No. 4RTEHB  
 Elephant Head Road Bridge - Over Santa Cruz River

| Date        | 7/20/15  |
|-------------|----------|
| Designed    | SST      |
| Drawn       | ATS, TRK |
| Checked     | JAC      |
| Proj. Engr. | TWB      |

| No. | Revision | Description | Engineer | Date |
|-----|----------|-------------|----------|------|
|     |          |             |          |      |

JULY 2015  
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 OR RECORDING



**LOCATION PLAN AND ELEVATION**  
**ELEPHANT HEAD ROAD BRIDGE**  
**OVER THE SANTA CRUZ RIVER**  
**PROJECT NO. 4RTEHB**

Project ID: 00000000258562  
 Client Number: 02145  
 Pentable: plotandtbl  
 Plotdriver: B22226-Vsharf\_B&W\_PDF.plt





**GENERAL NOTES**

**Construction Specifications**

Pima Association of Governments Standard Specifications for Public Improvements 2014 Edition and the Special Provisions.

**Design Specifications**

American Association of State Highway and Transportation Officials (AASHTO) LRFD Bridge Design Specifications, Seventh Edition, 2014.

**Bridge Loading**

Dead Load - Dead Load includes allowance of 35 pounds per square foot (psf) for future wearing surface.

Live Load - AASHTO HL-93.

**Concrete**

All concrete shall be Class "S" unless noted otherwise.

Construction joints shall be permitted only at indicated locations. Additional construction joints or changes to those shown shall be approved by the Engineer.

Sandblast all construction joints prior to placement of adjacent concrete.

Chamfer all exposed corners 3/4" unless noted otherwise.

For concrete finishes, see the Standard Specifications.

**Reinforcing Steel**

Reinforcing steel shall conform to ASTM Specification A615. All reinforcing steel shall be furnished as Grade 60.

All bend dimensions for reinforcing steel shall be out-to-out of bars.

All placement dimensions for reinforcing steel shall be to center of bars, unless noted otherwise.

All reinforcing steel shall have 2" clear cover, unless noted otherwise.

All bends and hooks shall meet the requirements of AASHTO Article 5.10.

**Structural Steel**

Structural steel shall conform to ASTM A36 (Fy=36ksi) unless noted otherwise.

Structural tubing shall conform to ASTM A-500, Grade B (Fy=46ksi).

All welding shall conform to American Welding Society, AASHTO/AWS D1.5M/D1.5: 2010 Bridge Welding Code.

**Box Beams**

The bridge superstructure shall use precast, prestressed AASHTO Type B1-48 Box Beams. The design is composite for live load and superimposed dead load only. Box Beams are designed using transformed section properties.

**Stresses**

Deck Slab & Diaphragms (Class S): f'c = 4500 psi (fc=1800 psi)

Approach Slab & Barriers (Class S): f'c = 4000 psi

Precast, Prestressed Box Beams: f'c = 6000 psi

f'cl = 4500 psi

All other Concrete (Class S): f'c = 4000 psi

High Strength Non-Shrink Grout: f'c = 5000 psi at 24 hours

Reinforcing Steel (Grade 60): fs = 24,000 psi

fs = 20,000 psi (Transverse Deck Reinforcement)

Prestressing Steel: fs = 270,000 psi (1/2" 7-wire low relaxation strand)

**Dimensions**

Dimensions shall not be scaled from drawings. All dimensions are in feet and inches and all stations and elevations are in feet.

Vertical dimensions are measures plumb, unless noted otherwise.

**Concrete Barriers & Parapets**

Concrete bridge barriers shall be constructed after deck slab falsework has been removed. Bridge barriers shall not be slip formed.

**Existing Conditions**

Contractor shall coordinate all existing conditions during construction of project including but not limited to verifying the distances between existing pier and abutment caps and all other dimensions required for the fabrication of precast elements of the project. Utility information shown on the plans may not be complete or accurately depict the location of the facilities shown. The Contractor shall coordinate the location of all existing, new, relocated and abandoned utilities with the project plans and notify respective owners before commencing work. Conflicts shall be brought to the attention of the Engineer and resolved prior to proceeding with the work.

**Existing Bridge**

The existing bridge, Elephant Head Road (formerly La Canea Road) Bridge over the Santa Cruz River (Structure Number 08912), is an eight span precast, prestressed concrete beam bridge that was constructed in 1986. The bridge is approximately 488 feet long measured back-to-back of abutments. The superstructure consists of nine 30" deep x 48" wide x 60" long precast inverted channel beams that are placed side-by-side in each span. The beams were salvaged from the old Swan Road Bridge over the Rillito River, which was constructed in 1962 and removed in approximately 1985. There is an asphalt overlay that was placed directly on top of the inverted channel beams. The superstructure is supported by 48" diameter reinforced concrete caissons at both the piers and abutments. The bridge has a skew of 10 degrees. The original construction plans for the bridge can be obtained from Pima County.

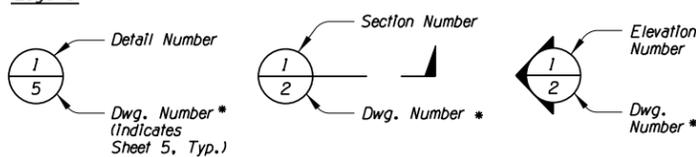
The existing inverted channel beams shall be completely removed from the bridge, including the anchor rods, shear transfer plates, and asphalt topping. The substructure that is to remain shall not be damaged. The precast channel beams are anchored to the bridge substructure with vertical anchor rods that have been grouted in place through the beams. The contractor shall submit a demolition plan to the Engineer for review and approval prior to starting demolition activities.

**Inventory and Operating Rating**

Rating for the superstructure are in accordance with the AASHTO Manual for Bridge Evaluation, 2nd Edition with Interim revisions through 2015. Ratings use the HS20-44 Live Load in accordance with the Load Factor Rating (LFR) Method.

Inventory Rating HSXX.XX  
Operating Rating HSXX.XX

**Legend**



\* "-" indicates Section or Detail is located on same drawing.

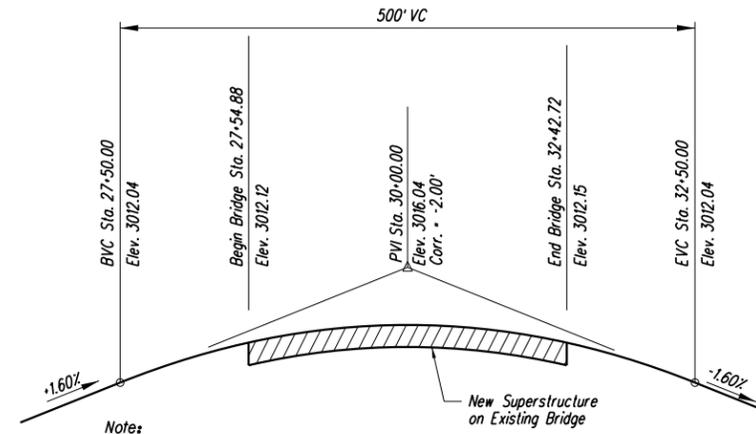
**ADOT Standard Drawings**

Bridge Group SD Drawings: SD 1.01, SD 2.01, SD 3.02

**Partial List of Submittals**

The Contractor shall submit shop drawings and other such information to the Engineer for review and approval in accordance with the Standard Specifications and the Special Provisions. The following is a partial list of items that will need to be submitted:

- Concrete Mix Designs Including High Strength Non-Shrink Grout
- Reinforcing Steel Shop Drawings
- Bearing Pad Shop Drawings
- Precast, Prestressed Box Beam Shop Drawings
- Demolition Plan
- Deck Placement Plan
- Metal Railing Shop Drawings
- Deck Joint Shop Drawings



Note: Bridge Profile Grade Line is taken along the Elephant Head Road Construction Centerline and is only valid between the Begin Bridge station and the End Bridge station. See Sheet 1 for profile grade line required to match the existing roadway into the new bridge superstructure.

**BRIDGE PROFILE GRADE LINE**

No Scale

**Approximate Quantities**

| Item           | Class 'S' Concrete |            | Reinforcing Steel | AASHTO Type B1-48 Box Beams | Deck Joint Assembly | Bearing Pads |
|----------------|--------------------|------------|-------------------|-----------------------------|---------------------|--------------|
|                | 4000 psi           | 4500 psi   |                   |                             |                     |              |
|                | CU. YD.            | CU. YD.    |                   |                             |                     |              |
| Abutment 1     | 6                  | -          | -                 | -                           | 34                  | 18           |
| Pier 1         | -                  | -          | -                 | -                           | -                   | 36           |
| Pier 2         | -                  | -          | -                 | -                           | -                   | 36           |
| Pier 3         | -                  | -          | -                 | -                           | -                   | 36           |
| Pier 4         | -                  | -          | -                 | -                           | 34                  | 36           |
| Pier 5         | -                  | -          | -                 | -                           | -                   | 36           |
| Pier 6         | -                  | -          | -                 | -                           | -                   | 36           |
| Pier 7         | -                  | -          | -                 | -                           | -                   | 36           |
| Abutment 2     | 10                 | -          | -                 | -                           | 34                  | 18           |
| Superstructure | -                  | 376        | 57,600            | 4,302                       | -                   | -            |
| Approach Slabs | 12                 | -          | 1,500             | -                           | -                   | -            |
| <b>Total</b>   | <b>28</b>          | <b>376</b> | <b>59,100</b>     | <b>4,302</b>                | <b>102</b>          | <b>288</b>   |
| As Built Total |                    |            |                   |                             |                     |              |

F-Shaped Barrier (34")..... 992 LF Restrainers, Vertical (Expansion)..... 36 EA  
Metal Railing (on 34" F-Shape Barrier)..... 1,020 LF Metal Pedestrian Railing..... 488 LF

Note: Quantities for bearing pads and vertical restrainers are provided for information only. The cost of these items is considered incidental to other contract items. See Standard Specifications and Special Provisions.

PRELIMINARY  
FOR INFORMATION ONLY  
JULY 20, 2015

Project ID: 00000000258562  
Client Number: 02145  
Pentable: plotand;tbl  
Plotdriver: %shar;B&W\_PDF.plt



Priscilla S. Cornelia, P.E., Director

| Date    | Designed | Drawn    | Checked | Proj. Engr. |
|---------|----------|----------|---------|-------------|
| 7/20/15 | SST      | ATS, TRK | JAC     | TWB         |
| 7/20/15 |          |          |         |             |
| 7/20/15 |          |          |         |             |

| No. | Revision Description | Engineer | Date |
|-----|----------------------|----------|------|
|     |                      |          |      |
|     |                      |          |      |
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JULY 2015  
PRELIMINARY  
NOT FOR  
CONSTRUCTION  
OR RECORDING

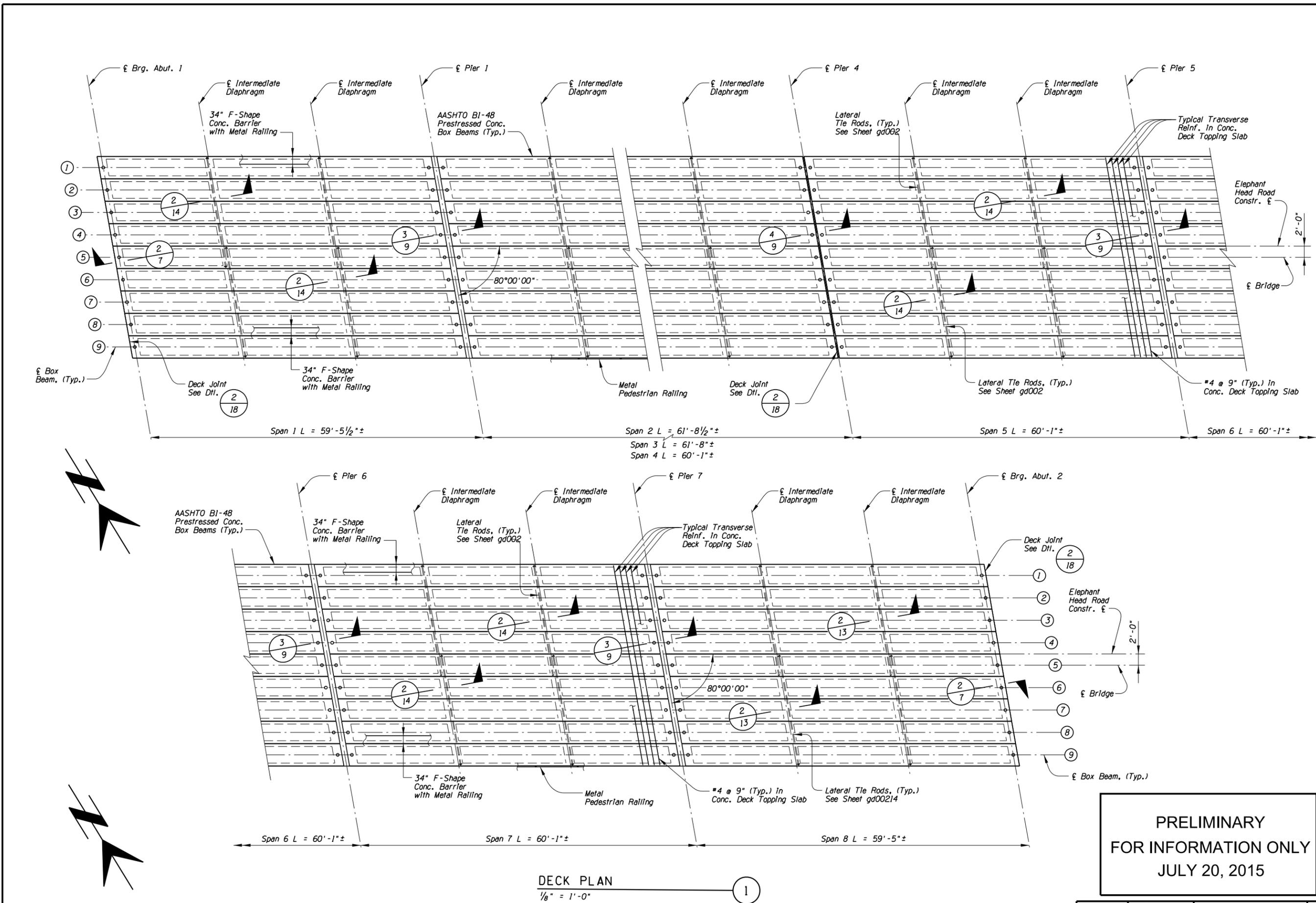


GENERAL NOTES AND QUANTITIES  
ELEPHANT HEAD ROAD BRIDGE  
OVER THE SANTA CRUZ RIVER  
PROJECT NO. 4RTEHB

Pima County Department of Transportation

Elephant Head Road Bridge - Over Santa Cruz River - Project No. 4RTEHB

Project ID: 00000000258562  
 Client Number: 02145  
 Pentable: plotofdr.tbl  
 Plotdriver: BS2226-VehInf-B&W\_PDF.plt



PRELIMINARY  
 FOR INFORMATION ONLY  
 JULY 20, 2015

Priscilla S. Cornelia, P.E., Director

| Date        | 7/20/15 |
|-------------|---------|
| Designed    | SST     |
| Drawn       | TRK     |
| Checked     | JAC     |
| Proj. Engr. | TWB     |

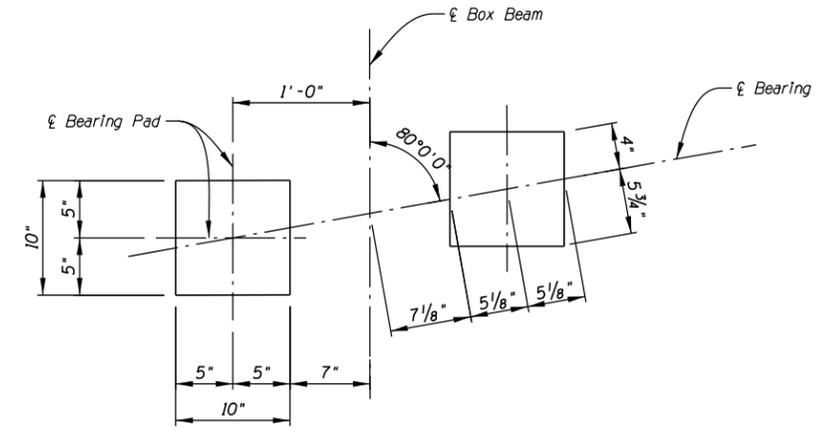
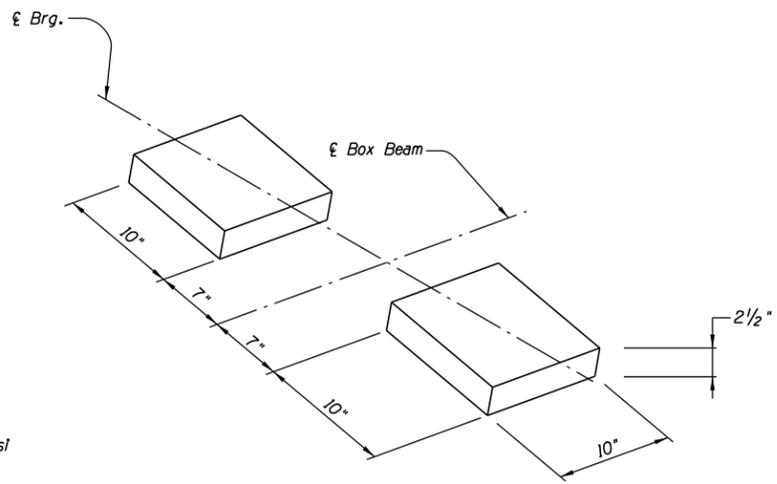
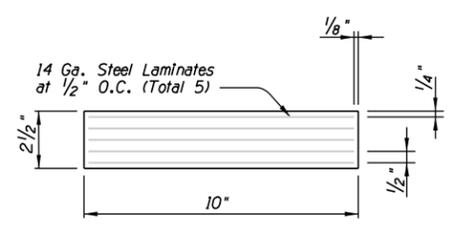
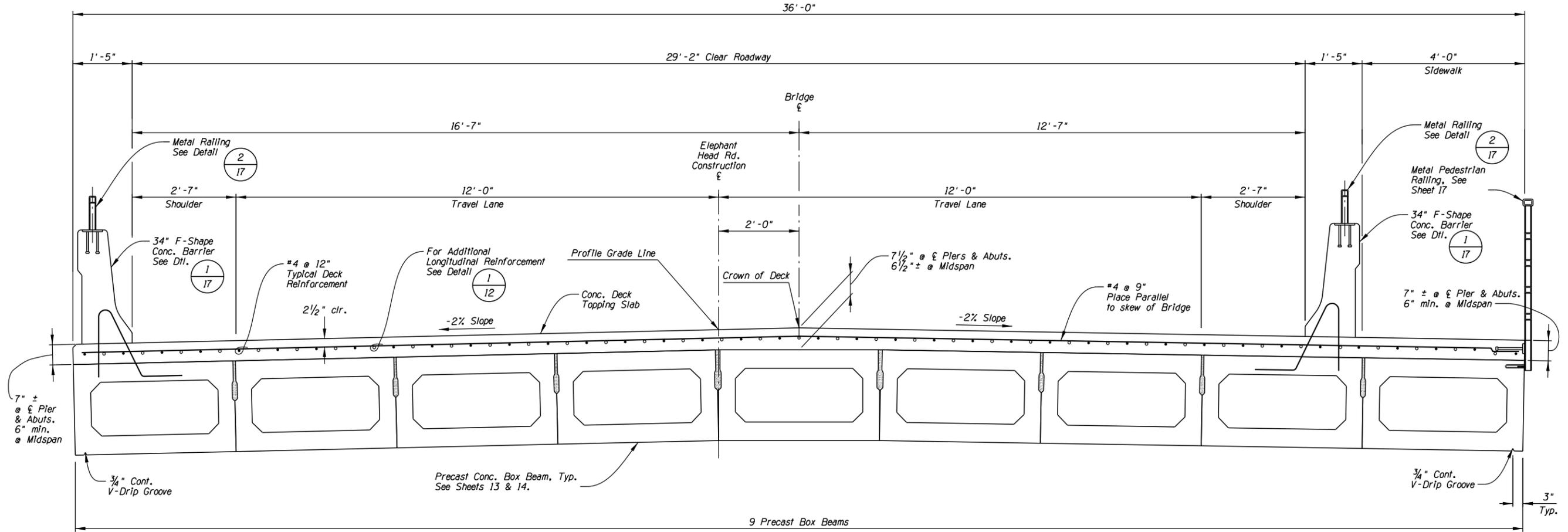
| No. | Revision Description | Engineer | Date |
|-----|----------------------|----------|------|
|     |                      |          |      |

JULY 2015  
 PRELIMINARY  
 NOT FOR  
 CONSTRUCTION  
 OR RECORDING



Pima County Department of Transportation  
 DECK PLAN  
 ELEPHANT HEAD ROAD BRIDGE  
 OVER THE SANTA CRUZ RIVER  
 PROJECT NO. 4RTEHB

Elephant Head Road Bridge - Over Santa Cruz River - Project No. 4RTEHB



- Notes:**
- Elastomer shall have a shear modulus of 130 psi at 73° F and a Durometer hardness of 55.
  - Elastomeric Bearing Pads shall be reinforced with steel.
  - Bearing Design Parameters:  
 Design Method A  
 Design Load: 49 Kips (Expansion, Service I)  
 71 Kips (Fixed, Service I)  
 Low Temperature Zone B  
 Elastomer Grade 2
  - For additional information, see Standard Specifications. Cost of bearing pads is considered incidental to the cost of the precast concrete box beams.

**DETAIL - ELASTOMERIC BEARING PADS**  
 No Scale

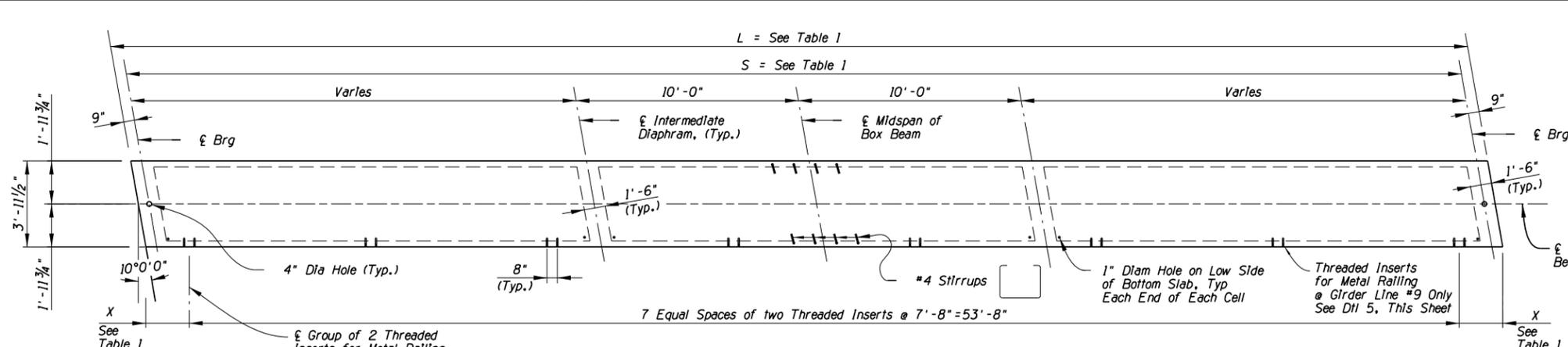
Priscilla S. Cornelio, P.E., Director  
 Pima County Department of Transportation  
 DECK SECTION AND DETAILS  
 ELEPHANT HEAD ROAD BRIDGE  
 OVER THE SANTA CRUZ RIVER  
 PROJECT NO. 4RTEHB

|             |          |
|-------------|----------|
| Date        | 7/24/15  |
| Designed    | SST      |
| Drawn       | JMF, TRK |
| Checked     | JAC      |
| Proj. Engr. | TMB      |

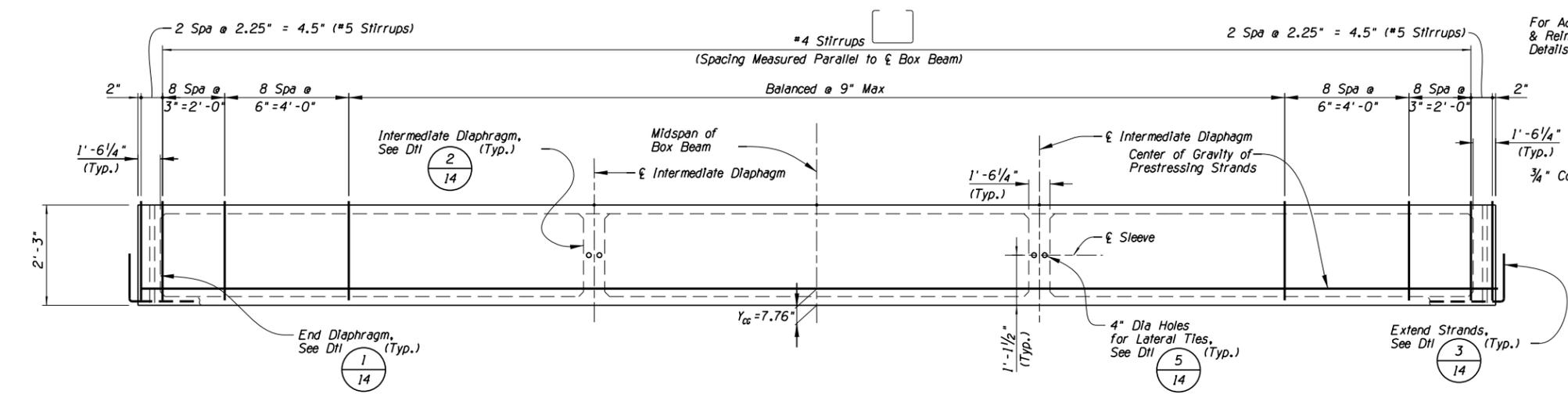
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|-----|----------|-------------|----------|------|
| No. | Revision | Description | Engineer | Date |
|     |          |             |          |      |

Scales: Horiz. \_\_\_\_\_, Vert. \_\_\_\_\_  
 Sheet 11 of 20 Page of

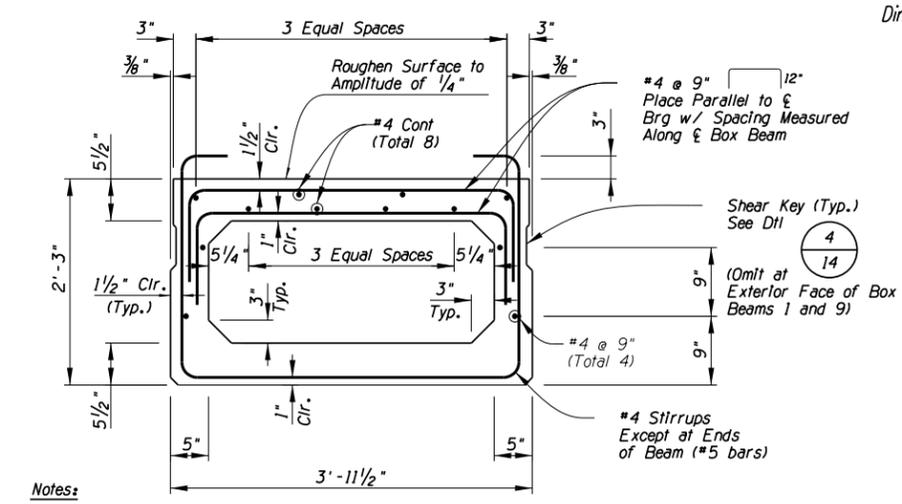
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 Client Number: 02145  
 Pentable: plotcard.tbl  
 Plotdriver: COTPMkplot\_V8hal\_B&W.plt



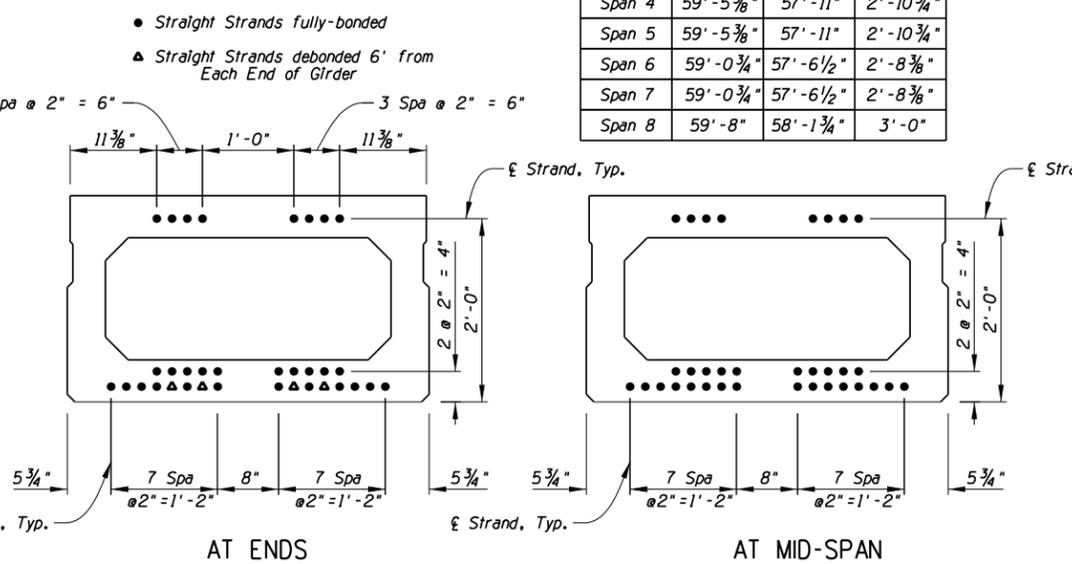
TYPICAL BOX BEAM PLAN  
No Scale



TYPICAL BOX BEAM ELEVATION  
Dimensions are along the  $\epsilon$  of Girder  
No Scale



TYPICAL BOX BEAM SECTION  
Type B1-48 (27" Deep) Box Beam  
Scale: 1" = 1'-0"



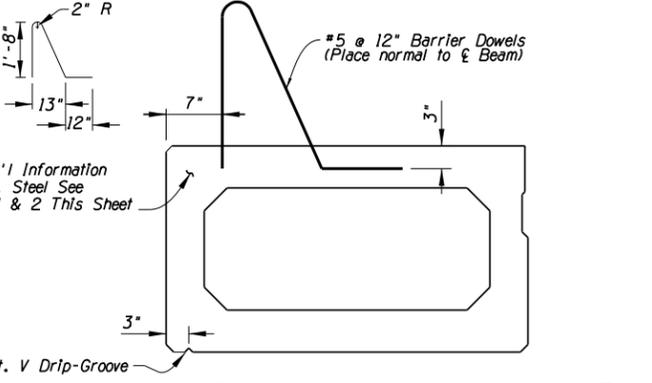
TYPICAL STRAND PATTERN  
3/4" Dia 7-Wire Low Relaxation Strands  
Scale: 1" = 1'-0"

Table 1 - Box Beam Dimensions

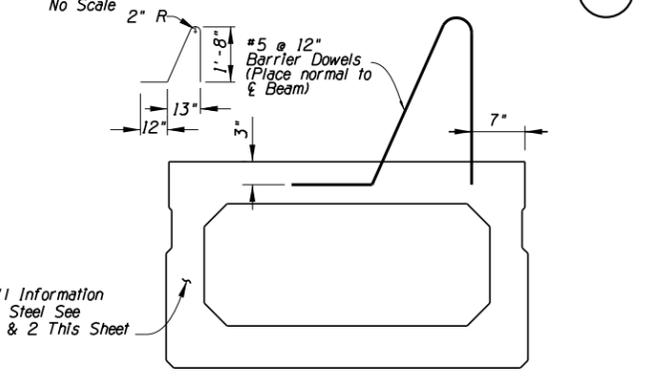
| Location | L          | S          | X          |
|----------|------------|------------|------------|
| Span 1   | 59'-8"     | 58'-1 3/4" | 3'-0"      |
| Span 2   | 60'-8"     | 59'-1 3/4" | 3'-6"      |
| Span 3   | 60'-8"     | 59'-1 3/4" | 3'-6"      |
| Span 4   | 59'-5 3/8" | 57'-11"    | 2'-10 3/4" |
| Span 5   | 59'-5 3/8" | 57'-11"    | 2'-10 3/4" |
| Span 6   | 59'-0 3/4" | 57'-6 1/2" | 2'-8 3/8"  |
| Span 7   | 59'-0 3/4" | 57'-6 1/2" | 2'-8 3/8"  |
| Span 8   | 59'-8"     | 58'-1 3/4" | 3'-0"      |

PRESTRESSED BOX BEAM NOTES:

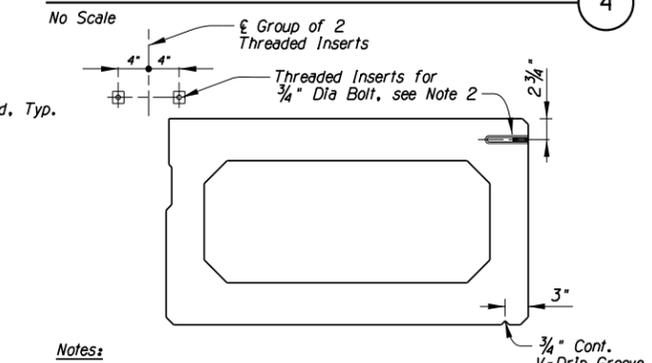
- $P_i = 1053$  kips Initial Tension before losses.  
 $P_w = 878$  kips Working Force remaining after all losses.  
 $f'_{ci} = 4500$  psi minimum concrete compressive strength at transfer.  
 $f'_{cs} = 6000$  psi minimum concrete compressive strength at 28 days.  
Prestressing Steel shall be 1/2" diameter, Grade 270, 7-wire low relaxation strand. (Strand area of 0.153 square inch per strand)
- All low relaxation strands shall be stressed to 0.75 f's.
- All box beams shall be prestressed by the pretensioning method only.
- $Y_{cg}$  = Distance to Center of Gravity of Prestressing Strands measured from bottom of box beams.
- Ends of box beams shall be constructed to be vertical when erected.
- See Special Provisions for other requirements for Box Beam delivery and erection.



BOX BEAM DETAIL - GIRDER LINE 1  
No Scale



BOX BEAM DETAIL - GIRDER LINE 8  
No Scale



BOX BEAM DETAIL - GIRDER LINE 9  
No Scale

- Notes:
- For information not shown or noted, see Detail 1, this sheet.
  - Threaded inserts shall be galvanized and shall accommodate a 3/4" diameter galvanized ASTM A307 bolt and shall have a minimum safe working load in tension of 5,000 pounds and a minimum safe working load in shear of 5,000 pounds. The safe working load shall provide a minimum factor of safety of 3 to 1. Contractor shall submit product data for the insert to the Engineer for review and approval prior to fabrication of the box beams.

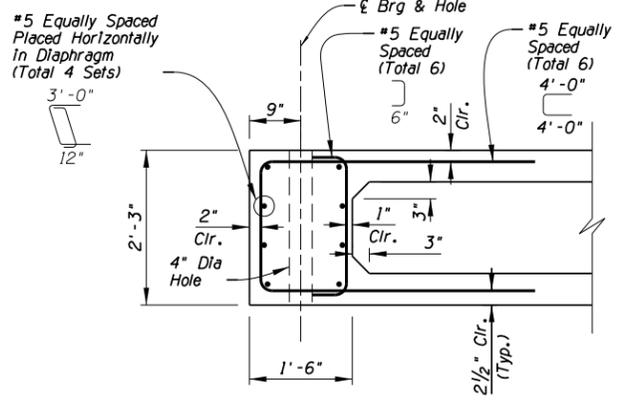
Priscilla S. Cornelia, P.E., Director

|             |          |
|-------------|----------|
| Date        | 7/20/15  |
| Designed    | SST      |
| Drawn       | ATK, TRK |
| Checked     | JAC      |
| Proj. Engr. | TMB      |
| Date        | 7/20/15  |
| Designed    |          |
| Drawn       |          |
| Checked     |          |
| Proj. Engr. |          |

Pima County Department of Transportation

PRECAST BOX BEAM DETAILS  
(1 OF 2)  
ELEPHANT HEAD ROAD BRIDGE  
OVER THE SANTA CRUZ RIVER  
PROJECT NO. 4RTEHB

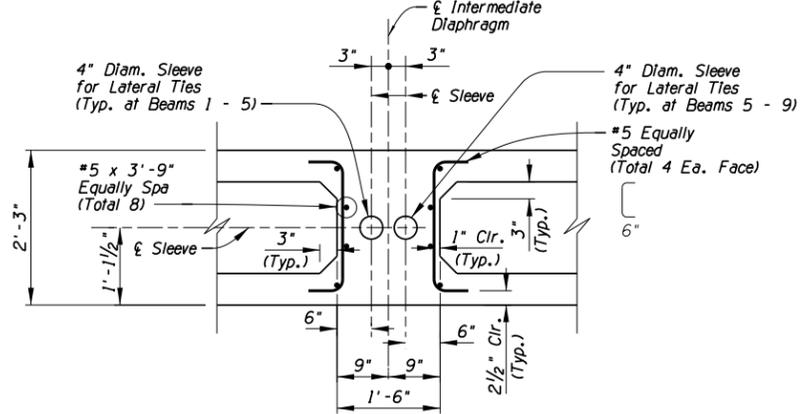
Elephant Head Road Bridge - Over Santa Cruz River - Project No. 4RTEHB



TYPICAL END DIAPHRAGM DETAIL

Scale 3/4" = 1'-0"

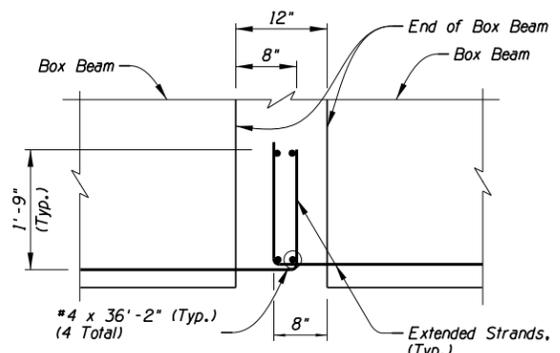
1



TYPICAL INTERMEDIATE DIAPHRAGM DETAIL

Scale 3/4" = 1'-0"

2



SECTION A

No Scale

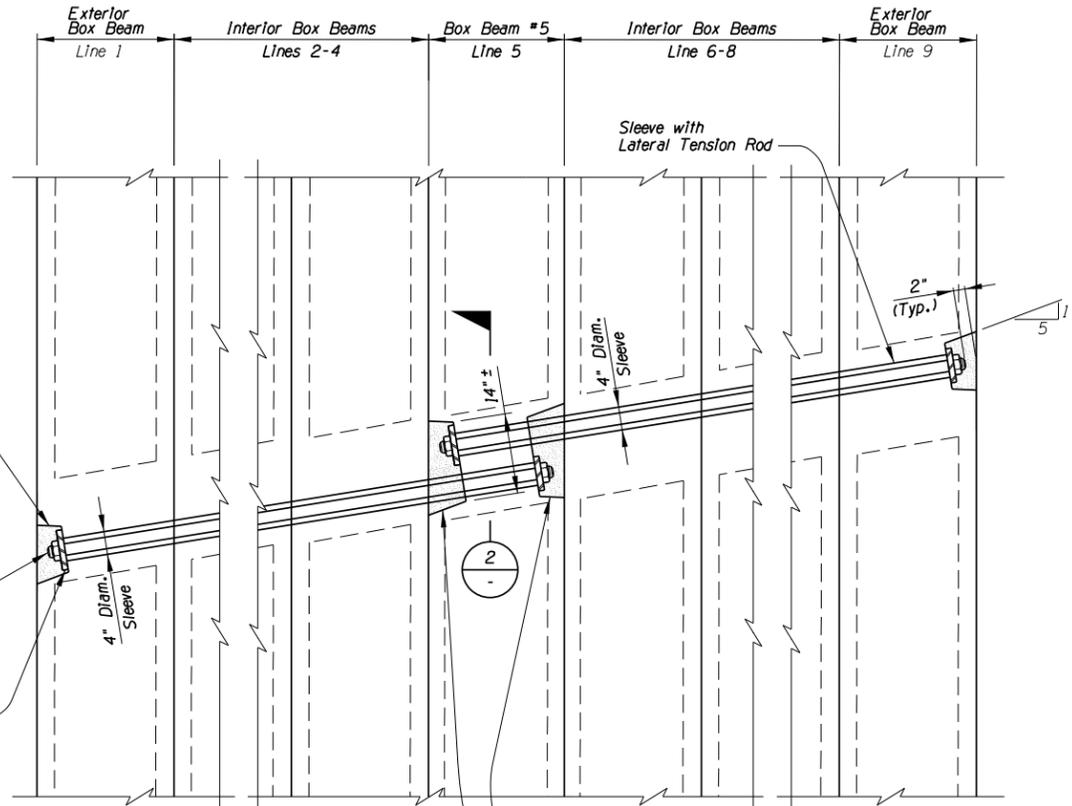
A

- Extend Strands from Box Beam End.
  - Cut Strands Flush with Box Beam End and Protect with Asphalt Coating.
- Notes: Alternate strands with opposite girder at piers. Extension of strands not required at Pier 4.

8" wide x 8" tall recess in Face of Box Beam at Anchorage. Epoxy Coat all Steel and Concrete Surfaces, and Patch With Non-Shrink Grout (f'c = 5,000 psi @ 24 hrs) to match Box Beam Finish

1 1/2" Diam. Rod (ASTM A36), with Heavy Hex Nut Each End. Tension Rod to 30,000 lbs. Tack Weld Nut to Plate after Tension is Applied

P 1"x 7"x 7" (ASTM A36) Each End with 1 7/8" Diam. Hole Centered



Provide Recess and Handholes as required for installation and tightening of Tension Rods. Fill with grout after tensioning.

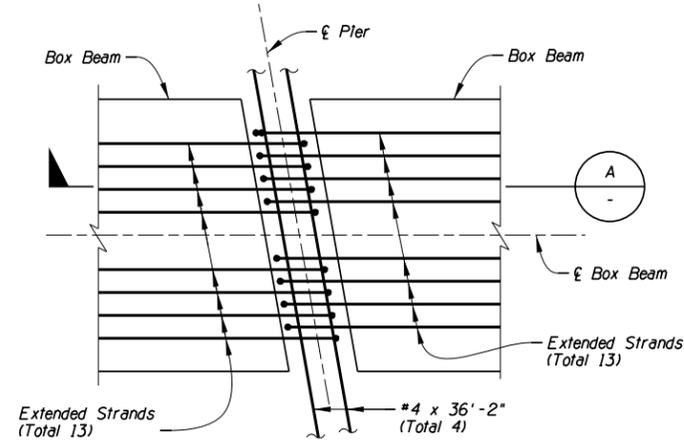
Notes:

- Tie rods shall be initially tensioned to position the box beams prior to grouting the shear keys. Final tensioning shall be accomplished by applying 1 1/4 turns of the nut from the hand tight position to achieve 30 kips of force in the rod.
- Tie rod sections shall be joined using threaded couplers. Threaded couplers shall develop 125% of the yield strength of the tie rod. Submit coupler for review and approval.
- Rod, nut and bearing plate shall be galvanized in accordance with ASTM A153.
- Contractor to submit specifications for Non-Shrink Grout to the Engineer for Review and Approval.

TYPICAL LATERAL TIE DETAIL

No Scale

5



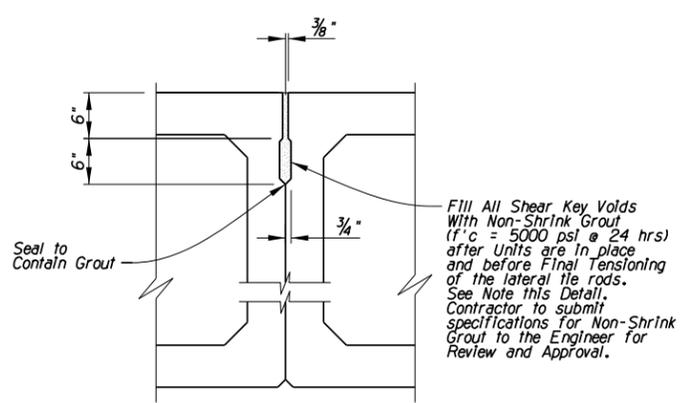
PLAN AT PIER 1, 2, 3, 5, 6, & 7

(Extension of Strands not required at Pier 4)

END OF BOX BEAM DETAIL AT PIERS

Scale 3/4" = 1'-0"

3



Notes:

Written approval is required from PCDOT, to change the sequence of tensioning the tie rods.

TYPICAL SHEAR KEY DETAIL

Scale 1" = 1'-0"

4

Priscilla S. Cornelia, P.E., Director

|             |         |
|-------------|---------|
| Date        | 7/20/15 |
| Designed    | SST     |
| Drawn       | TRK     |
| Checked     | JAC     |
| Proj. Engr. | TMB     |
| Date        | 7/20/15 |

|     |          |             |          |      |
|-----|----------|-------------|----------|------|
| No. | Revision | Description | Engineer | Date |
|     |          |             |          |      |



Pima County Department of Transportation  
 PRECAST BOX BEAM DETAILS  
 (2 of 2)  
 ELEPHANT HEAD ROAD BRIDGE  
 OVER THE SANTA CRUZ RIVER  
 PROJECT NO. 4RTEHB

Project ID: 00000000258562  
 Client Number: 02145  
 Pentable: plotofdr.tbl  
 Plotdriver: BS2226-Vbhalf\_B&W\_PDF.plt

Elephant Head Road Bridge - Over Santa Cruz River - Project No. 4RTEHB