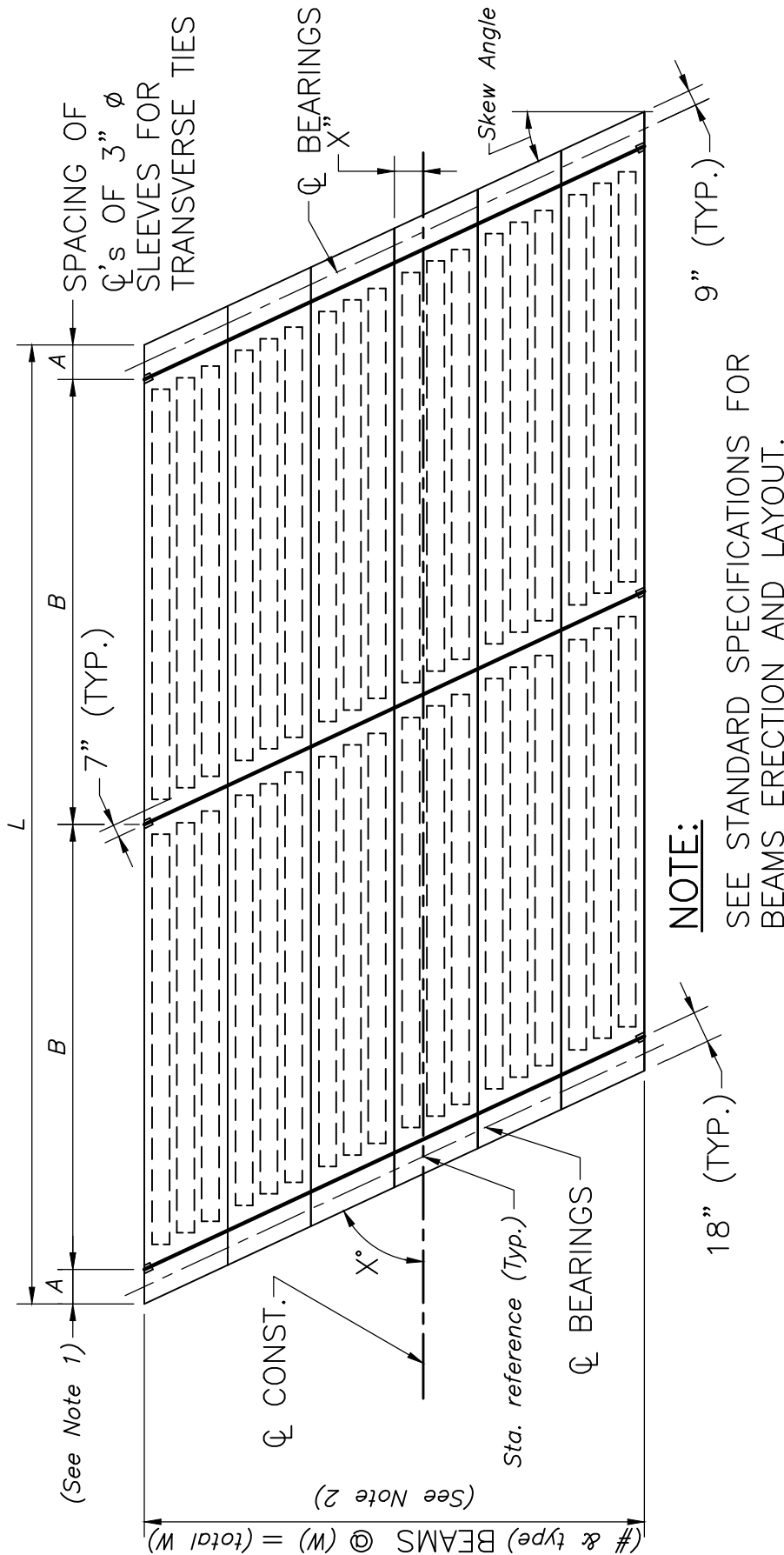


# FRAMING PLAN

## PRECAST CONCRETE DECK BEAMS

DATE OF ISSUE  
 JUNE 2013

DRAWING NUMBER  
**4.1.1**



### NOTES:

1.  $A = 18''/\cos(\text{Skew Angle})$   
 $L = \text{Span Length} + A$   
 $B = (L/2) - A$
2. Specify beam type (e.g. S48-21). Use only nominal beam widths when specifying beam width (W) and calculating total width (total W).
3. Framing plan shall be drawn full length without breaks and to scale on the Construction Drawings. Show all internal voids and transverse ties and include North Arrow.
4. If torsional load in the fascia beams (due to sidewalk overhang or utilities) is excessive, consideration shall be given to increasing the number of lateral strands and/or post-tensioning, and adjusting transverse tie locations as necessary.
5. For those bridges with East and West abutments, the beams shall be numbered consecutively starting from the Southern most beam to the Northern most and the spans shall be numbered consecutively from the West abutment to the East abutment. For those bridges with North and South abutments, the beams shall be numbered consecutively starting from the Western most beam to the Eastern most and the spans shall be numbered consecutively from the South abutment to the North abutment.

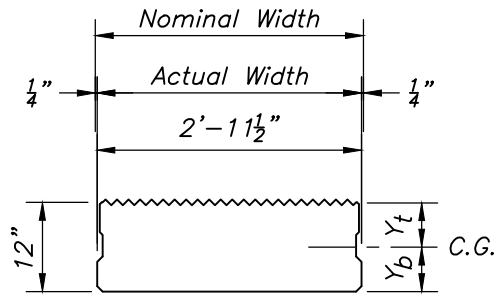
### FRAMING PLAN

SCALE:  $(\frac{1}{8}'' = 1'-0'' \text{ Min.})$

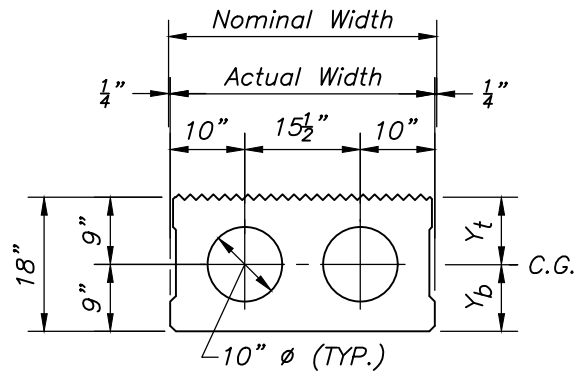
### NOTE:

SEE STANDARD SPECIFICATIONS FOR BEAMS ERECTION AND LAYOUT.

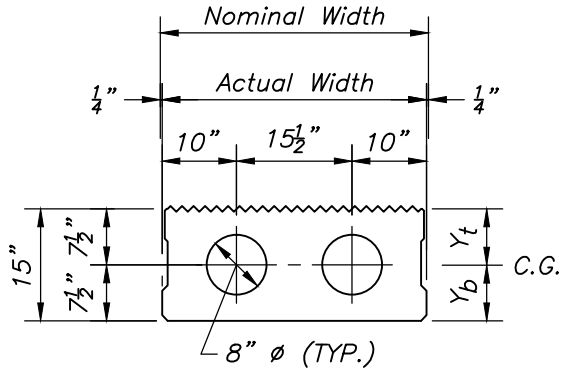




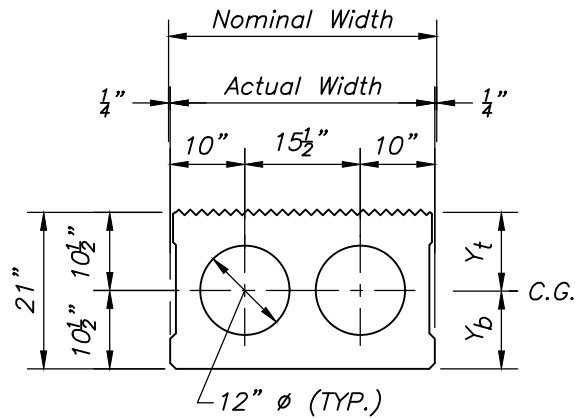
**S36-12**



**S36-18**



**S36-15**



**S36-21**

## BEAM PROPERTIES

| BEAM TYPE | WIDTH (in) |      | DEPTH (in) | AREA (in <sup>2</sup> ) | I (in <sup>4</sup> ) | Y <sub>b</sub> (in) | Y <sub>t</sub> (in) | S <sub>b</sub> (in <sup>3</sup> ) | S <sub>t</sub> (in <sup>3</sup> ) | WEIGHT (lbs/ft) | MAX. SPAN (ft) |
|-----------|------------|------|------------|-------------------------|----------------------|---------------------|---------------------|-----------------------------------|-----------------------------------|-----------------|----------------|
|           | Nom.       | Act. |            |                         |                      |                     |                     |                                   |                                   |                 |                |
| S36-12    | 36.0       | 35.5 | 12         | 417                     | 5033                 | 5.98                | 6.02                | 842                               | 836                               | 434             | 39             |
| S36-15    | 36.0       | 35.5 | 15         | 419                     | 9419                 | 7.47                | 7.53                | 1261                              | 1251                              | 436             | 47             |
| S36-18    | 36.0       | 35.5 | 18         | 464                     | 15963                | 8.96                | 9.04                | 1782                              | 1766                              | 483             | 54             |
| S36-21    | 36.0       | 35.5 | 21         | 497                     | 24827                | 10.45               | 10.55               | 2376                              | 2353                              | 518             | 61             |

### NOTES:

- Above drawing is not to scale.
- See Dwg. No. 4.1.8 for shear key details.
- Maximum Span lengths are approximate and are based on the following assumptions:
  - $f'_c = 6500$  psi (Precast)
  - $f'_{ci} = 4500$  psi (Precast)
  - $f'_c = 4000$  psi (5" thick Cast-in-Place Composite Deck)
  - Final Allowable Tension at bottom of beam is equal to  $0.0948\sqrt{f'_c}$  ksi.
  - HL-93 Live Load
  - Time-Dependent Losses of Article 5.9.5.3 of the AASHTO-LRFD were used.
  - The CP-PL2 Barrier was assumed on the bridge.
  - 3.5" thick HMA wearing surface.
  - 0.6" diameter low relaxation strands.
  - The factor "k" in the Live Load distribution factor equation was taken as 1.5
- Weight of beams does not include the weight of the solid sections located at the transverse ties. Include the weight of the solid sections for design.



LRFD BRIDGE  
MANUAL, PART II

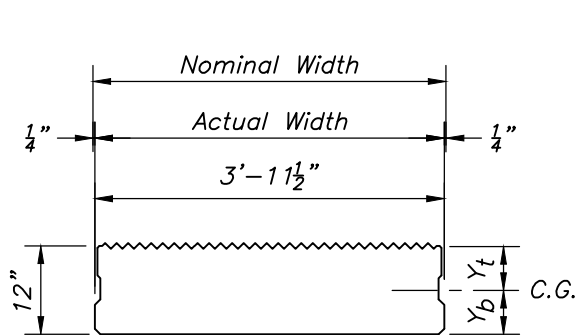
## STANDARD 36" WIDE BEAMS

PRECAST CONCRETE DECK BEAMS

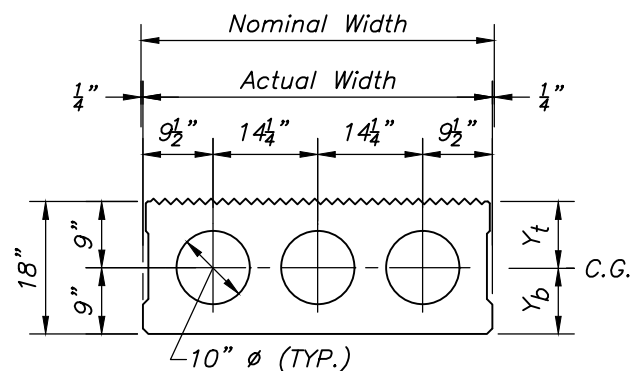
DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

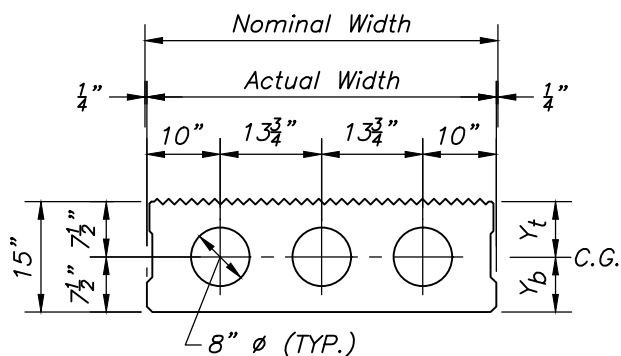
**4.1.3**



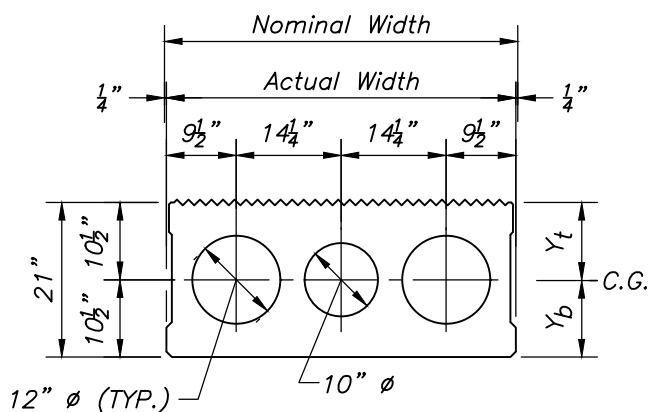
**S48-12**



**S48-18**



**S48-15**



**S48-21**

### BEAM PROPERTIES

| BEAM TYPE | WIDTH (in) |      | DEPTH (in) | AREA (in <sup>2</sup> ) | I (in <sup>4</sup> ) | Y <sub>b</sub> (in) | Y <sub>t</sub> (in) | S <sub>b</sub> (in <sup>3</sup> ) | S <sub>t</sub> (in <sup>3</sup> ) | WEIGHT (lbs/ft) | MAX. SPAN (ft) |
|-----------|------------|------|------------|-------------------------|----------------------|---------------------|---------------------|-----------------------------------|-----------------------------------|-----------------|----------------|
|           | Nom.       | Act. |            |                         |                      |                     |                     |                                   |                                   |                 |                |
| S48-12    | 48.0       | 47.5 | 12         | 561                     | 6761                 | 5.98                | 6.02                | 1131                              | 1123                              | 584             | 40             |
| S48-15    | 48.0       | 47.5 | 15         | 548                     | 12593                | 7.47                | 7.53                | 1686                              | 1672                              | 571             | 48             |
| S48-18    | 48.0       | 47.5 | 18         | 601                     | 21303                | 8.97                | 9.03                | 2375                              | 2359                              | 626             | 57             |
| S48-21    | 48.0       | 47.5 | 21         | 670                     | 33597                | 10.47               | 10.53               | 3209                              | 3191                              | 698             | 63             |

#### NOTES:

- Above drawing is not to scale.
- See Dwg. No. 4.1.8 for shear key details.
- Maximum Span lengths are approximate and are based on the following assumptions:
  - $f'_c = 6500$  psi (Precast)
  - $f'_{ci} = 4500$  psi (Precast)
  - $f'_c = 4000$  psi (5" thick Cast-in-Place Composite Deck)
  - Final Allowable Tension at bottom of beam is equal to  $0.0948\sqrt{f'_c}$  ksi.
  - HL-93 Live Load
  - Time-Dependent Losses of Article 5.9.5.3 of the AASHTO-LRFD were used.
  - The CP-PL2 Barrier was assumed on the bridge.
  - 3.5" thick HMA wearing surface.
  - 0.6" diameter low relaxation strands.
  - The factor "k" in the Live Load distribution factor equation was taken as 1.5
- Weight of beams does not include the weight of the solid sections located at the transverse ties. Include the weight of the solid sections for design.



LRFD BRIDGE  
MANUAL, PART II

## STANDARD 48" WIDE BEAMS

PRECAST CONCRETE DECK BEAMS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

**4.1.4**

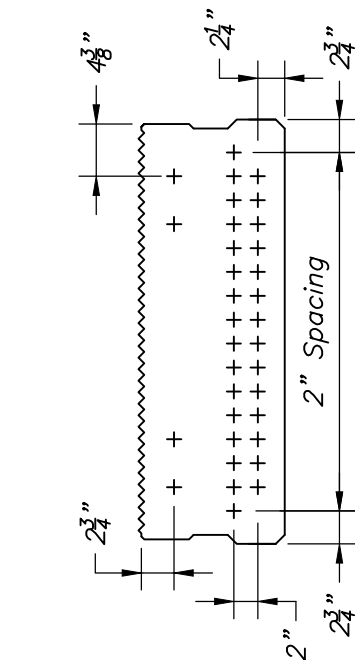
# STANDARD STRAND LOCATION

## 36" WIDE BEAMS

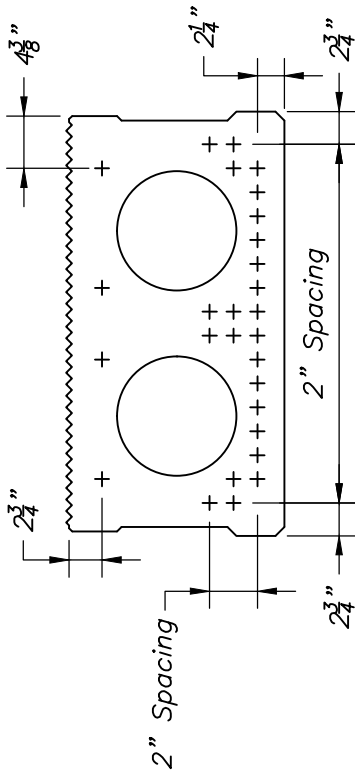
### PRECAST CONCRETE DECK BEAMS

DATE OF ISSUE  
 JUNE 2013

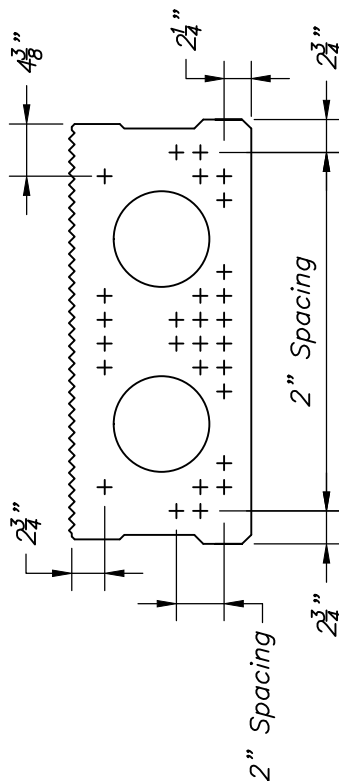
DRAWING NUMBER  
**4.1.5**



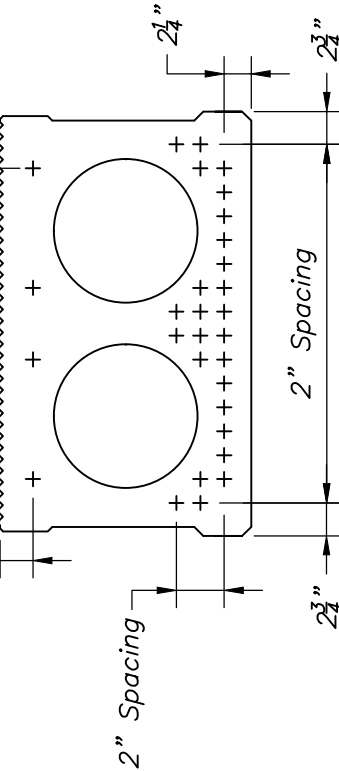
**S36-12**



**S36-18**



**S36-15**



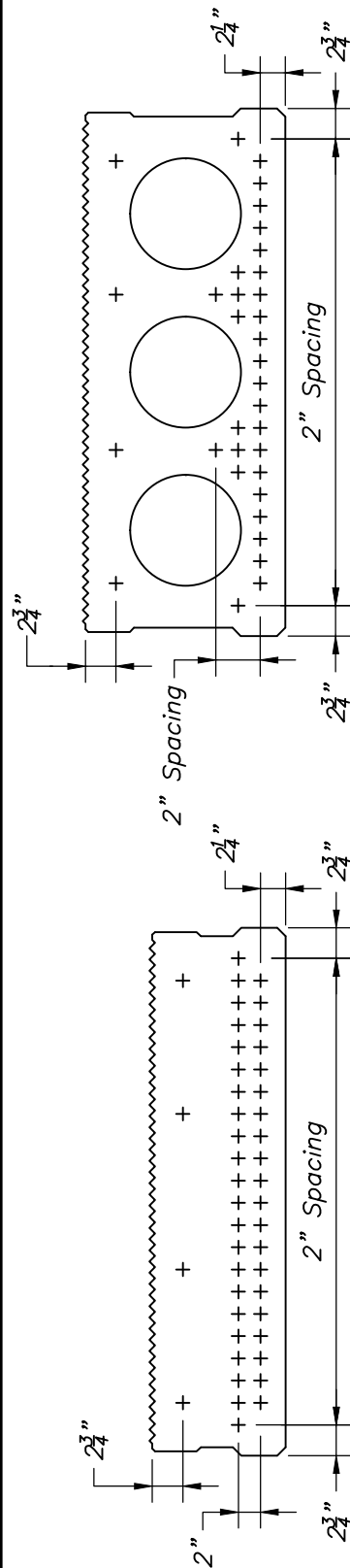
**S36-21**

## STRAND LOCATION

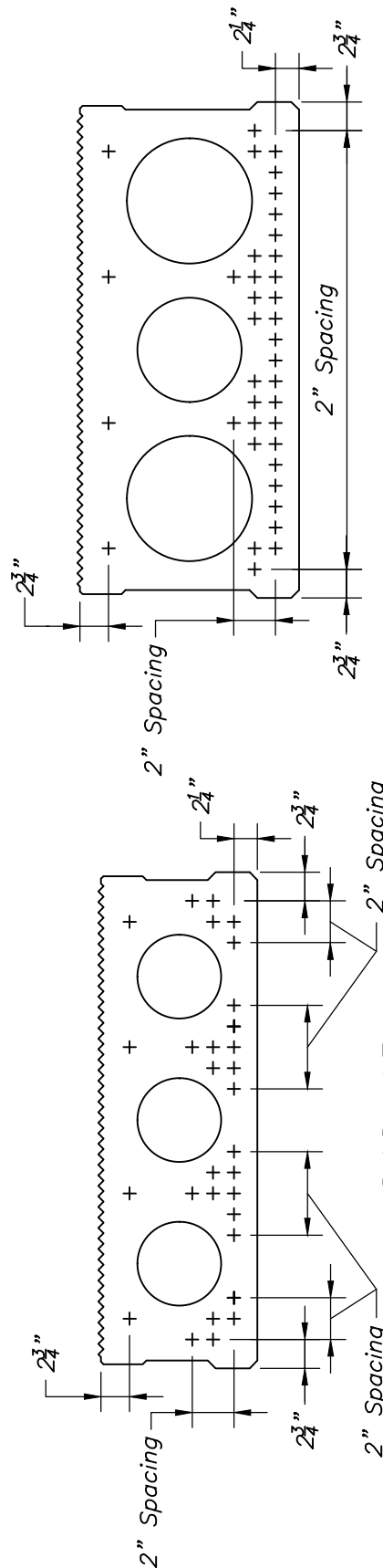
NOT TO SCALE

### NOTES:

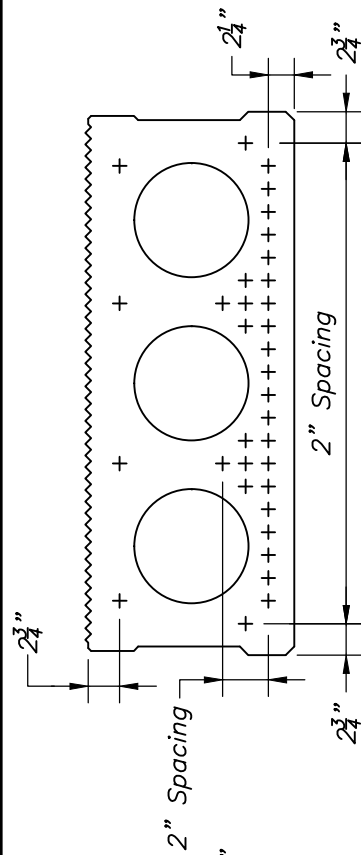
1. The standard strand pattern shown above depicts the maximum number of strands possible that can be located in a given beam while still meeting applicable fabrication clearances. For most beam designs, strands shall be placed in as many locations within the pattern as required. If a particular beam design requires the placement of strands outside this pattern, the Designer shall be responsible for verifying the beam's constructibility and its conformance to the AASHTO LRFD requirements.
2. + Denotes straight strands.
3. ⊕ Denotes debonded strands (none shown above). No more than 25% of the total number of strands and no more than 40% of the strands in each row shall be debonded. In addition, no more than 40% of the debonded strands, or four (4) strands, whichever is greater, shall have the debonding terminated at any one section. The spacing between debonded strands in a layer shall be 4" minimum. Exterior strands in each layer shall be fully bonded. In general, the length of debonded strand from each end of the beam should be limited to approximately 15% of the span length.
4. The Designer shall verify that the strands will not interfere with the transverse tie and the chuck hardware.
5. If required by design, the top row of strands may consist of a maximum of 4 fully stressed strands. Otherwise, use a minimum of 2 strands pretensioned to 2 Kips each.



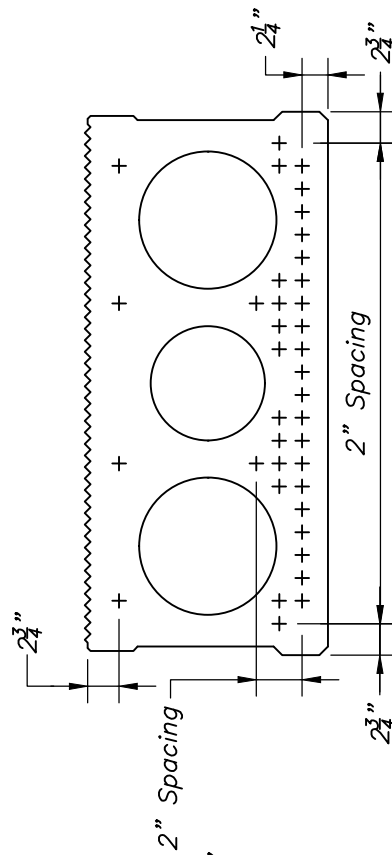
S48-12



S48-15



S48-18



S48-21

## STRAND LOCATION

NOT TO SCALE

### NOTES:

1. The standard strand pattern shown above depicts the maximum number of strands possible that can be located in a given beam while still meeting applicable fabrication clearances. For most beam designs, strands shall be placed in as many locations within the pattern as required. If a particular beam design requires the placement of strands outside this pattern, the Designer shall be responsible for verifying the beam's constructibility and its conformance to the AASHTO LRFD requirements.
2. + Denotes straight strands.
3. ⊕ Denotes debonded strands (none shown above). No more than 25% of the total number of strands and no more than 40% of the strands in each row shall be debonded. In addition, no more than 40% of the debonded strands, or four (4) strands, whichever is greater, shall have the debonding terminated at any one section. The spacing between debonded strands in a layer shall be 4" minimum. Exterior strands in each layer shall be fully bonded. In general, the length of debonded strand from each end of the beam should be limited to approximately 15% of the span length.
4. The Designer shall verify that the strands will not interfere with the transverse tie and the chuck hardware.
5. If required by design, the top row of strands may consist of a maximum of 4 fully stressed strands. Otherwise, use a minimum of 2 strands pretensioned to 2 Kips each.



LRFD BRIDGE  
MANUAL, PART II

# STANDARD STRAND LOCATION 48" WIDE BEAMS PRECAST CONCRETE DECK BEAMS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

**4.1.6**

## PRESTRESS NOTES:

1. ALL PRETENSIONING ELEMENTS SHALL BE 0.6"  $\phi$ , UNCOATED, SEVEN-WIRE, LOW RELAXATION STEEL STRANDS AND SHALL CONFORM TO AASHTO M 203.
2. THE TENSILE STRENGTH OF THE PRETENSIONING STRANDS SHALL BE 270 KSI.
3. THE INITIAL TENSION PER 0.6"  $\phi$  STRAND SHALL BE 44 KIPS.
4. THE MINIMUM 28 DAY COMPRESSIVE STRENGTH SHALL BE 6500 PSI. (*See Note*)
5. NO PRESTRESS SHALL BE TRANSFERRED TO THE CONCRETE UNTIL IT HAS ATTAINED A COMPRESSIVE STRENGTH, AS SHOWN BY CYLINDER TEST, OF AT LEAST 4500 PSI. (*See Note*)
6. THE TOP OF ALL BEAMS SHALL BE GIVEN A RAKE FINISH ( $\frac{1}{4}$ " AMPLITUDE) ACROSS THE WIDTH (PERPENDICULAR TO THE BEAM'S AXIS).
7. THE FABRICATOR IS FULLY RESPONSIBLE FOR THE DESIGN OF THE LIFTING DEVICES WHICH SHALL BE ADEQUATE FOR THE SAFETY FACTORS REQUIRED BY THE ERECTION PROCEDURE.

### NOTE:

*The Designer may increase the 28 day compressive strength of the concrete and/or the compressive strength at transfer if justified and feasible. See the prestressed concrete section of Part I of the Bridge Manual.*



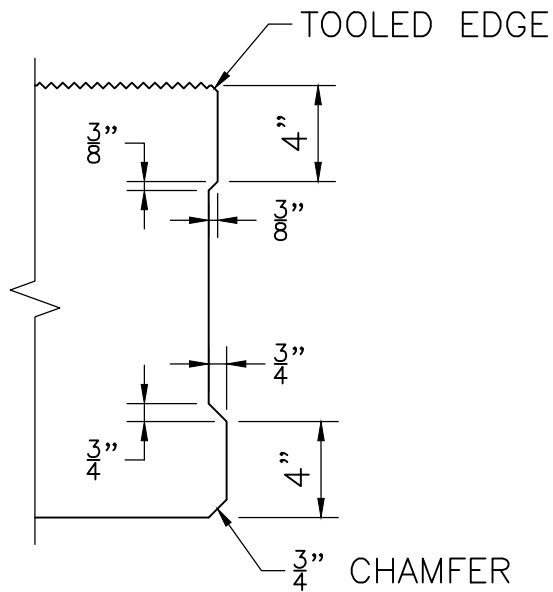
LRFD BRIDGE  
MANUAL, PART II

## PRESTRESS NOTES

PRECAST CONCRETE DECK BEAMS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER  
**4.1.7**



## SHEAR KEY DETAIL

SCALE:  $1\frac{1}{2}'' = 1'-0''$



LRFD BRIDGE  
MANUAL, PART II

## SHEAR KEY DETAILS

PRECAST CONCRETE DECK BEAMS

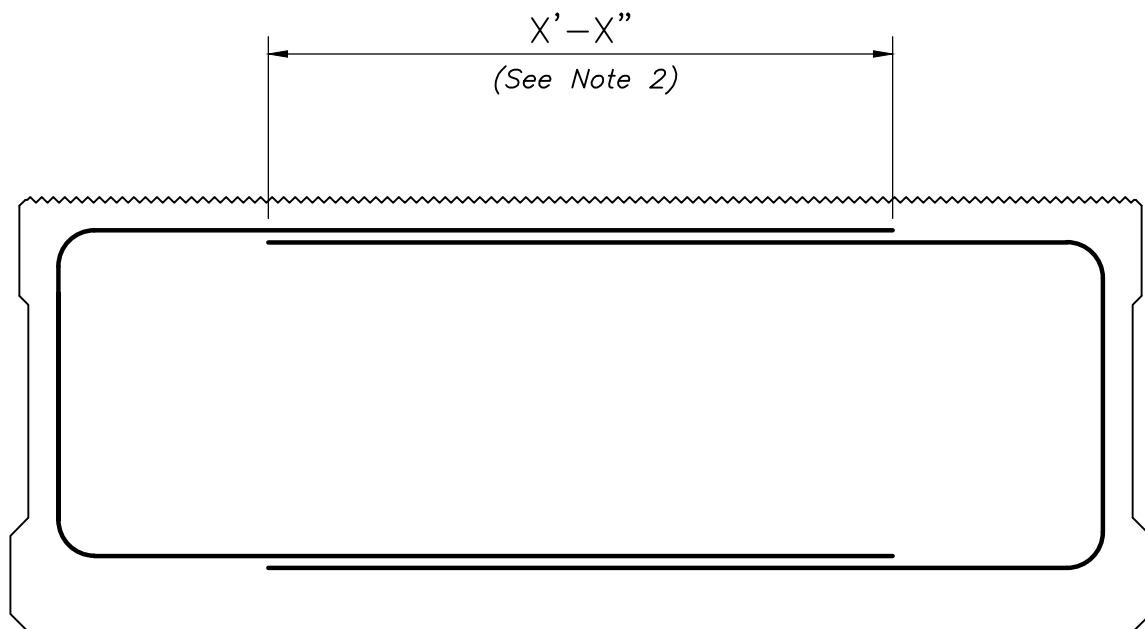
DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

**4.1.8**







### NOTES:

1. CONTRACTOR MAY SUBMIT ABOVE STIRRUP PATTERN TO THE ENGINEER FOR APPROVAL PROVIDED THAT THE ABOVE CRITERIA IS MET.
2. MAINTAIN ALL CLEARANCES AS SHOWN ON THE PLANS.

## ALTERNATE STIRRUP PATTERN

SCALE:  $1\frac{1}{2}'' = 1'-0''$

### NOTES:

1. For S36-12 and S48-12 (12" deep) beams use this alternate stirrup pattern exclusively.
2. Provide Class C Splice as per AASHTO-LRFD Article 5.11.5.3.1.



LRFD BRIDGE  
MANUAL, PART II

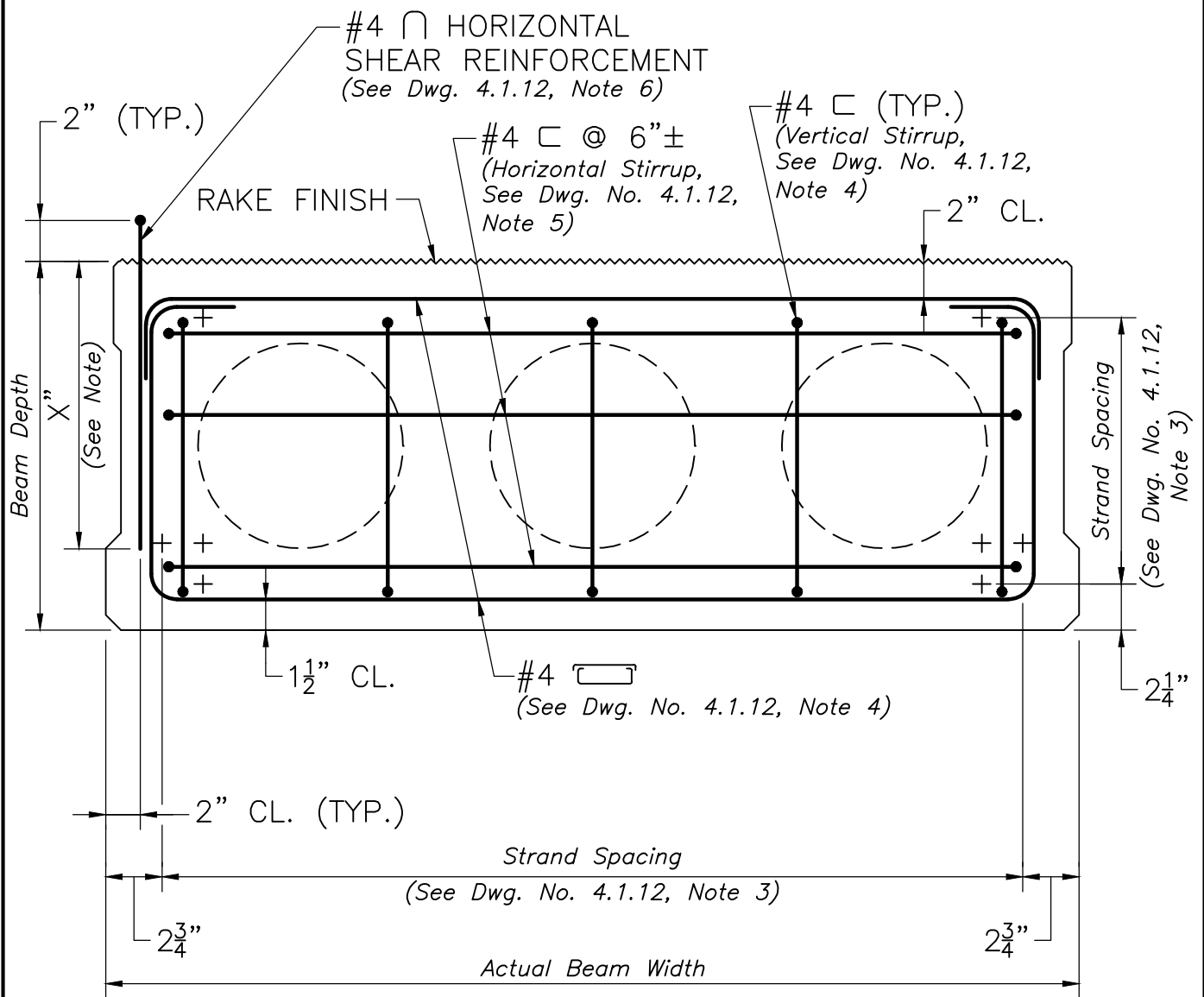
## ALTERNATE STIRRUP PATTERN

PRECAST CONCRETE DECK BEAMS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

**4.1.10**



### NOTES:

1. + DENOTES STRAIGHT STRANDS.
2.  $\oplus$  DENOTES DEBONDED STRANDS. (None Shown Above)
3. SEE SHEAR KEY DETAIL ON SHEET (Provide Reference).
4. SEE END OF BEAM PLAN FOR STIRRUP SPACING.

## END OF BEAM SECTION

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

### NOTE:

Specify 10" for 12" deep beams, 12" for 15" deep beams, and 14" for 18" and 21" deep beams.



LRFD BRIDGE

MANUAL, PART II

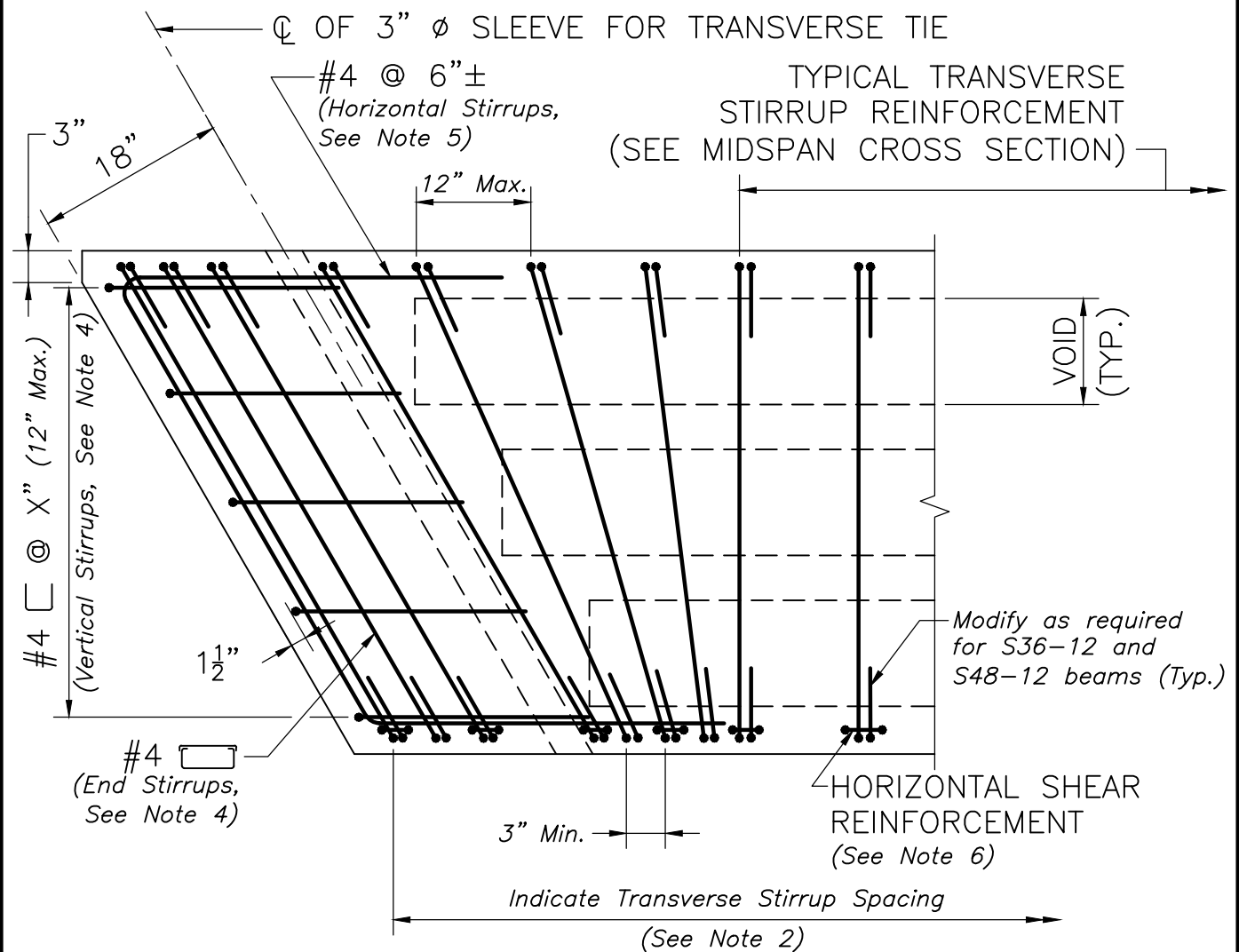
## TYPICAL END OF BEAM SECTION

PRECAST CONCRETE DECK BEAMS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

**4.1.11**



## END OF BEAM PLAN

SCALE:  $\frac{3}{4}$ " = 1'-0"

### NOTES:

1. See the prestressed section of Part I of the Bridge Manual for the design of the transverse stirrups. Spacing shall not exceed 12".
2. The extent of the beam shown in the Plan of Beam should be long enough to indicate typical transverse stirrup spacing throughout the beam.
3. The actual number and location of the prestressing strands shall be designed and shall conform to the spacings shown in Dwg. No.'s 4.1.6 and 4.1.7.
4. See the prestressed section of Part I of the Bridge Manual for the design of the end transverse stirrups and vertical stirrups. The horizontal leg lengths of the vertical stirrups are equal to the depth of the beam and shall be dimensioned on the plan view.
5. Horizontal stirrups shall be embedded a minimum distance equal to the depth of the beam or 12" into the web of the voided section, whichever is longer. Length of embedment shall be noted on the plan view.
6. Horizontal shear reinforcement shall be designed in accordance with Article 5.8.4 of the AASHTO LRFD and shall be spaced at a multiple of the transverse stirrups.
7. Properly note and show the location and spacing of any dowels which extend into slabs, sidewalks, curb, or barriers on the cross section and plan views of the beams.



LRFD BRIDGE  
MANUAL, PART II

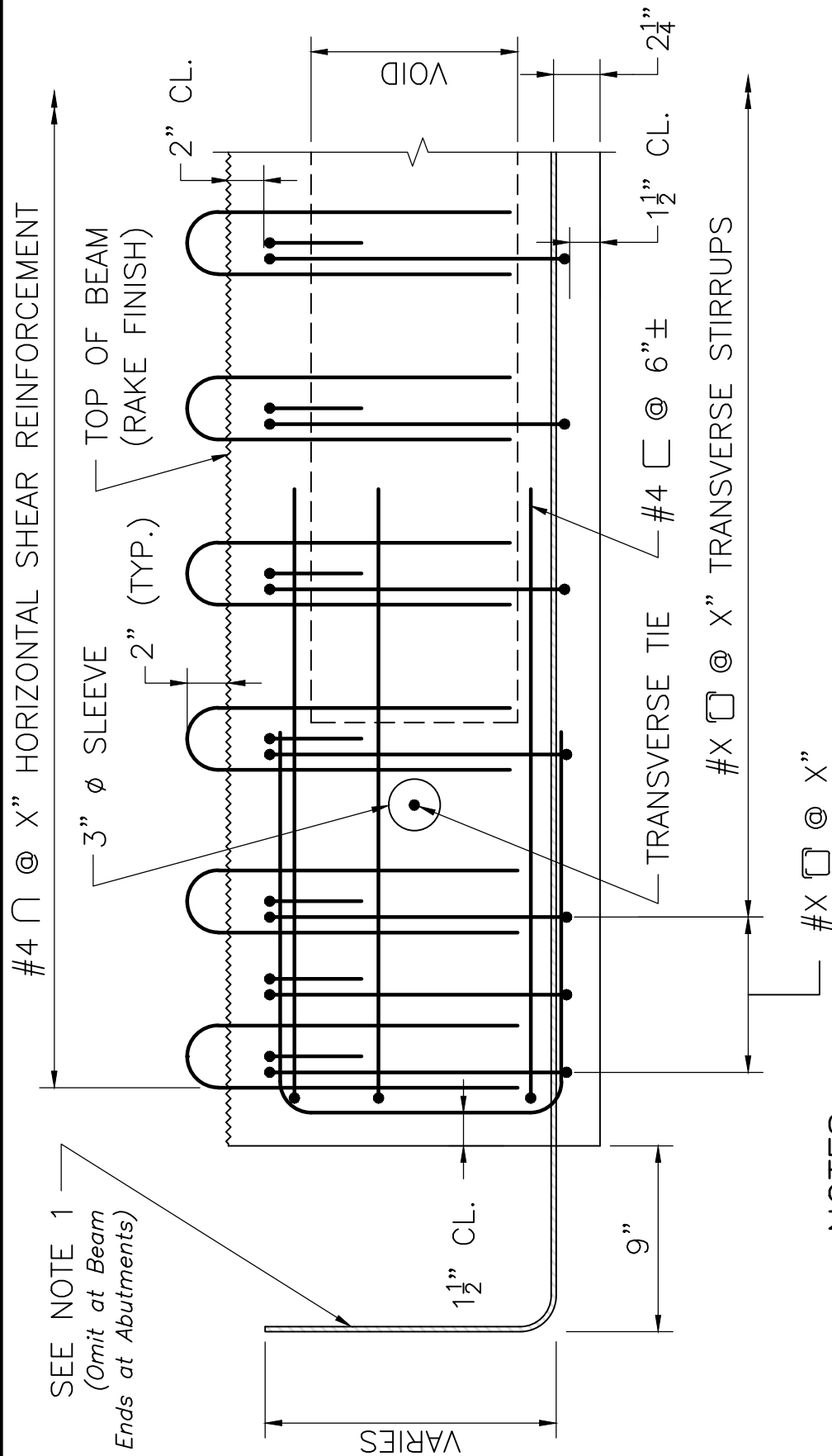
## TYPICAL END OF BEAM PLAN

PRECAST CONCRETE DECK BEAMS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

**4.1.12**



### NOTES:

1. ONLY FULLY BONDED STRANDS IN THE BOTTOM ROW SHALL BE EXTENDED INTO THE CONTINUITY DIAPHRAGM.
2. THE REMAINDER OF THE STRANDS IS NOT SHOWN FOR CLARITY.

## LONGITUDINAL SECTION

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



LRFD BRIDGE

MANUAL, PART II

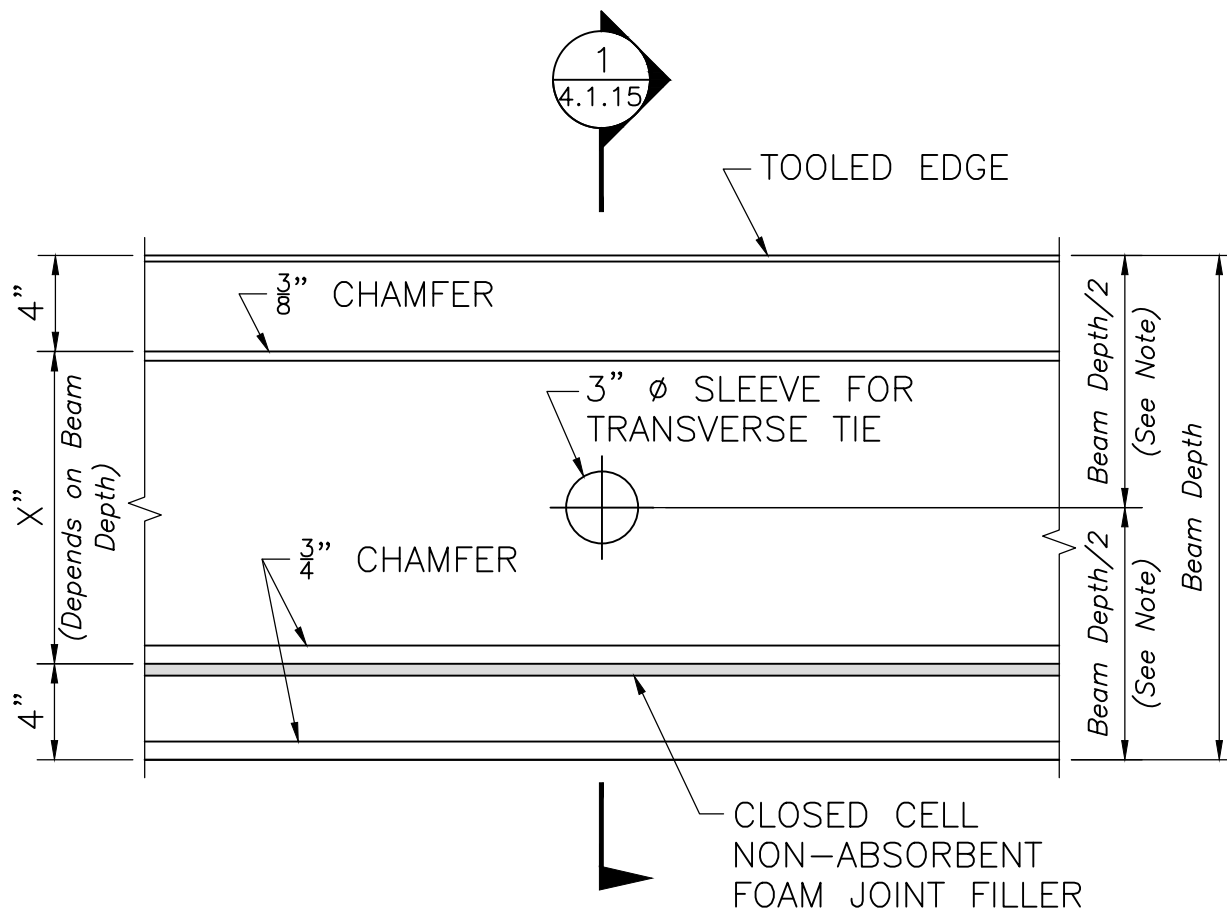
## LONGITUDINAL SECTION

PRECAST CONCRETE DECK BEAM

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

**4.1.13**



## TYPICAL BEAM ELEVATION AT TRANSVERSE TIE LOCATIONS

SCALE:  $1\frac{1}{2}'' = 1'-0''$

**NOTE:**

*Transverse ties are located at the midspan and at both ends of the deck beams.*



LRFD BRIDGE  
MANUAL, PART II

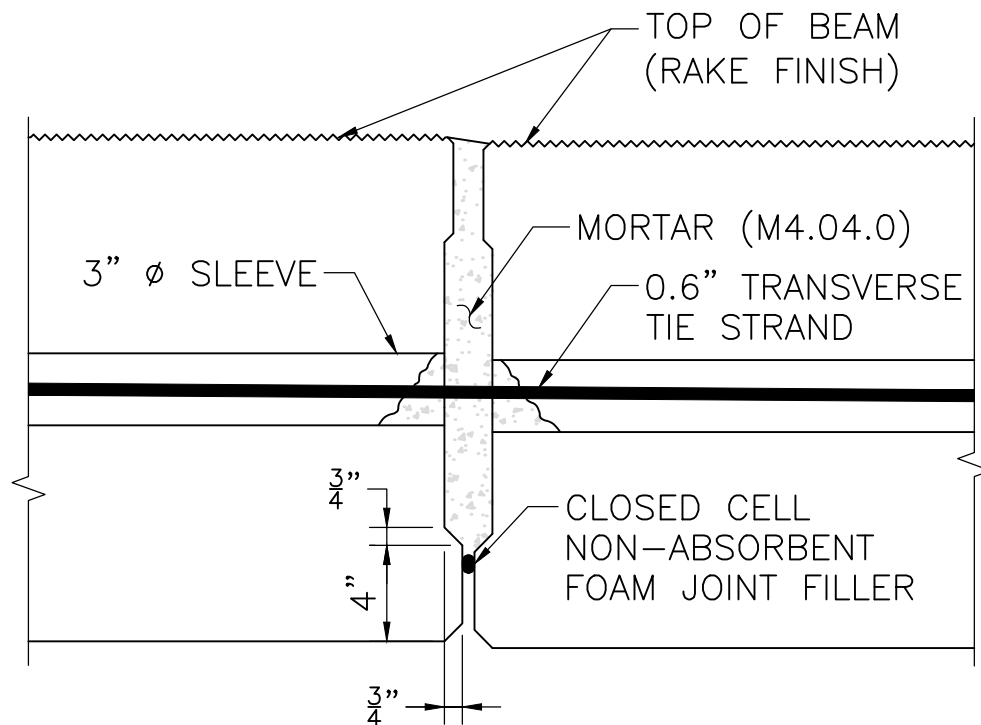
## TYPICAL LONGITUDINAL JOINT ELEVATION

PRECAST CONCRETE DECK BEAMS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

**4.1.14**



## SECTION 1

SCALE:  $1\frac{1}{2}" = 1'-0"$



LRFD BRIDGE  
MANUAL, PART II

## TYPICAL LONGITUDINAL JOINT SECTION

PRECAST CONCRETE DECK BEAMS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

**4.1.15**

## CONSTRUCTION SEQUENCE NOTES:

1. AFTER ALL BEAMS HAVE BEEN ERECTED, TENSION EACH TRANSVERSE TIE TO 5 KIPS.
2. FILL ALL KEYWAYS WITH MORTAR (M4.04.0). IF THE KEYWAYS ARE NOT FILLED WITHIN FIVE (5) DAYS AFTER THE BEAMS ARE ERECTED, THE CONTRACTOR SHALL COVER AND PROTECT THE KEYWAYS FROM WEATHER AND DEBRIS UNTIL THEY ARE FILLED.
3. AFTER THE MORTAR HAS CURED (24 HOURS MINIMUM), TENSION EACH TRANSVERSE TIE TO 44 KIPS.
4. CONCRETE FOR DECK SLAB SHALL BE 4000 PSI,  $\frac{3}{4}$  IN, 585 HP CEMENT CONCRETE AND SHALL BE PLACED AFTER THE TRANSVERSE TIES HAVE BEEN FULLY TENSIONED.
5. NO TRAFFIC OR HEAVY EQUIPMENT WILL BE PERMITTED ON THE BRIDGE UNTIL ALL TRANSVERSE TIES HAVE BEEN PROPERLY TENSIONED AND THE DECK HAS BEEN CAST AND CURED PER THE STANDARD SPECIFICATIONS.

NOTE:

*Include the Notes from Dwg. No. 4.1.21 on projects with Stage Construction.*



LRFD BRIDGE  
MANUAL, PART II

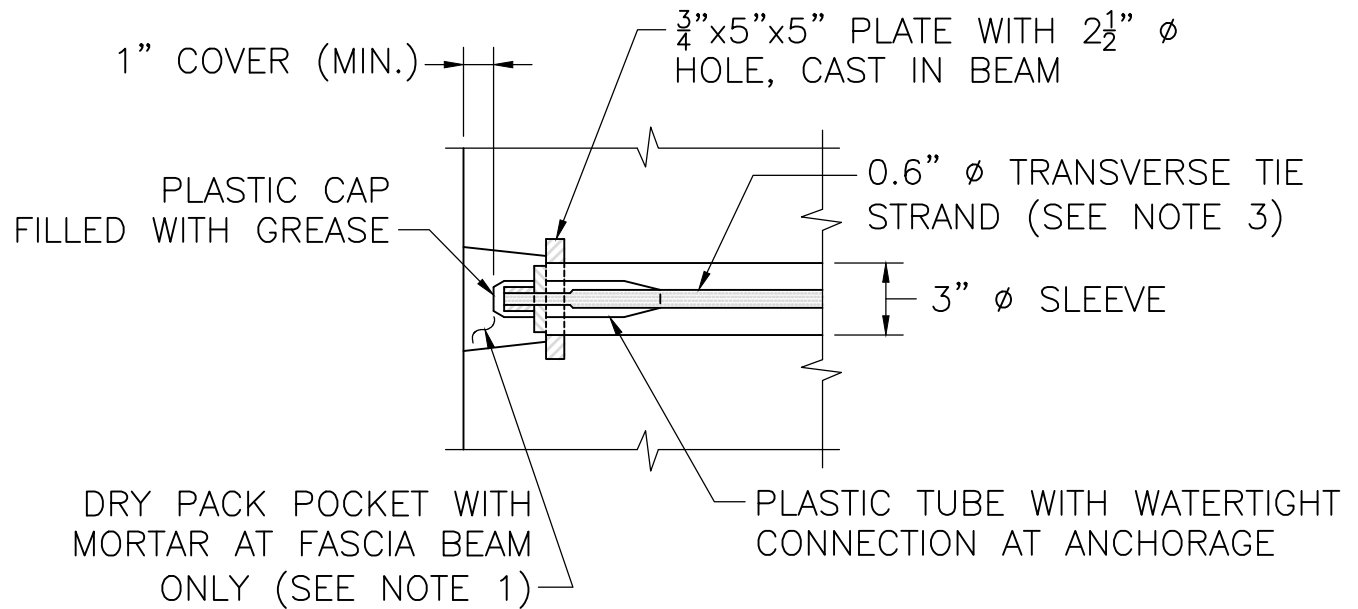
## CONSTRUCTION SEQUENCE NOTES

PRECAST CONCRETE DECK BEAMS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER  
**4.1.16**





### NOTES:

1. MORTAR FOR EXTERIOR POCKETS SHALL CONFORM TO M4.02.15 AND SHALL BE THE SAME COLOR AND TEXTURE AS THE BEAM CONCRETE.
2. OTHER ANCHORAGE SYSTEMS MAY BE SUBSTITUTED WITH THE APPROVAL OF THE ENGINEER. ALTERNATE ANCHORAGE SYSTEMS SHALL BE WATERTIGHT AND CORROSION PROOF.
3. TRANSVERSE TIES SHALL BE COVERED BY A SEAMLESS POLYPROPYLENE SHEATH (WITH CORROSION INHIBITING GREASE BETWEEN THE STRAND AND SHEATH) FOR THE FULL LENGTH OF THE STRAND, EXCEPT AT THE ANCHORAGE LOCATION.

## TRANSVERSE TIE ANCHORAGE

SCALE:  $1\frac{1}{2}" = 1'-0"$



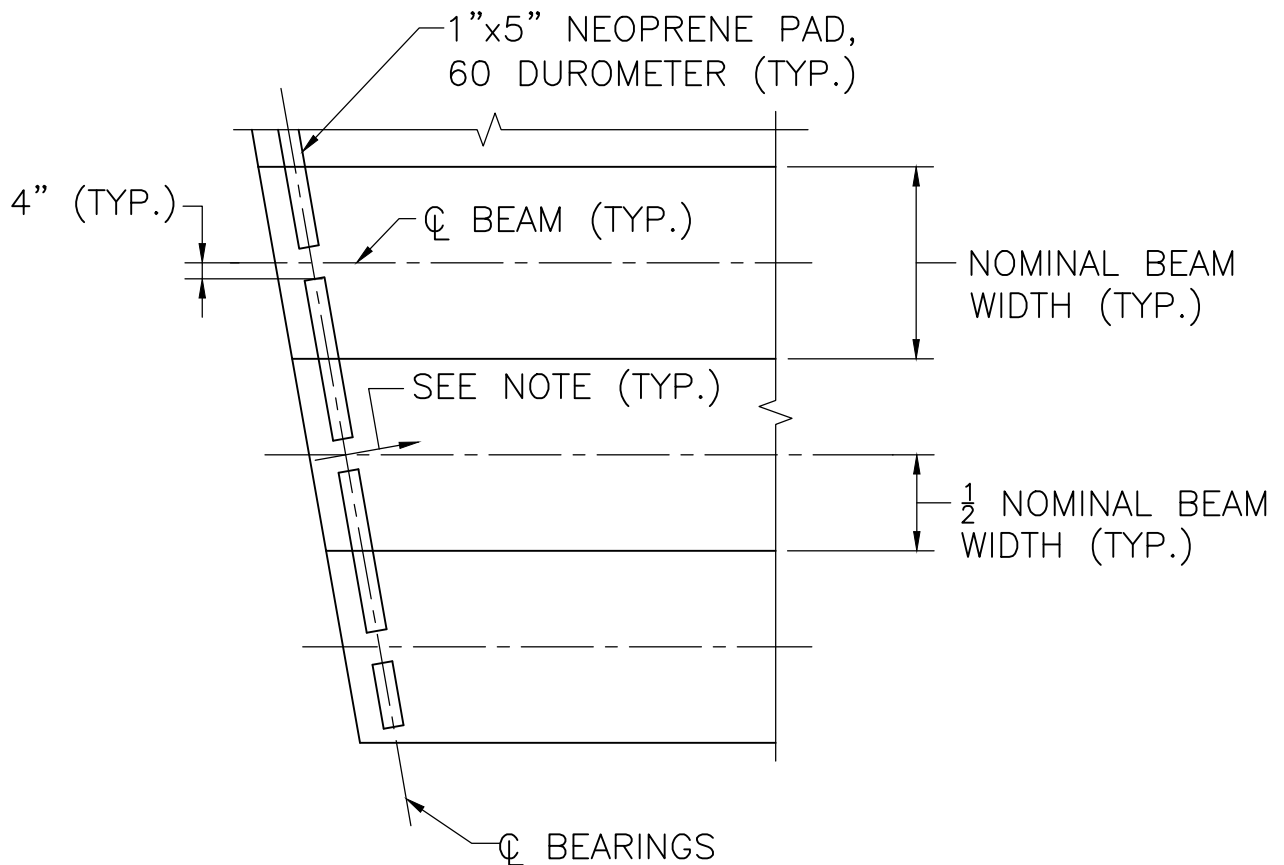
LRFD BRIDGE  
MANUAL, PART II

## TRANSVERSE TIE ANCHORAGE

PRECAST CONCRETE DECK BEAMS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER  
**4.1.17**



**NOTE:**

PROVIDE  $\frac{1}{8}$ "/FT. SLOPE BETWEEN BEARINGS.

**LAYOUT OF BEARINGS**

SCALE:  $\frac{1}{4}$ " = 1'-0"

**NOTE:**

See Dwg. No. 4.1.19 for spans greater than 50'.



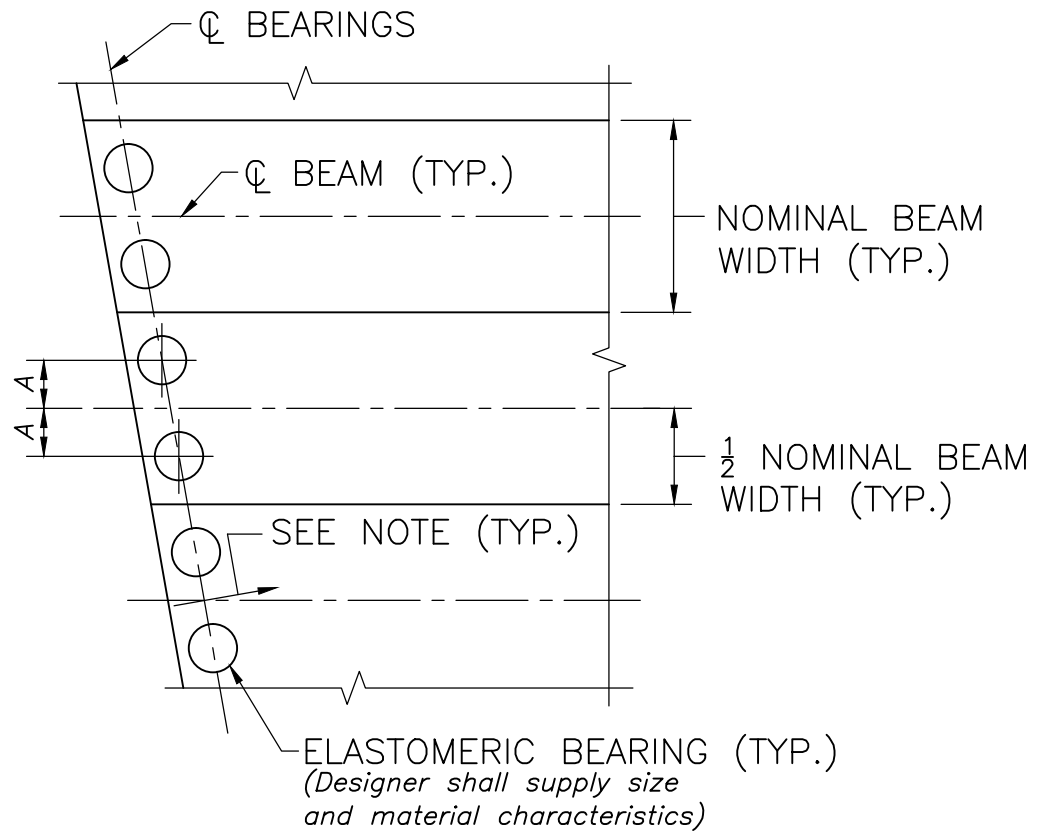
LRFD BRIDGE  
MANUAL, PART II

LAYOUT OF BEARINGS  
SPANS  $\leq$  50'  
PRECAST CONCRETE DECK BEAMS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

**4.1.18**



**NOTE:**

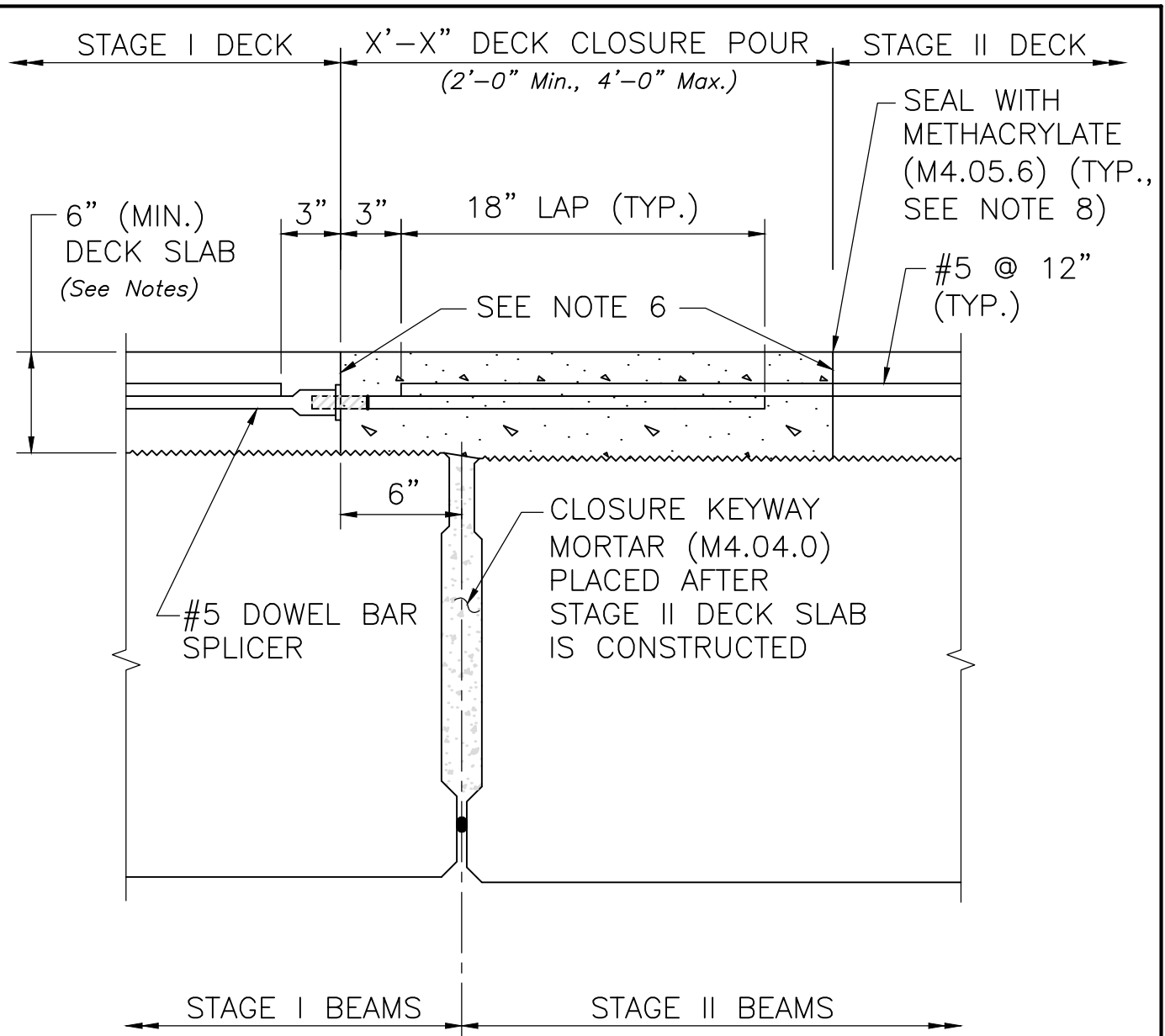
PROVIDE  $\frac{1}{8}$ "/FT. SLOPE BETWEEN BEARINGS.

**LAYOUT OF BEARINGS** (SPANS > 50')

SCALE:  $\frac{1}{4}$ " = 1'-0"

**NOTES:**

1.  $A = (\text{Nominal Width of Beam})/4$
2. See Dwg. No. 4.1.18 for spans less or equal to 50'.



## NOTES:

(See Dwg. No. 4.1.21 for Notes to be included on the Construction Drawings)

## STAGE CONSTRUCTION DETAIL

SCALE:  $1\frac{1}{2}" = 1'-0"$

### NOTES:

1. The use of 6" (Min.) deck slab is required for the temporary concrete bridge barrier installation for staged construction. In these situations, the drilling into the top  $\frac{1}{2}"$  of the precast beam will be allowed to provide for the required by the crash test  $6\frac{1}{2}"$  embedment length for anchor bolts.
2. The thickness of the deck slab may need to be increased to accommodate roadway profile.



LRFD BRIDGE

MANUAL, PART II

## STAGE CONSTRUCTION DETAIL

PRECAST CONCRETE DECK BEAMS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

**4.1.20**

## STAGE CONSTRUCTION NOTES:

1. AFTER ALL STAGE II BEAMS HAVE BEEN ERECTED, TENSION EACH STAGE II TRANSVERSE TIE TO 5 KIPS.
2. FILL ALL KEYWAYS BETWEEN STAGE II BEAMS WITH MORTAR (M4.04.0). IF THE KEYWAYS ARE NOT FILLED WITHIN FIVE (5) DAYS AFTER THE BEAMS HAVE BEEN ERECTED, THE CONTRACTOR SHALL COVER AND PROTECT THE KEYWAYS FROM WEATHER AND DEBRIS UNTIL THEY ARE FILLED.
3. AFTER THE MORTAR HAS CURED (24 HOURS MINIMUM), TENSION EACH TRANSVERSE TIE TO 44 KIPS.
4. CONCRETE FOR STAGE II DECK SLAB SHALL BE PLACED AFTER THE STAGE II TRANSVERSE TIES HAVE BEEN FULLY TENSIONED. DECK SLAB SHALL BE 4000 PSI,  $\frac{3}{4}$  IN, 585 HP CEMENT CONCRETE.
5. FILL CLOSURE KEYWAY BETWEEN STAGE I AND STAGE II BEAMS WITH MORTAR (M4.04.0).
6. VERTICAL SURFACES OF PREVIOUSLY CAST DECK SLAB CONCRETE SHALL BE PRE-WETTED FOR 24 HOURS IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS.
7. IMMEDIATELY PLACE AND CURE 4000 PSI,  $\frac{3}{4}$  IN, 585 HP CEMENT CONCRETE CLOSURE POUR.
8. AFTER END OF CURING PERIOD, TOP OF DECK STAGE CONSTRUCTION JOINT SHALL BE SEALED IN ACCORDANCE WITH REQUIREMENTS FOR METHACRYLATE CRACK SEALING OF SECTION 901.73 OF STANDARD SPECIFICATIONS.



## STAGE CONSTRUCTION NOTES

PRECAST CONCRETE DECK BEAMS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

**4.1.21**

| LOCATION           | LEFT EDGE<br>OF DECK SLAB | PROFILE<br>GRADE LINE | CROWN<br>LINE | RIGHT EDGE<br>OF DECK SLAB |
|--------------------|---------------------------|-----------------------|---------------|----------------------------|
| ℄ BRGS.<br>@ ABUT. |                           |                       |               |                            |
| MIDSPAN            |                           |                       |               |                            |
| ℄ BRGS.<br>@ ABUT. |                           |                       |               |                            |

NOTES:

1. THIS TABLE INDICATES THE THEORETICAL THICKNESS OF THE DECK SLAB IN INCHES BASED UPON ASSUMED BEAM CAMBERS AT ERECTION.
2. TABLE IS PROVIDED TO ASSIST IN ESTIMATING THE REQUIRED CONCRETE VOLUME.
3. THE ACTUAL DECK THICKNESSES WILL BE AS REQUIRED TO MEET THE PROFILE GRADES.

THEORETICAL DECK SLAB THICKNESS TABLE

NOTES:

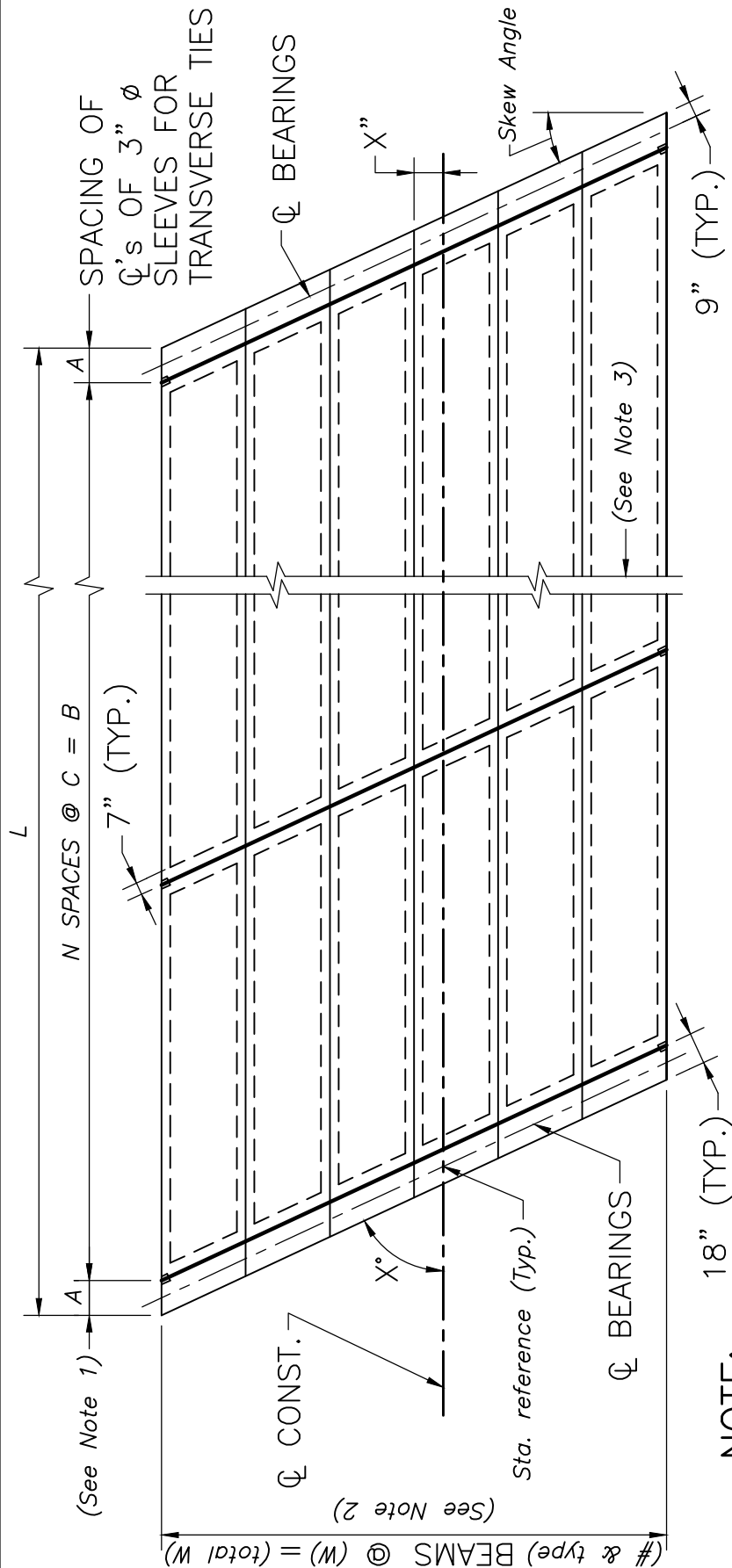
1. *Expand the table where required to include all spans.*
2. *Crown line dimensions need only be provided when they differ from the profile grade line.*

# FRAMING PLAN

## PRECAST CONCRETE BOX BEAMS

DATE OF ISSUE  
 JUNE 2013

DRAWING NUMBER  
**4.2.1**



### NOTE:

SEE STANDARD SPECIFICATIONS FOR BEAM ERECTION AND LAYOUT.

### FRAMING PLAN

SCALE:  $\left(\frac{1}{8}'' = 1'-0'' \text{ Min}\right)$

#### NOTES:

1.  $A = 18''/\cos(\text{Skew Angle})$   
 $L = \text{Span Length} + A$   
 $B = L - 2A$
2.  $C = B/N$ , where  $N = \text{number of internal voids}$ . (See Dwg. No. 4.2.13 for the required number of transverse ties.)  
 Specify beam type (e.g. B36-24). Use only nominal beam widths when specifying beam width ( $W$ ) and calculating total width (total  $W$ ).
3. Framing plan shall be drawn full length without breaks and to scale on the Construction Drawings. Show all internal voids and transverse ties and include North Arrow.
4. For those bridges with East and West abutments, the beams shall be numbered consecutively starting from the Southern most beam to the Northern most and the spans shall be numbered consecutively from the West abutment to the East abutment. For those bridges with North and South abutments, the beams shall be numbered consecutively starting from the Western most beam to the Eastern most and the spans shall be numbered consecutively from the South abutment to the North abutment.

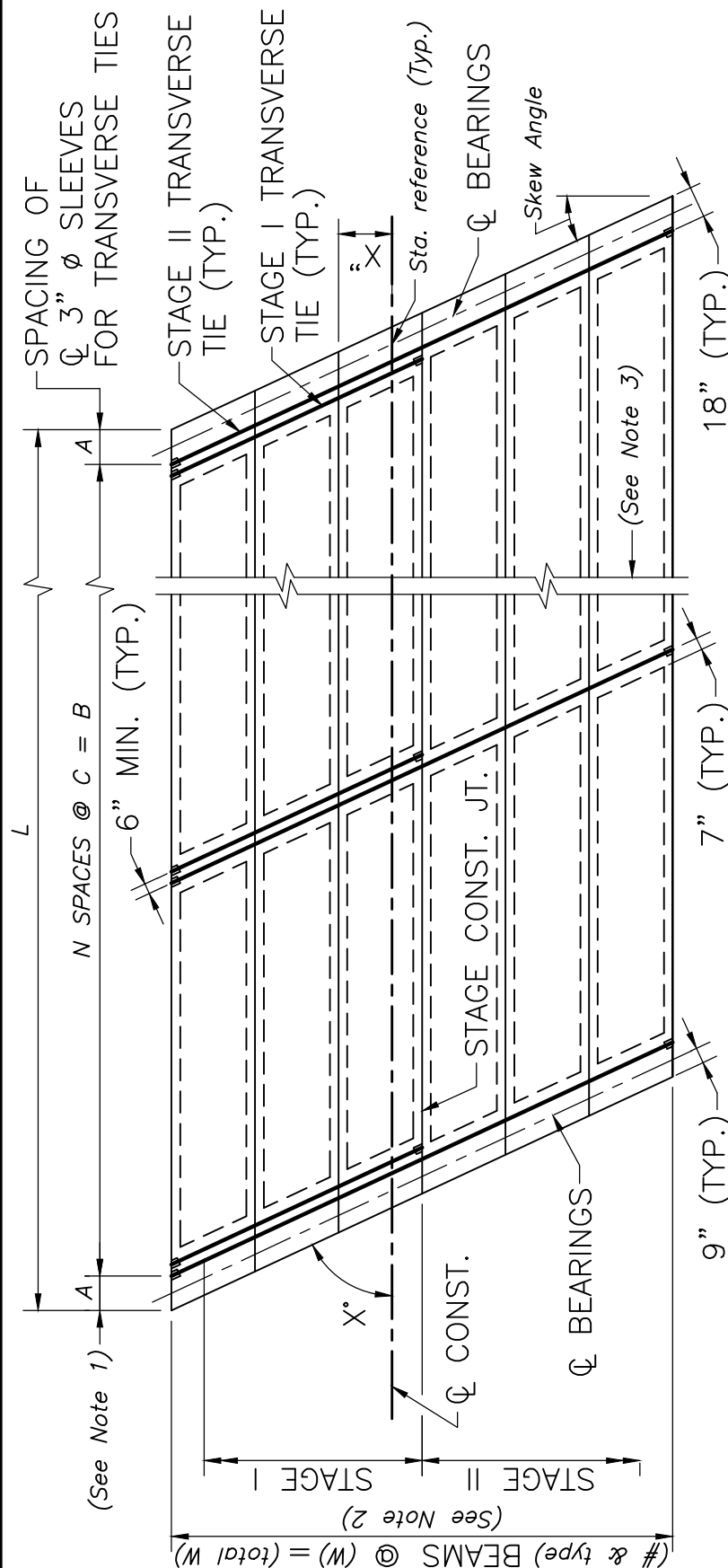
# FRAMING PLAN STAGE CONSTRUCTION PRECAST CONCRETE BOX BEAMS

DATE OF ISSUE

JUNE 2013

DRAWING NUMBER

**4.2.2**



## NOTE:

SEE STANDARD SPECIFICATIONS FOR BEAM ERECTION AND LAYOUT.

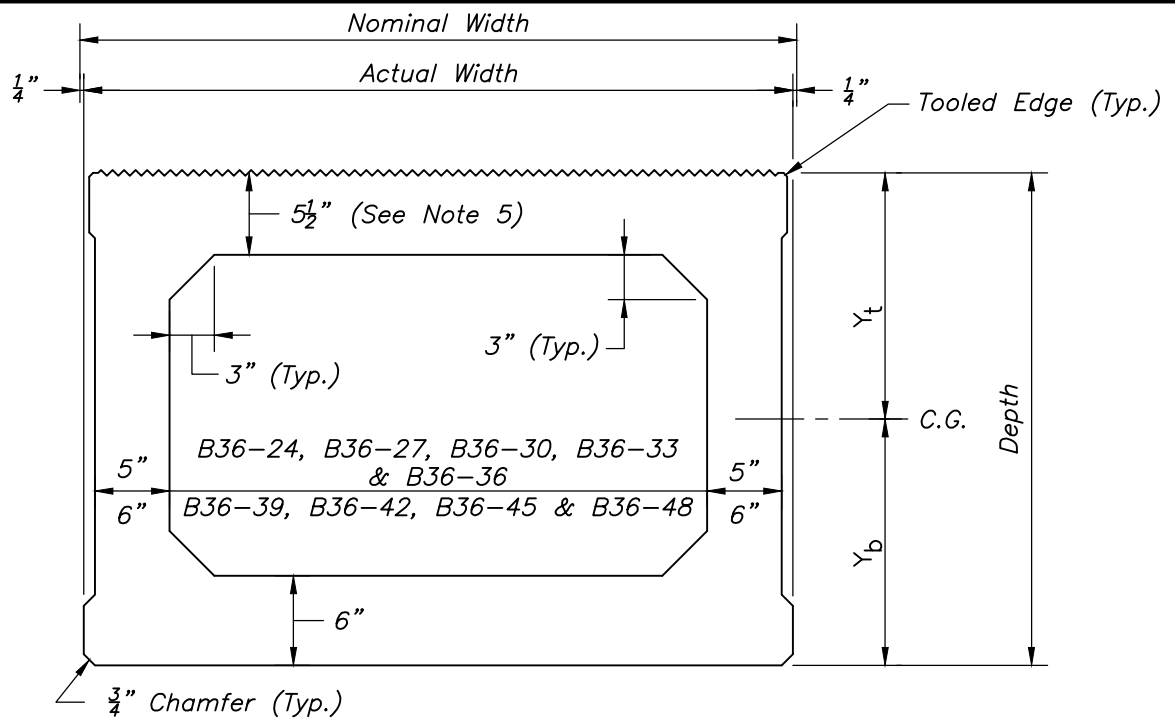
## FRAMING PLAN

SCALE:  $(\frac{1}{8}'' = 1'-0'' \text{ Min})$

### NOTES:

1.  $A = 18'' / \cos(\text{Skew Angle})$   
 $L = \text{Span Length} + A$   
 $B = L - 2A$
2.  $C = B/N$ , where  $N$  = number of internal voids. (See Dwg. No. 4.2.13 for the required number of transverse ties.)  
 Specify beam type (e.g. B48-24). Use only nominal beam widths when specifying beam width ( $W$ ) and calculating total width (total  $W$ ).
3. Framing plan shall be drawn full length without breaks and to scale on the Construction Drawings. Show all internal voids and transverse ties and include North Arrow.
4. For those bridges with East and West abutments, the beams shall be numbered consecutively starting from the Southern most beam to the Northern most and the spans shall be numbered to the East abutment. For those bridges with North and South abutments, the beams shall be numbered consecutively starting from the Western most beam to the Eastern most and the spans shall be numbered consecutively from the South abutment to the North abutment.





### BEAM PROPERTIES

| BEAM TYPE | WIDTH (in.) |      | DEPTH (in) | AREA (in <sup>2</sup> ) | I (in <sup>4</sup> ) | Y <sub>b</sub> (in) | Y <sub>t</sub> (in) | S <sub>b</sub> (in <sup>3</sup> ) | S <sub>t</sub> (in <sup>3</sup> ) | WEIGHT (lbs/ft) | MAX. SPAN (ft) |
|-----------|-------------|------|------------|-------------------------|----------------------|---------------------|---------------------|-----------------------------------|-----------------------------------|-----------------|----------------|
|           | Nom.        | Act. |            |                         |                      |                     |                     |                                   |                                   |                 |                |
| B36-24    | 36.0        | 35.5 | 24         | 543                     | 36609                | 11.82               | 12.18               | 3097                              | 3006                              | 566             | 73             |
| B36-27    | 36.0        | 35.5 | 27         | 573                     | 50267                | 13.29               | 13.71               | 3782                              | 3666                              | 597             | 83             |
| B36-30    | 36.0        | 35.5 | 30         | 603                     | 66503                | 14.77               | 15.23               | 4503                              | 4367                              | 628             | 91             |
| B36-33    | 36.0        | 35.5 | 33         | 633                     | 85453                | 16.24               | 16.76               | 5262                              | 5099                              | 659             | 96             |
| B36-36    | 36.0        | 35.5 | 36         | 663                     | 107251               | 17.72               | 18.28               | 6053                              | 5867                              | 691             | 105            |
| B36-39    | 36.0        | 35.5 | 39         | 748                     | 135514               | 19.24               | 19.76               | 7043                              | 6858                              | 779             | 115            |
| B36-42    | 36.0        | 35.5 | 42         | 784                     | 164680               | 20.73               | 21.27               | 7944                              | 7742                              | 817             | 122            |
| B36-45    | 36.0        | 35.5 | 45         | 820                     | 197374               | 22.21               | 22.79               | 8887                              | 8661                              | 854             | 129            |
| B36-48    | 36.0        | 35.5 | 48         | 856                     | 233759               | 23.70               | 24.30               | 9863                              | 9620                              | 892             | 135            |

#### NOTES:

1. Above drawing is not to scale.
2. See Dwg. No. 4.2.8 for shear key details.
3. Maximum Span lengths are approximate and are based on the following assumptions:
  - $f'_c = 6500$  psi (Precast)
  - $f'_{ci} = 4500$  psi (Precast)
  - $f'_c = 4000$  psi (5" thick Cast-in-Place Composite Deck)
  - Final Allowable Tension at bottom of beam is equal to  $0.0948\sqrt{f'_c}$  ksi.
  - HL-93 Live Load
  - Time-Dependent Losses of Article 5.9.5.3 of the AASHTO-LRFD were used.
  - The CP-PL2 Barrier was assumed on the bridge.
  - 3.5" thick HMA wearing surface.
  - 0.6" diameter low relaxation strands.
  - The factor "k" in the Live Load distribution factor equation was taken as 1.5
4. Weights of beams do not include the weight of the solid sections located at the transverse ties. Include the weight of the solid sections for design.
5. Thickness of top flange may have to be increased in order to develop sidewalk/safety curb barrier reinforcement (see Dwg. No. 4.3.2). The Designer will have to calculate and use the modified beam properties in such cases.



LRFD BRIDGE  
MANUAL, PART II

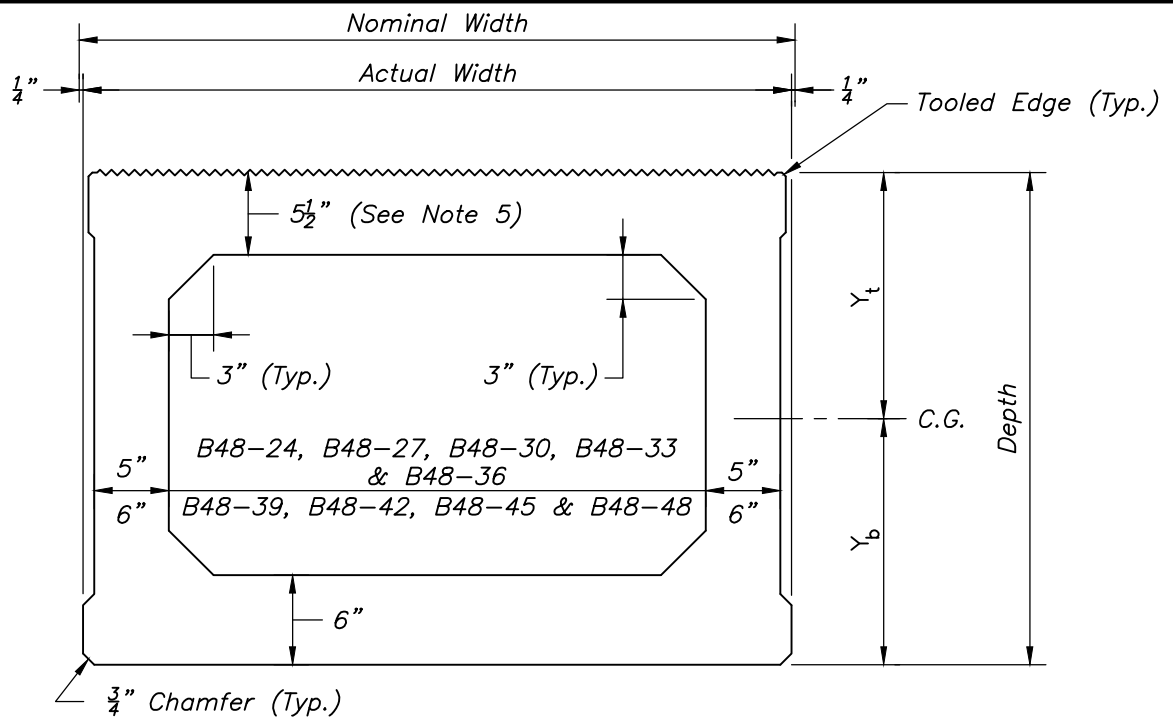
## STANDARD 36" WIDE BEAMS

PRECAST CONCRETE BOX BEAMS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

**4.2.3**



### BEAM PROPERTIES

| BEAM TYPE | WIDTH (in.) |      | DEPTH (in) | Area (in <sup>2</sup> ) | I (in <sup>4</sup> ) | Y <sub>b</sub> (in) | Y <sub>t</sub> (in) | S <sub>b</sub> (in <sup>3</sup> ) | S <sub>t</sub> (in <sup>3</sup> ) | WEIGHT (lbs/ft) | MAX. SPAN (ft) |
|-----------|-------------|------|------------|-------------------------|----------------------|---------------------|---------------------|-----------------------------------|-----------------------------------|-----------------|----------------|
|           | Nom.        | Act. |            |                         |                      |                     |                     |                                   |                                   |                 |                |
| B48-24    | 48          | 47.5 | 24         | 681                     | 48461                | 11.80               | 12.20               | 4107                              | 3972                              | 709             | 74             |
| B48-27    | 48          | 47.5 | 27         | 711                     | 66201                | 13.27               | 13.73               | 4989                              | 4822                              | 741             | 82             |
| B48-30    | 48          | 47.5 | 30         | 741                     | 87139                | 14.73               | 15.27               | 5916                              | 5707                              | 772             | 91             |
| B48-33    | 48          | 47.5 | 33         | 771                     | 111410               | 16.20               | 16.80               | 6877                              | 6632                              | 803             | 97             |
| B48-36    | 48          | 47.5 | 36         | 801                     | 139151               | 17.68               | 18.32               | 7871                              | 7596                              | 834             | 104            |
| B48-39    | 48          | 47.5 | 39         | 886                     | 173980               | 19.19               | 19.81               | 9066                              | 8782                              | 923             | 113            |
| B48-42    | 48          | 47.5 | 42         | 922                     | 210330               | 20.67               | 21.33               | 10176                             | 9861                              | 960             | 121            |
| B48-45    | 48          | 47.5 | 45         | 958                     | 250828               | 22.15               | 22.85               | 11324                             | 10977                             | 998             | 127            |
| B48-48    | 48          | 47.5 | 48         | 994                     | 295638               | 23.63               | 24.37               | 12511                             | 12131                             | 1035            | 134            |

#### NOTES:

- Above drawing is not to scale.
- See Dwg. No. 4.2.8 for shear key details.
- Maximum Span lengths are approximate and are based on the following assumptions:
  - $f'_c = 6500$  psi (Precast)
  - $f'_{ci} = 4500$  psi (Precast)
  - $f'_c = 4000$  psi (5" thick Cast-in-Place Composite Deck)
  - Final Allowable Tension at bottom of beam is equal to  $0.0948\sqrt{f'_c}$  ksi.
  - HL-93 Live Load
  - Time-Dependent Losses of Article 5.9.5.3 of the AASHTO-LRFD were used.
  - The CP-PL2 Barrier was assumed on the bridge.
  - 3.5" thick HMA wearing surface.
  - 0.6" diameter low relaxation strands.
  - The factor "k" in the Live Load distribution factor equation was taken as 1.5
- Weights of beams do not include the weight of the solid sections located at the transverse ties. Include the weight of the solid sections for design.
- Thickness of top flange may have to be increased in order to develop sidewalk/safety curb barrier reinforcement (see Dwg. No. 4.3.2). The Designer will have to calculate and use the modified beam properties in such cases.



LRFD BRIDGE  
MANUAL, PART II

## STANDARD 48" WIDE BEAMS

PRECAST CONCRETE BOX BEAMS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

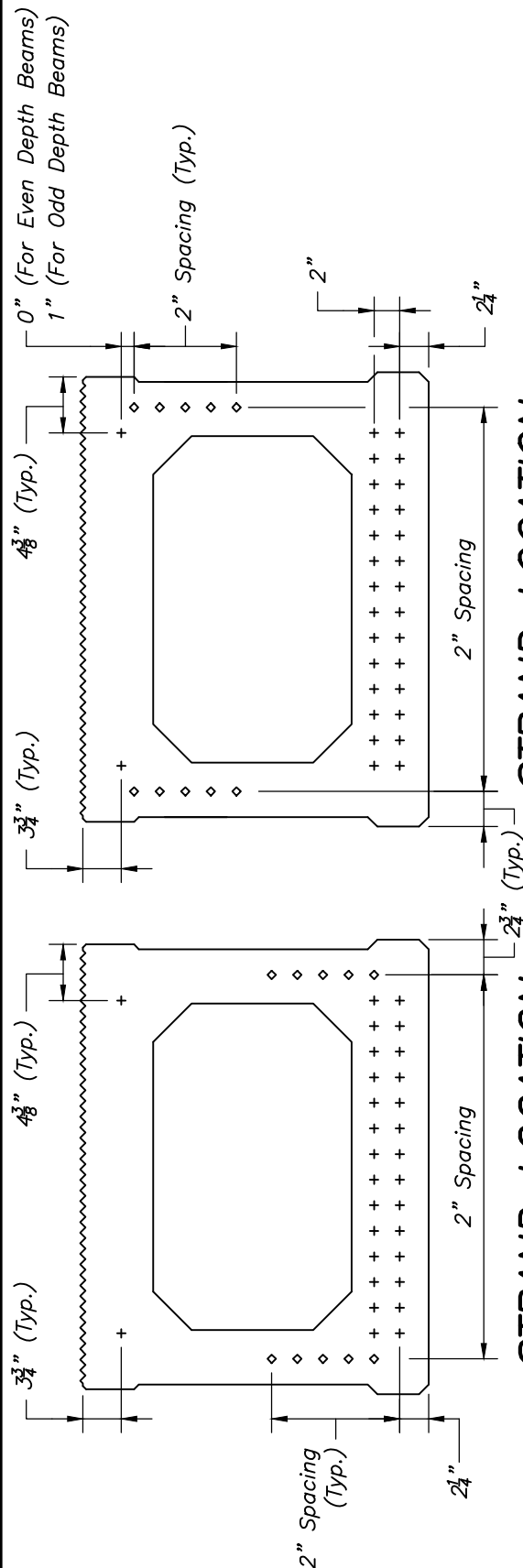
**4.2.4**

# STANDARD STRAND LOCATION 24" THRU 36" DEEP BEAMS

PRECAST CONCRETE BOX BEAMS

DATE OF ISSUE  
 JUNE 2013

DRAWING NUMBER  
**4.2.5**



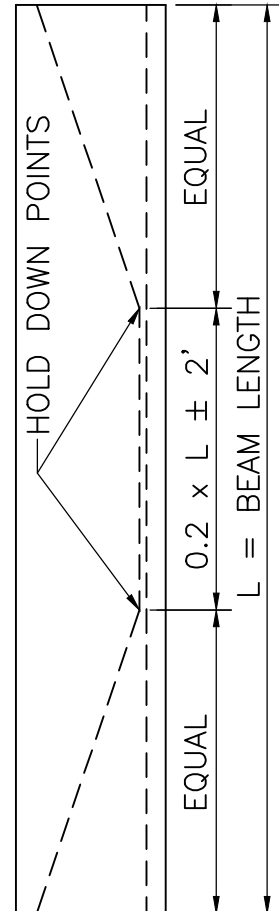
## STRAND LOCATION AT MIDSPAN

## STRAND LOCATION AT END OF BEAM

NOT TO SCALE

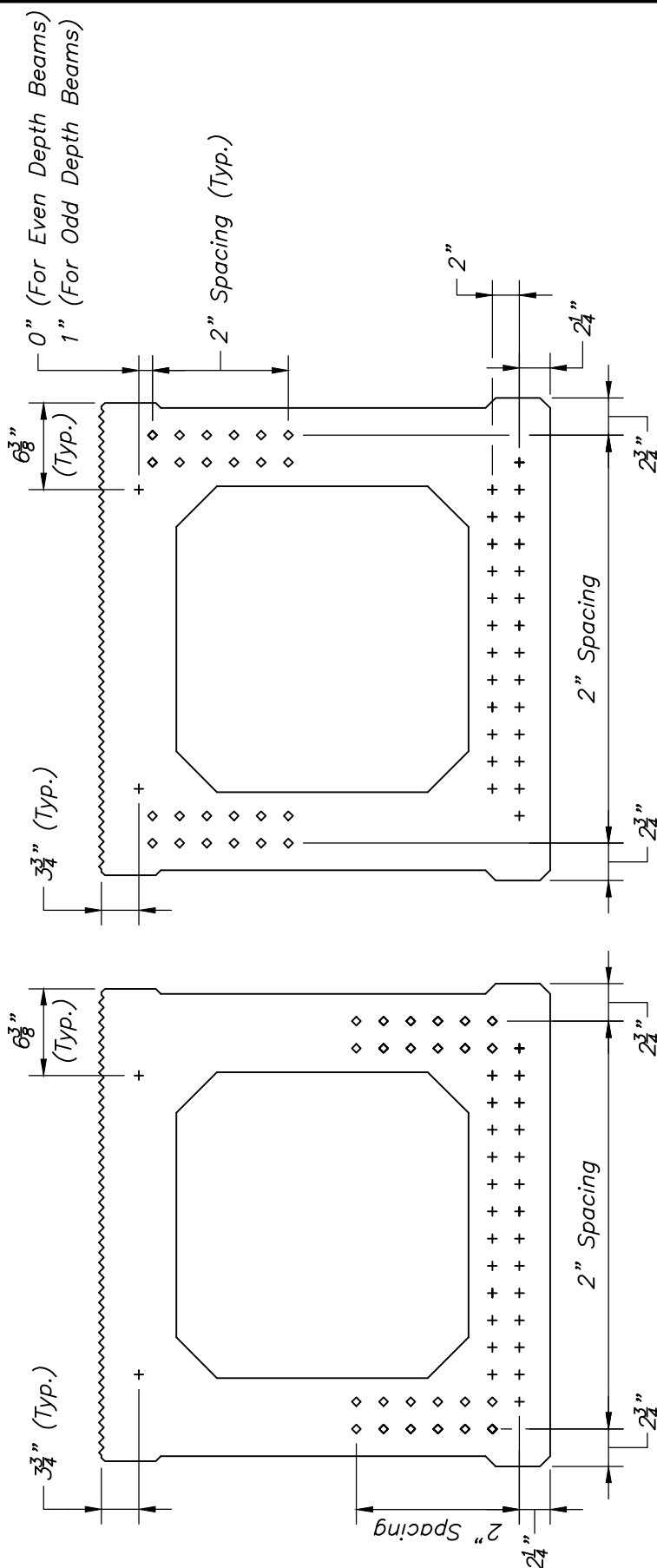
### NOTES:

1. + Denotes straight strands.
2. ◊ Denotes draped strands. The total hold down force for each beam should not exceed 75% of the total beam weight.
3. ⊕ Denotes debonded strands (none shown above). No more than 25% of the total number of strands and no more than 40% of the strands in each row shall be debonded. In addition, no more than 40% of the debonded strands, or four (4) strands, whichever is greater, shall have the debonding terminated at any one section. The spacing between debonded strands in a layer shall be 4" minimum. Exterior strands in each layer shall be fully bonded. In general, the length of debonded strand from each end of the beam should be limited to approximately 15% of the span length.
4. Design must accommodate hold down location tolerance shown below.
5. If required by design, a maximum of 2 fully stressed strands may be provided in the top flange at the specified locations. Otherwise, provide a minimum of 2 strands at the same locations pretensioned to 2 Kips each.



## HOLD DOWN POINTS FOR DRAPED STRANDS

NOT TO SCALE



**STRAND LOCATION**  
**AT END OF BEAM**  
NOT TO SCALE

**STRAND LOCATION**  
**AT MIDSPAN**  
NOT TO SCALE

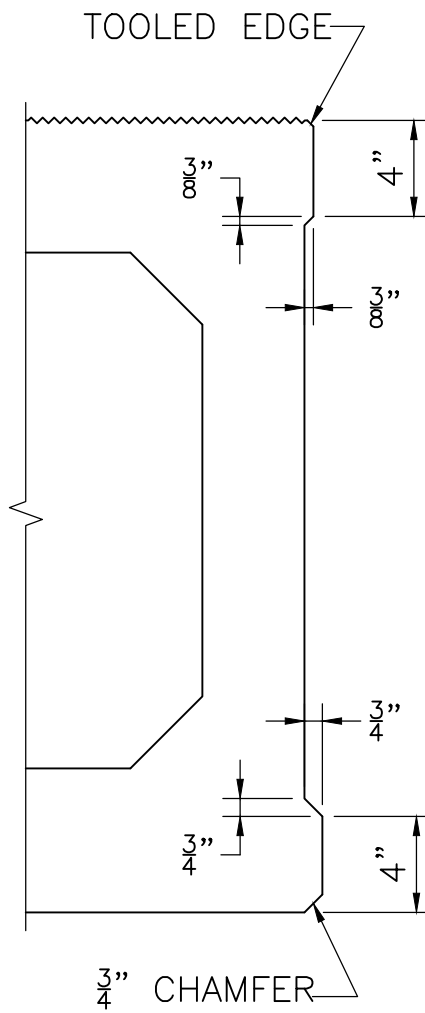
- NOTES:**
- + Denotes straight strands.
  - ♦ Denotes draped strands. Where draped strands are used, the total hold down force of all draped strands for each beam should not exceed 75% of the total beam weight. When using two columns of draped strands in each web, an even number of strands shall be used.
  - ⊕ Denotes debonded strands (none shown above). No more than 25% of the total number of strands and no more than 40% of the strands in each row shall be debonded. In addition, no more than 40% of the debonded strands, or four (4) strands, whichever is greater, shall have the debonding terminated at any one section. The spacing between debonded strands in a layer shall be 4" minimum. Exterior strands in each layer shall be fully bonded. In general, the length of debonded strand from each end of the beam should be limited to approximately 15% of the span length.
  - For location of hold down points see Dwg. No. 4.2.5. Design must accommodate hold down location tolerance shown on Dwg. No. 4.2.5.
  - If required by design, a maximum of 2 fully stressed strands may be provided in the top flange at the specified locations. Otherwise, provide a minimum of 2 strands at the same locations pretensioned to 2 Kips each.

## PRESTRESS NOTES:

1. ALL PRETENSIONING ELEMENTS SHALL BE 0.6"  $\phi$ , UNCOATED, SEVEN-WIRE, LOW RELAXATION STEEL STRANDS AND SHALL CONFORM TO AASHTO M 203.
2. THE TENSILE STRENGTH OF THE PRETENSIONING STRANDS SHALL BE 270 KSI.
3. THE INITIAL TENSION PER 0.6"  $\phi$  STRAND SHALL BE 44 KIPS.
4. THE MINIMUM 28 DAY COMPRESSIVE STRENGTH SHALL BE 6500 PSI. (*See Note*)
5. NO PRESTRESS SHALL BE TRANSFERRED TO THE CONCRETE UNTIL IT HAS ATTAINED A COMPRESSIVE STRENGTH, AS SHOWN BY CYLINDER TEST, OF AT LEAST 4500 PSI. (*See Note*)
6. THE TOP OF ALL BEAMS SHALL BE GIVEN A RAKE FINISH ( $\frac{1}{4}$ " AMPLITUDE) ACROSS THE WIDTH (PERPENDICULAR TO THE BEAM'S AXIS).
7. THE FABRICATOR IS FULLY RESPONSIBLE FOR THE DESIGN OF THE LIFTING DEVICES WHICH SHALL BE ADEQUATE FOR THE SAFETY FACTORS REQUIRED BY THE ERECTION PROCEDURE.

### NOTE:

*The Designer may increase the 28 day compressive strength of the concrete and/or the compressive strength at transfer if justified and feasible. See the prestressed concrete section of Part I of the Bridge Manual.*



## SHEAR KEY DETAIL

SCALE:  $1\frac{1}{2}" = 1'-0"$



LRFD BRIDGE  
MANUAL, PART II

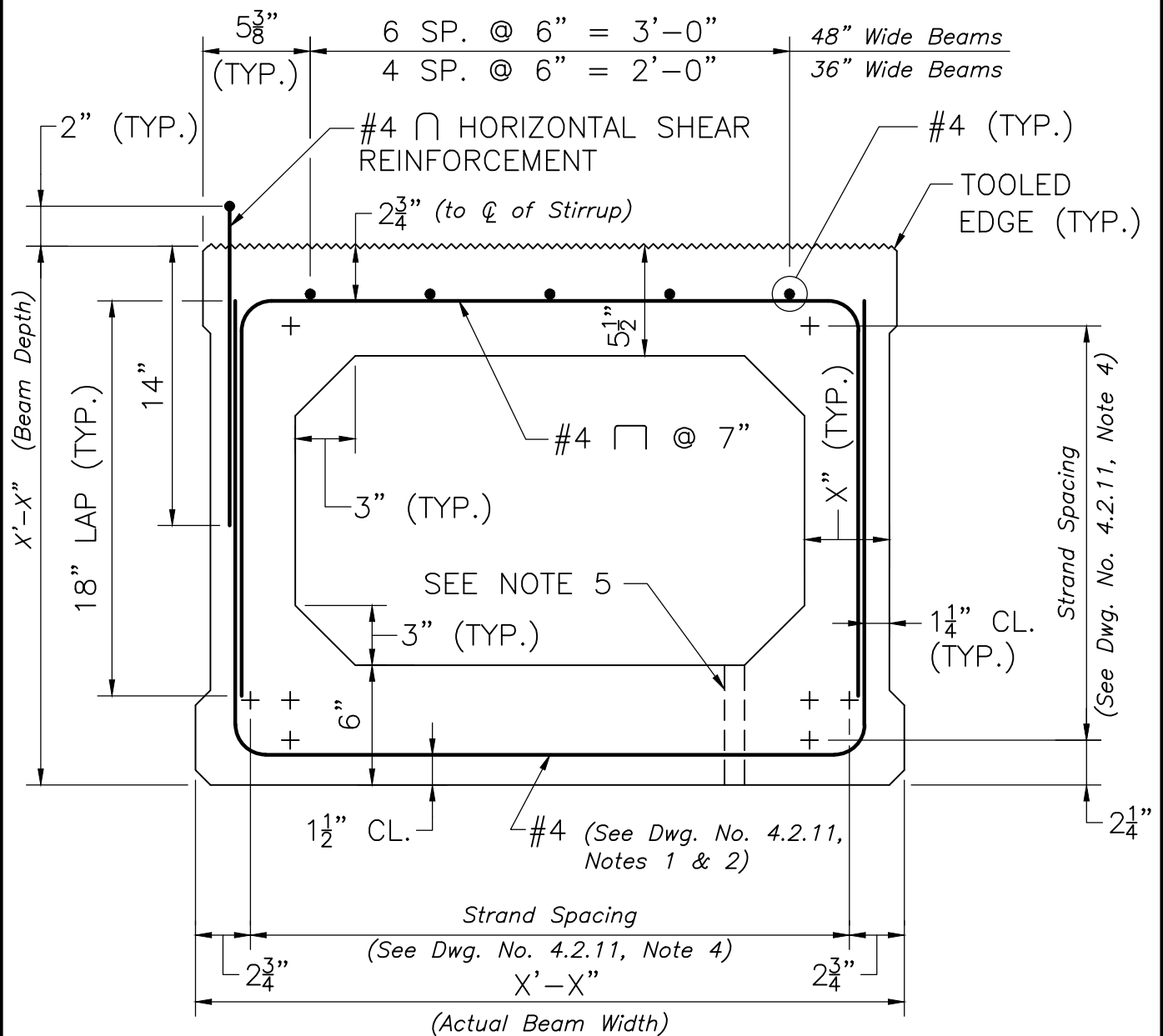
## SHEAR KEY DETAIL

PRECAST CONCRETE BOX BEAMS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

**4.2.8**



### NOTES:

1. + DENOTES STRAIGHT STRANDS.
2.  $\diamond$  DENOTES DRAPED STRANDS. (None Shown Above)
3.  $\oplus$  DENOTES DEBONDED STRANDS. (None Shown Above)
4. SEE SHEAR KEY DETAIL ON SHEET (Provide Reference).
5. 1"  $\phi$  DRAIN PLACED AT BOTH ENDS OF EACH VOID.
6. SEE END OF BEAM PLAN FOR STIRRUP SPACING.

## MIDSPAN SECTION

SCALE: 1 $\frac{1}{2}$ " = 1'-0"



LRFD BRIDGE  
MANUAL, PART II

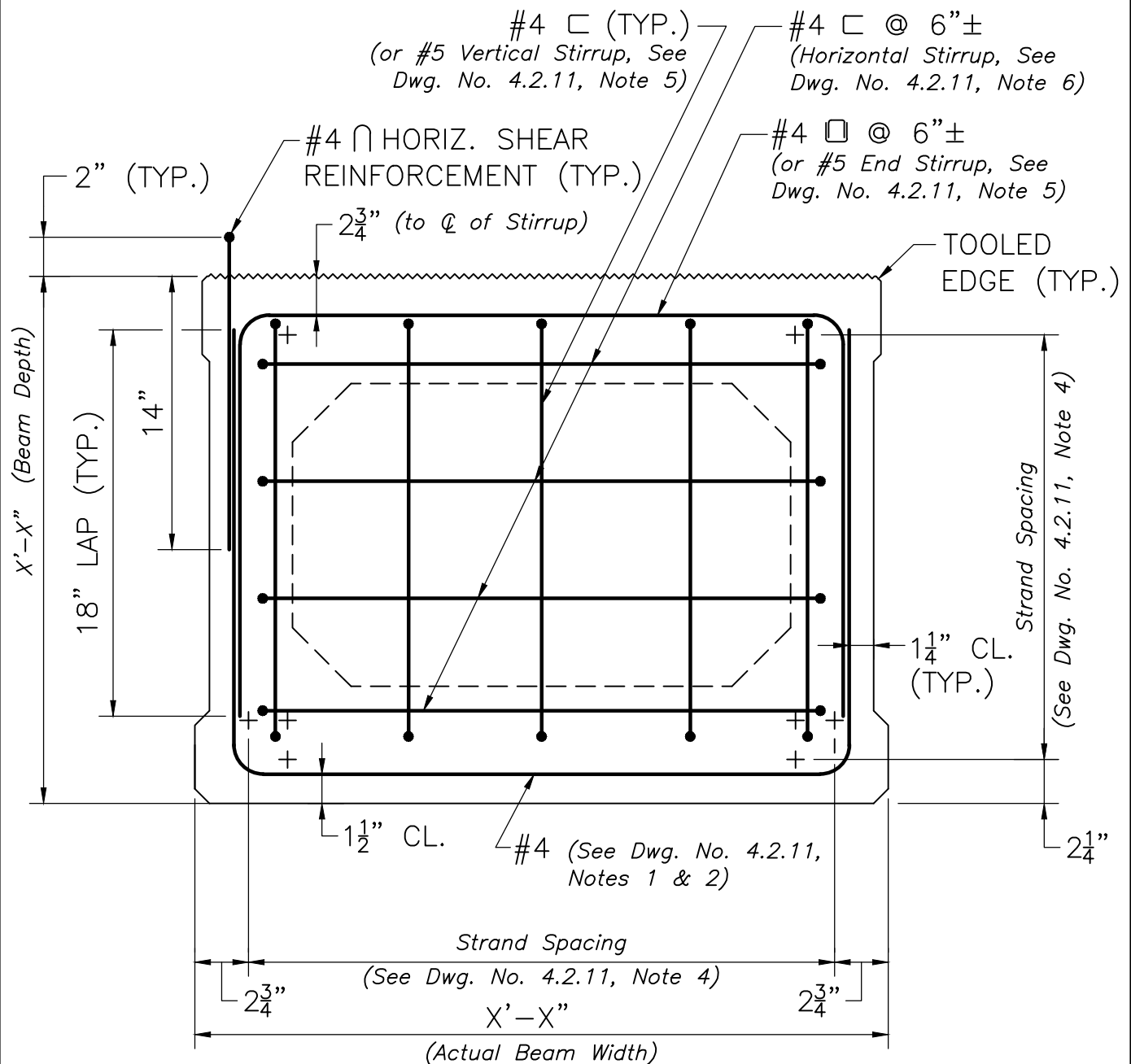
## TYPICAL MIDSPAN SECTION

PRECAST CONCRETE BOX BEAMS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

**4.2.9**



### NOTES:

1. + DENOTES STRAIGHT STRANDS.
2.  $\diamond$  DENOTES DRAPED STRANDS. (None Shown Above)
3.  $\oplus$  DENOTES DEBONDED STRANDS. (None Shown Above)
4. SEE SHEAR KEY DETAIL ON SHEET (Provide Reference).

## END OF BEAM SECTION

SCALE:  $1\frac{1}{2}" = 1'-0"$



LRFD BRIDGE  
MANUAL, PART II

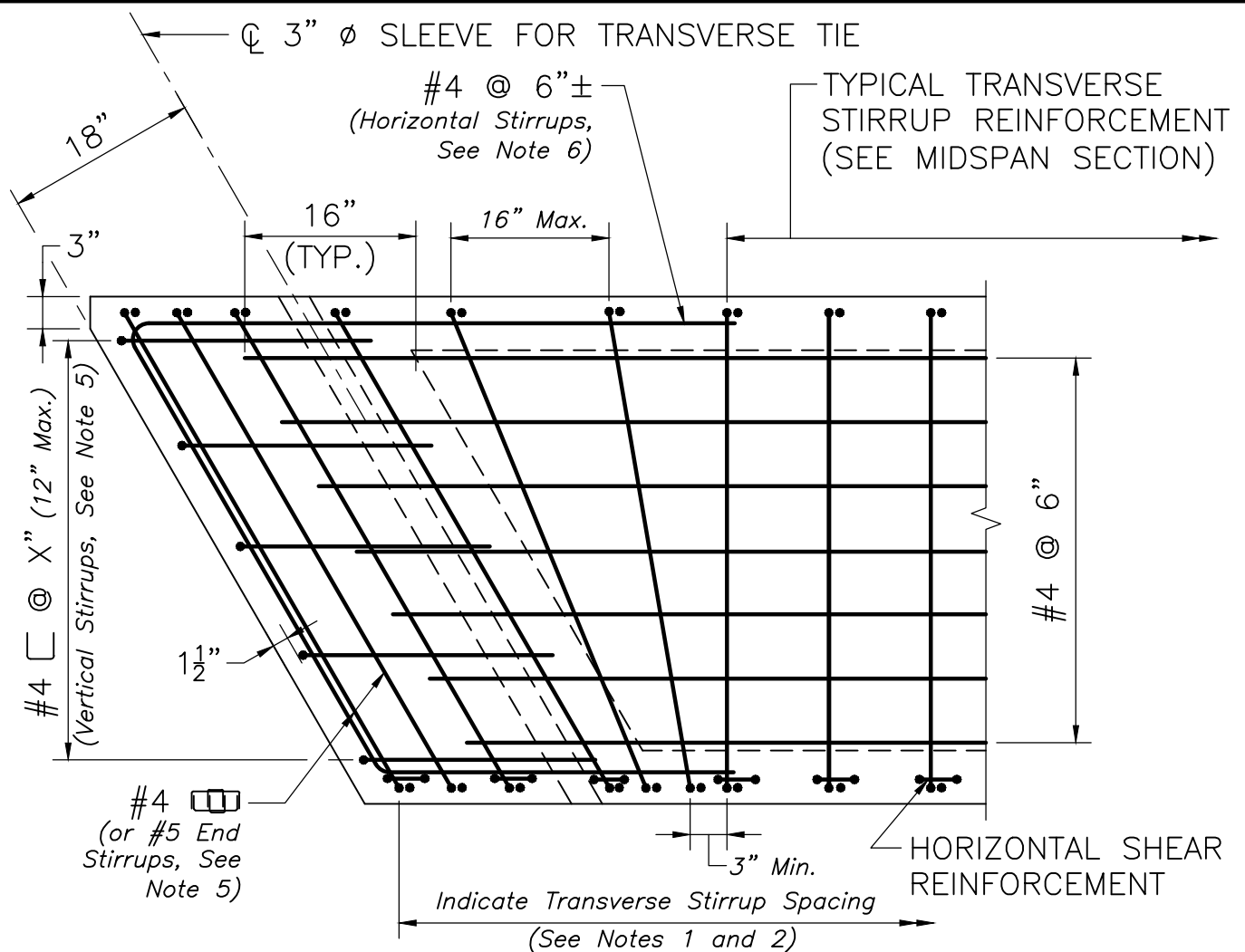
TYPICAL END OF  
BEAM SECTION  
PRECAST CONCRETE BOX BEAMS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

**4.2.10**





## END OF BEAM PLAN

SCALE:  $\frac{3}{4}" = 1'-0"$

### NOTES:

1. See the prestressed section of Part I of the Bridge Manual for the design of the transverse stirrups.
2. Bottom transverse stirrups shall be placed at a multiple of the top transverse stirrups spacing with a maximum spacing of 14".
3. The extent of the beam shown in the End of Beam Plan should be long enough to indicate typical transverse stirrup spacing throughout the beam.
4. The actual number and location of the prestressing strands shall be designed and shall conform to Dwg. No.'s 4.2.5 and 4.2.6.
5. See the prestressed section of Part I of the Bridge Manual for the design of the end transverse stirrups and vertical stirrups. The horizontal leg lengths of the vertical stirrups shall equal the depth of the beam and shall be dimensioned on the plan view.
6. Horizontal stirrups shall be embedded a minimum distance equal to the depth of the beam or 12" into the web of the voided section, whichever is longer. Length of embedment shall be noted on the plan view.
7. Horizontal shear reinforcement shall be designed in accordance with Article 5.8.4 of the AASHTO-LRFD and shall be spaced at a multiple of the transverse stirrups.
8. Properly note or show the location and spacing of any dowels which extend into sidewalks, curb, or barriers on the cross section and plan views of the beams.



LRFD BRIDGE  
MANUAL, PART II

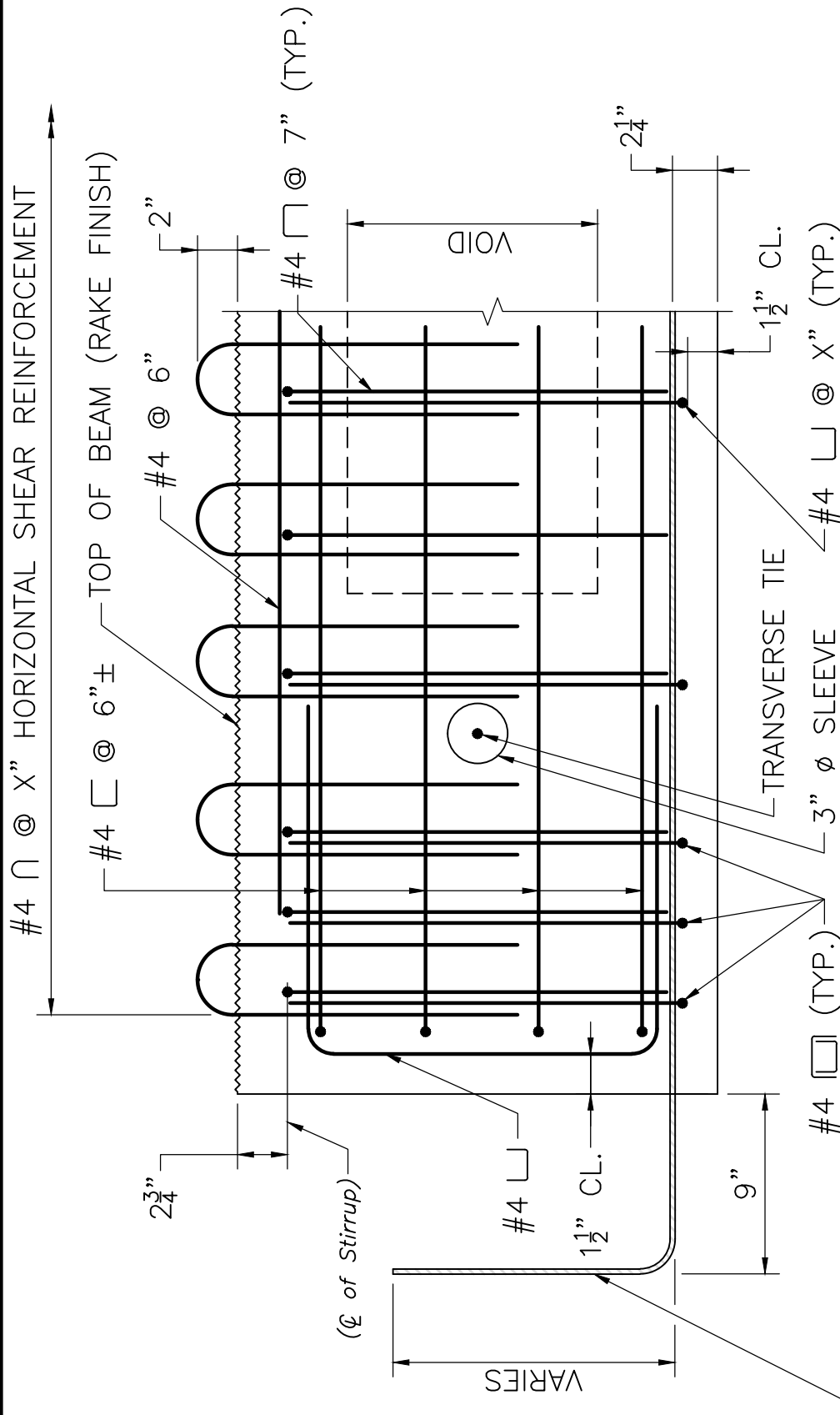
## TYPICAL END OF BEAM PLAN

PRECAST CONCRETE BOX BEAMS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

**4.2.11**



# NOTES:

SEE NOTE 1

(Omit at Beam Ends at Abutments)

1. ONLY FULLY BONDED STRANDS IN THE BOTTOM ROW SHALL BE EXTENDED INTO THE CONTINUITY DIAPHRAGM.

2. THE REMAINDER OF THE STRANDS IS NOT SHOWN FOR CLARITY.

## LONGITUDINAL SECTION

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



LRFD BRIDGE

MANUAL, PART II

## LONGITUDINAL SECTION

PRECAST CONCETE BOX BEAMS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

**4.2.12**

| SPAN<br>LENGTH | TIE LOCATIONS |                      |         |
|----------------|---------------|----------------------|---------|
|                | Ends          | $\frac{1}{4}$ Points | Midspan |
| $\leq 50'$     | X             |                      | X       |
| $> 50'$        | X             | X                    | X       |

## TRANSVERSE TIE LOCATIONS

NOTE:

*If torsional load in the fascia beams (due to sidewalk, overhang or utilities) is excessive, consideration shall be given to increasing the number of transverse ties and/or the post-tensioning force. Adjust the transverse tie locations as necessary.*



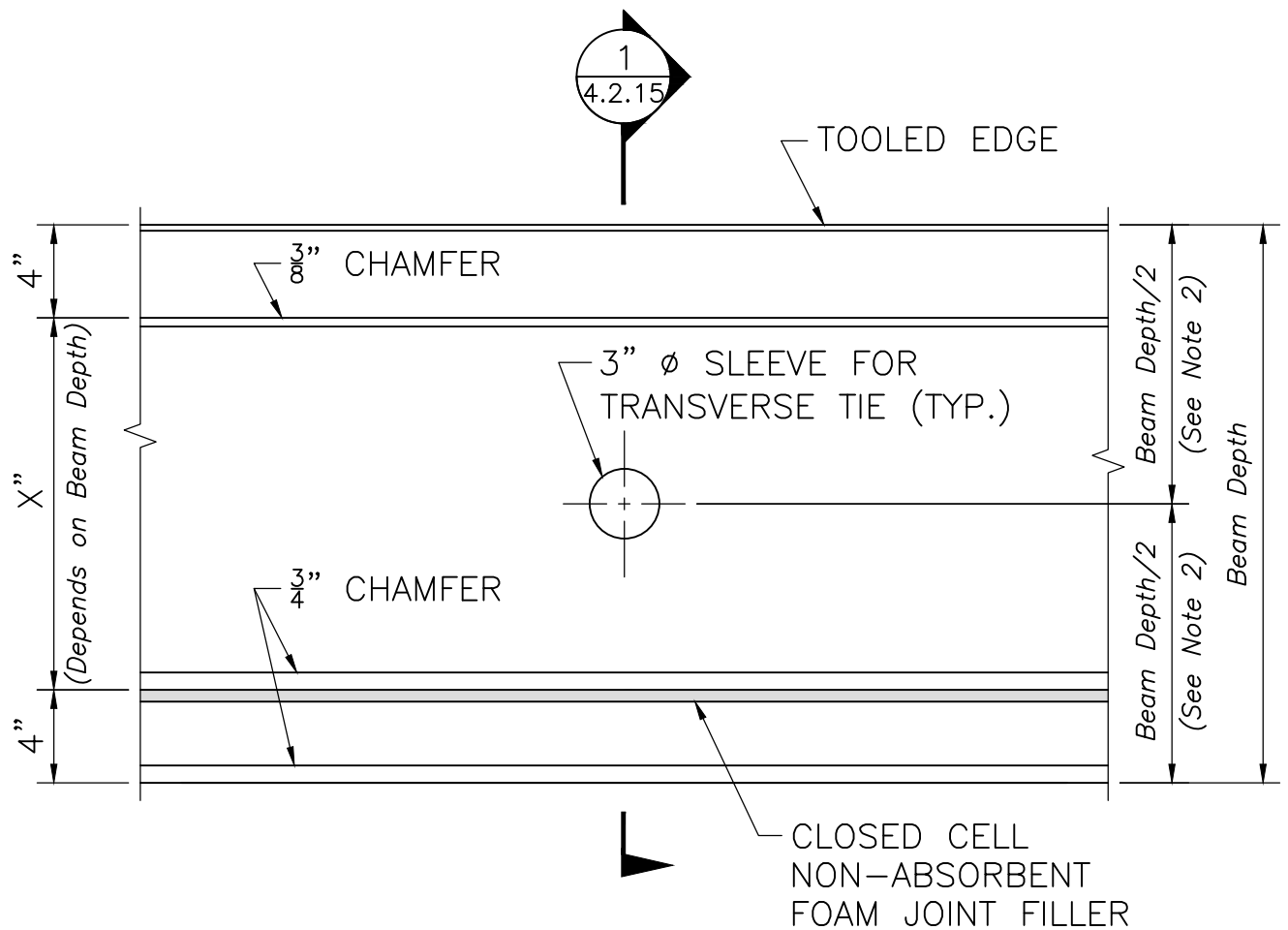
LRFD BRIDGE  
MANUAL, PART II

## TRANSVERSE TIE LOCATIONS

PRECAST CONCRETE BOX BEAMS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER  
**4.2.13**



## TYPICAL BEAM ELEVATION AT TRANSVERSE TIE LOCATIONS

SCALE:  $1\frac{1}{2}'' = 1'-0''$

**NOTES:**

1. See Dwg. No. 4.2.13 for the locations of the transverse ties.
2. The vertical position of the transverse tie strands must be coordinated with the locations of the prestressing strands and adjusted as necessary to avoid interference.



LRFD BRIDGE  
MANUAL, PART II

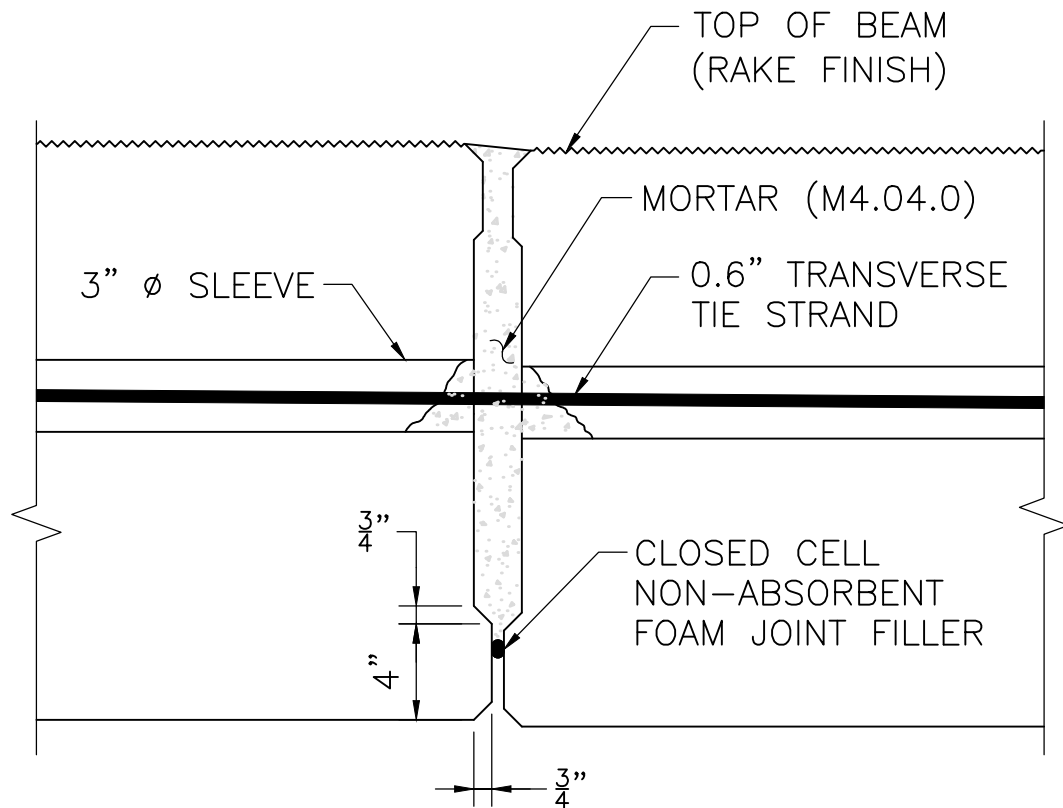
## TYPICAL LONGITUDINAL JOINT ELEVATION

PRECAST CONCRETE BOX BEAMS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

4.2.14



## SECTION 1

SCALE:  $1\frac{1}{2}" = 1'-0"$



LRFD BRIDGE  
MANUAL, PART II

# TYPICAL LONGITUDINAL JOINT SECTION

PRECAST CONCRETE BOX BEAMS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

**4.2.15**

## CONSTRUCTION SEQUENCE NOTES:

1. AFTER ALL BEAMS HAVE BEEN ERECTED, TENSION EACH TRANSVERSE TIE TO 5 KIPS.
2. FILL ALL KEYWAYS WITH MORTAR (M4.04.0). IF THE KEYWAYS ARE NOT FILLED WITHIN FIVE (5) DAYS AFTER THE BEAMS ARE ERECTED, THE CONTRACTOR SHALL COVER AND PROTECT THE KEYWAYS FROM WEATHER AND DEBRIS UNTIL THEY ARE FILLED.
3. AFTER THE MORTAR HAS CURED (24 HOURS MINIMUM), TENSION EACH TRANSVERSE TIE TO 44 KIPS.
4. CONCRETE FOR DECK SLAB SHALL BE 4000 PSI,  $\frac{3}{4}$  IN, 585 HP CEMENT CONCRETE AND SHALL BE PLACED AFTER THE TRANSVERSE TIES HAVE BEEN FULLY TENSIONED.
5. NO TRAFFIC OR HEAVY EQUIPMENT WILL BE PERMITTED ON THE BRIDGE UNTIL ALL TRANSVERSE TIES HAVE BEEN PROPERLY TENSIONED AND THE DECK HAS BEEN CAST AND CURED PER THE STANDARD SPECIFICATIONS.

NOTE:

*Include the Notes from Dwg. No. 4.1.21 on projects with Stage Construction.*



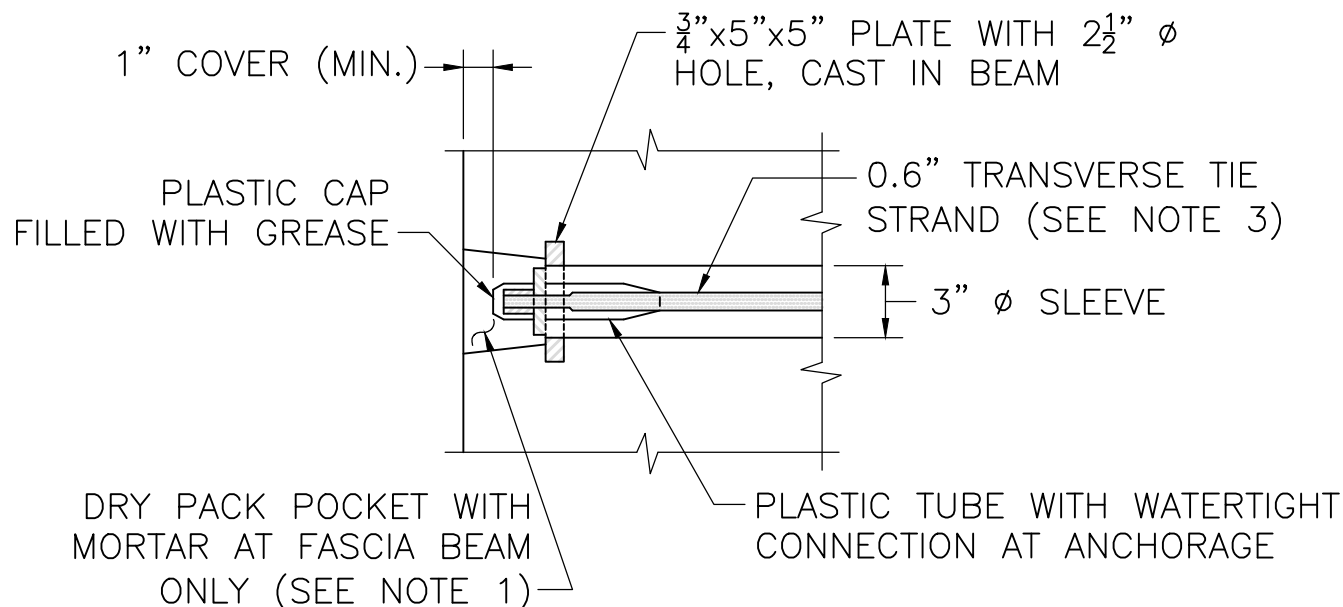
LRFD BRIDGE  
MANUAL, PART II

## CONSTRUCTION SEQUENCE NOTES

PRECAST CONCRETE BOX BEAMS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER  
**4.2.16**



### NOTES:

1. MORTAR FOR EXTERIOR POCKETS SHALL CONFORM TO M4.02.15 AND SHALL BE THE SAME COLOR AND TEXTURE AS THE BEAM CONCRETE.
2. OTHER ANCHORAGE SYSTEMS MAY BE SUBSTITUTED WITH THE APPROVAL OF THE ENGINEER. ALTERNATE ANCHORAGE SYSTEMS SHALL BE WATERTIGHT AND CORROSION PROOF.
3. TRANSVERSE TIES SHALL BE COVERED BY A SEAMLESS POLYPROPYLENE SHEATH (WITH CORROSION INHIBITING GREASE BETWEEN THE STRAND AND SHEATH) FOR THE FULL LENGTH OF THE STRAND, EXCEPT AT THE ANCHORAGE LOCATION.

## TRANSVERSE TIE ANCHORAGE

SCALE:  $1\frac{1}{2}" = 1'-0"$



LRFD BRIDGE  
MANUAL, PART II

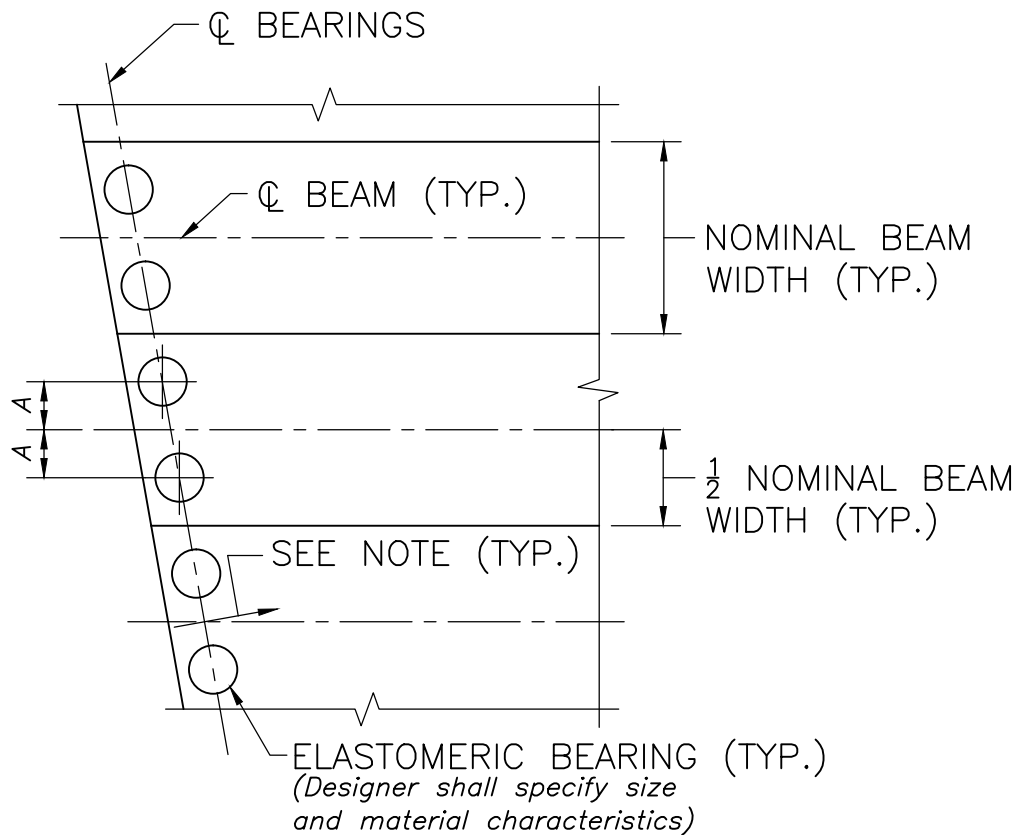
## TRANSVERSE TIE ANCHORAGE

PRECAST CONCRETE BOX BEAMS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

**4.2.17**



**NOTE:**

PROVIDE  $\frac{1}{8}$ "/FT. SLOPE BETWEEN BEARINGS.

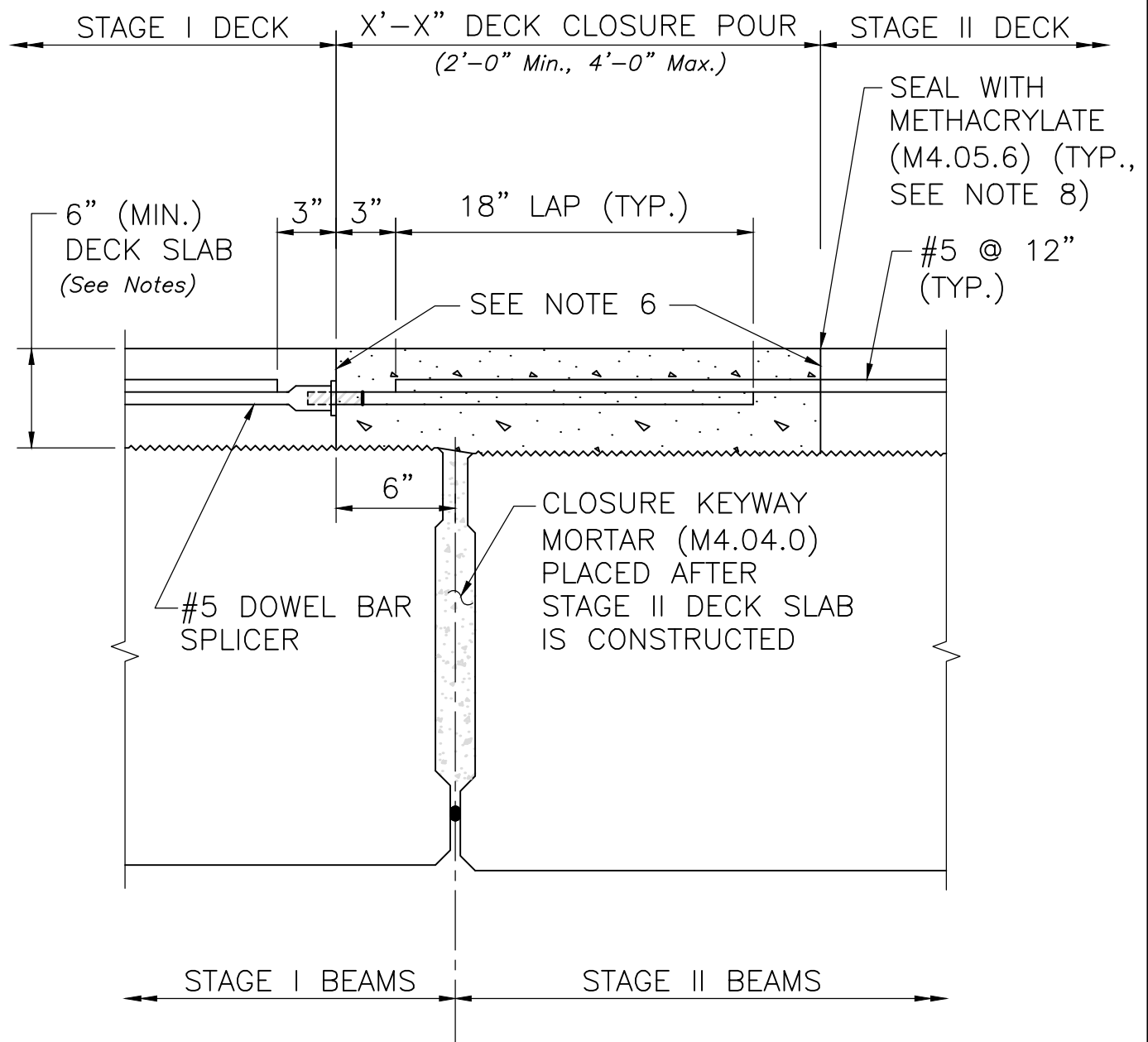
**LAYOUT OF BEARINGS**

SCALE:  $\frac{1}{4}$ " = 1'-0"

**NOTE:**

$A = (\text{Nominal Width of Beam})/4$





## NOTES:

(See Dwg. No. 4.2.20 for Notes to be included on the Construction Drawings)

## STAGE CONSTRUCTION DETAIL

SCALE:  $1\frac{1}{2}" = 1'-0"$

### NOTES:

1. The use of 6" (Min.) deck slab is required for the temporary concrete bridge barrier installation for staged construction. In these situations, the drilling into the top  $\frac{1}{2}"$  of the precast beam will be allowed to provide for the required by the crash test  $6\frac{1}{2}"$  embedment length for anchor bolts.
2. The thickness of the deck slab may need to be increased to accommodate roadway profile.



LRFD BRIDGE

MANUAL, PART II

## STAGE CONSTRUCTION DETAIL

PRECAST CONCRETE BOX BEAMS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

**4.2.19**

## STAGE CONSTRUCTION NOTES:

1. AFTER ALL STAGE II BEAMS HAVE BEEN ERECTED, TENSION EACH STAGE II TRANSVERSE TIE TO 5 KIPS.
2. FILL ALL KEYWAYS BETWEEN STAGE II BEAMS WITH MORTAR (M4.04.0). IF THE KEYWAYS ARE NOT FILLED WITHIN FIVE (5) DAYS AFTER THE BEAMS HAVE BEEN ERECTED, THE CONTRACTOR SHALL COVER AND PROTECT THE KEYWAYS FROM WEATHER AND DEBRIS UNTIL THEY ARE FILLED.
3. AFTER THE MORTAR HAS CURED (24 HOURS MINIMUM), TENSION EACH TRANSVERSE TIE TO 44 KIPS.
4. CONCRETE FOR STAGE II DECK SLAB SHALL BE PLACED AFTER THE STAGE II TRANSVERSE TIES HAVE BEEN FULLY TENSIONED. DECK SLAB SHALL BE 4000 PSI,  $\frac{3}{4}$  IN, 585 HP CEMENT CONCRETE.
5. FILL CLOSURE KEYWAY BETWEEN STAGE I AND STAGE II BEAMS WITH MORTAR (M4.04.0).
6. VERTICAL SURFACES OF PREVIOUSLY CAST DECK SLAB CONCRETE SHALL BE PRE-WETTED FOR 24 HOURS IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS.
7. IMMEDIATELY PLACE AND CURE 4000 PSI,  $\frac{3}{4}$  IN, 585 HP CEMENT CONCRETE CLOSURE POUR.
8. AFTER END OF CURING PERIOD TOP OF DECK STAGE CONSTRUCTION JOINT SHALL BE SEALED IN ACCORDANCE WITH REQUIREMENTS FOR METHACRYLATE CRACK SEALING OF SECTION 901.73 OF STANDARD SPECIFICATIONS.



## STAGE CONSTRUCTION NOTES

PRECAST CONCRETE BOX BEAMS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER  
**4.2.20**

| LOCATION           | LEFT EDGE<br>OF DECK SLAB | PROFILE<br>GRADE LINE | CROWN<br>LINE | RIGHT EDGE<br>OF DECK SLAB |
|--------------------|---------------------------|-----------------------|---------------|----------------------------|
| ℄ BRGS.<br>@ ABUT. |                           |                       |               |                            |
| MIDSPAN            |                           |                       |               |                            |
| ℄ BRGS.<br>@ ABUT. |                           |                       |               |                            |

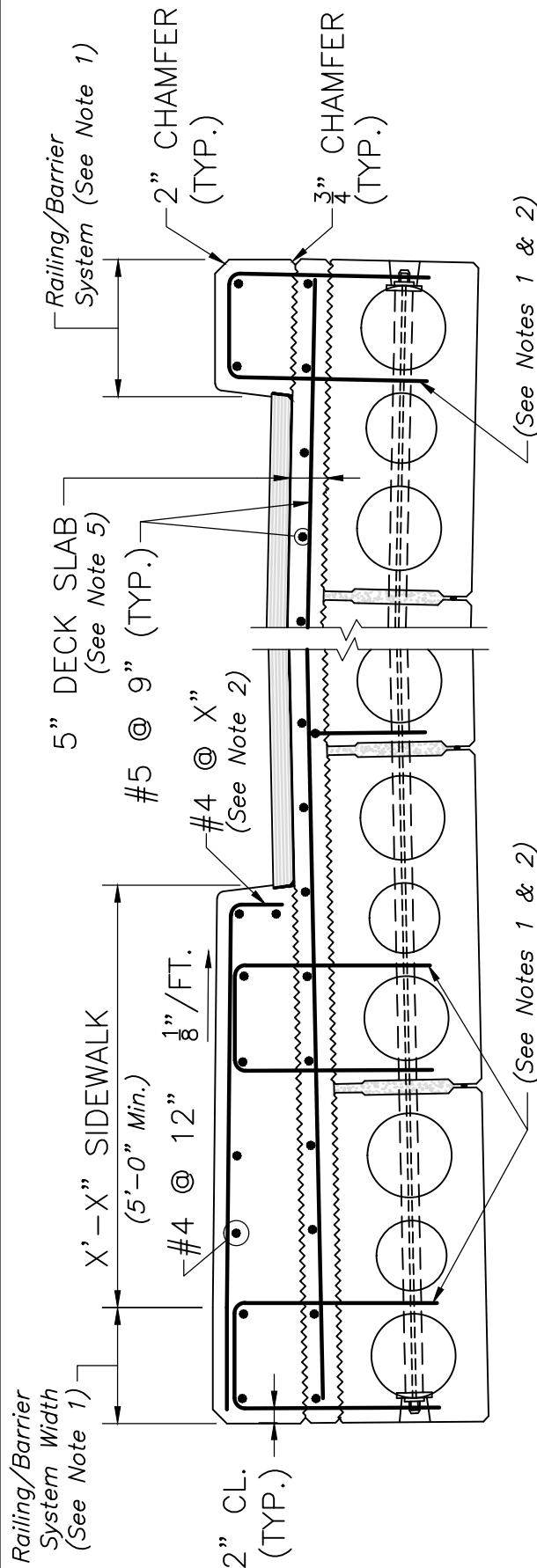
NOTES:

1. THIS TABLE INDICATES THE THEORETICAL THICKNESS OF THE DECK SLAB IN INCHES BASED UPON ASSUMED BEAM CAMBERS AT ERECTION.
2. TABLE IS PROVIDED TO ASSIST IN ESTIMATING THE REQUIRED CONCRETE VOLUME.
3. THE ACTUAL DECK THICKNESSES WILL BE AS REQUIRED TO MEET THE PROFILE GRADES.

THEORETICAL DECK SLAB THICKNESS TABLE

NOTES:

1. *Expand the table where required to include all spans.*
2. *Crown line dimensions need only be provided when they differ from the profile grade line.*



### NOTES:

1. DECK SLAB SHALL BE 4000 PSI,  $\frac{3}{4}$  IN, 585 HP CEMENT CONCRETE.
2. SIDEWALK AND SAFETY CURB CONCRETE SHALL BE 5000 PSI,  $\frac{3}{4}$  IN, 685 HP CEMENT CONCRETE.

### SIDEWALK SECTION

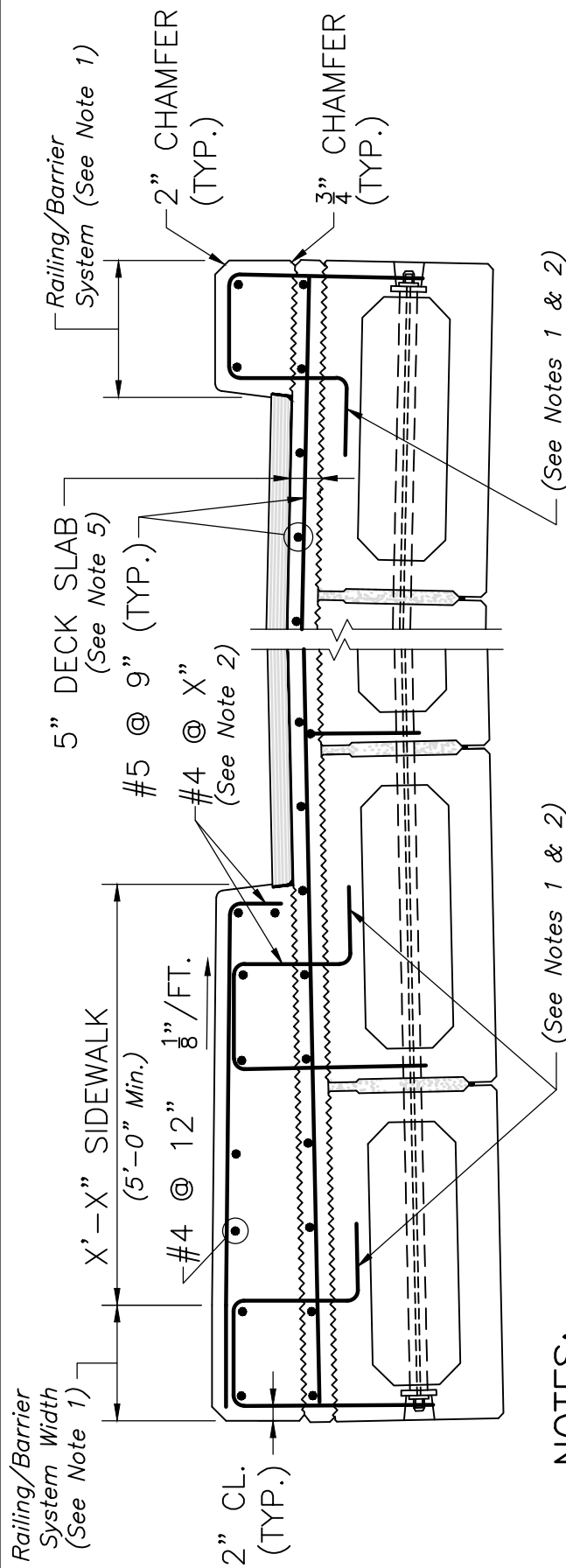
SCALE:  $\frac{1}{2}" = 1'-0"$

### SAFETY CURB SECTION

SCALE:  $\frac{1}{2}" = 1'-0"$

### NOTES:

1. See Chapter 9, Railing/Barrier System for sidewalk and safety curb dimensions, reinforcement and embedment lengths not shown. Modify the sections in Chapter 9 to show the beam arrangement and details shown above. Safety curb for S3-TL4 rail shown (width shall not be less than 19 $\frac{1}{2}$ " for S3-TL4 rail). Actual safety curb width depends on railing/barrier system chosen.
2. Spacing of sidewalk and safety curb dowels and transverse sidewalk and safety curb reinforcement shall be in multiples of the deck beam stirrup reinforcement.
3. Sidewalk slab may overhang the exterior beam by a maximum of 3" without altering the reinforcement shown. For overhangs greater than 3" use the details shown on Dwg. No.'s 4.3.5, 9.3.5, and 9.3.6. Safety curb cannot overhang the exterior beam.
4. Provide paraffin joints in the sidewalk and safety curb.
5. The thickness of the deck slab may need to be increased to accommodate roadway profile.



### NOTES:

1. DECK SLAB SHALL BE 4000 PSI,  $\frac{3}{4}$  IN, 585 HP CEMENT CONCRETE.
2. SIDEWALK AND SAFETY CURB CONCRETE SHALL BE 5000 PSI,  $\frac{3}{4}$  IN, 685 HP CEMENT CONCRETE.

### SIDEWALK SECTION

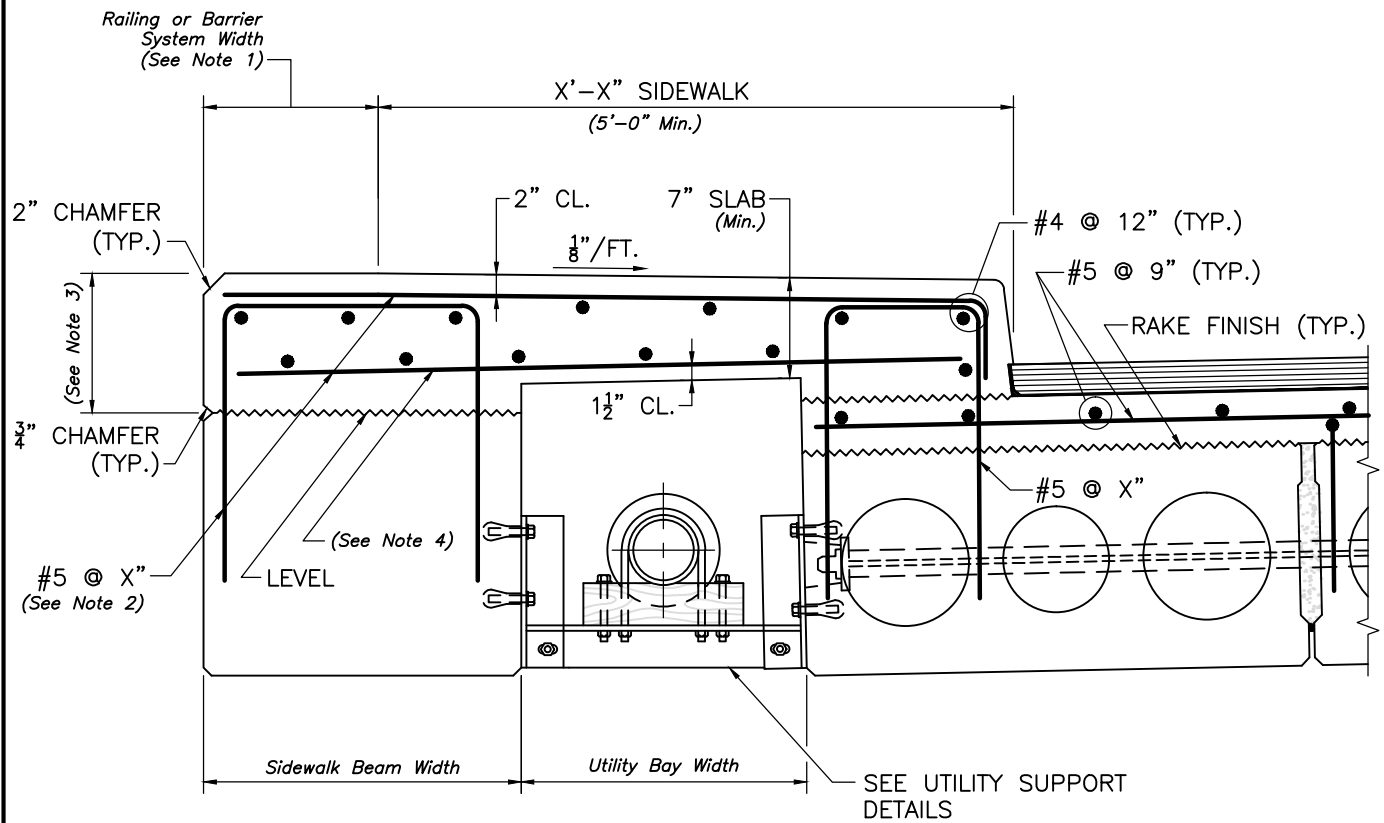
SCALE:  $\frac{1}{2}" = 1'-0"$

### SAFETY CURB SECTION

SCALE:  $\frac{1}{2}" = 1'-0"$

### NOTES:

1. See Chapter 9, Railing/Barrier System for sidewalk and safety curb dimensions, reinforcement and embedment lengths not shown. Modify the sections in Chapter 9 to show the beam arrangement and details shown above. Safety curb for S3-TL4 rail shown (width shall not be less than 19 $\frac{1}{2}$ " for S3-TL4 rail). Actual safety curb width depends on railing/barrier system chosen.
2. Spacing of sidewalk and safety curb dowels and transverse sidewalk and safety curb reinforcement shall be in multiples of the box beam stirrup reinforcement.
3. Sidewalk slab may overhang the exterior beam by a maximum of 3" without altering the reinforcement shown. For overhangs greater than 3" use the details shown on Dwg. No.'s 4.3.6, 9.3.5, and 9.3.6. Safety curb cannot overhang the exterior beam.
4. Provide paraffin joints in the sidewalk and safety curb.
5. The thickness of the deck slab may need to be increased to accommodate roadway profile.



**NOTES:**

1. DECK SLAB SHALL BE 4000 PSI,  $\frac{3}{4}$  IN, 585 HP CEMENT CONCRETE.
2. SIDEWALK AND SAFETY CURB CONCRETE SHALL BE 5000 PSI,  $\frac{3}{4}$  IN, 685 HP CEMENT CONCRETE.

(18" DEEP AND 21" DEEP DECK BEAMS ONLY)

**SIDEWALK SECTION**

SCALE: 1" = 1'-0"



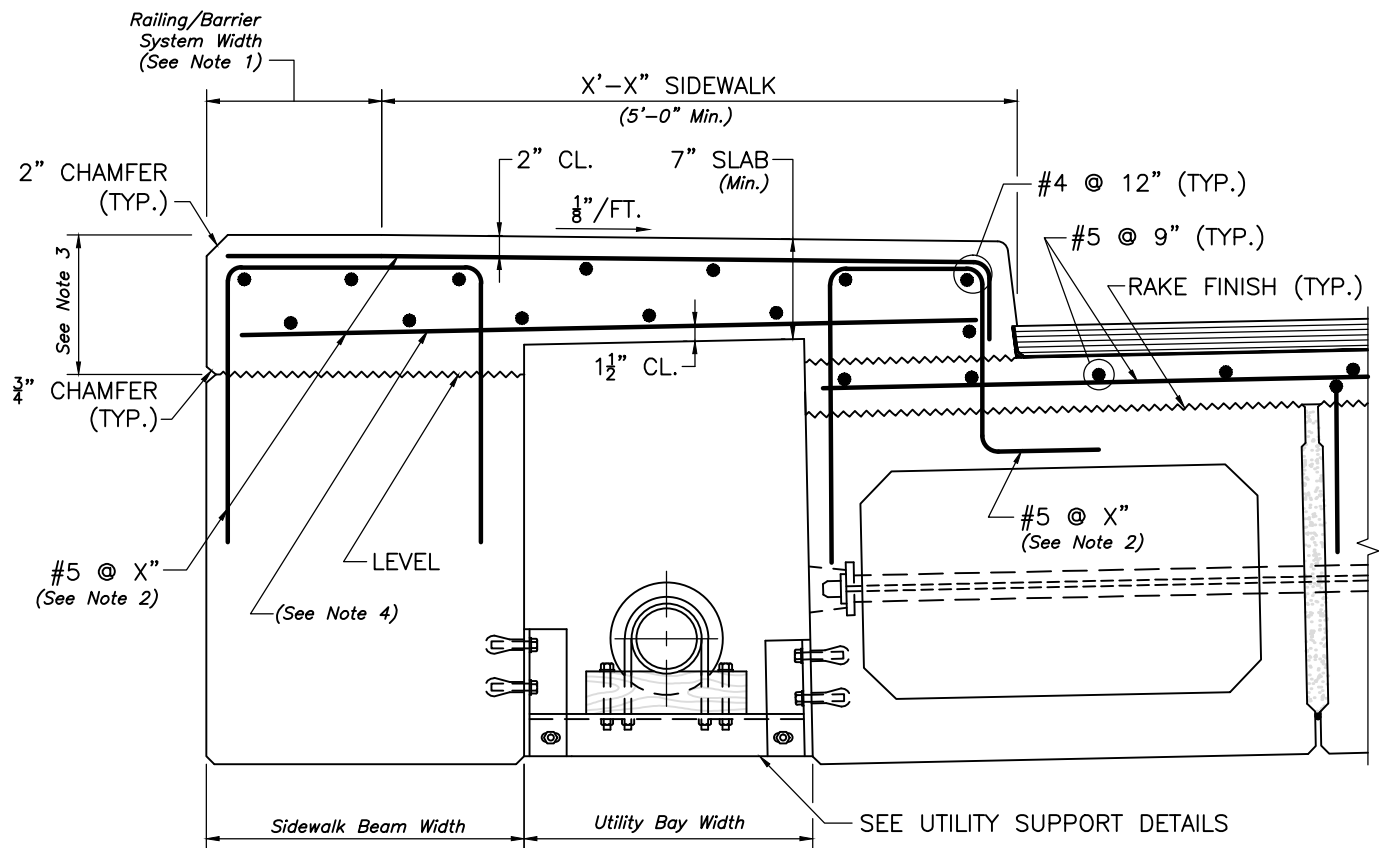
LRFD BRIDGE  
MANUAL, PART II

SIDEWALK DETAIL W/UTILITY  
BAY FOR DECK BEAMS  
SIDEWALK AND SAFETY CURB DETAILS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

**4.3.3**



#### NOTES:

1. DECK SLAB SHALL BE 4000 PSI,  $\frac{3}{4}$  IN, 585 HP CEMENT CONCRETE.
2. SIDEWALK AND SAFETY CURB CONCRETE SHALL BE 5000 PSI,  $\frac{3}{4}$  IN, 685 HP CEMENT CONCRETE.

### SIDEWALK SECTION

SCALE: 1" = 1'-0"

#### NOTES:

1. Dimensions vary depending on railing or barrier used. Modify the sections in Chapter 9 to show the beam arrangement and details shown above.
2. Spacing of the sidewalk reinforcement shall be designed and it shall be spaced in multiples of beam stirrups and top of beam slab reinforcement.
3. Depth of slab over sidewalk beam must be sufficient to embed the bolts or develop the reinforcing of the railing or barrier system.
4. The development length of the slab reinforcement shall be labeled on both sides of the utility bay (15" Min.)
5. Do not provide paraffin joints in sidewalk.
6. For bridges with large utilities and shallow beams, this detail may not be practical, in which case use exterior utility supports shown on Dwg. No. 4.3.6.



LRFD BRIDGE  
MANUAL, PART II

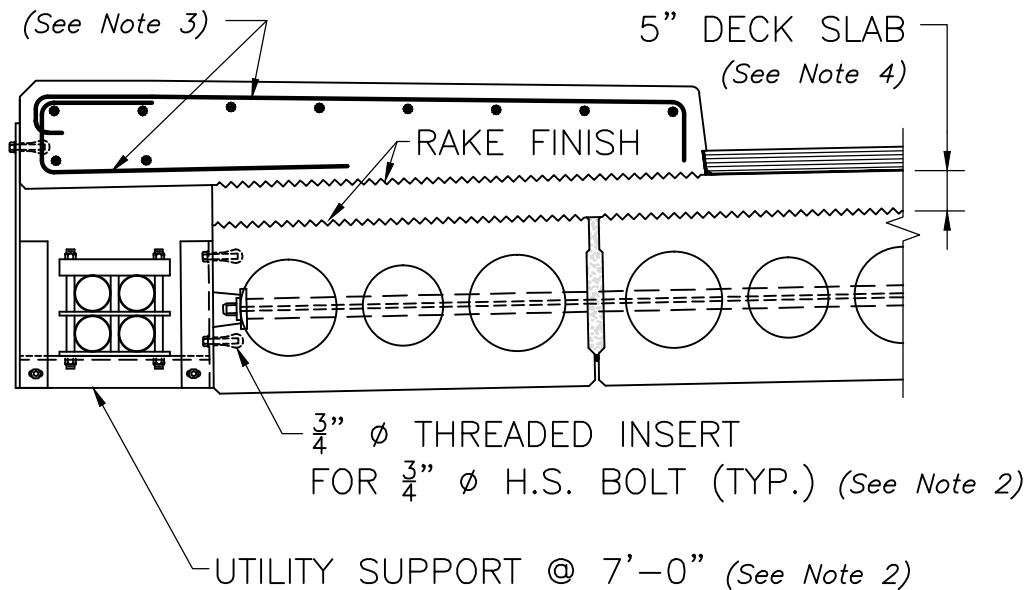
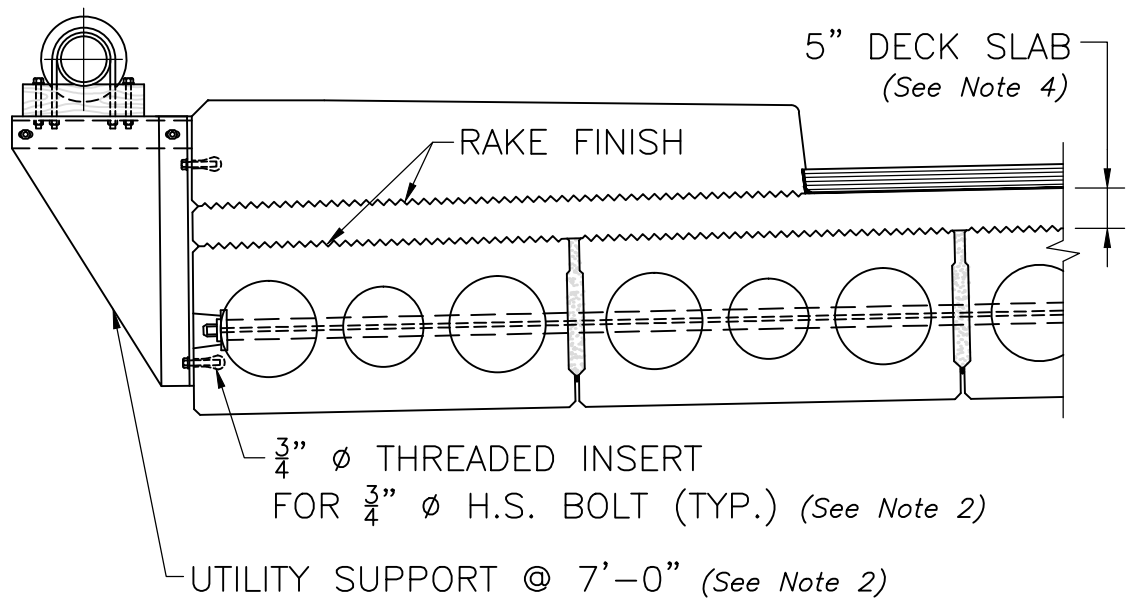
## SIDEWALK DETAIL W/UTILITY BAY FOR BOX BEAMS

SIDEWALK AND SAFETY CURB DETAILS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

**4.3.4**



## EXTERIOR UTILITY SUPPORTS FOR DECK BEAMS

SCALE:  $\frac{1}{2}$ " = 1'-0"

### NOTES:

1. Incorporate the above details with the sidewalk details shown on Dwg. No. 4.3.1.
2. The Designer shall be responsible for the design of the utility supports and shall check the adequacy of the bolts and inserts. Inserts shall be spaced so that they do not interfere with strands or internal voids. The details of the utility support shall be shown on the Construction Drawings.
3. For reinforcement, see Chapter 9, Railing/Barrier Systems, overhanging sidewalk details.
4. The thickness of the deck slab may need to be increased to accommodate roadway profile.



LRFD BRIDGE  
MANUAL, PART II

## EXTERIOR UTILITY SUPPORTS FOR DECK BEAMS

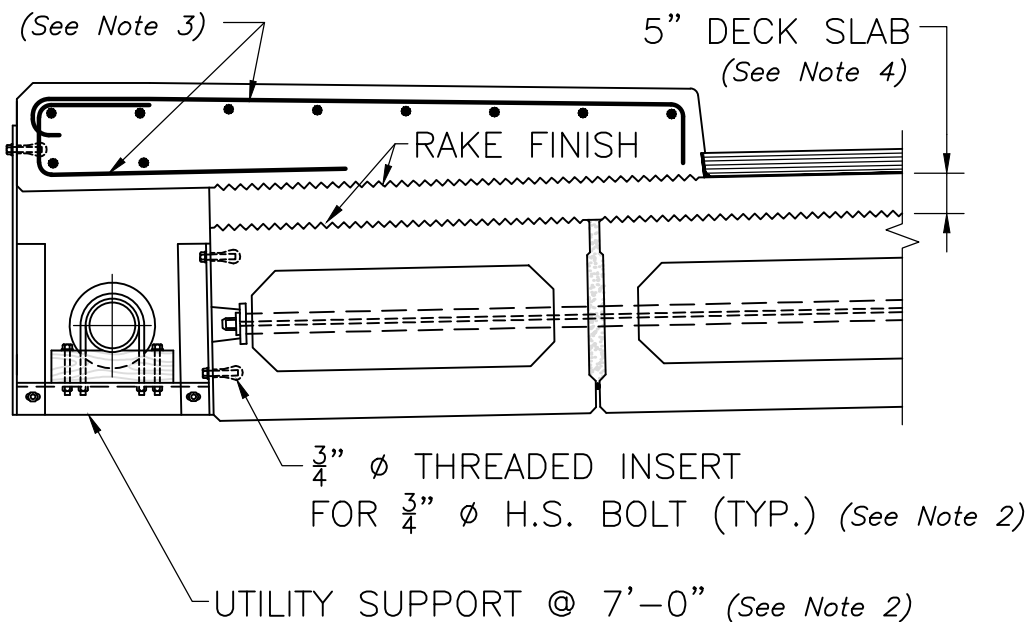
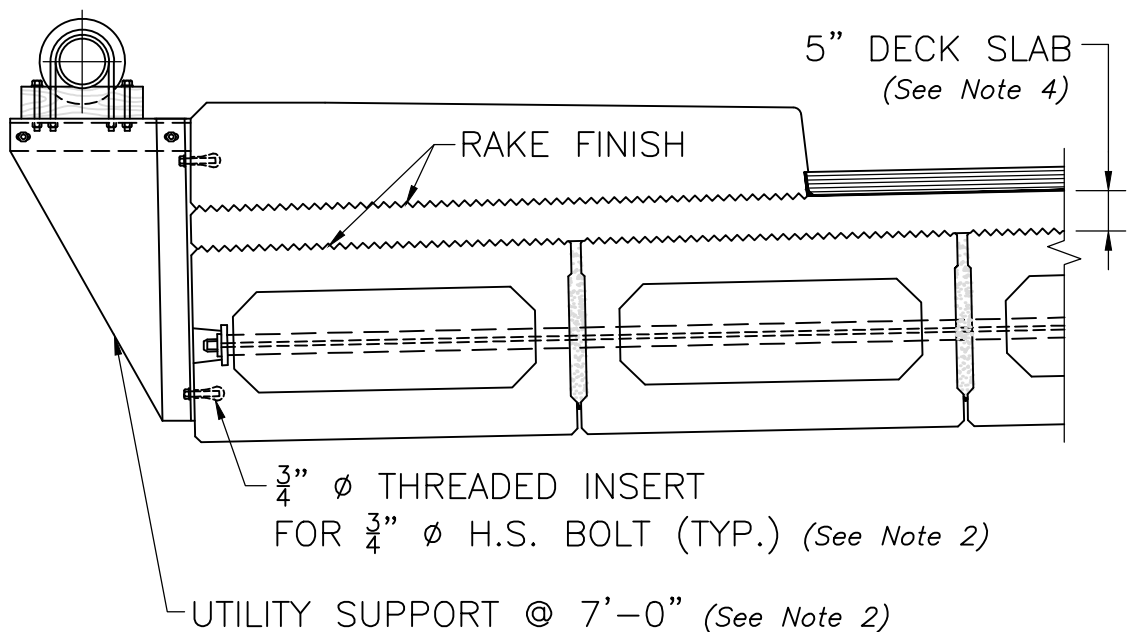
SIDEWALK AND SAFETY CURB DETAILS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

**4.3.5**





## EXTERIOR UTILITY SUPPORTS FOR BOX BEAMS

SCALE:  $\frac{1}{2}$ " = 1'-0"

### NOTES:

1. Incorporate the above details with the sidewalk details shown on Dwg. No. 4.3.2.
2. The Designer shall be responsible for the design of the utility supports and shall check the adequacy of the bolts and inserts. Inserts shall be spaced so that they do not interfere with strands or internal voids. The details of the utility support shall be shown on the Construction Drawings.
3. For reinforcement, see Chapter 9, Railing/Barrier Systems, overhanging sidewalk details.
4. The thickness of the deck slab may need to be increased to accommodate roadway profile.



LRFD BRIDGE  
MANUAL, PART II

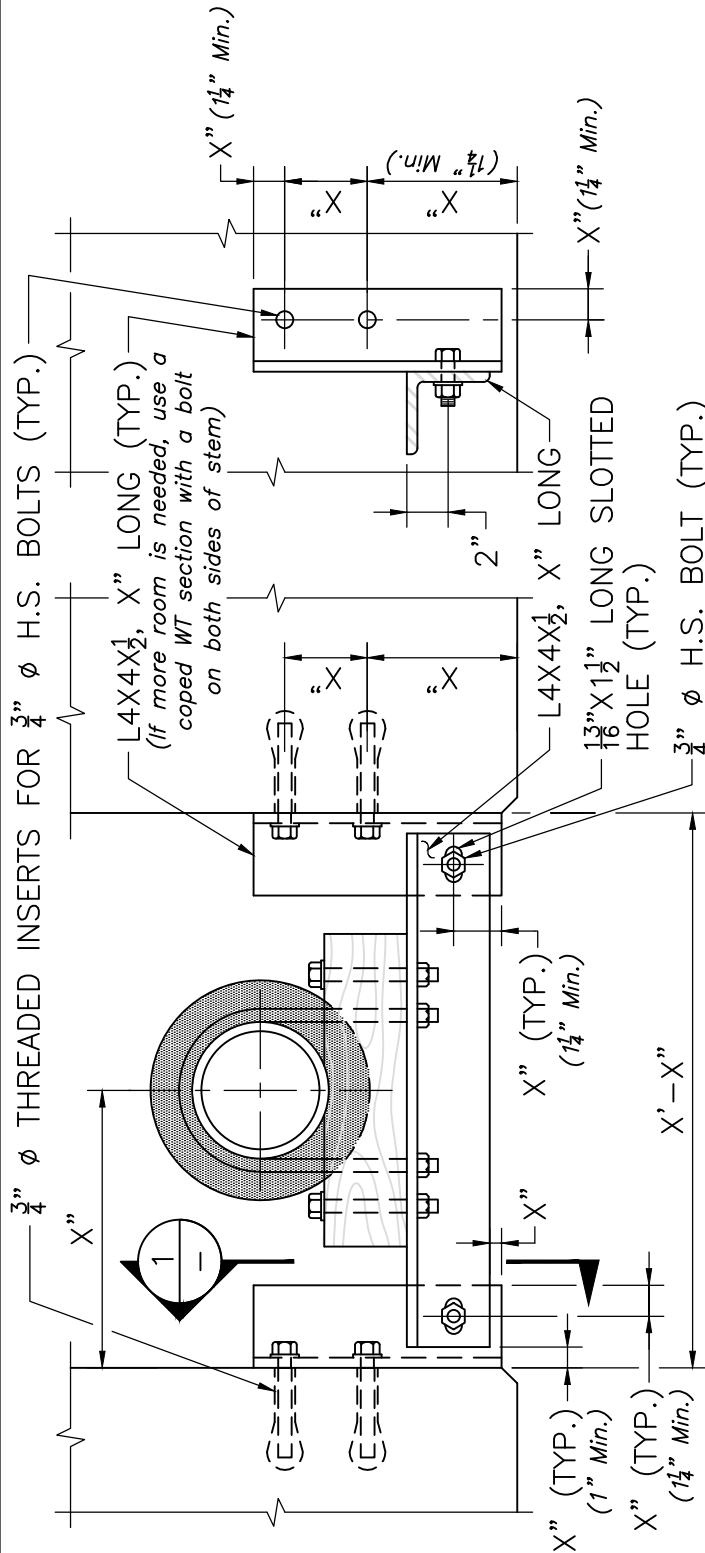
## EXTERIOR UTILITY SUPPORTS FOR BOX BEAMS

SIDEWALK AND SAFETY CURB DETAILS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

**4.3.6**



### ELEVATION

### SECTION 1

#### NOTES:

1. ALL STRUCTURAL STEEL SHALL CONFORM TO AASHTO M 270 GRADE 36.
2. ALL STRUCTURAL STEEL AND FASTENERS SHALL BE GALVANIZED IN ACCORDANCE WITH AASHTO M 111 AND M 232.
3. THE  $\frac{3}{4}$ "  $\phi$  THREADED INSERTS FOR  $\frac{3}{4}$ "  $\phi$  BOLTS SHALL BE CAST INTO THE PRECAST BEAMS BY THE FABRICATOR AND SHALL PROVIDE A MINIMUM NOMINAL TENSILE RESISTANCE OF 6.0 KIPS AND A MINIMUM NOMINAL SHEAR RESISTANCE OF 6.0 KIPS IN 3000 PSI CONCRETE.

#### NOTES:

1. The limits of the utility support detailed above are: Maximum total utility weight is 250 plf; Maximum utility bay width is 4'-0"; Maximum support spacing is 10'-0". If any of these limits is exceeded, the Designer shall size the members accordingly.
2. Position the bolts such that they meet the standard edge distances and construction requirements and that the inserts do not interfere with strands and reinforcing bars.

### UTILITY SUPPORT DETAILS

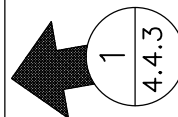
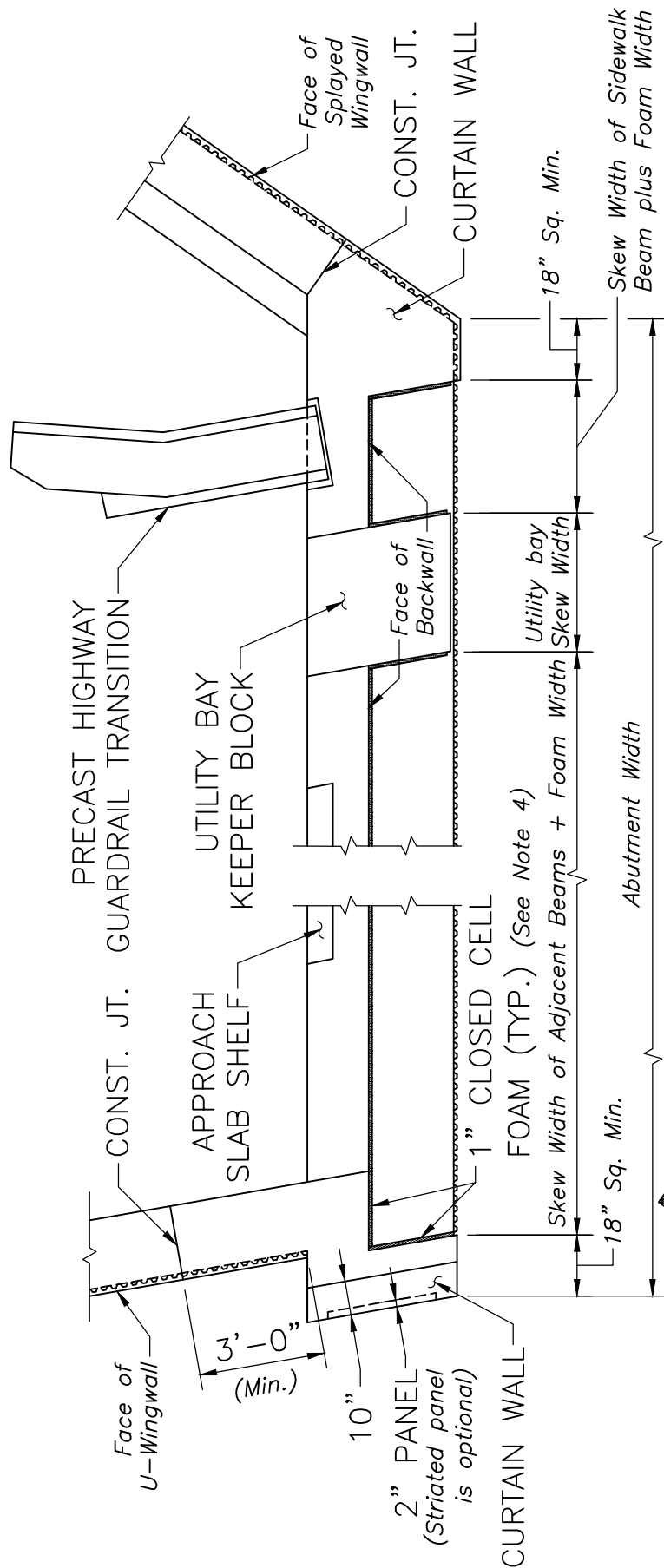
SCALE:  $1\frac{1}{2}" = 1'-0"$

# ABUTMENT PLAN

## ABUTMENT DETAILS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER  
**4.4.1**



BRIDGE WITHOUT UTILITY BAY  
BRIDGE WITH U-WINGWALLS

BRIDGE WITH UTILITY BAY  
BRIDGE WITH SPLAYED WINGWALLS

### ABUTMENT PLAN

SCALE: ( $\frac{1}{4}$ " = 1'-0" Min.)

#### NOTES:

1. Utility bay details may be used with either U-wingwalls or splayed wingwalls.
2. Remainder of abutment has been omitted for clarity.
3. Abutment Plan shall be drawn without breaks and to scale on the Construction Drawings. Include all relevant dimensions, angles, survey information and North Arrow.
4. The thickness of the closed cell foam may be increased as necessary to accommodate thermal expansion.

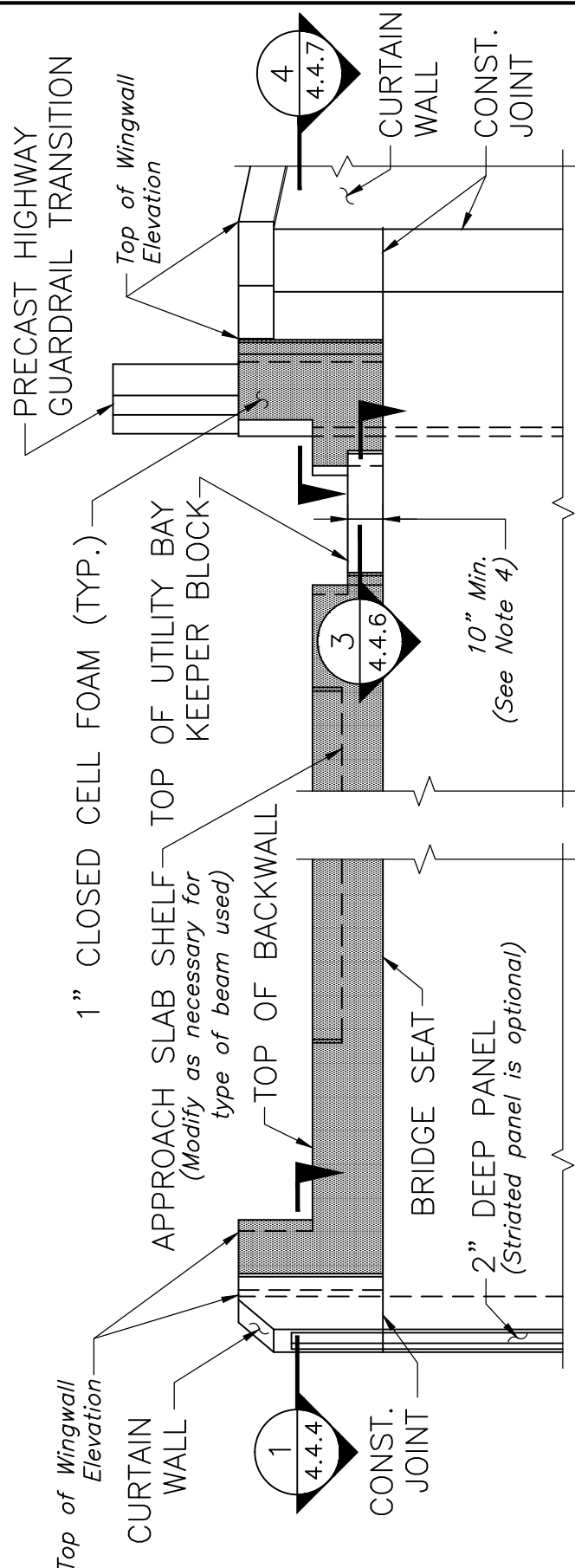
# ABUTMENT ELEVATION

ABUTMENT DETAILS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

**4.4.2**



BRIDGE WITHOUT UTILITY BAY  
BRIDGE WITH U-WINGWALLS

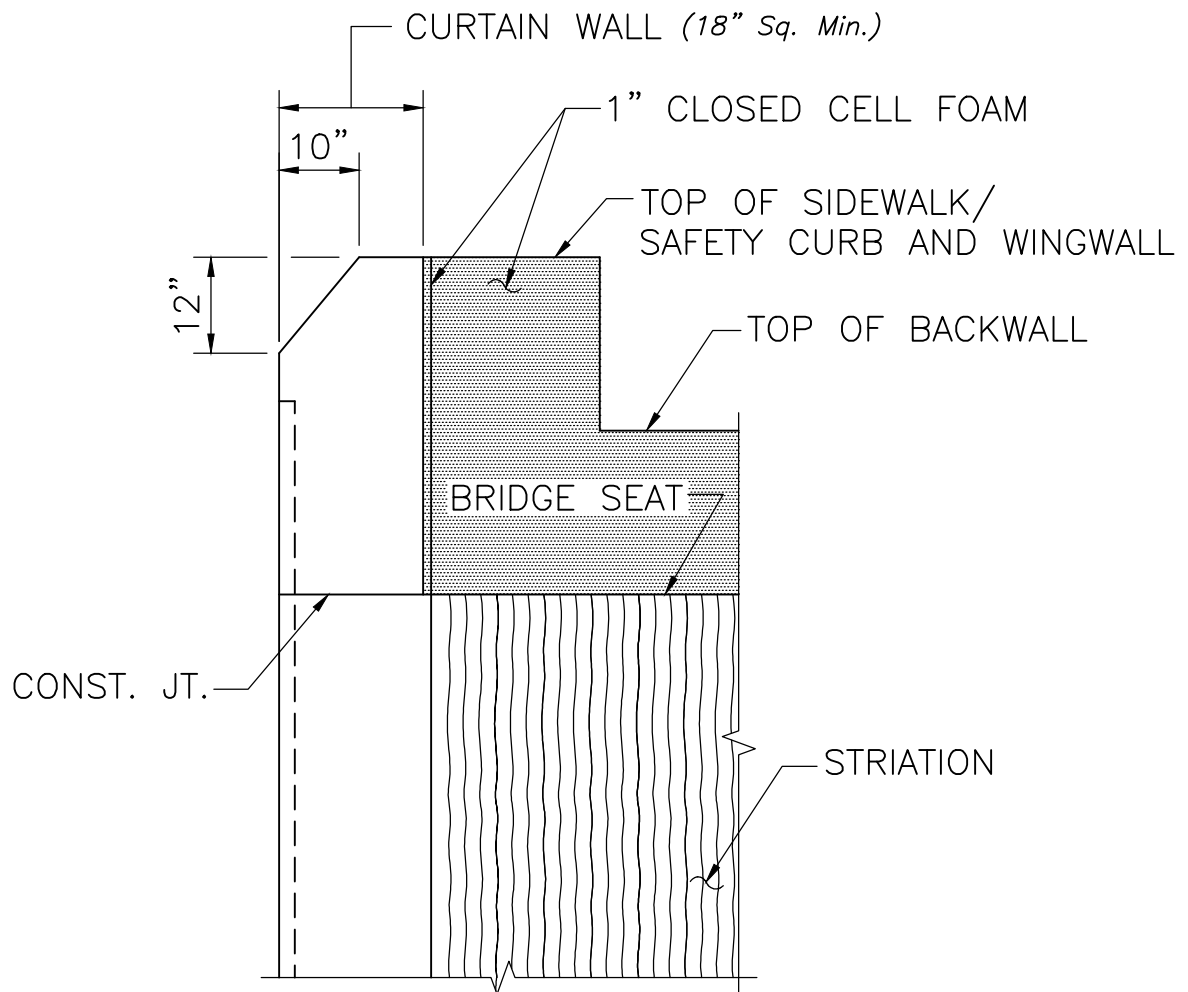
BRIDGE WITH UTILITY BAY  
BRIDGE WITH SPLAYED WINGWALLS

## ABUTMENT ELEVATION

SCALE: ( $\frac{1}{4}$ " = 1'-0" Min.)

### NOTES:

1. Utility bay details may be used with either U-wingwalls or splayed wingwalls.
2. Remainder of abutment has been omitted for clarity.
3. Abutment Elevation shall be drawn without breaks and to scale on the Construction Drawings.
4. If a 10" minimum height of the utility bay keeper block interferes with the placement of the utilities, the Designer shall design an alternate method to brace the beams laterally for seismic loads.
5. Striations are not shown for clarity, but shall be shown on the Construction Drawings.



**VIEW 1**  
SCALE:  $\frac{1}{2}" = 1'-0"$



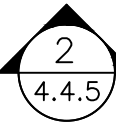
LRFD BRIDGE  
MANUAL, PART II

# DETAIL AT U-WINGWALL CORNER ABUTMENT DETAILS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

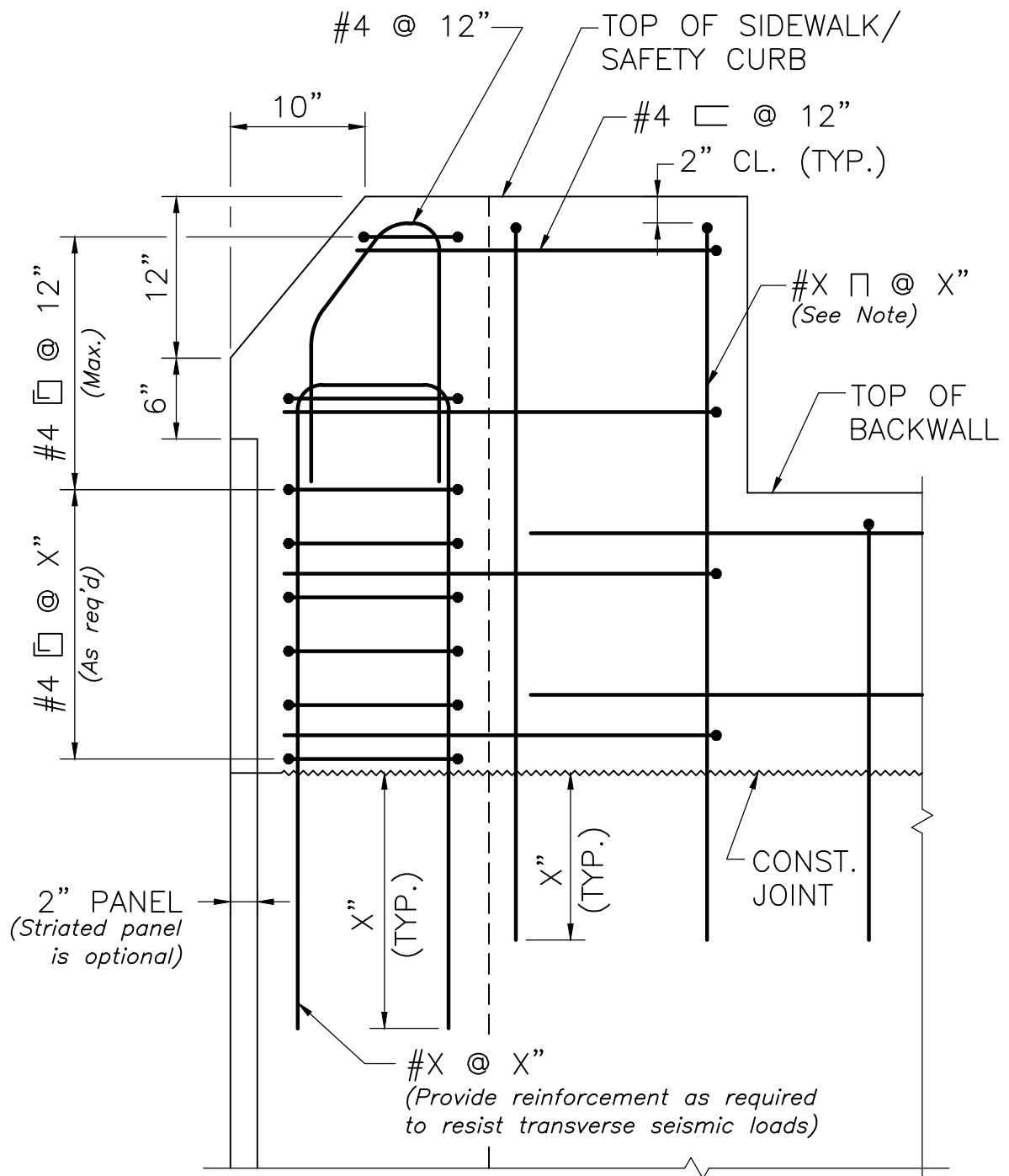
**4.4.3**



ATTACH CLOSED CELL FOAM TO THE BACK AND SIDE OF THE EXTERIOR PRECAST BEAM PRIOR TO PLACING THE CONCRETE FOR THE BACKWALL AND CURTAIN WALL.

SCALE:  $1'' = 1'-0''$

*Backwall reinforcement extending into the top of abutment shall be designed to resist longitudinal seismic loads. At a minimum, provide #5 @ 12".*



### NOTE:

REINFORCEMENT BELOW CONSTRUCTION JOINT HAS BEEN OMITTED FOR CLARITY.

## SECTION 2

SCALE: 1" = 1'-0"

### NOTE:

Backwall reinforcement extending into the top of abutment shall be designed to resist longitudinal seismic loads. At a minimum, provide #5 @ 12".



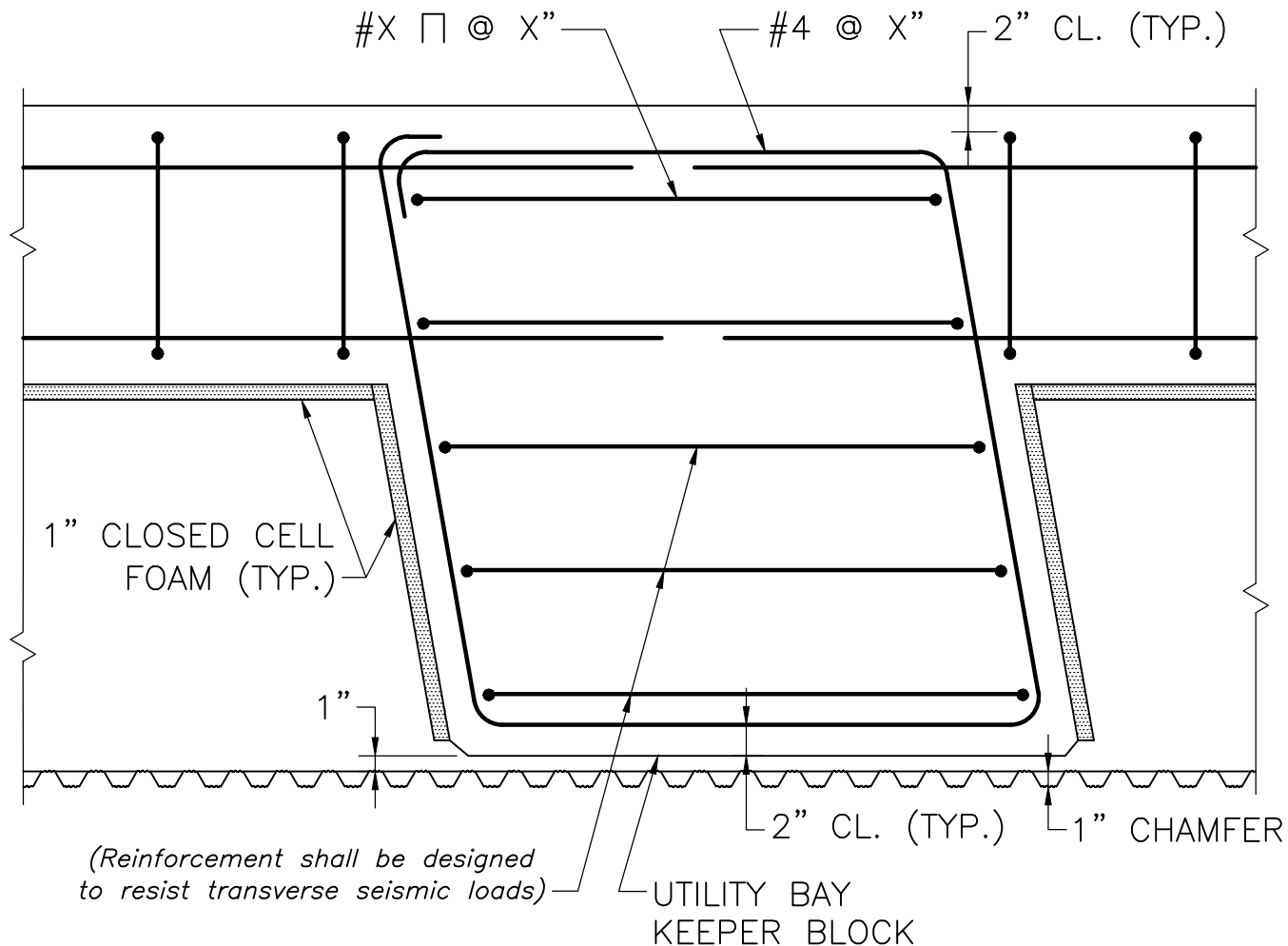
LRFD BRIDGE  
MANUAL, PART II

SECTION AT ABUTMENT  
END U-WINGWALLS  
ABUTMENT DETAILS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

**4.4.5**



### NOTE:

ATTACH CLOSED CELL FOAM TO THE BACK AND SIDE OF THE PRECAST BEAMS PRIOR TO PLACING THE CONCRETE FOR THE BACKWALL AND UTILITY BAY KEEPER BLOCK.

## SECTION 3

SCALE: 1" = 1'-0"



LRFD BRIDGE  
MANUAL, PART II

## PLAN SECTION AT UTILITY BAY KEEPER BLOCK

ABUTMENT DETAILS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

**4.4.6**



PRECAST HIGHWAY  
GUARDRAIL TRANSITION  
(SEE NOTE)

BLOCK-OUT IN  
BACKWALL AND  
ABUTMENT  
PERPENDICULAR  
TO  $\phi$  ROADWAY

FILL WITH NON-SHRINK GROUT  
AFTER CONTROLLED DENSITY  
FILL BELOW HAS SET  
(See Note)

CONST. JT.

2"  $\pm$  (TYP.)

2" CL. (TYP.)

5  
4.4.8

#4 @ X"

1" CLOSED  
CELL FOAM

1" CHAMFER

#X  $\square$  @ X"

(Reinforcement to be designed to resist  
transverse seismic loads)

NOTE:  
See Chapter 3, Precast  
Highway Guardrail Transitions,  
for additional information  
and relevant details.

NOTE:

ATTACH CLOSED CELL FOAM TO THE BACK AND SIDE OF THE EXTERIOR PRECAST  
BEAM PRIOR TO PLACING THE CONCRETE FOR THE BACKWALL AND CURTAIN WALL.

## SECTION 4

SCALE:  $\frac{3}{4}" = 1'-0"$



LRFD BRIDGE  
MANUAL, PART II

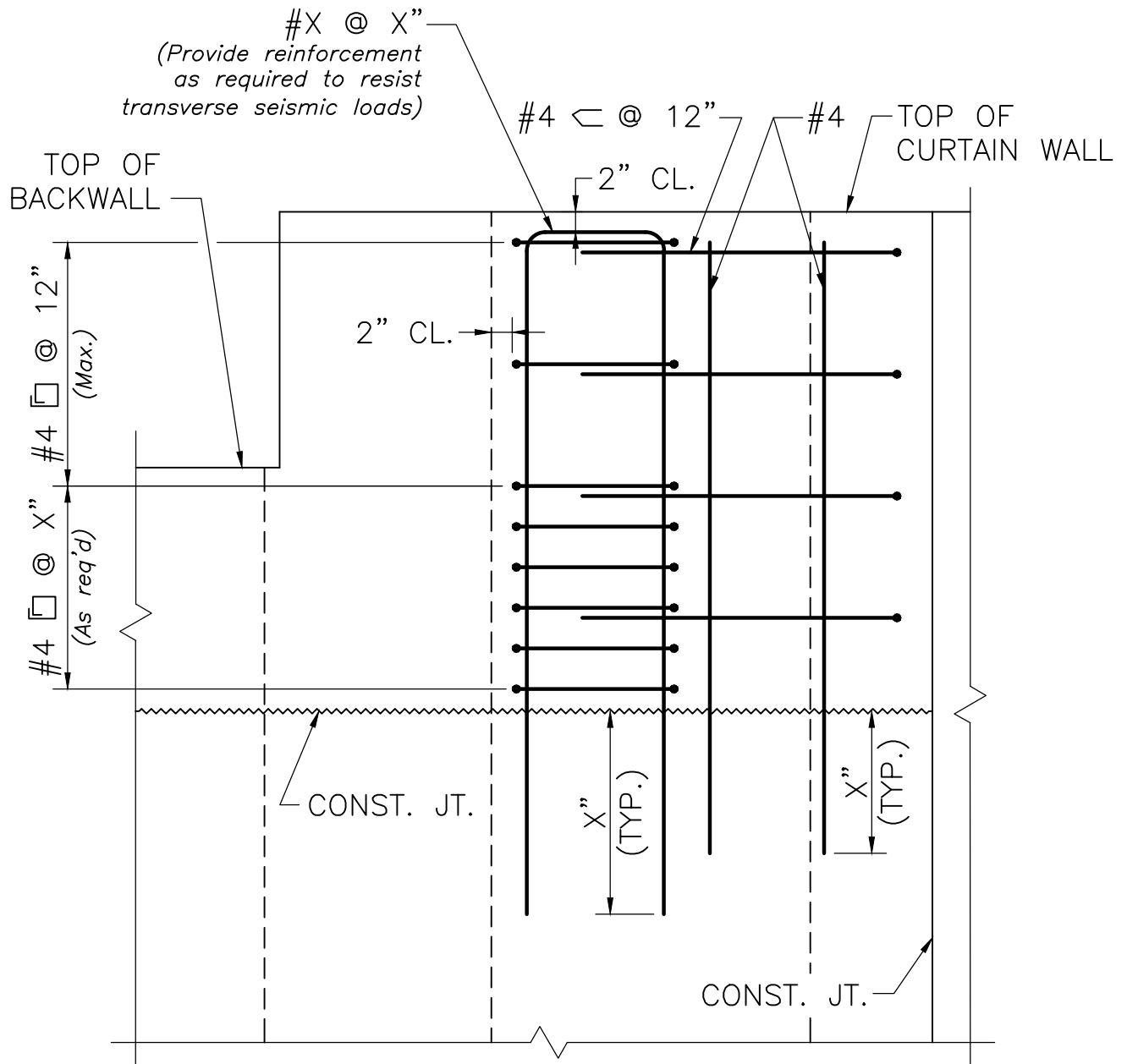
# PLAN SECTION AT ABUTMENT END SPLAYED WINGWALLS

ABUTMENT DETAILS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

**4.4.7**



**NOTE:**

REINFORCEMENT BELOW HORIZONTAL CONSTRUCTION JOINT HAS BEEN OMITTED FOR CLARITY.

**SECTION 5**

SCALE:  $\frac{3}{4}" = 1'-0"$



LRFD BRIDGE  
MANUAL, PART II

**SECTION AT ABUTMENT END  
SPLAYED WINGWALLS**

ABUTMENT DETAILS

DATE OF ISSUE  
JUNE 2013

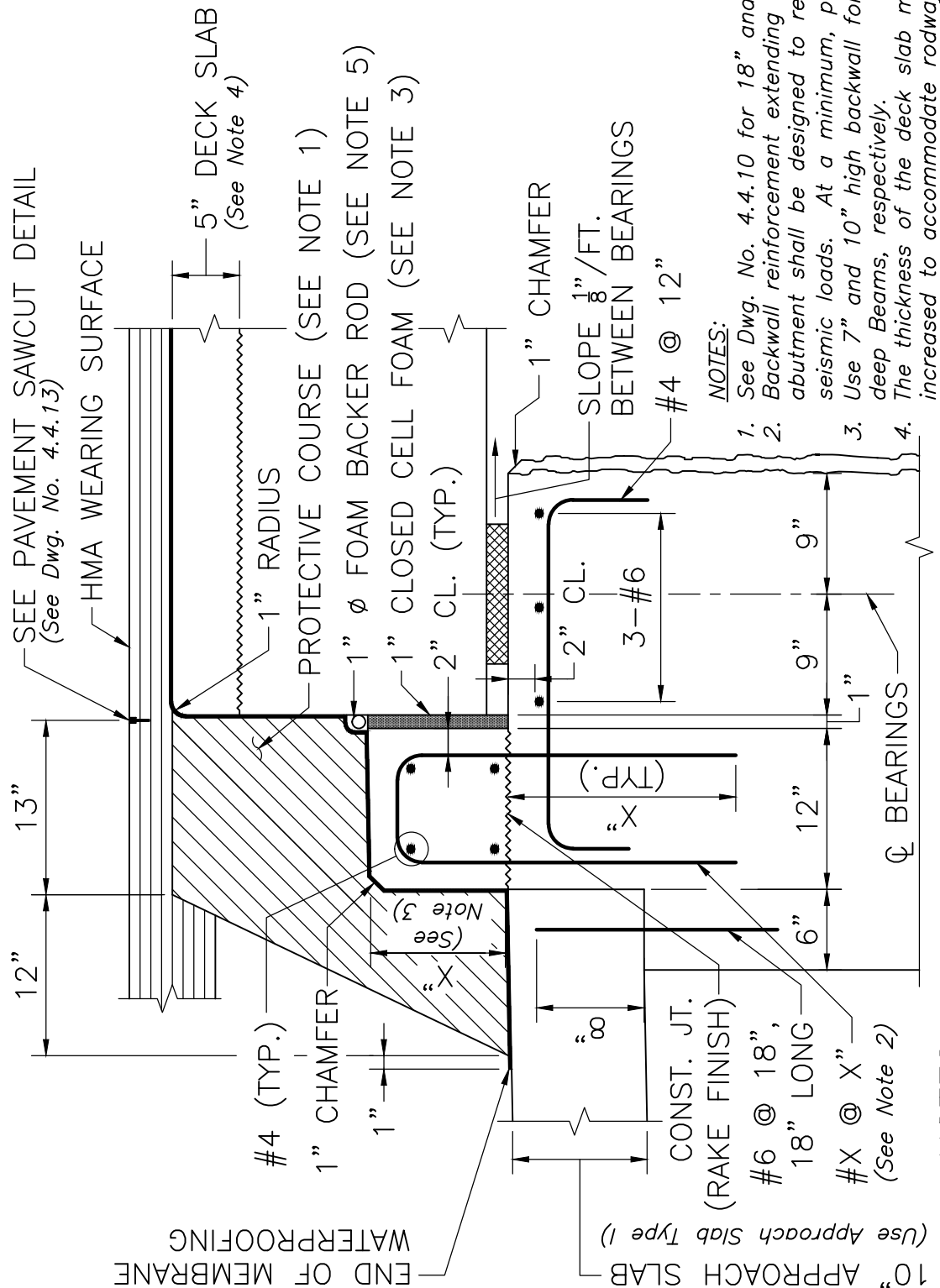
DRAWING NUMBER

**4.4.8**

# ROADWAY SECTION FOR 12" & 15" DEEP DECK BEAMS ABUTMENT DETAILS

DATE OF ISSUE  
 JUNE 2013

DRAWING NUMBER  
**4.4.9**



- NOTES:**
1. See Dwg. No. 4.4.10 for 18" and 21" deep Beams.
  2. Backwall reinforcement extending into the top of abutment shall be designed to resist longitudinal seismic loads. At a minimum, provide #5 @ 12".
  3. Use 7" and 10" high backwall for 12" and 15" deep Beams, respectively.
  4. The thickness of the deck slab may need to be increased to accommodate roadway profile.

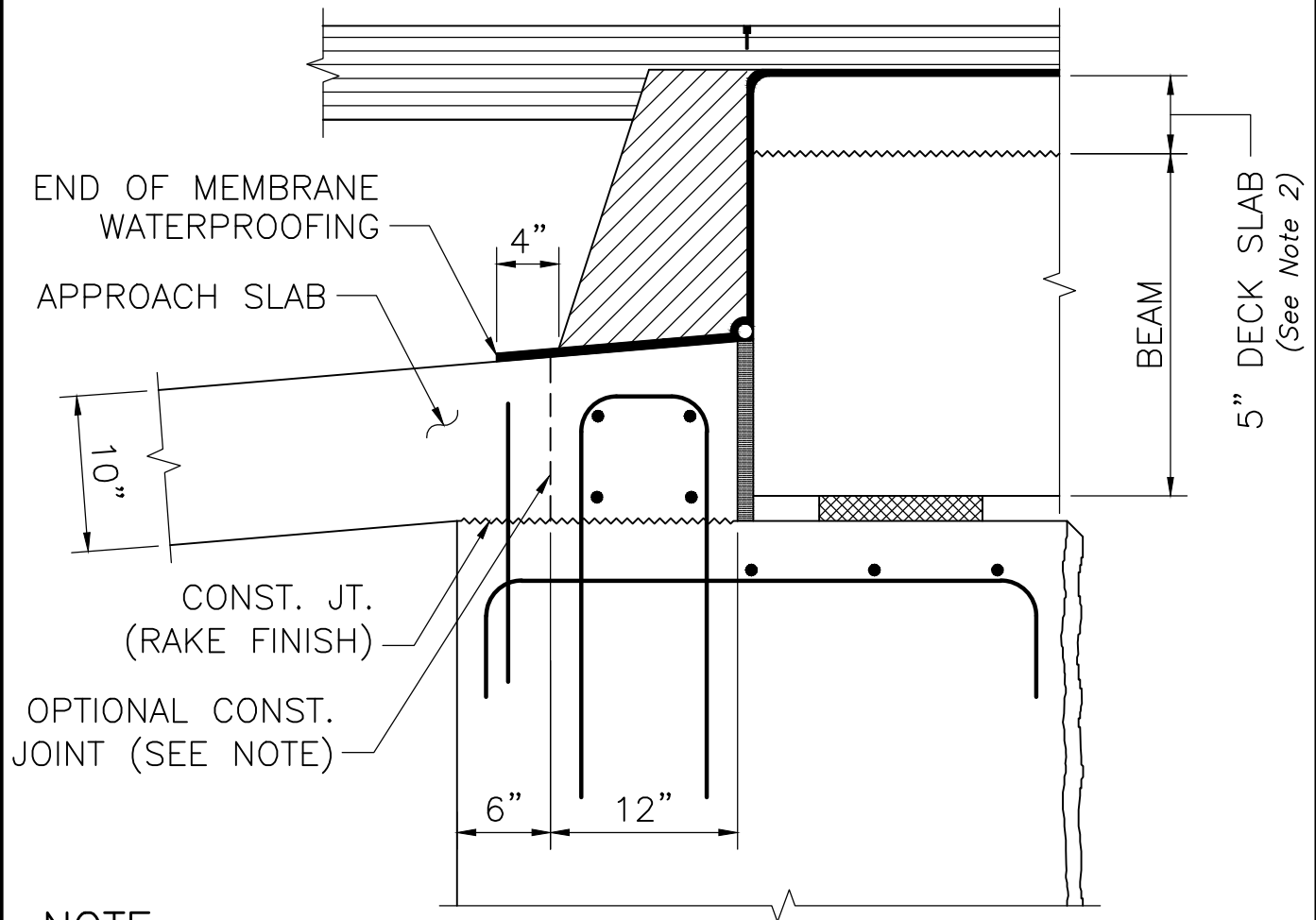
## NOTES:

(See Dwg. No. 4.4.12 for Notes to be included on Construction Drawings)

## DETAILS AT ABUTMENT – ROADWAY SECTION

SCALE: 1" = 1'-0"

## MODIFICATIONS FOR 18" AND 21" DEEP DECK BEAMS:



### NOTE:

IF THE APPROACH SLAB IS POURED MONOLITHICALLY WITH THE BACKWALLS, MAKE A 2" DEEP BY  $\frac{1}{8}$ " WIDE SAWCUT IN THE TOP OF THE SLAB AT THE OPTIONAL CONSTRUCTION JOINT LOCATION. FILL SAWCUT WITH CONCRETE JOINT SEALER.

## DETAILS AT ABUTMENT – ROADWAY SECTION

SCALE: 1" = 1'-0"

### NOTES:

1. For 18" and 21" deep beams, modify Dwg. No. 4.4.9 to the reinforcing and construction joint details shown above. Add the note above to the Construction Notes. All other items not detailed or designated above shall be as shown on Dwg. No. 4.4.9.
2. The thickness of the deck slab may need to be increased to accommodate roadway profile.



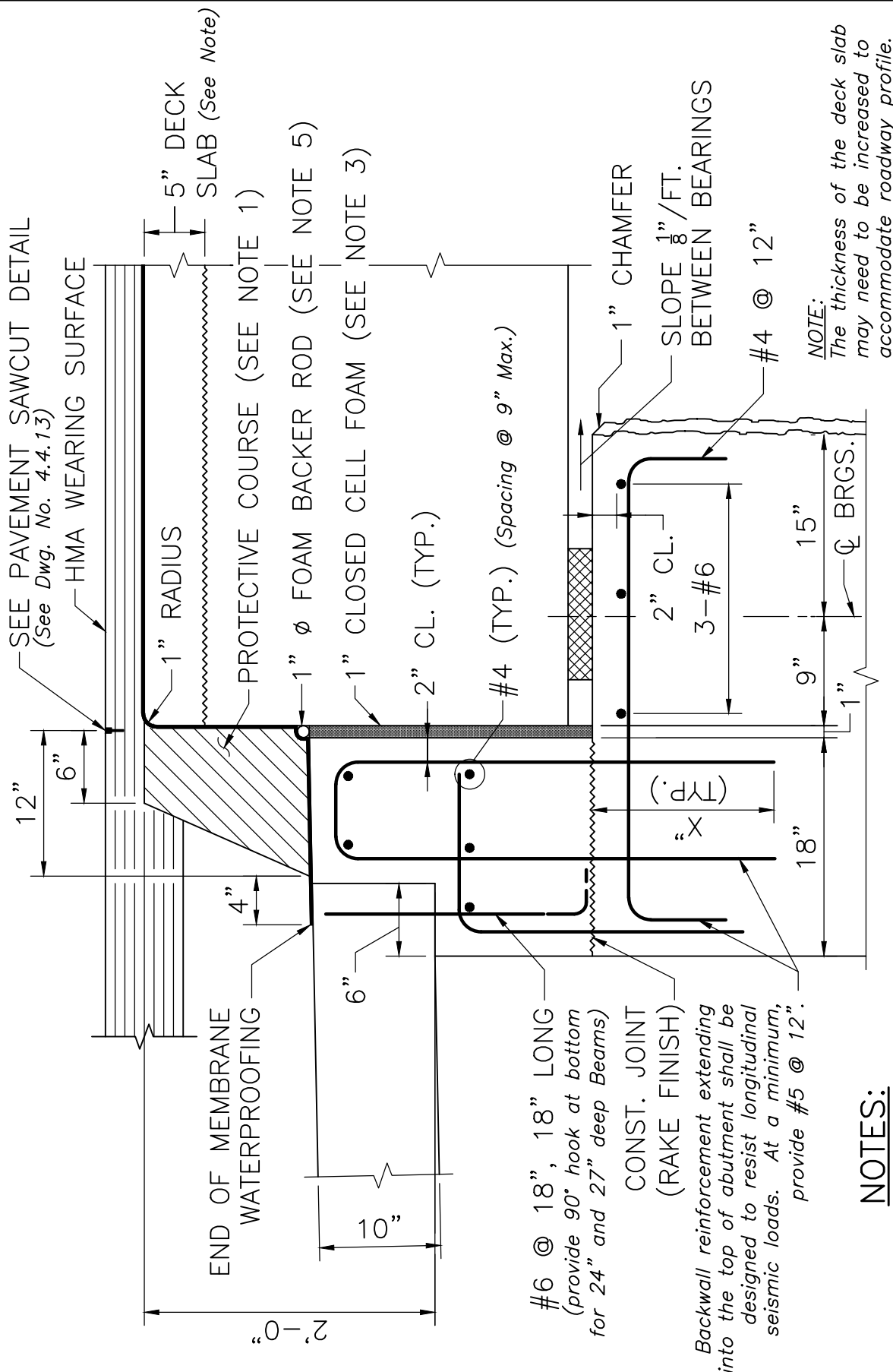
LRFD BRIDGE  
MANUAL, PART II

ROADWAY SECTION FOR 18"  
& 21" DEEP DECK BEAMS  
ABUTMENT DETAILS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

**4.4.10**



**NOTES:**

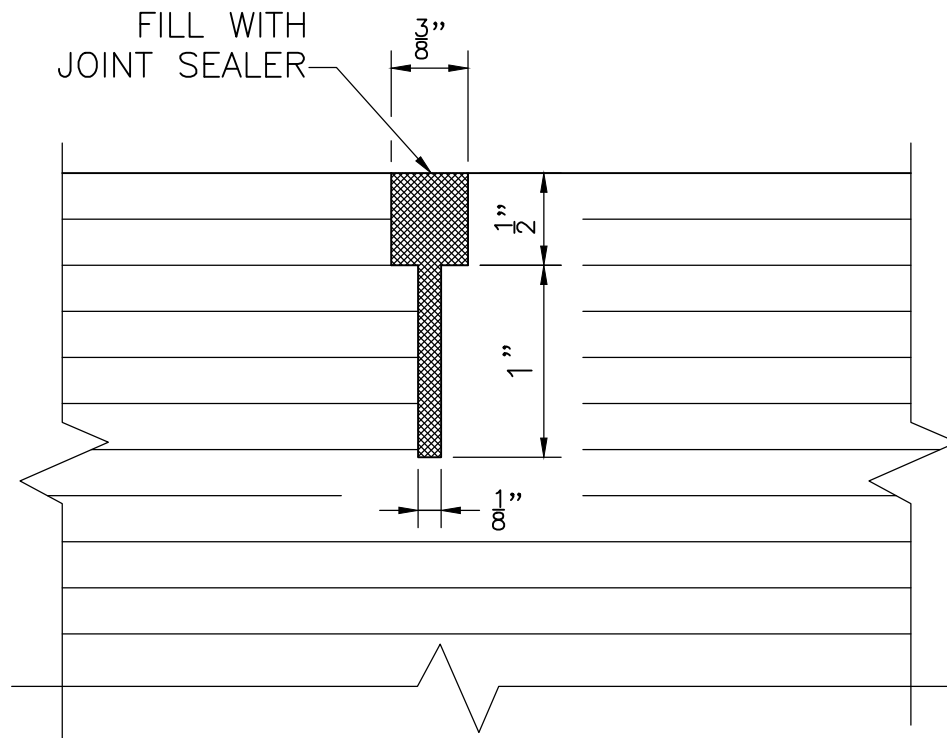
(See Dwg. No. 4.4.12 for Notes to be included on Construction Drawings)

**DETAILS AT ABUTMENT – ROADWAY SECTION**

SCALE: 1" = 1'-0"

**NOTES:** *(Include these Notes with details shown on Dwg. No.'s 4.4.9, 4.4.11, and 4.4.14.)*

1. PROTECTIVE COURSE TO BE CLASS I DENSE BINDER COURSE FOR BRIDGES, PLACED IN 2" LAYERS AND COMPACTED WITH A MECHANICAL HAND-GUIDED TAMPER WITHIN 12 HOURS AFTER PLACING MEMBRANE WATERPROOFING.
2. ALL REINFORCING SHOWN IN THIS DETAIL SHALL BE COATED BARS, EXCEPT FOR APPROACH SLAB REINFORCEMENT.
3. ATTACH CLOSED CELL FOAM TO BACK OF PRECAST BEAM WITH ADHESIVE.
4. ALL KEEPER BLOCK AND BACKWALL CONCRETE SHALL BE 4000 PSI,  $\frac{3}{4}$  IN, 610 CEMENT CONCRETE AND SHALL BE PLACED AFTER ALL BEAMS HAVE BEEN ERECTED.
5. DRAPE MEMBRANE WATERPROOFING OVER CLOSED CELL FOAM BACKER ROD.



## PAVEMENT SAWCUT DETAIL

FULL SIZE



LRFD BRIDGE  
MANUAL, PART II

## PAVEMENT SAWCUT DETAIL

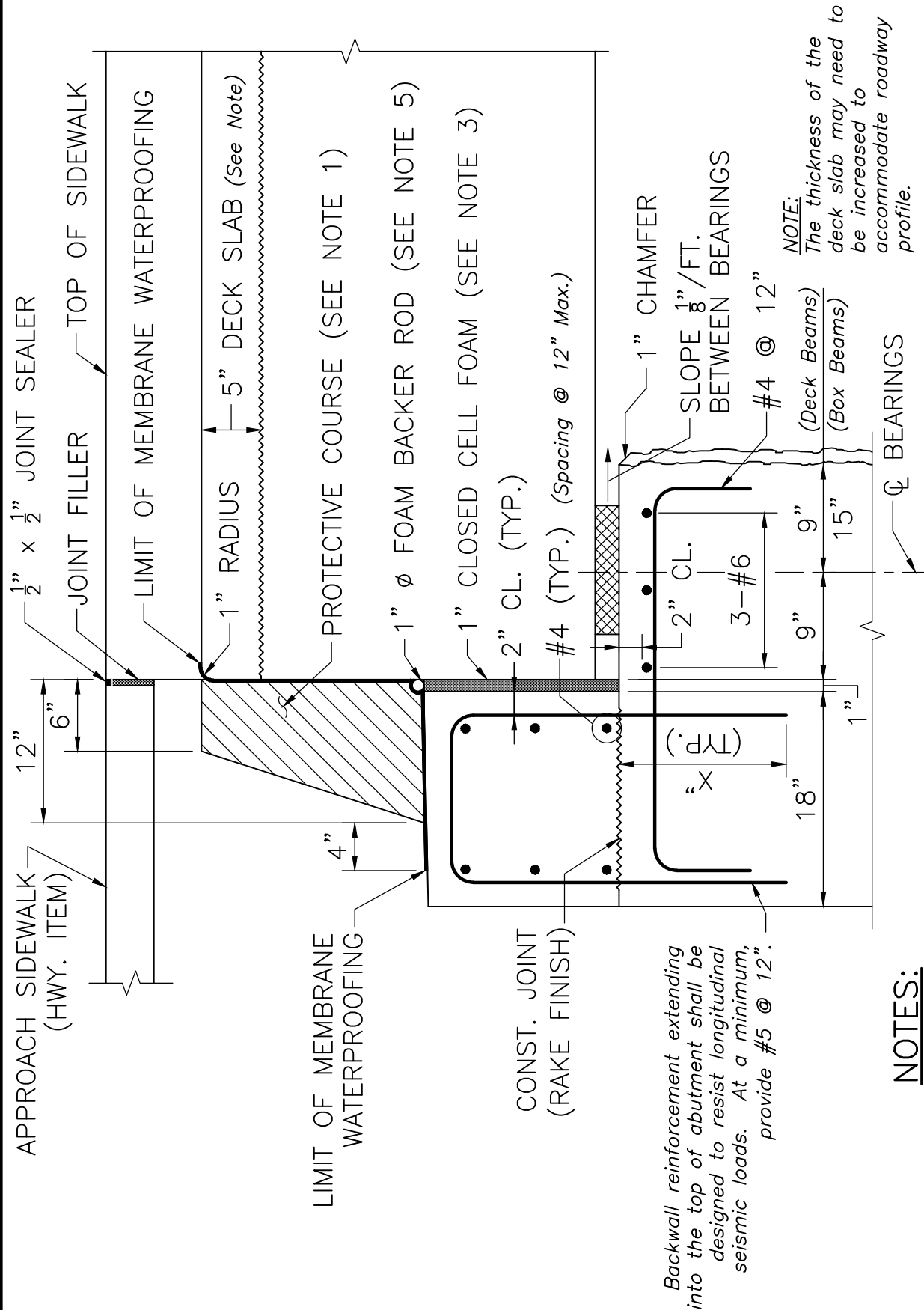
ABUTMENT DETAILS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER  
**4.4.13**

# SIDEWALK SECTION DECK AND BOX BEAMS ABUTMENT DETAILS

DATE OF ISSUE  
JUNE 2013  
DRAWING NUMBER  
**4.4.14**



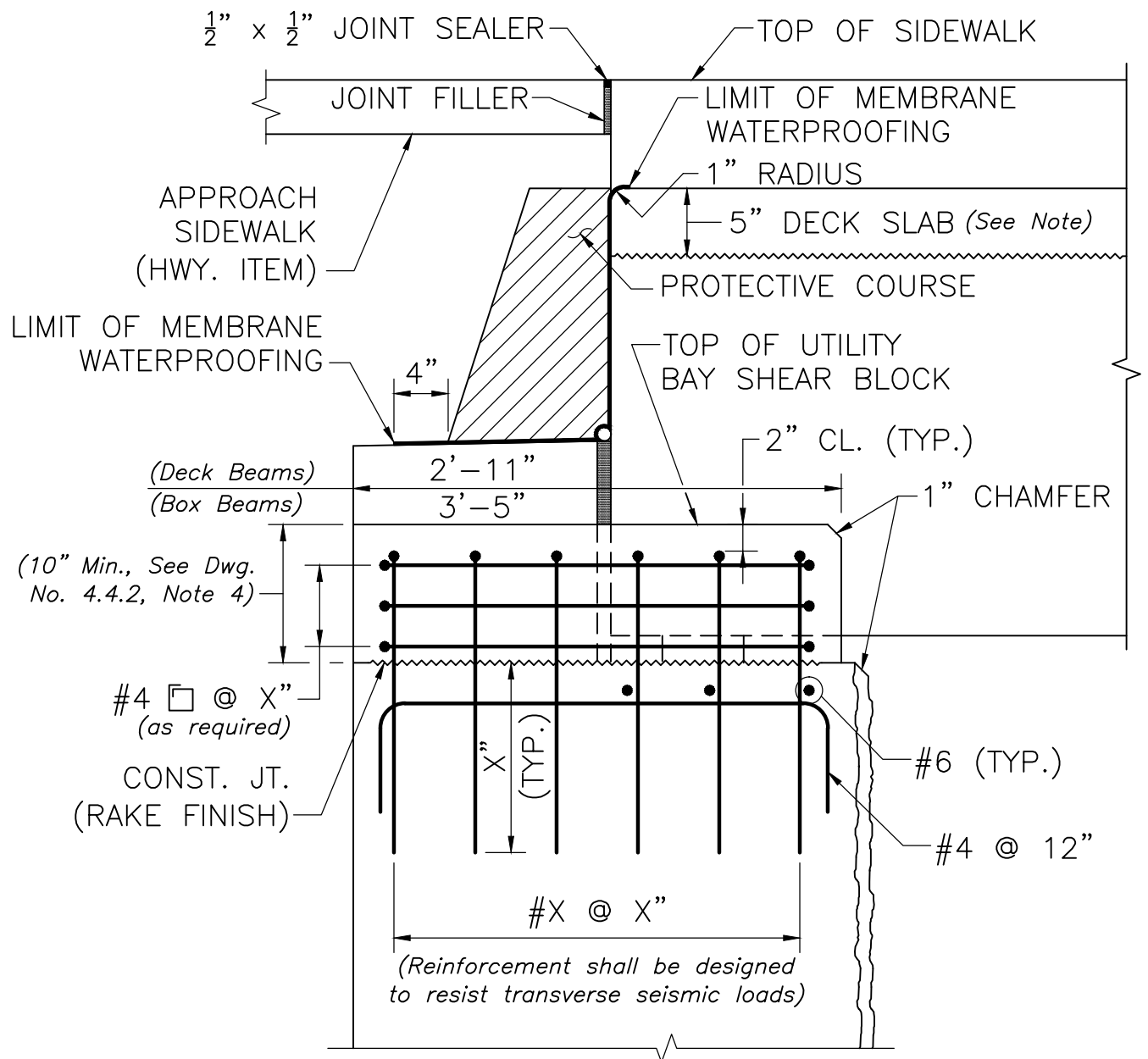
## NOTES:

(See Dwg. No. 4.4.12 for Notes to be included on Construction Drawings, modify as necessary)

## DETAILS AT ABUTMENT – SIDEWALK SECTION

SCALE: 1" = 1'-0"





### NOTES:

1. BRICK-UP AROUND UTILITIES AFTER BEAMS ARE IN PLACE AND AFTER THE BACKWALL AND THE UTILITY BAY SHEAR BLOCK HAVE BEEN CONSTRUCTED.
2. UTILITIES ARE NOT SHOWN FOR CLARITY. *(Designer shall verify proper fit)*

## DETAILS AT ABUTMENT – UTILITY BAY SECTION

SCALE: 1" = 1'-0"

### NOTE:

*The thickness of the deck slab may need to be increased to accommodate roadway profile.*



LRFD BRIDGE  
MANUAL, PART II

## UTILITY BAY SECTION DECK AND BOX BEAMS ABUTMENT DETAILS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

**4.4.15**

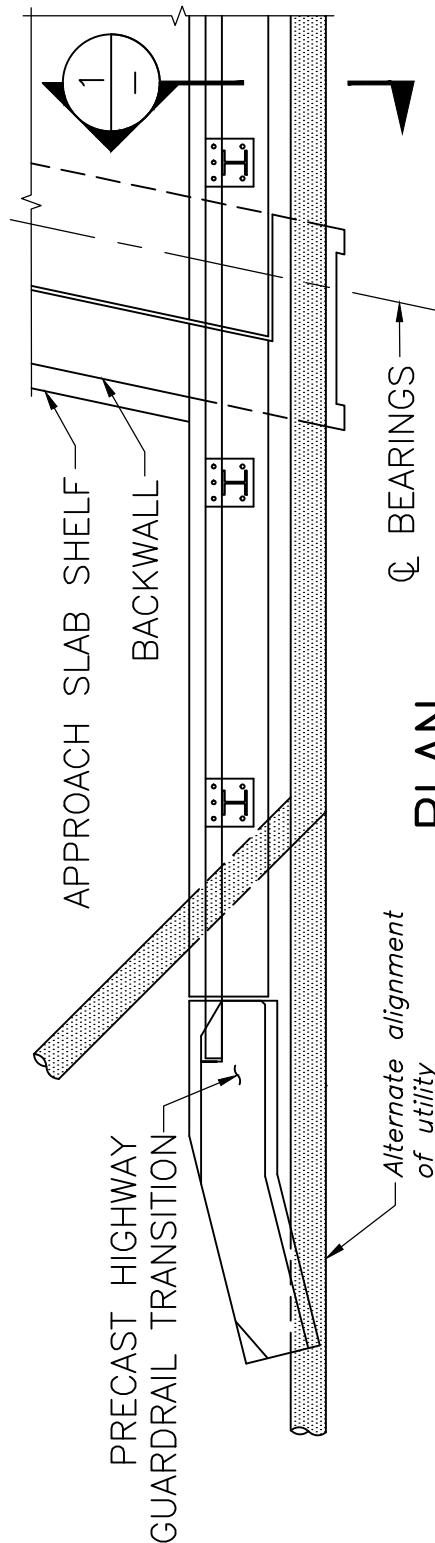
# UTILITY THRU U-WINGWALL

## ABUTMENT DETAILS

DATE OF ISSUE  
 JUNE 2013

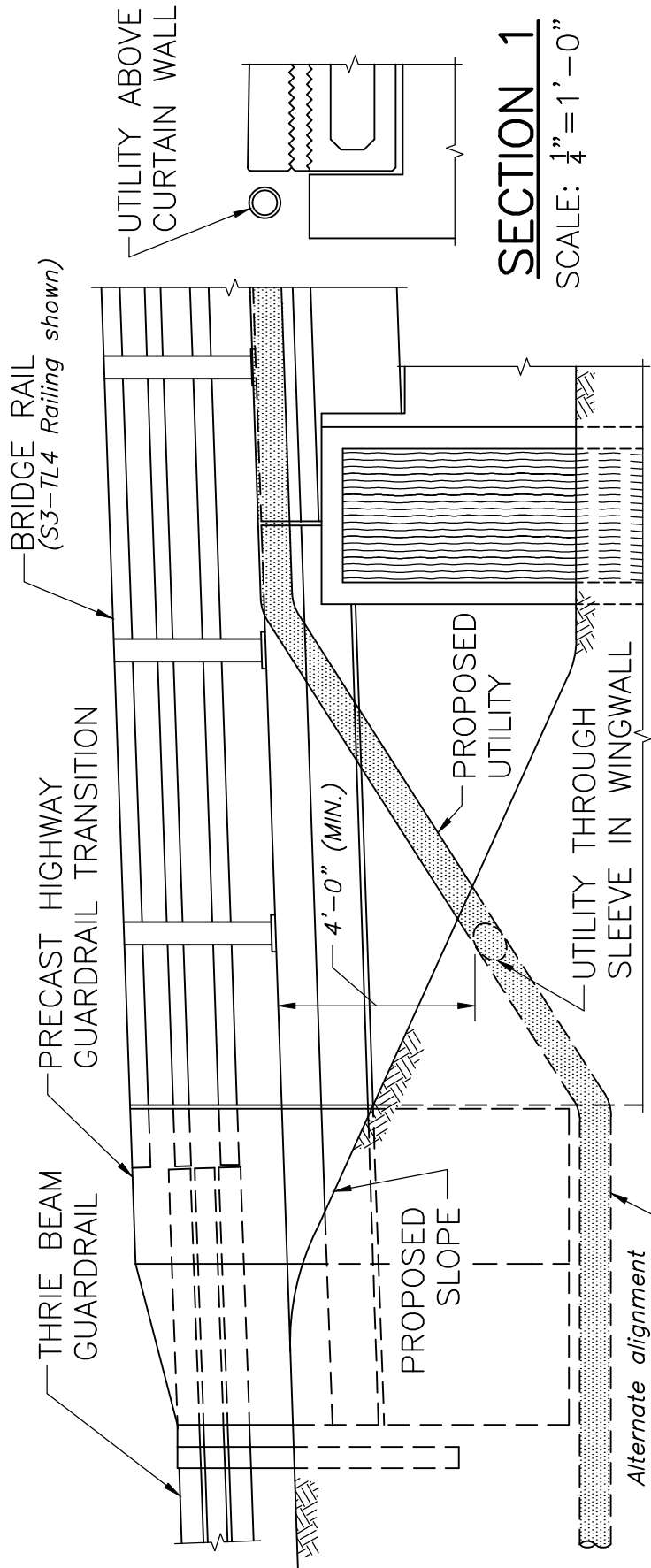
DRAWING NUMBER

**4.4.16**



### PLAN

SCALE:  $\frac{1}{4}$ " = 1'-0"



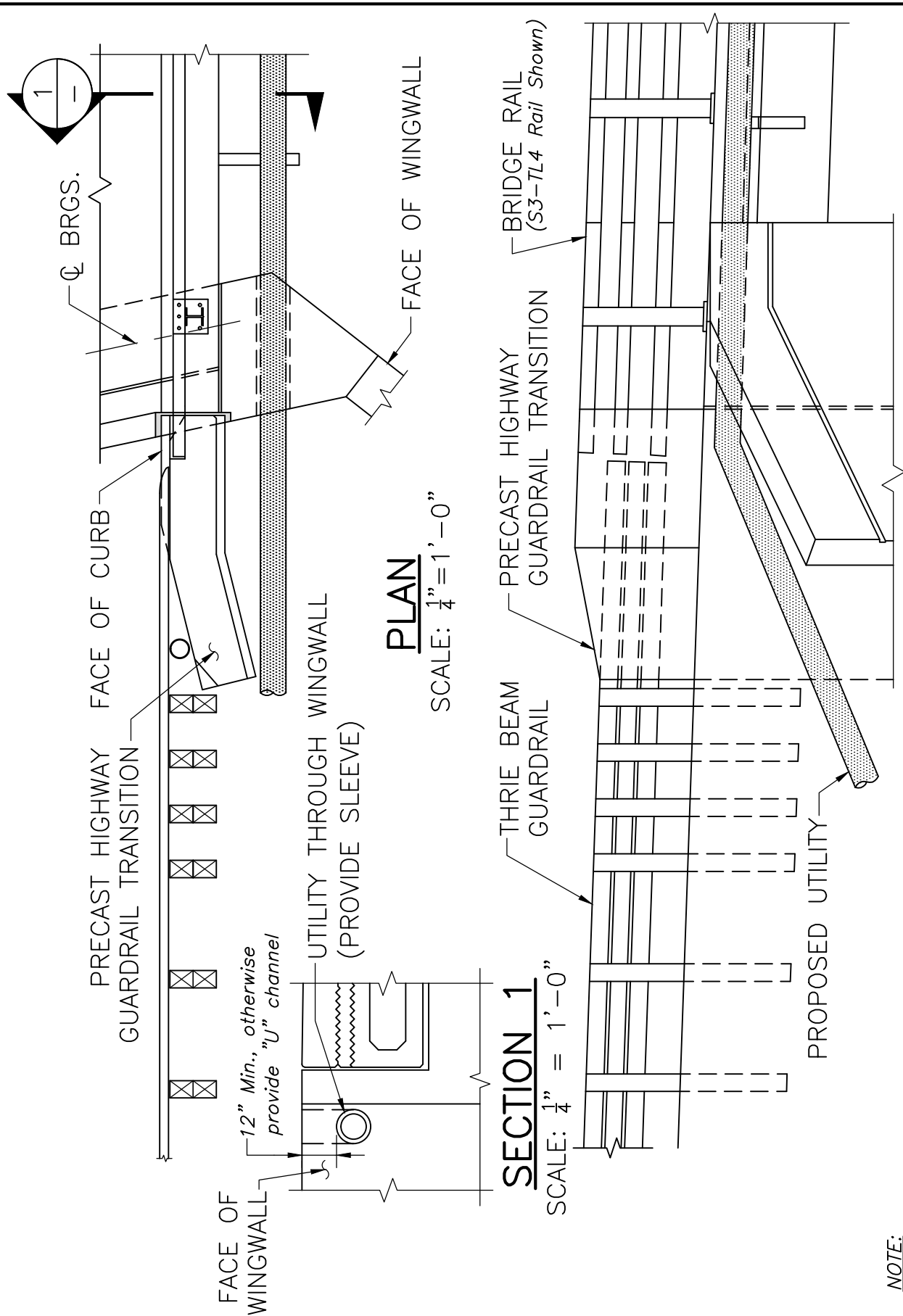
### SECTION 1

SCALE:  $\frac{1}{4}$ " = 1'-0"

### ELEVATION

SCALE:  $\frac{1}{4}$ " = 1'-0"

**NOTE:**  
 These details are to be used only if it is not feasible to run the utility through a utility bay.



**NOTE:**  
These details are to be used only if it is not feasible to run utility through a utility bay.



LRFD BRIDGE  
MANUAL, PART II

# UTILITY THRU SPLAYED WINGWALL ABUTMENT DETAILS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER  
**4.4.17**

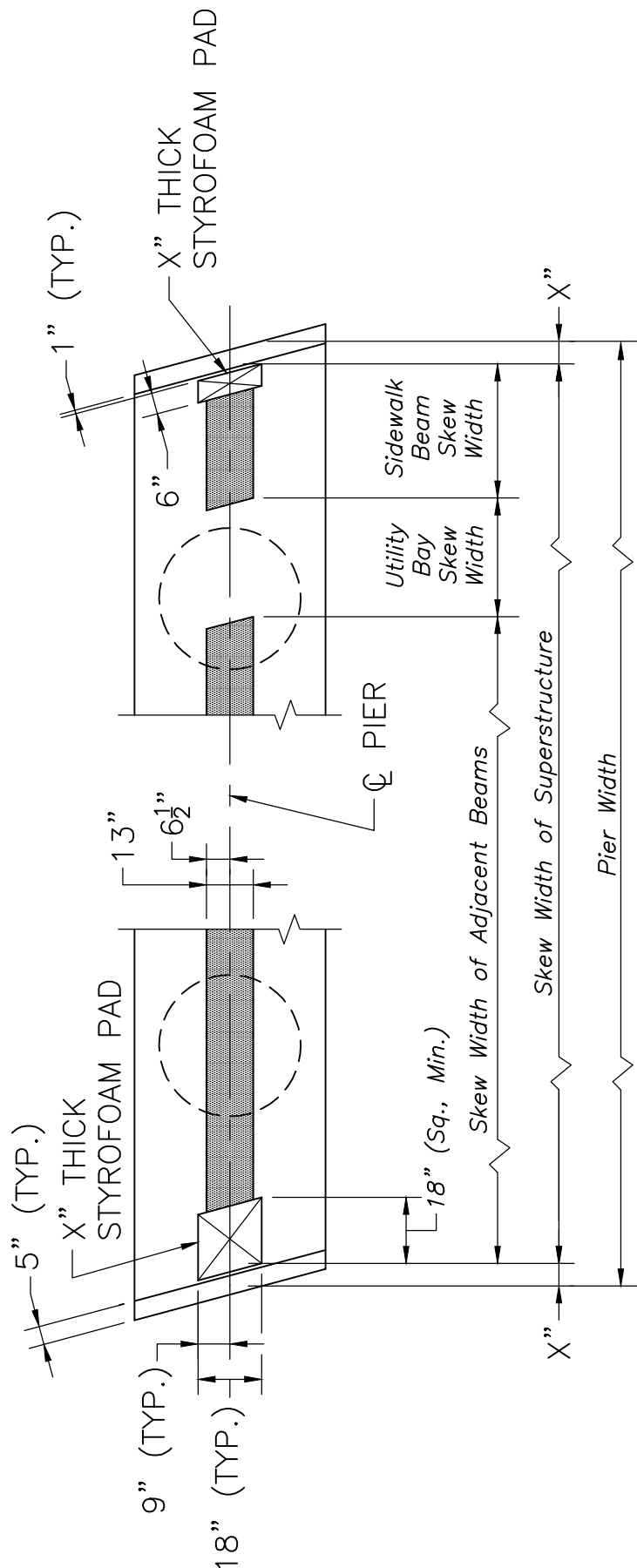
# TYPICAL PLAN OF PIER

PIER DETAILS

DATE OF ISSUE  
 JUNE 2013

DRAWING NUMBER

**4.5.1**



(BRIDGE WITHOUT UTILITY BAY) (BRIDGE WITH UTILITY BAY)

## NOTES:

1. DENOTES LIMITS OF 11" DEEP BY 13" WIDE SHEAR KEY.
2. ALL SURFACES OF THE SHEAR KEY SHALL BE LINED WITH 1/2" THICK CLOSED CELL FOAM.
3. PROVIDE ADDITIONAL STYROFOAM AS SHOWN IN DETAILS OVER PIER.

## PLAN OF PIER

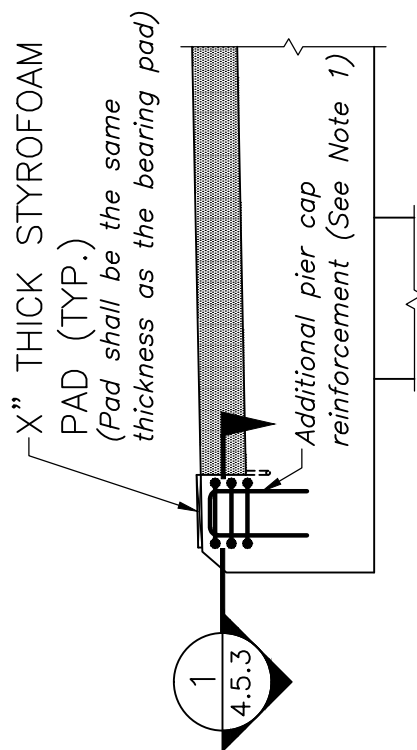
SCALE: (1/4" = 1'-0" Min.)

### NOTES:

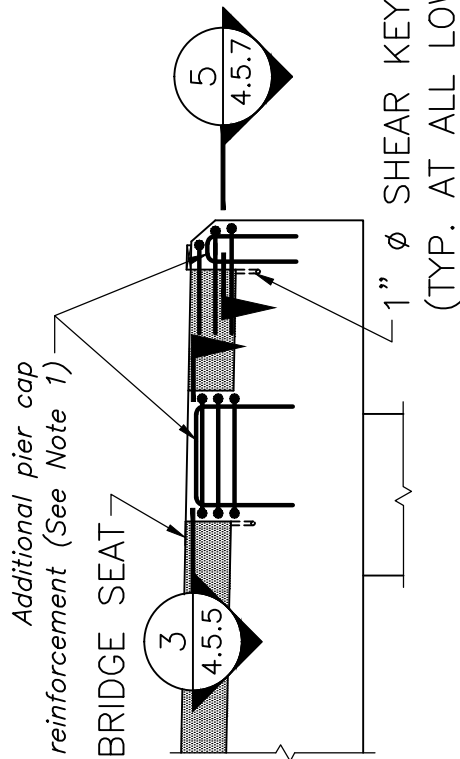
1. Remainder of pier has been omitted for clarity.
2. Plan of pier shall be drawn without breaks and to scale on the Construction Drawings. Include all relevant dimensions, angles, survey information and North Arrow.

# TYPICAL TRANSVERSE SECTION OF PIER

PIER DETAILS



(BRIDGE WITHOUT UTILITY BAY)



(BRIDGE WITH UTILITY BAY)

## NOTES:

1.  DENOTES LIMITS OF 11" DEEP BY 13" WIDE SHEAR KEY.
2. ALL SURFACES OF THE SHEAR KEY SHALL BE LINED WITH  $\frac{1}{2}$ " THICK CLOSED CELL FOAM JOINT FILLER.

## TRANSVERSE SECTION OF PIER

SCALE: ( $\frac{1}{4}$ " = 1'-0" Min)

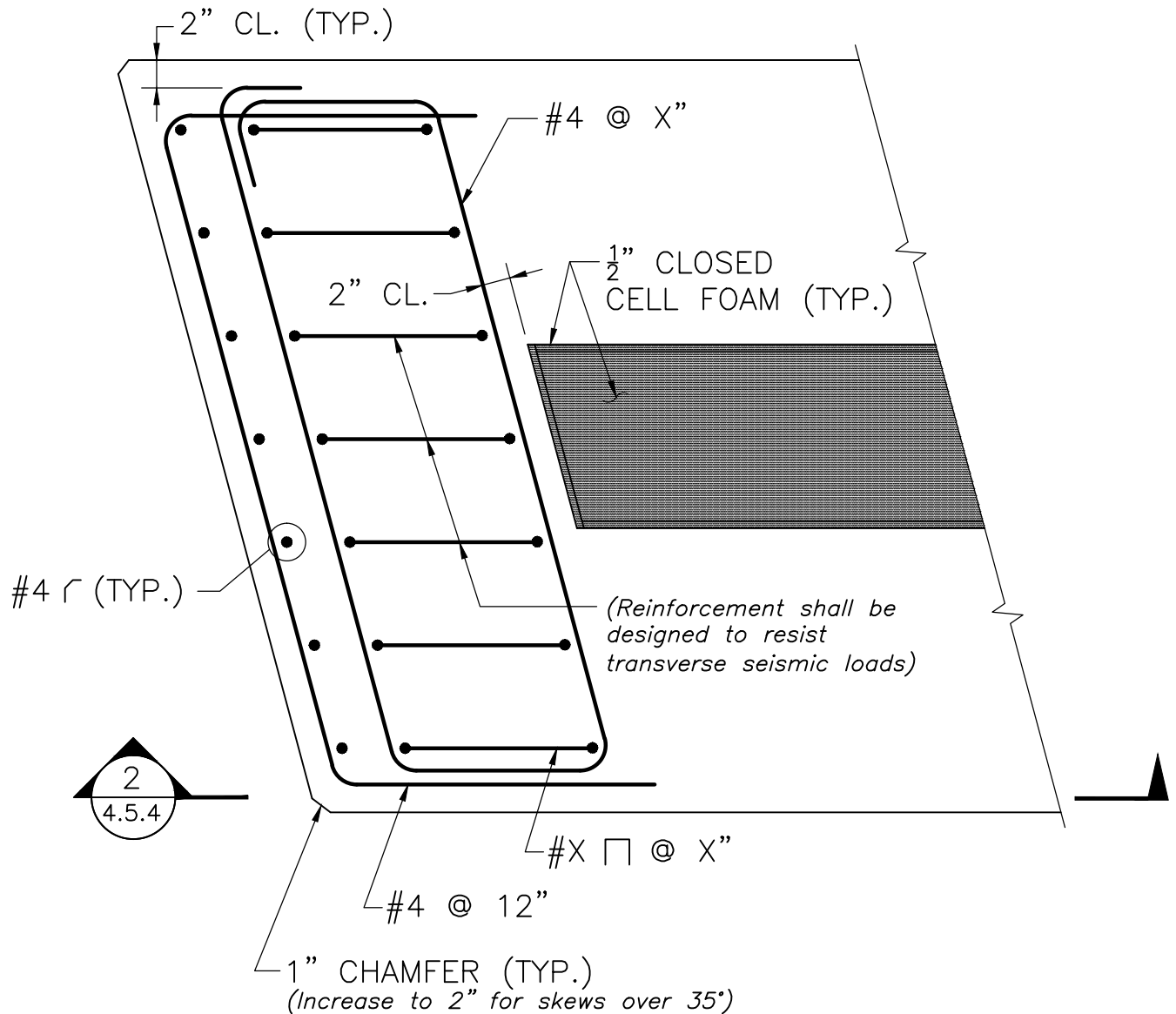
## NOTES:

1. Additional pier cap reinforcement for transverse restraint shall be designed as a connection for seismic forces.
2. Remainder of pier and pier reinforcement has been omitted for clarity.
3. The transverse section shall be drawn without breaks and to scale on the Construction Drawings and all reinforcement shall be included.

DATE OF ISSUE  
 JUNE 2013

DRAWING NUMBER

**4.5.2**



## SECTION 1

SCALE: 1" = 1'-0"

### NOTES:

1. Only pier end reinforcement is shown. The rest of the pier reinforcement has been omitted for clarity.
2. The Designer shall verify that the reinforcement shown does not interfere with or duplicate the normal pier reinforcement and adjust as necessary.



LRFD BRIDGE  
MANUAL, PART II

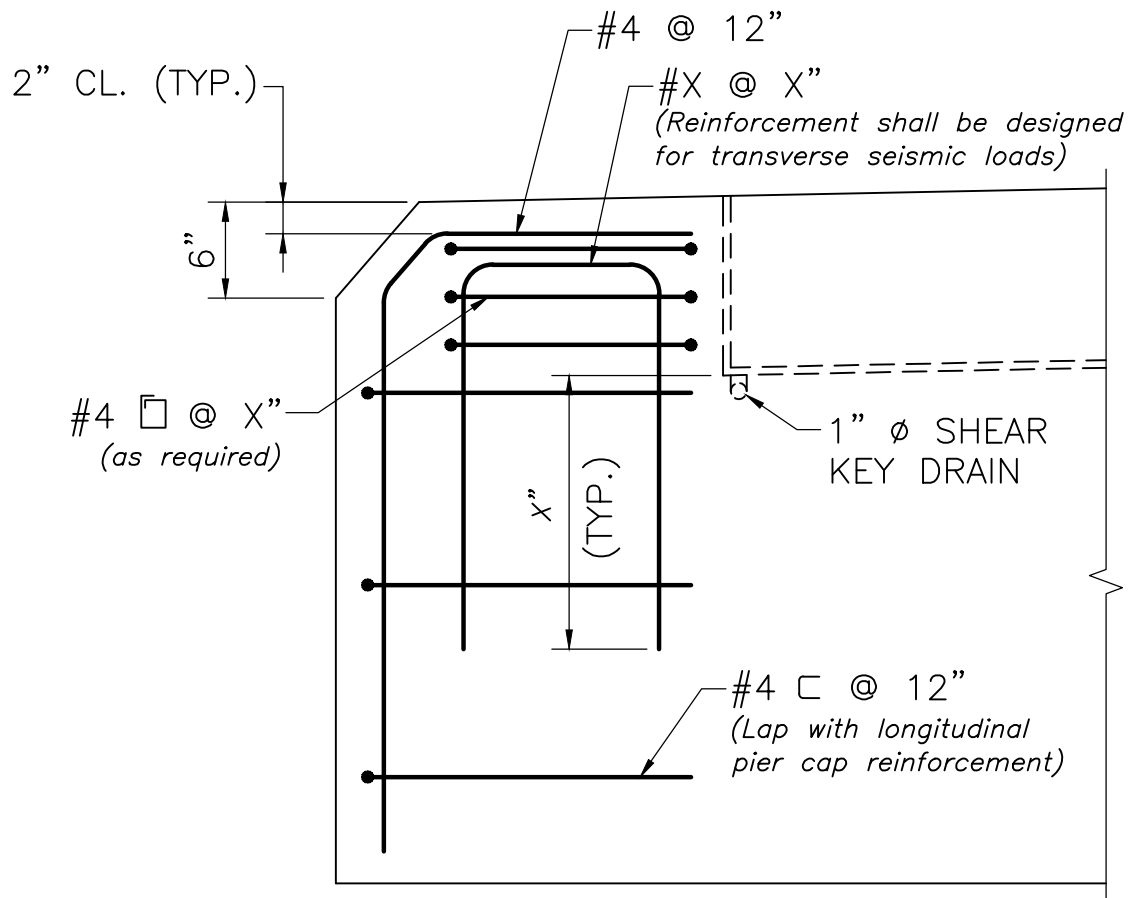
## PLAN SECTION AT PIER END WITHOUT UTILITY BAY

PIER DETAILS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

**4.5.3**



## SECTION 2

SCALE: 1" = 1'-0"

### NOTES:

1. Only pier end reinforcement is shown. The rest of the pier reinforcement has been omitted for clarity.
2. The Designer shall verify that the reinforcement shown does not interfere with or duplicate the normal pier reinforcement and adjust as necessary.



LRFD BRIDGE  
MANUAL, PART II

VERTICAL SECTION AT PIER  
END WITHOUT UTILITY BAY

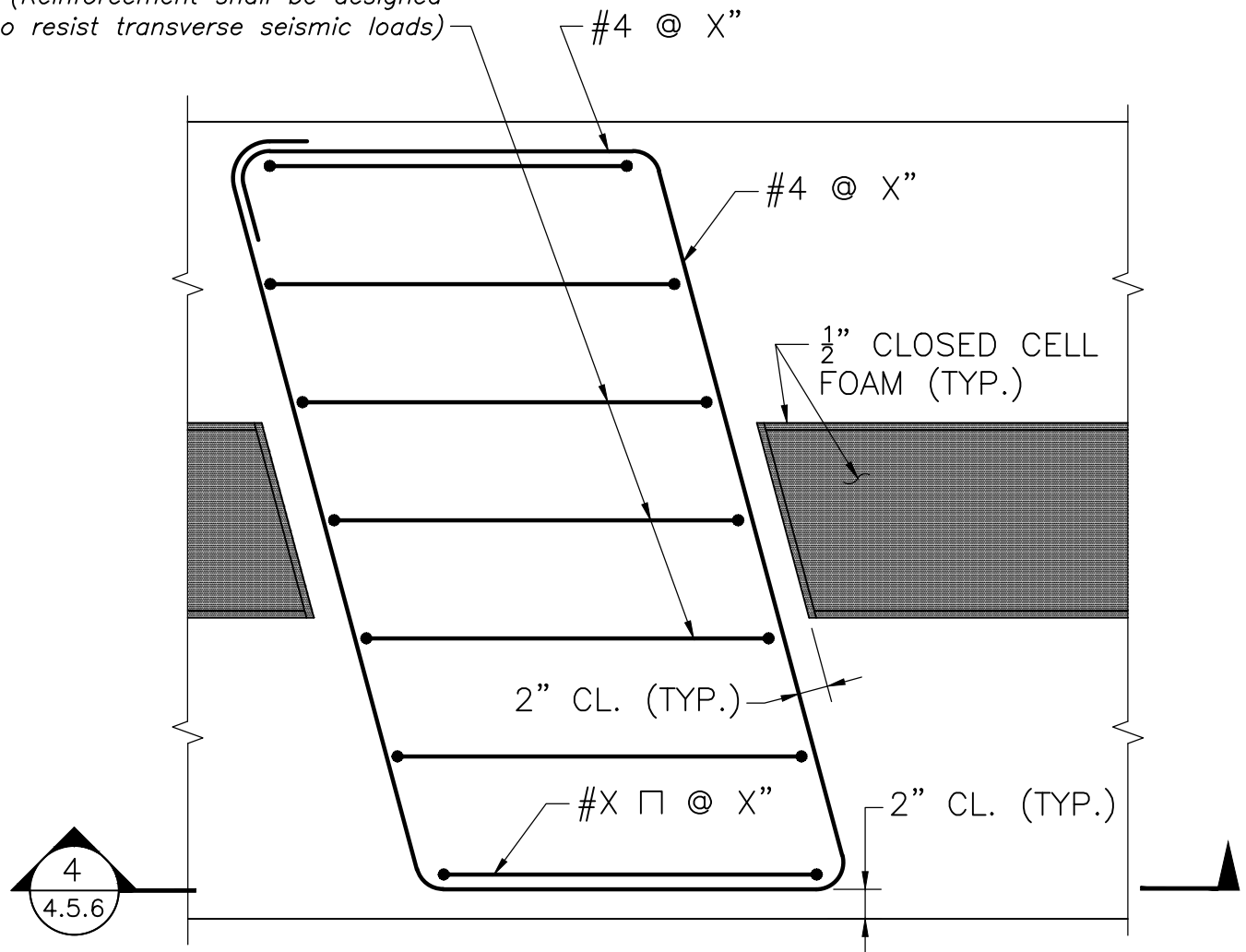
PIER DETAILS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

**4.5.4**

(Reinforcement shall be designed to resist transverse seismic loads)



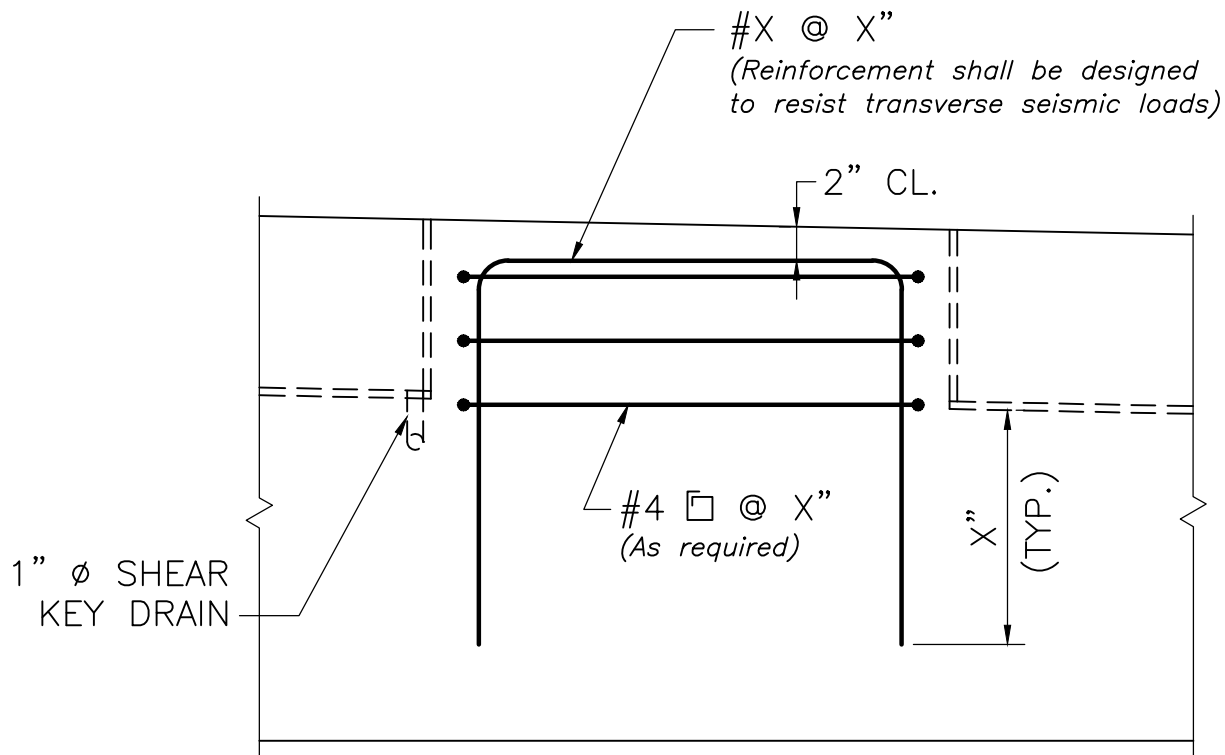
### SECTION 3

SCALE: 1" = 1'-0"

#### NOTES:

1. Only the transverse seismic reinforcement is shown. The rest of the pier reinforcement has been omitted for clarity.
2. The Designer shall verify that the reinforcement shown does not interfere with or duplicate the normal pier reinforcement and adjust as necessary.





## SECTION 4

SCALE: 1" = 1'-0"

### NOTES:

1. Only the transverse seismic reinforcement is shown. The rest of the pier reinforcement has been omitted for clarity.
2. The Designer shall verify that the reinforcement shown does not interfere with or duplicate the normal pier reinforcement and adjust as necessary.



LRFD BRIDGE  
MANUAL, PART II

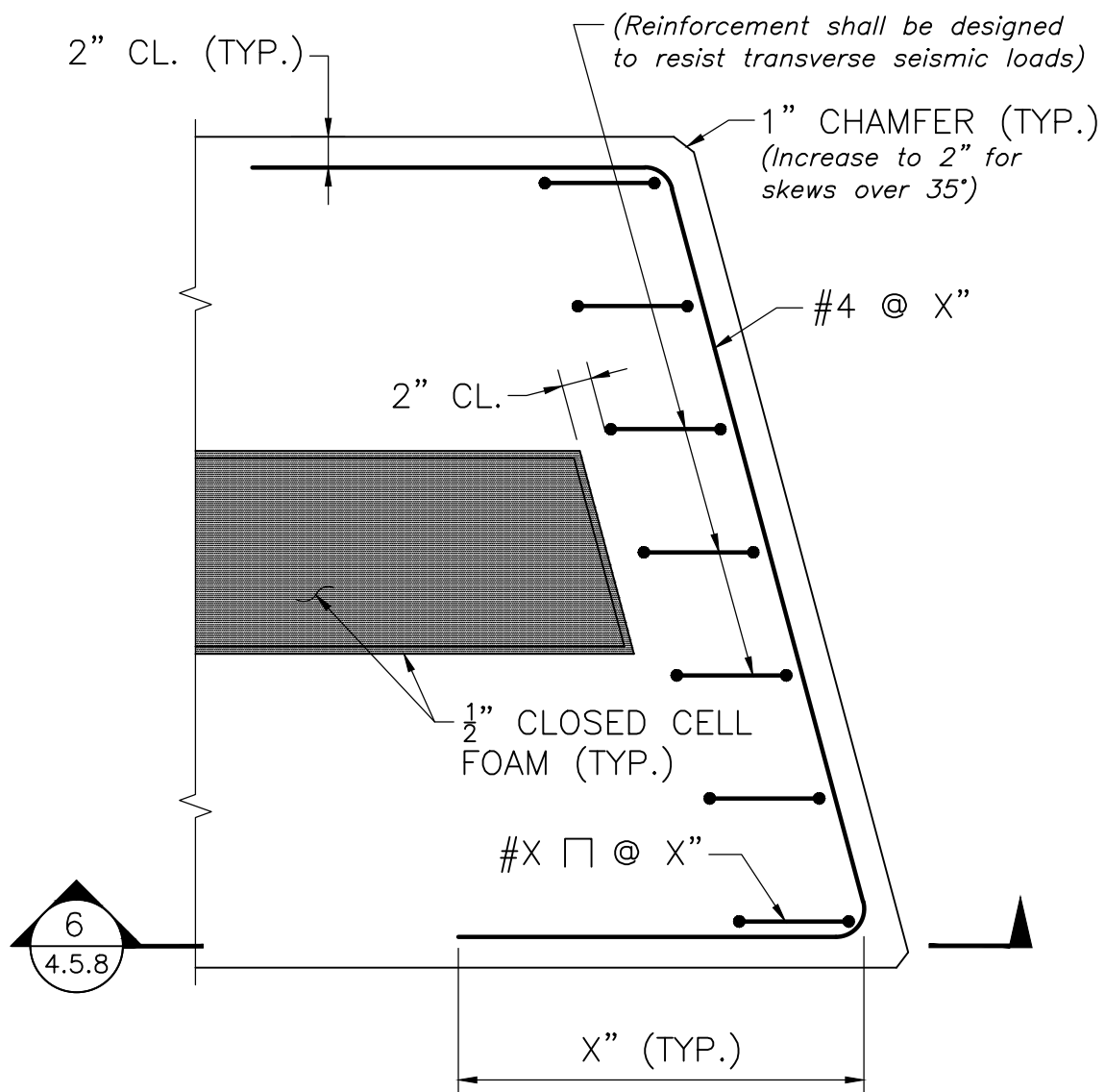
## VERTICAL SECTION OF PIER AT UTILITY BAY

PIER DETAILS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

**4.5.6**

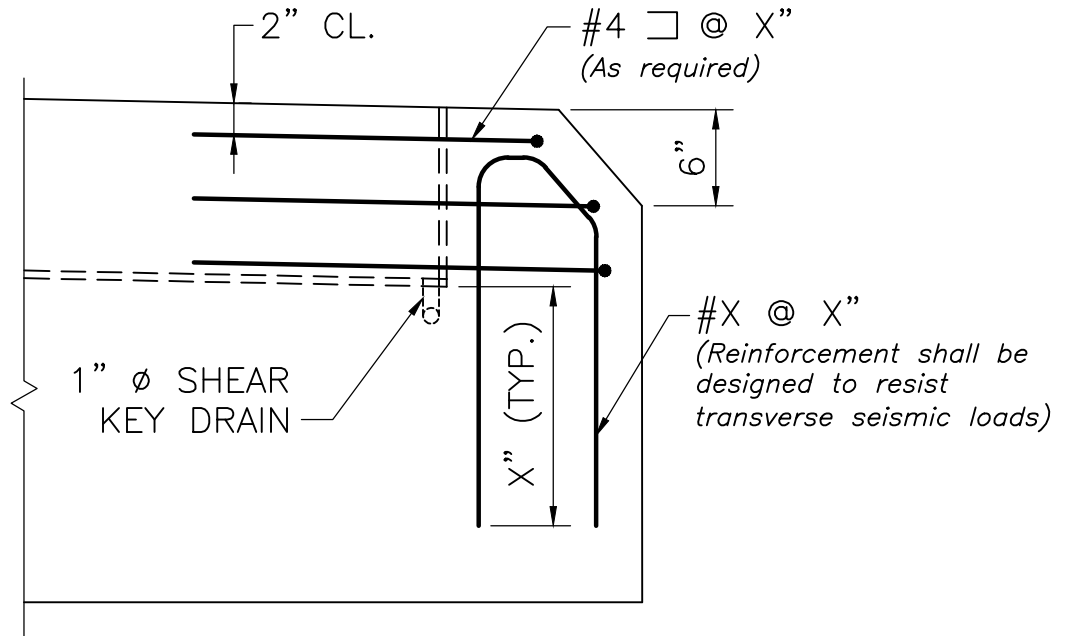


## SECTION 5

SCALE: 1" = 1'-0"

### NOTES:

1. Only the end reinforcement is shown. The rest of the pier reinforcement has been omitted for clarity.
2. The Designer shall verify that the reinforcement shown does not interfere with or duplicate the normal pier reinforcement and adjust as necessary.



## SECTION 6

SCALE: 1" = 1'-0"

### NOTES:

1. Only pier end reinforcement is shown. The rest of the pier reinforcement has been omitted for clarity.
2. The Designer shall verify that the reinforcement shown does not interfere with or duplicate the normal pier reinforcement and adjust as necessary.



LRFD BRIDGE  
MANUAL, PART II

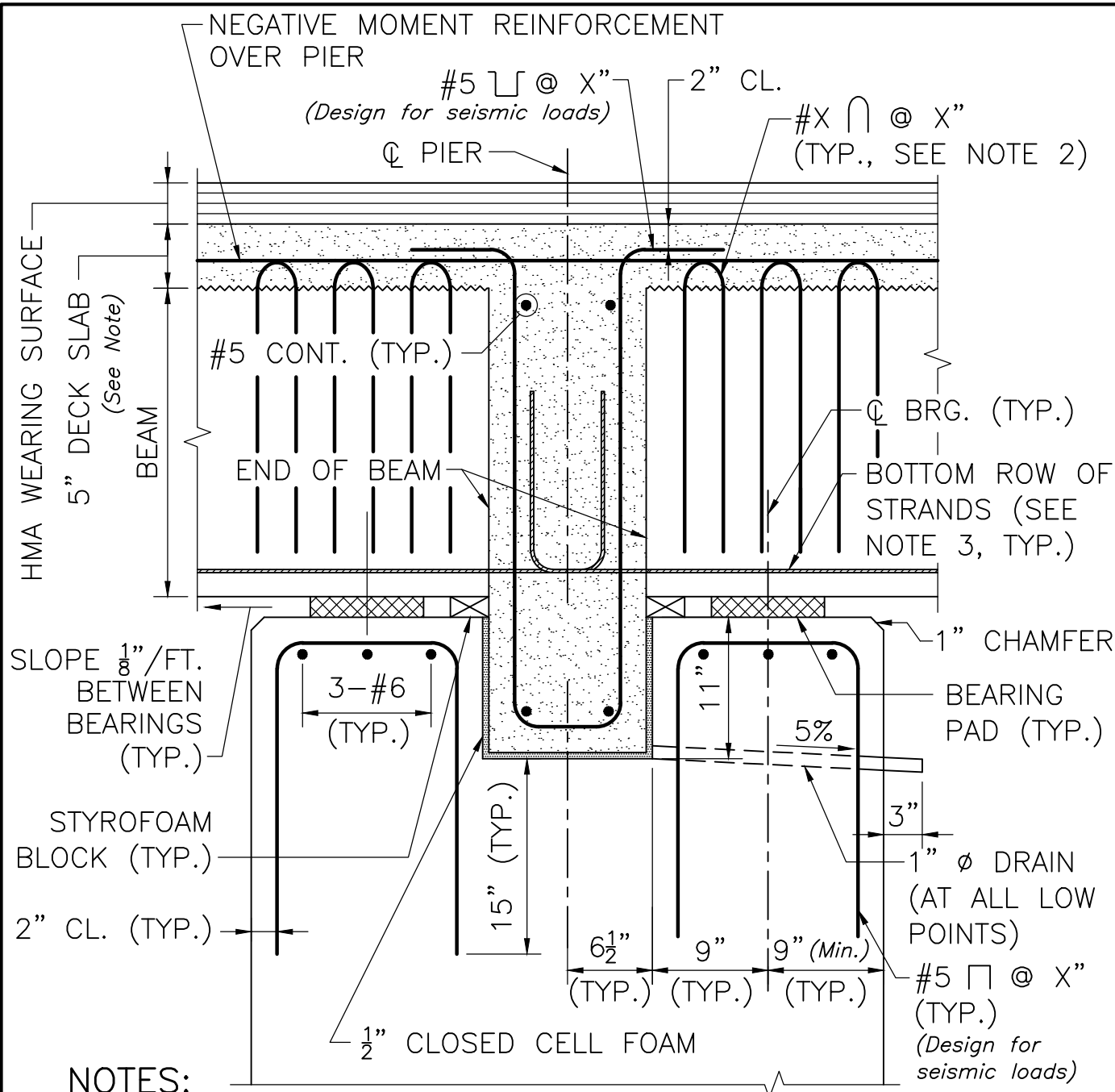
## VERTICAL SECTION AT PIER END WITH UTILITY BAY

PIER DETAILS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

4.5.8



### NOTES:

1. DENOTES LIMITS OF 4000 PSI,  $\frac{3}{4}$  IN., 585 HP CEMENT CONCRETE.
2. FOR BEAM REINFORCEMENT, SEE LONGITUDINAL SECTION OF BEAM SHEET XX.
3. DECK SLAB, PIER CAP REINFORCEMENT AND THE REMAINDER OF STRANDS IN BEAMS NOT SHOWN FOR CLARITY.

## DETAILS OVER PIER

SCALE: 1" = 1'-0"

### NOTE:

The thickness of the deck slab may need to be increased to accommodate roadway profile.



LRFD BRIDGE  
 MANUAL, PART II

## DETAILS OVER PIER FOR DECK AND BOX BEAMS

PIER DETAILS

DATE OF ISSUE  
 JUNE 2013

DRAWING NUMBER

**4.5.9**