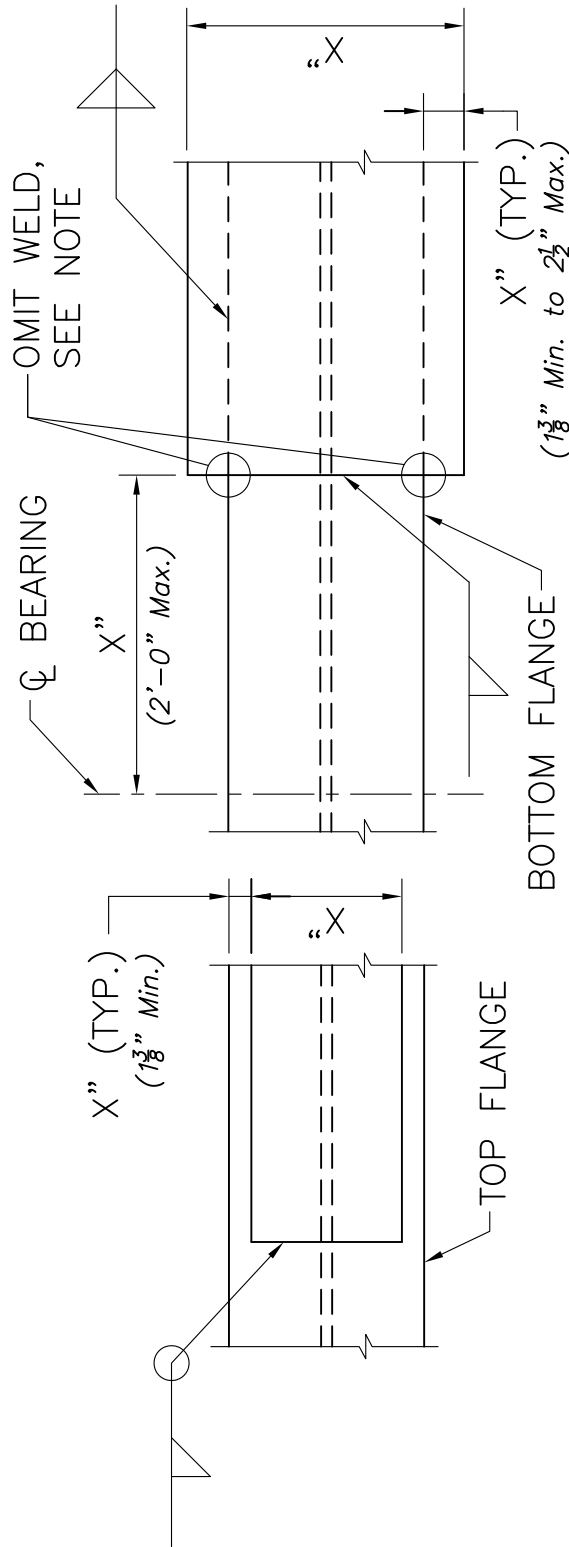




# COVER PLATE DETAILS

## STRINGERS



### AT TOP FLANGE

### AT BOTTOM FLANGE

#### NOTE:

TERMINATE LONGITUDINAL AND TRANSVERSE WELDS 1" FROM THE INTERSECTION OF THE COVER PLATE WITH THE EDGE OF FLANGE. (Include note as required)

## COVER PLATE DETAILS

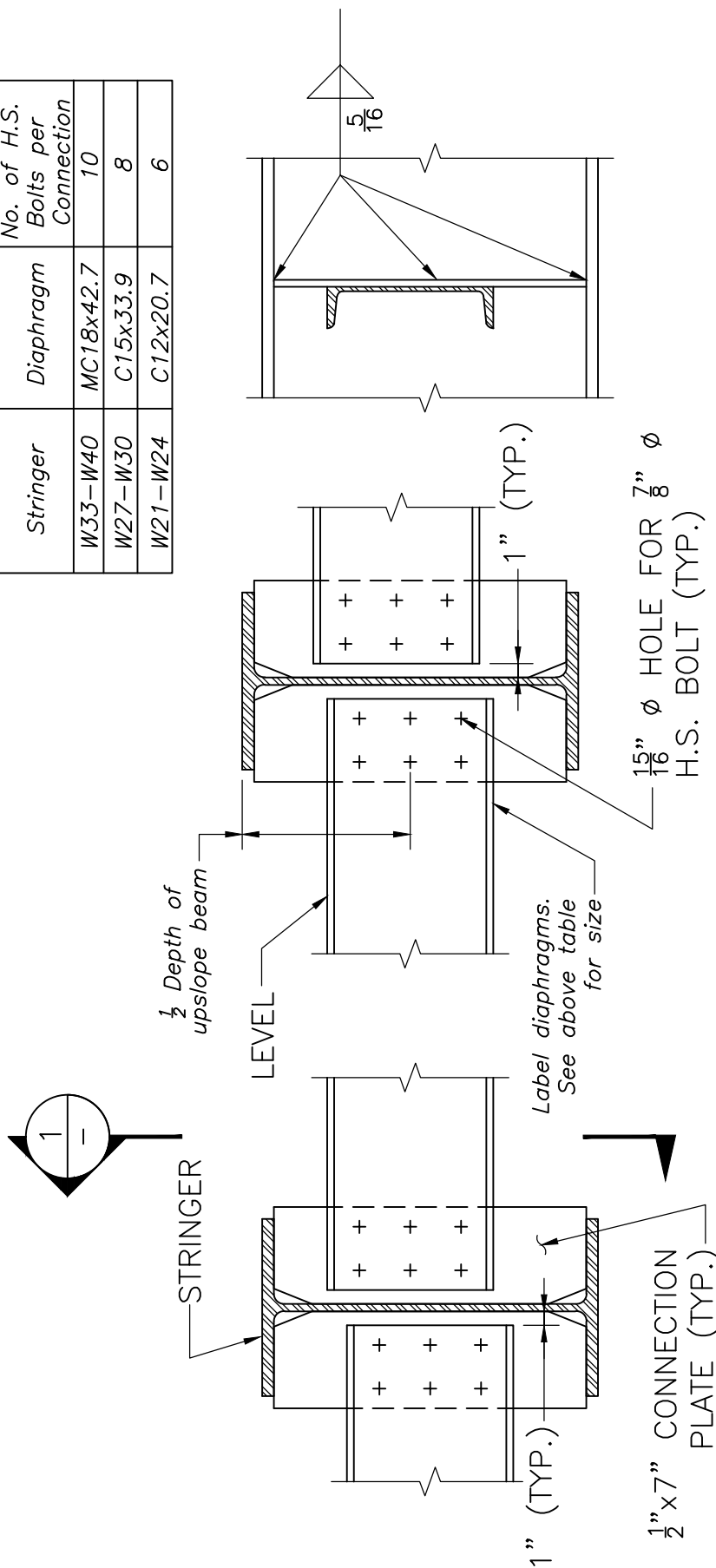
SCALE: 1" = 1'-0"

#### NOTES:

1. Modify the details as required to suit the project.
2. Cover plates are to be in one piece and shall be limited to one at any flange. The minimum cover plate thickness shall be  $\frac{1}{2}''$ .
3. The extent of any cover plate welded to the top flange shall be in accordance with the AASHTO-LRFD.
4. Weld sizes in the table are minimum sizes only. The Designer is responsible for assuring the weld size is adequate.

| Max. Plate & Flange Thickness      | Min. Size Of Fillet Weld |
|------------------------------------|--------------------------|
| $\frac{1}{2}''$ to $\frac{3}{4}''$ | $\frac{1}{4}''$          |
| over $\frac{3}{4}''$               | $\frac{5}{16}''$         |

| Stringer | Diaphragm | No. of H.S. Bolts per Connection |
|----------|-----------|----------------------------------|
| W33-W40  | MC18x42.7 | 10                               |
| W27-W30  | C15x33.9  | 8                                |
| W21-W24  | C12x20.7  | 6                                |



## ELEVATION VIEW

## SECTION 1

### NOTE:

SEE CLIP DETAILS ON SHEET X. (See Dwg. No. 5.1.9)

## INTERMEDIATE DIAPHRAGM DETAILS

SCALE: 1" = 1'-0"

### NOTES:

1. Include bolt hole spacing and edge distances in the "Elevation View" on the Construction Drawings.
2. Modify the details as necessary to suit the project.
3. Interior diaphragms shall be centered mid-depth on the upslope stringer.
4. Maximum spacing of diaphragms shall be 25'-0".



LRFD BRIDGE  
MANUAL, PART II

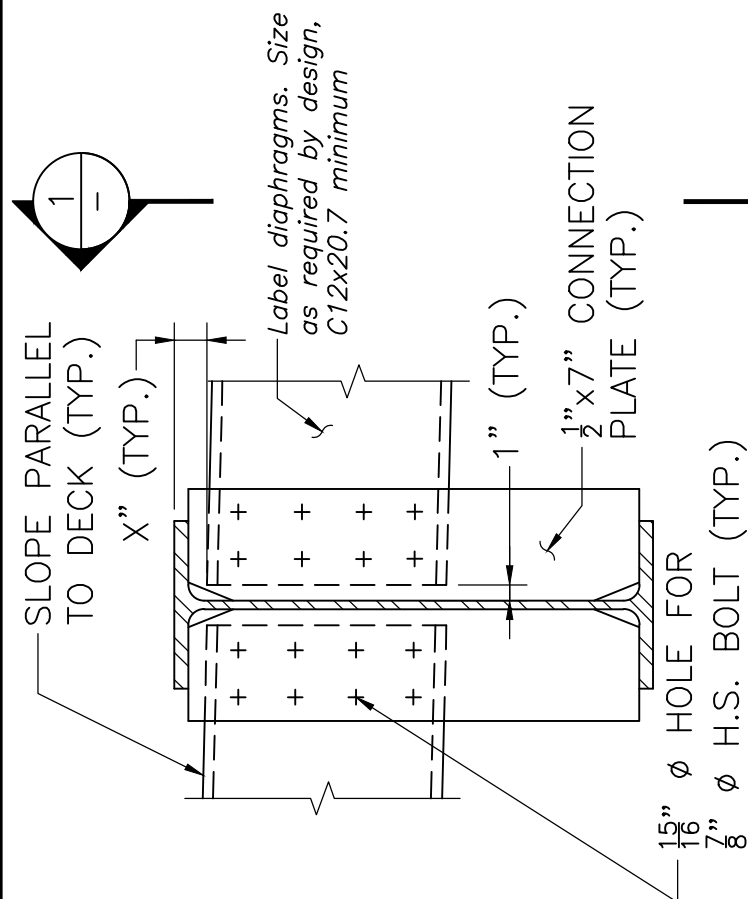
## INTERMEDIATE DIAPHRAGM DETAILS STRINGERS

DATE OF ISSUE  
JUNE 2013

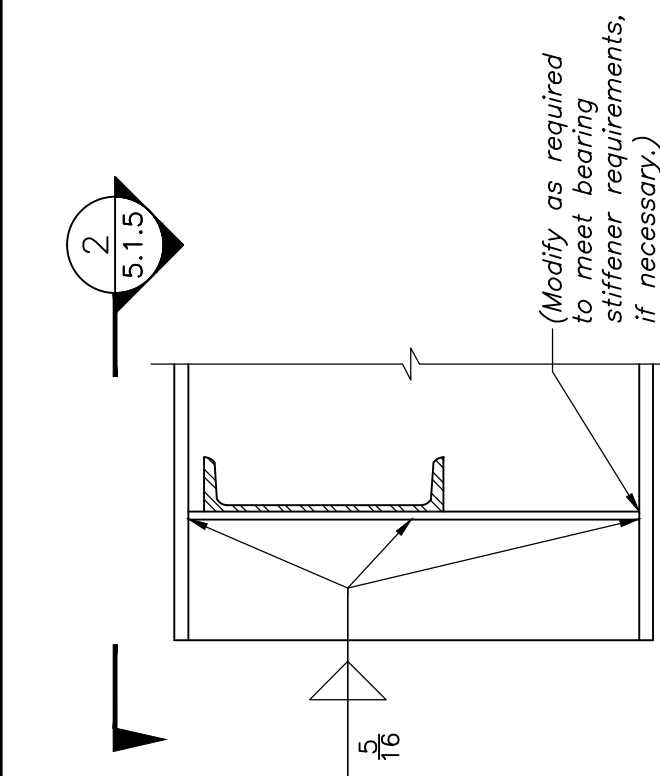
DRAWING NUMBER

**5.1.3**

# END DIAPHRAGM DETAILS ELEVATION AND SECTION 1 STRINGERS



## ELEVATION VIEW



## SECTION 1

### NOTE:

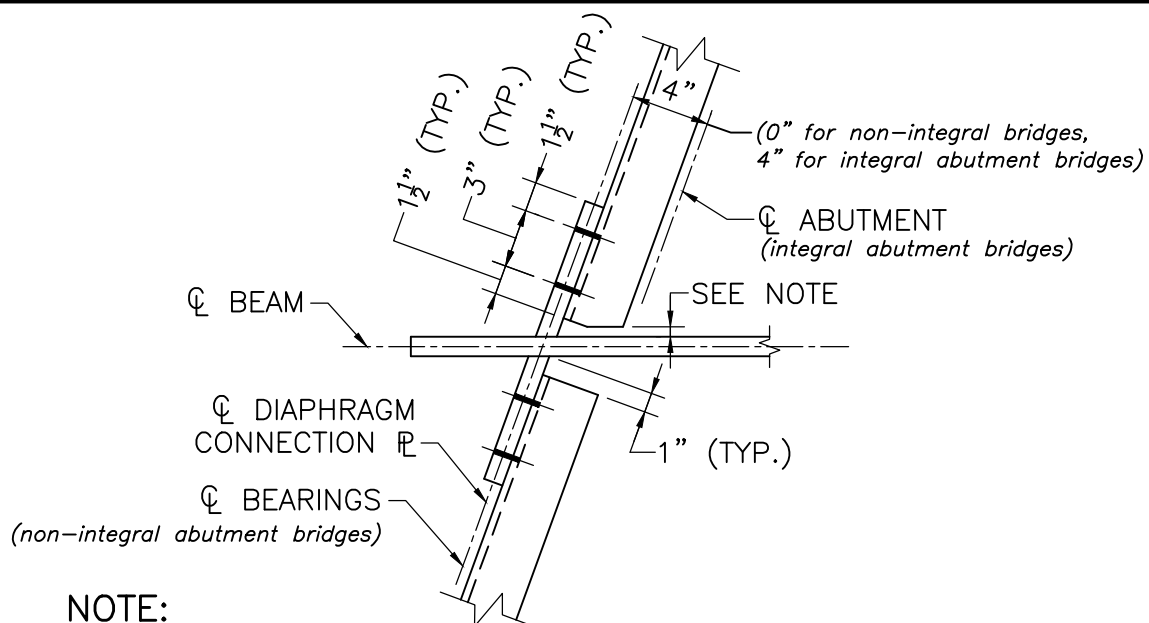
SEE CLIP DETAIL ON SHEET X. (See Dwg. No. 5.1.9)

## END DIAPHRAGM DETAILS

SCALE: 1" = 1'-0"

### NOTES:

1. Include the bolt hole spacing and edge distances in the "Elevation View" on the Construction Drawings.
2. Modify the details as necessary to suite the project. If connection plate is also required as a bearing stiffener, make all necessary changes to plate size and attachments to meet AASHTO-LRFD requirements.
3. Locate the end diaphragm as close to the top flange as possible.
4. End diaphragms shall be placed parallel to the centerline of bearings as shown in the Framing Plan.
5. Details shown on Drawing No. 5.2.7 shall be used if transverse seismic loads exceed the capacity of the details shown on this drawing.
6. Designer shall take into account reduced stiffness if diaphragm connection plates are also required as bearing stiffeners and are not perpendicular to web.



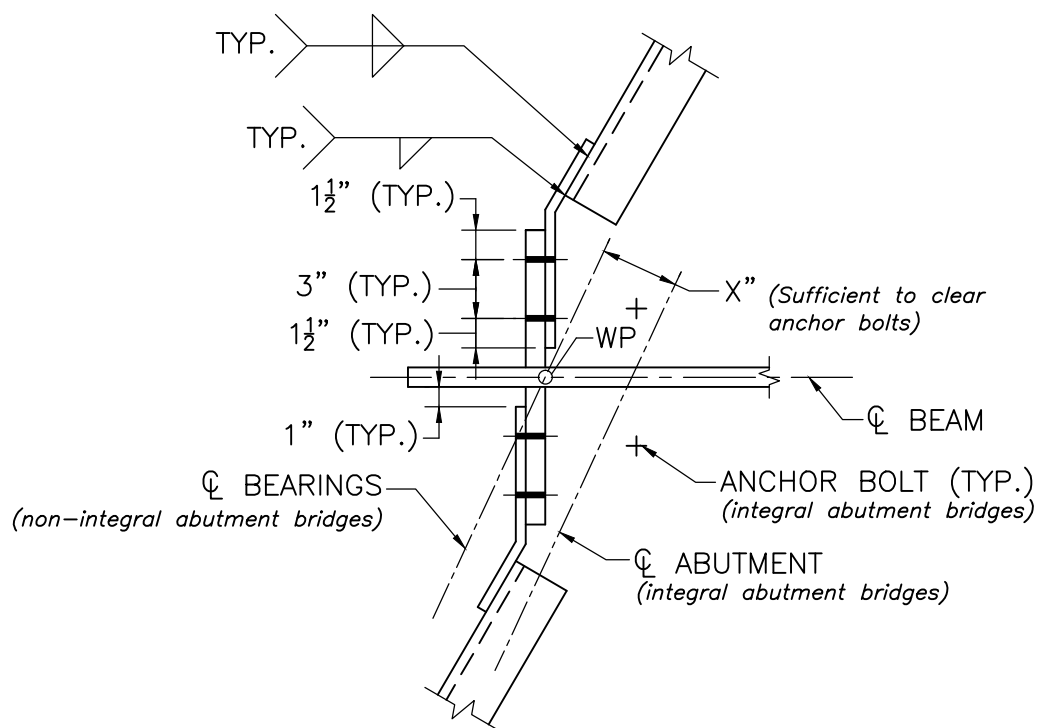
**NOTE:**

FLANGE OF CHANNEL MAY BE CLIPPED  
TO AVOID INTERFERENCE WITH WEB.

**SKEWS  $\leq 20^\circ$**

**SECTION 2**

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



**SKEWS  $> 20^\circ$**

**SECTION 2**

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



LRFD BRIDGE  
MANUAL, PART II

END DIAPHRAGM DETAILS  
SECTION 2  
STRINGERS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

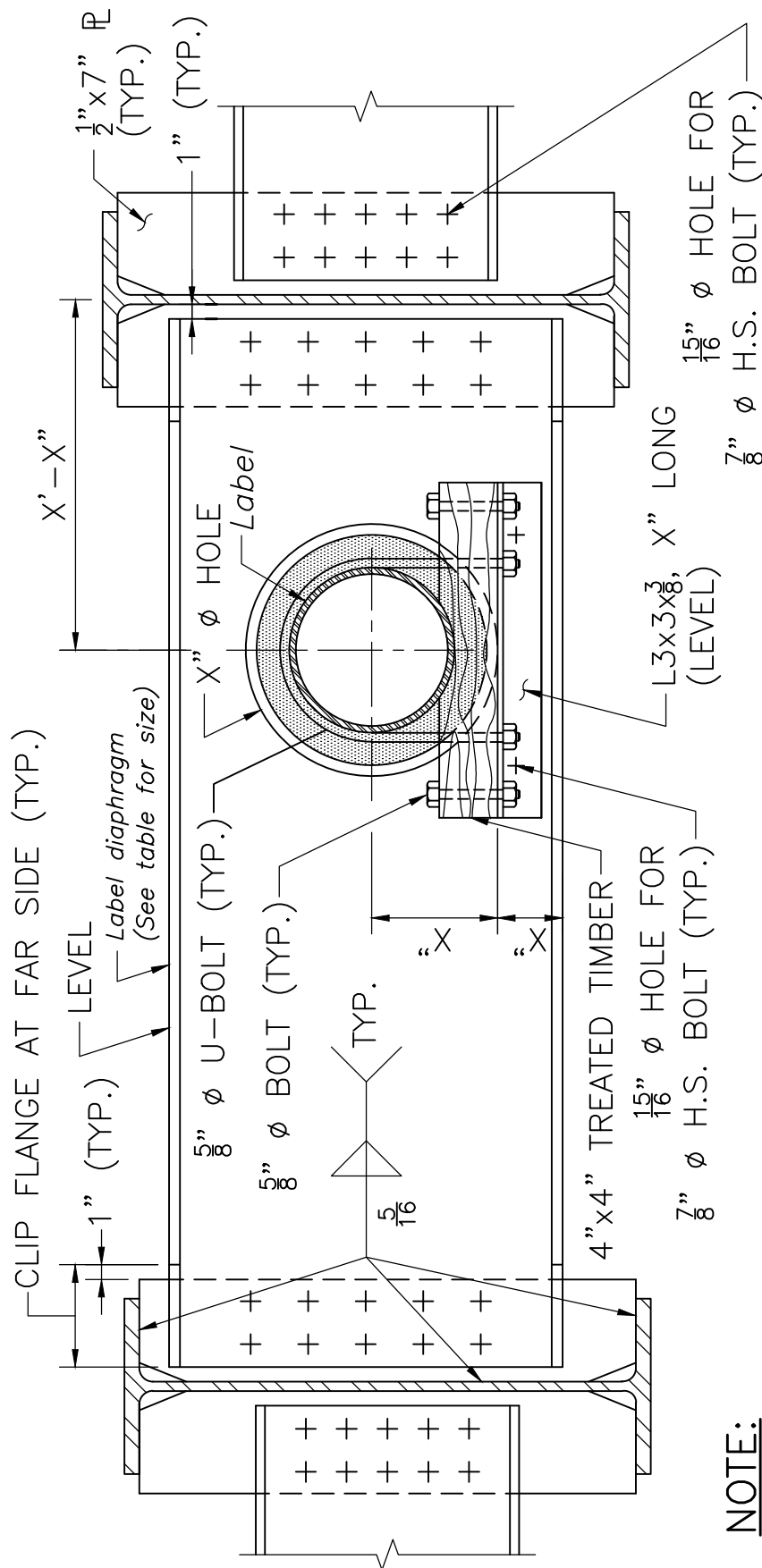
**5.1.5**

# UTILITY SUPPORT DETAILS INTERMEDIATE DIAPHRAGMS STRINGERS

DATE OF ISSUE  
 JUNE 2013

DRAWING NUMBER

**5.1.6**



## NOTE:

SEE DIAPHRAGM CONNECTION PLATE CLIP DETAILS ON SHEET X. (See Dwg. No. 5.1.9)

## UTILITY SUPPORT DETAILS AT INTERMEDIATE DIAPHRAGMS LOCATIONS

SCALE: 1" = 1'-0"

## NOTES:

1. Modify the details as necessary to suit project.
2. Combine the above detail with the detail for utility supports between diaphragms (Dwg. No. 5.1.8). For a utility bay located under a sidewalk, see Dwg. No. 5.1.7.
3. Provide at least as many bolts for the attachment of the diaphragm utility support as required for a normal diaphragm. Include the bolt hole spacing and edge distances.
4. Dimension the circular opening as well as the location of support angle and bolts. Water pipe is shown. For other utilities, provide the main supports only.

| Stringer | Diaphragms |
|----------|------------|
| W40      | W30x99     |
| W36      | W27x94     |
| W33      | W27x94     |
| W30      | W24x76     |
| W27      | W24x76     |
| W24      | W18x60     |
| W21      | W18x60     |



SEE DIAPHRAGM CONNECTION PLATE CLIP DETAILS ON SHEET X. (See Dwg. No. 5.1.9)

## UTILITY SUPPORT DETAILS

SCALE: 1" = 1'-0"

NOTES:

1. *Modify the details as necessary to suit project.*
2. *This detail is for utility bays located under sidewalks only. For utility bays located under roadway or safety curb, see Dwg. No. 5.1.6.*
3. *Combine the above detail with the detail for utility supports between diaphragms (Dwg. No. 5.1.8).*
4. *Utilities located under sidewalks shall be placed as close as possible to the exterior beam to minimize interference with the approach slab.*
5. *Dimension the locations of all supports and bolts (with edge distances) on the Construction Drawings. Water pipe shown. For other utilities, provide the main supports only.*

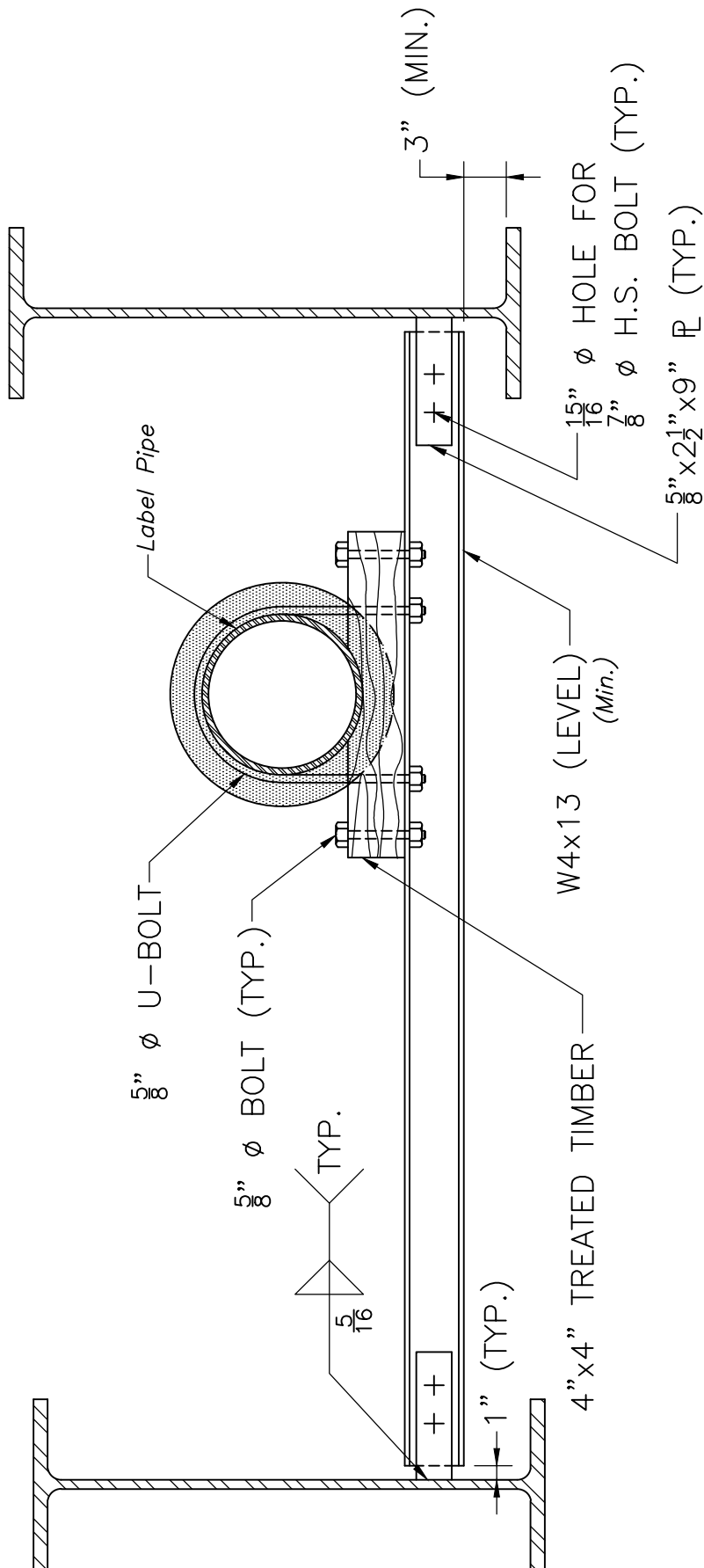


# UTILITY SUPPORT DETAILS DIAPHRAGMS UNDER SDWK. STRINGERS

DATE OF ISSUE  
JUNE 2013

|                |
|----------------|
| DRAWING NUMBER |
|----------------|

### 5.1.7



## UTILITY SUPPORT DETAILS BETWEEN DIAPHRAGMS

SCALE: 1" = 1'-0"

### NOTES:

1. Modify the details as necessary to suit project.
2. For utility bays located under the roadway or safety curb, combine this detail with the detail shown on Dwg. No. 5.1.6.
3. For utility bay located under the sidewalk, combine this detail with the detail shown on Dwg. No. 5.1.7.
4. Dimension the locations of the supports and bolts (with edge distances) on the Construction Drawings. Water pipe shown. For other utilities, provide the main supports only.
5. The minimum size of the utility support beam is shown. Actual size shall be as required by design.



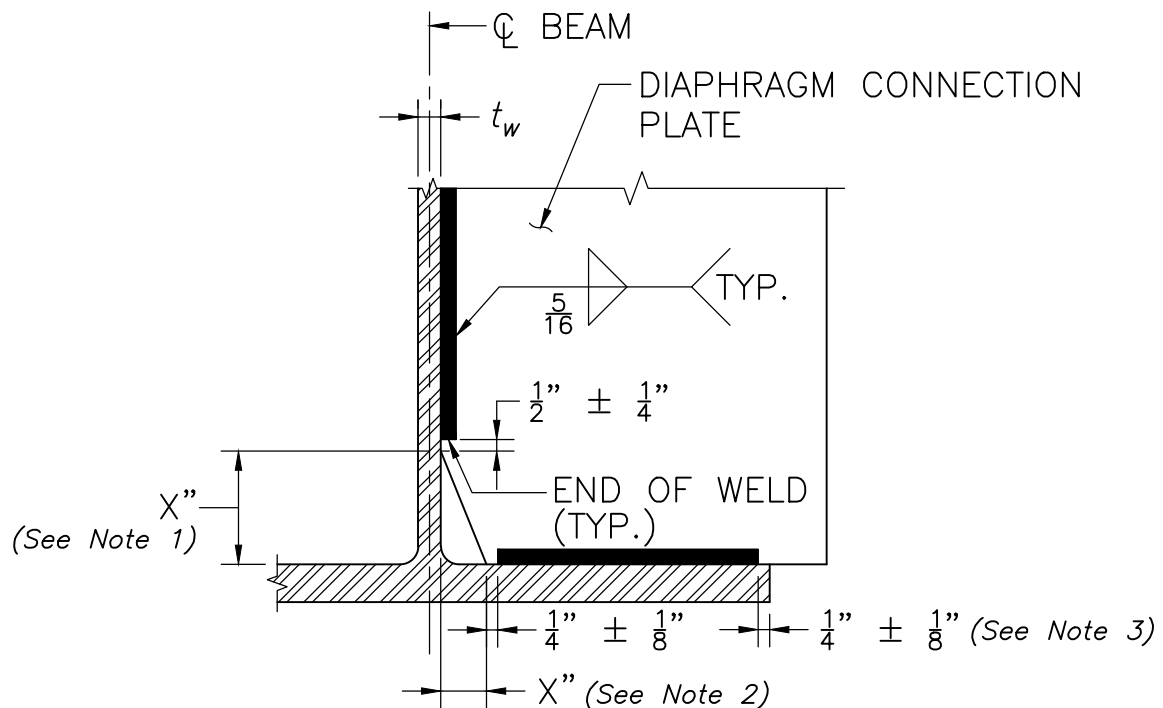
LRFD BRIDGE  
MANUAL, PART II

## UTILITY SUPPORT DETAILS BETWEEN DIAPHRAGMS STRINGERS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

**5.1.8**



## CLIP DETAIL

NOT TO SCALE

### NOTES:

1. Height of clip shall be  $5 \times t_w$
2. Width of clip shall be  $2 \times t_w$
3. Terminate weld  $\frac{1}{4}$ " from edge of flange or connection plate, whichever is encountered first.
4. Where the end connection plate is also required as a bearing stiffener, the bottom of the connection plate shall be either milled to fit the bottom flange and fillet welded, or attached to the bottom flange with a full penetration weld. Modify the above detail with construction notes as required.



LRFD BRIDGE  
MANUAL, PART II

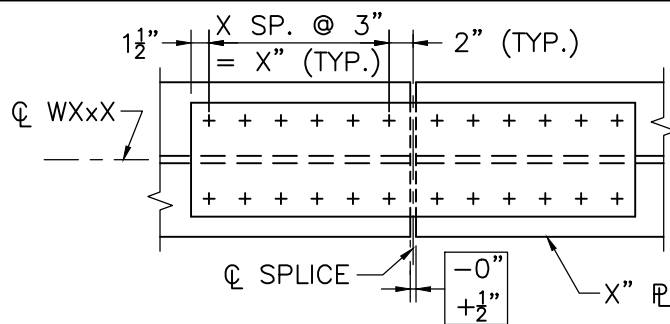
## CLIP DETAIL FOR DIAPHRAGM CONNECTION PLATES

STRINGERS

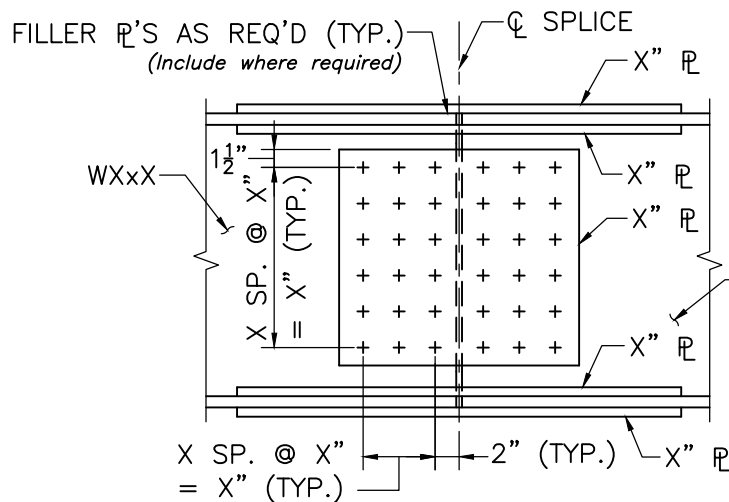
DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

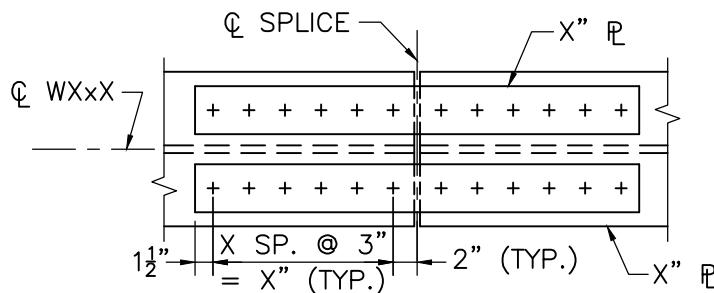
**5.1.9**



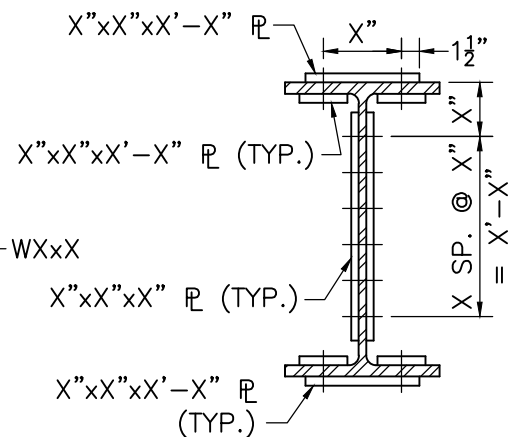
**TOP FLANGE**



**ELEVATION**



**BOTTOM FLANGE**



**SECTION**

**NOTES:**

1. BOLTED FIELD SPLICES SHALL BE CONSIDERED SLIP-CRITICAL CONNECTIONS WITH CLASS B FAYING SURFACES. (*Change to Class C for galvanized surfaces.*)
2. + DENOTES  $\frac{7}{8}$ "  $\phi$  ASTM A325 HIGH STRENGTH BOLT IN  $\frac{15}{16}$ "  $\phi$  HOLE.
3. THICKNESS DIFFERENCES OF  $\frac{1}{16}$ " OR LESS DO NOT REQUIRE FILLER PLATES. FILLER PLATES SHALL CONFORM TO AASHTO M 270 GRADE 50W OR ASTM A606. (*Include where required.*)
4. ONE ROW OF STUD SHEAR CONNECTORS SHALL BE PLACED ALONG THE CENTERLINE OF THE TOP FLANGE SPLICE PLATE.

**BOLTED FIELD SPLICE DETAILS**

SCALE: 1" = 1'-0"



## NOTES:

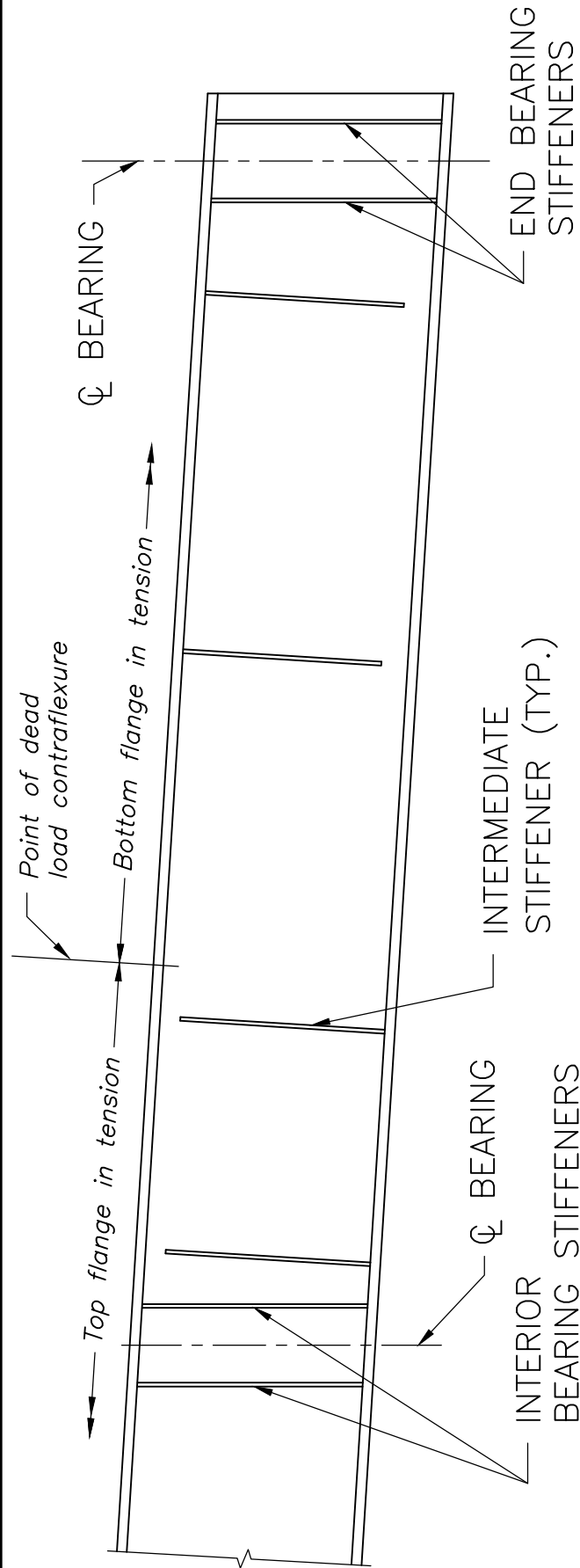
1. For the design of welded girders, the span to depth ratio shall be as specified in Part I of the Bridge Manual.
2. The flanges shall be sized as required by design and as follows:
  - For shipping and erection safety, the ratio of the length to width of the compression flange shall be limited to 85 where practical (even at the expense of some additional steel).
  - The flange width may vary over the length of the girder, however constant width flanges are preferred. The top and bottom flanges need not be of the same width.
  - The minimum thickness of any flange shall be  $\frac{3}{4}$ ".
3. The web plate thickness shall not be less than  $\frac{1}{2}$ ". The Designer shall consider thicker web plates to eliminate transverse stiffeners (see Part I of the Bridge Manual).
4. Where they are required, intermediate stiffeners shall:
  - Be cut short of the tension flange, unless they also serve as cross frame connection plates (see Dwg. No. 5.2.4).
  - Be placed in pairs on both sides of the web, unless a longitudinal stiffener is employed on one side.
  - Not be placed on the outside face of the exterior girders.
  - Have a minimum plate size of  $\frac{3}{8}$ " x 5" for spans 90' up to 120' and  $\frac{3}{8}$ " x 6" for spans 121' to 150'.
  - Shall be located a minimum of 3' from the C of a splice.
5. The use of longitudinal stiffeners shall be avoided, unless required by design. The longitudinal stiffener shall be placed on the opposite side of the web from the transverse stiffeners. For exterior girders, the longitudinal stiffener should be placed on the outside face.



# TYPICAL WELDED GIRDER ELEVATION PLATE GIRDERS

DATE OF ISSUE  
 JUNE 2013

DRAWING NUMBER  
**5.2.3**



## NOTES:

1. ALL INTERMEDIATE STIFFENERS SHALL BE PERPENDICULAR TO THE WEB AND TO THE GIRDER FLANGES.
2. ALL BEARING STIFFENERS SHALL BE PLUMB.
3. ENDS OF BEAMS SHALL BE FABRICATED SO THAT UNDER FULL DEAD LOAD THE ENDS WILL BE PLUMB.

## GIRDER ELEVATION

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

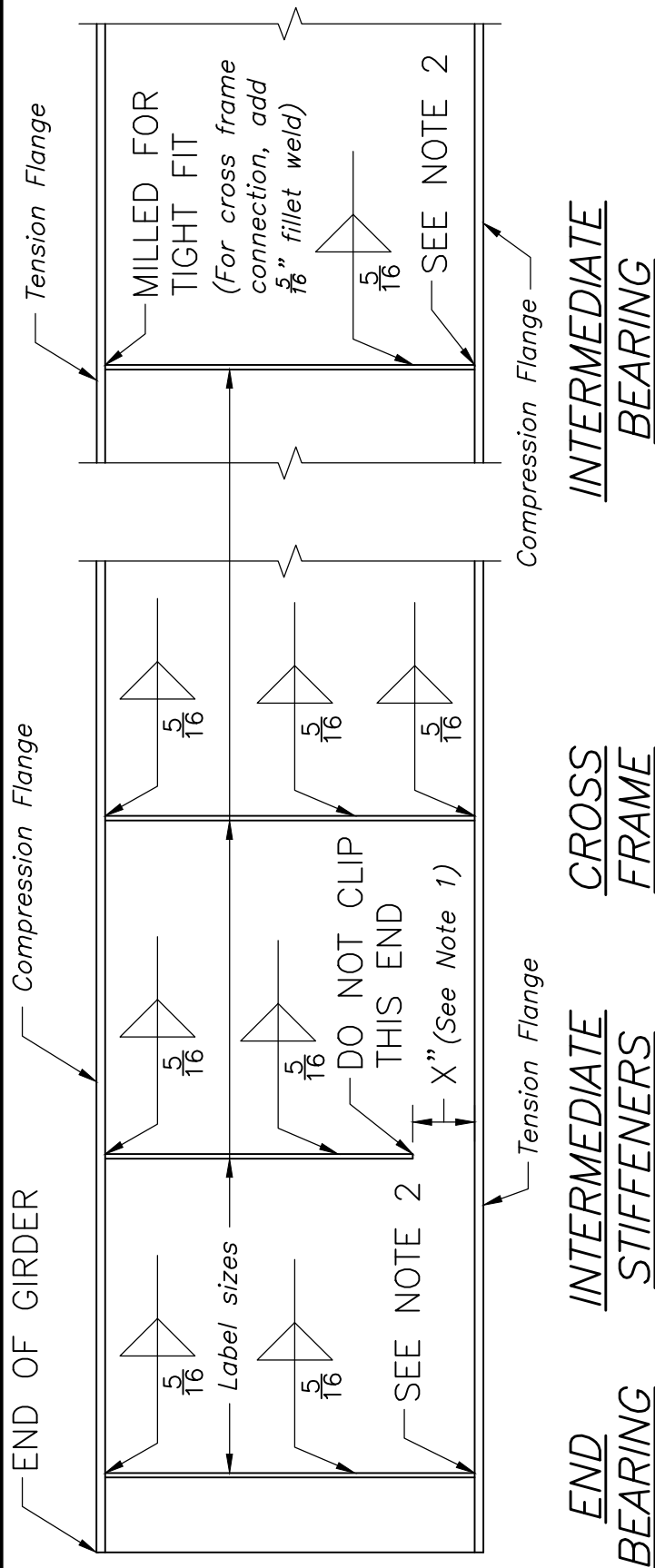
## NOTES:

1. Include girder elevation for each girder type on the Construction Drawings.
2. All main plates, welds and dimensions shall be labeled on the Construction Drawings for each girder type. Show location of any splices and stiffeners.

# STIFFENER ATTACHMENT DETAILS PLATE GIRDERS

DATE OF ISSUE  
 JUNE 2013

DRAWING NUMBER  
**5.2.4**



## NOTES:

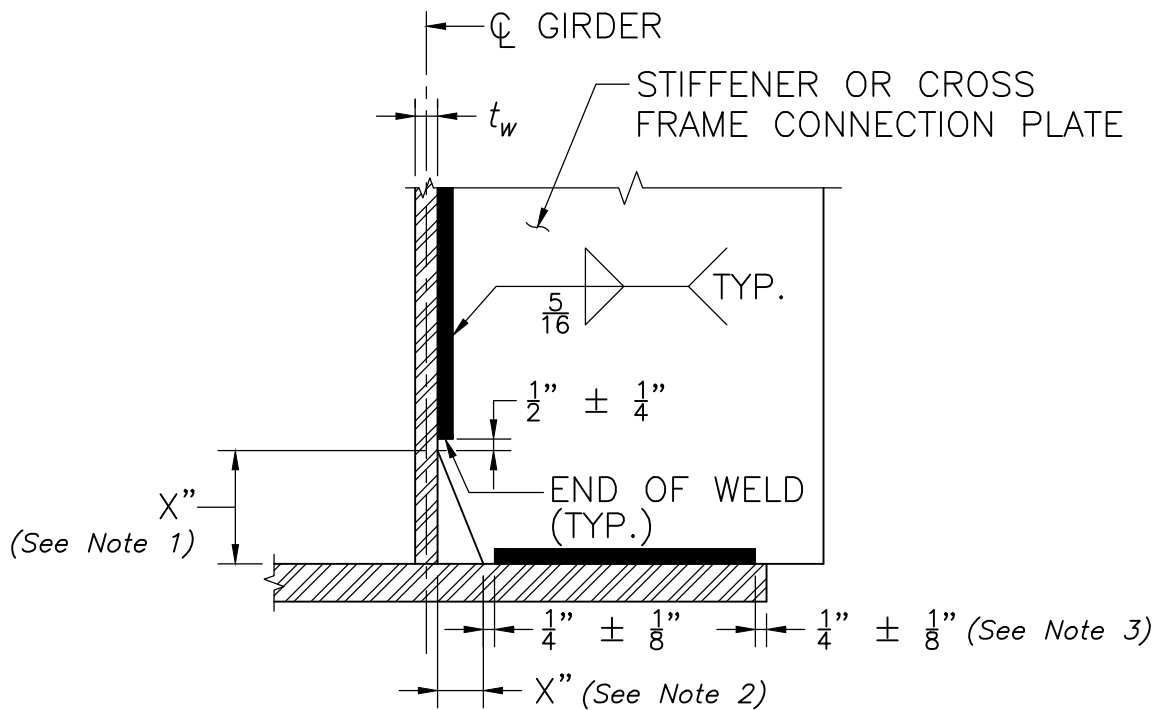
1. SEE CLIP DETAIL ON SHEET X. (See Dwg. No. 5.2.5)
2. BEARING STIFFENER PLATE AT BOTTOM FLANGE SHALL BE MILLED FOR TIGHT FIT AND WELDED WITH  $\frac{5}{16}$ " FILLET WELDS BOTH SIDES OF PLATE.

## STIFFENER ATTACHMENT DETAILS

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

## NOTES:

1. Intermediate stiffeners shall be terminated at a distance of 4 to 6 times the web thickness from the tension flange. Show the dimension on the Construction Drawings.
2. Bearing stiffener plates shall be wide enough to extend to the outer edges of flange as a minimum.



**NOTE:**

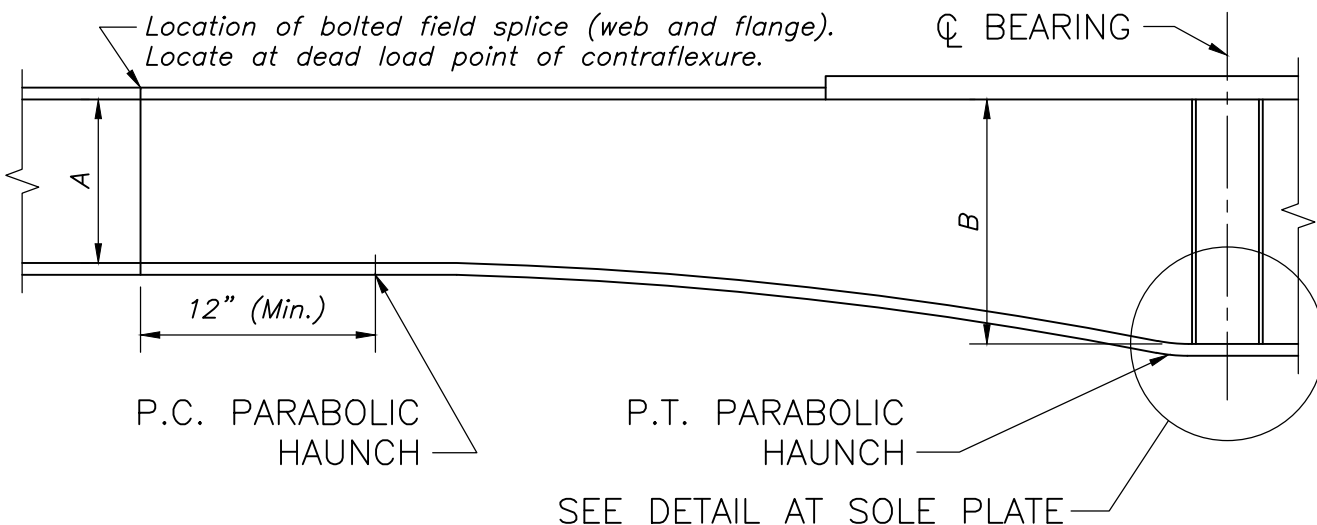
AT STIFFENER LOCATIONS, MODIFY THE PLATE ATTACHMENT TO THE FLANGES AS SHOWN IN THE TYPICAL STIFFENER ATTACHMENTS ON SHEET X.

**CLIP DETAIL**

NOT TO SCALE

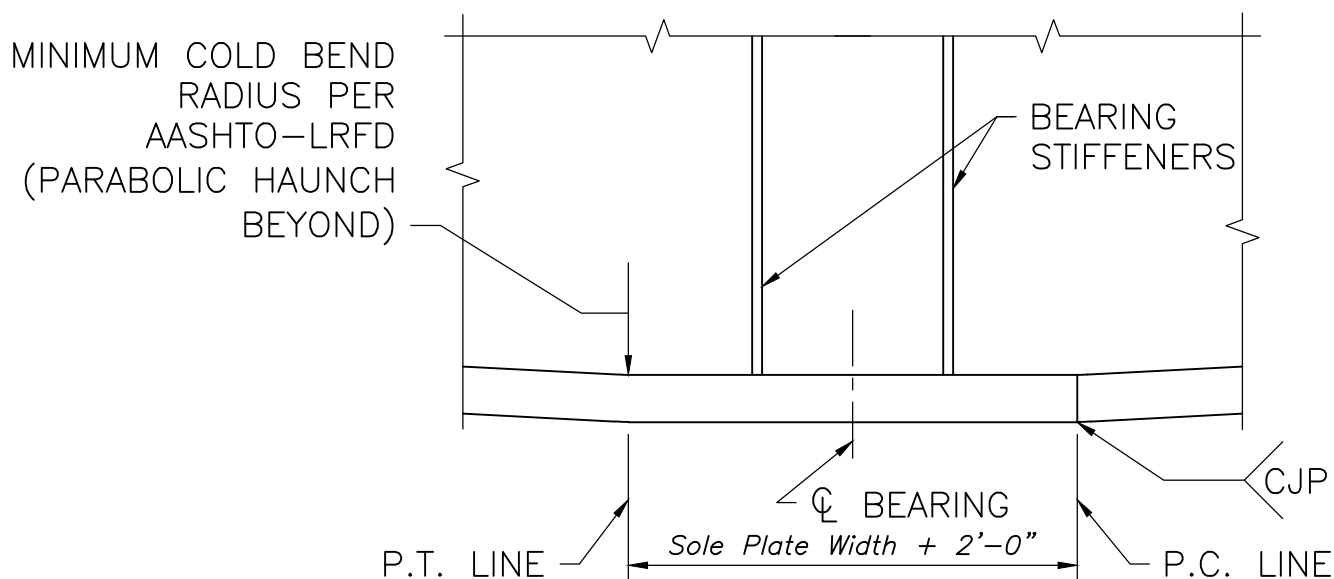
**NOTES:**

1. Height of clip shall be  $5 \times t_w$
2. Width of clip shall be  $2 \times t_w$
3. Terminate weld  $\frac{1}{4}$ " from edge of flange or connection plate, whichever is encountered first.



## GIRDER ELEVATION

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



### NOTE:

FABRICATOR MAY PROVIDE A WELDED JOINT AT THE END OF THE HAUNCH IN LIEU OF THE BEND.

## DETAIL AT SOLE PLATE

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

### NOTES:

1. Include the above details on the Construction Drawings with all relevant dimensions and plate sizes labeled.
2. Where feasible, the haunch shall be proportioned such that the ratio of web depths  $A/B = 0.7$ .
3. Intermediate stiffeners and connection plates shall be spaced so that they do not interfere with bolted field splices.
4. The location of splices shall be shown on the Framing Plan.
5. If girders are considered fracture critical, areas in tension shall be shown on Construction Drawings.



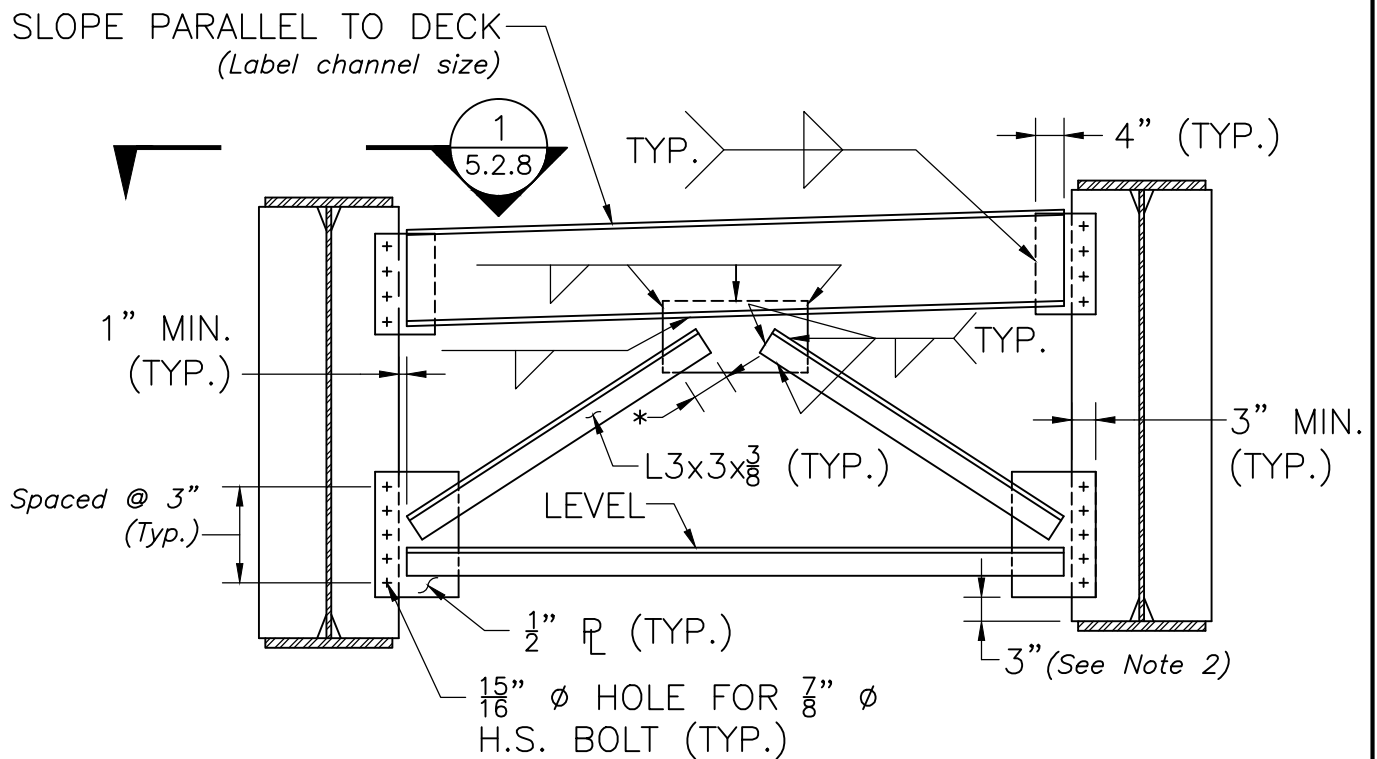
LRFD BRIDGE  
MANUAL, PART II

## PARABOLIC HAUNCH GIRDERS PLATE GIRDERS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

**5.2.6**



\* — 6" MIN. (TYP.)

### NOTES:

1. SEE CLIP DETAIL ON SHEET X. (See Dwg. No. 5.2.5)
2. TERMINATE FILLET WELDS  $\frac{1}{2}$ " SHORT OF ALL PLATE EDGES.

## END CROSS FRAME DETAILS

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

### NOTES:

1. Modify the details as necessary to suit project.
2. Cross frame shall be as deep as practical. Dimension the location of the angles and bolts (with edge distances) on this detail. Channel, angles, weld sizes, and number of bolts to be as required by design.
3. End cross frames shall be placed parallel to the centerline of bearings as shown in the Framing Plan.
4. Size connection plate width as required for attachment of cross frame. If connection plates also serve as bearing stiffeners they shall be at least as wide as the flange and shall meet AASHTO-LRFD size requirements at a minimum. Modify the attachment of the plate to the bottom flange as required (see Dwg. No. 5.2.4).



LRFD BRIDGE  
MANUAL, PART II

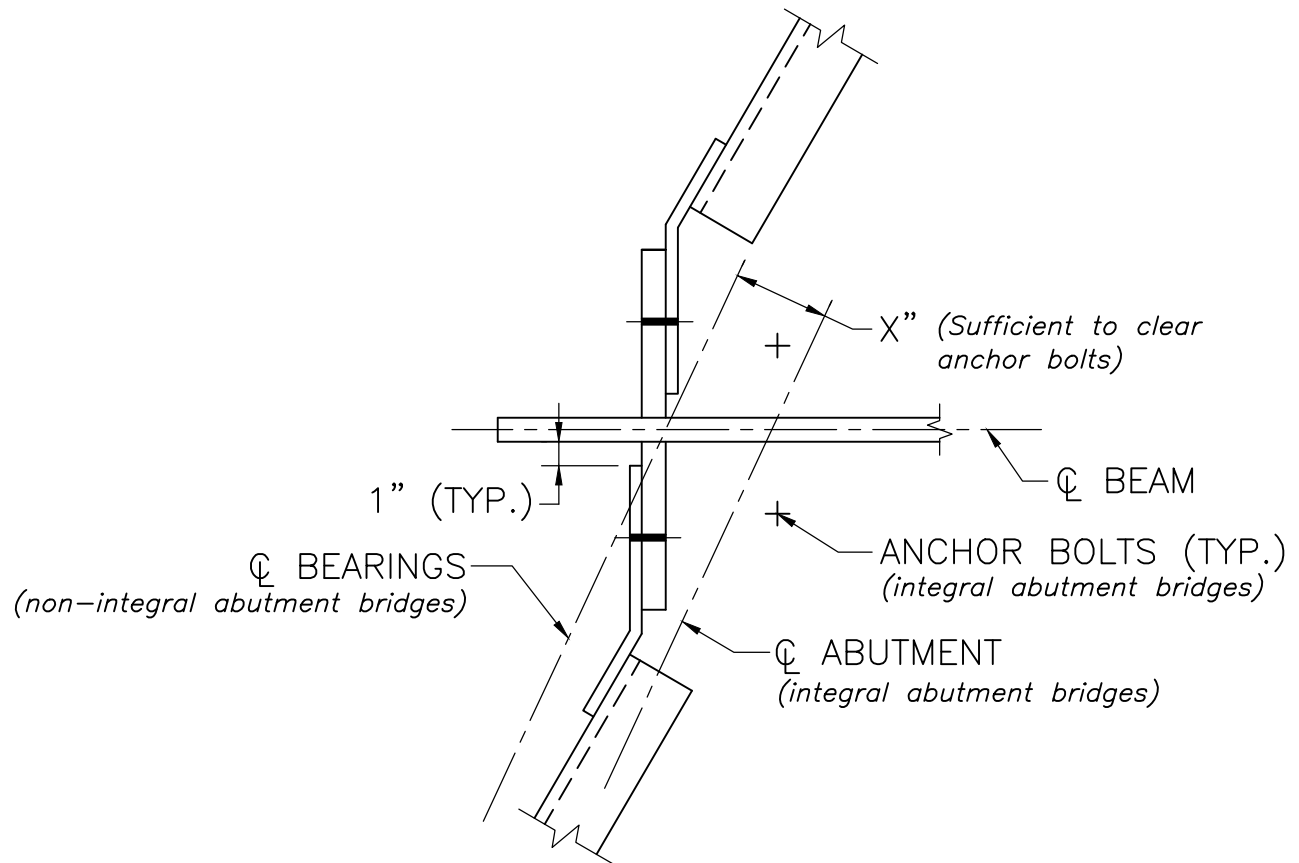
## END CROSS FRAME DETAILS

PLATE GIRDERS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

**5.2.7**



## SECTION 1

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



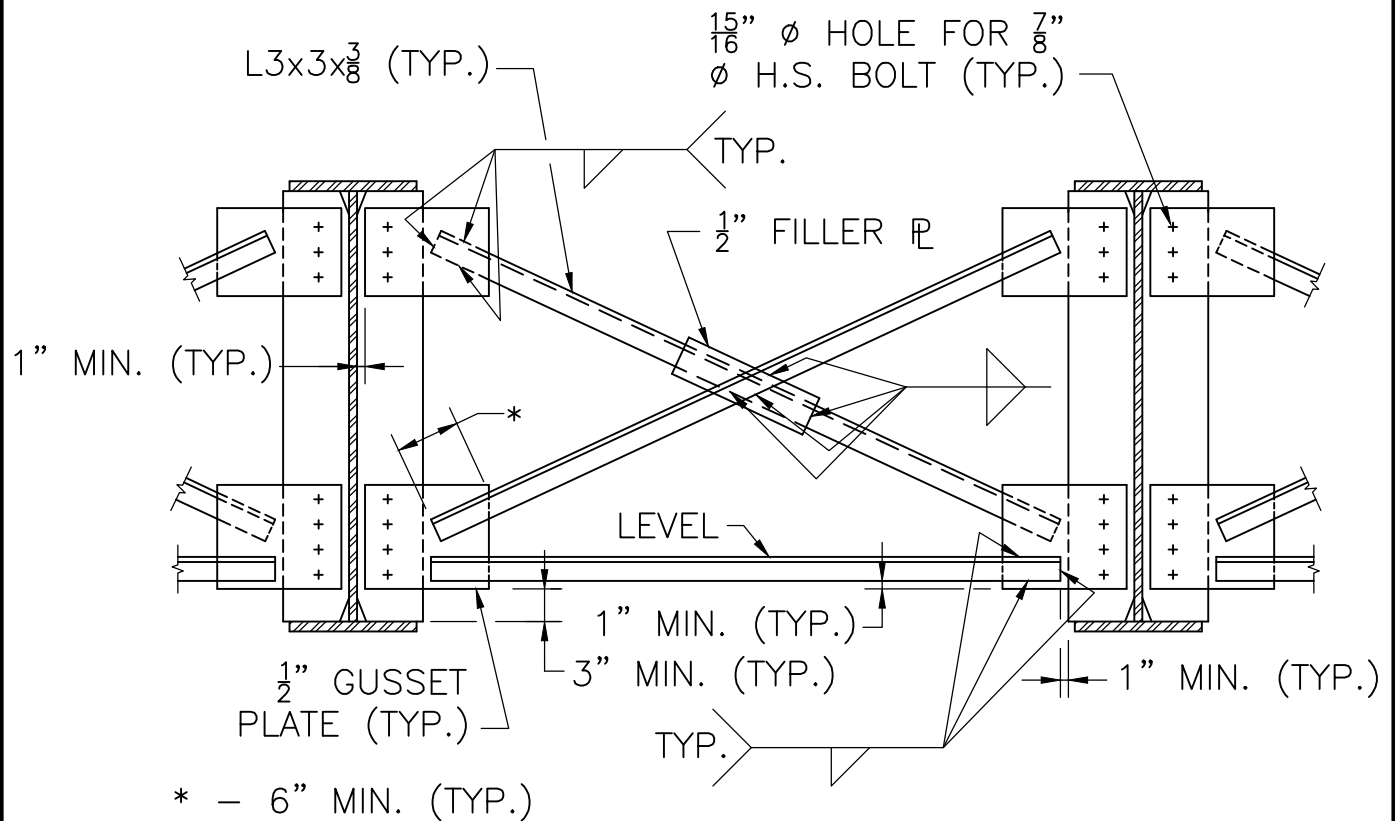
LRFD BRIDGE  
MANUAL, PART II

# END CROSS FRAME DETAILS SECTION 1 PLATE GIRDERS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

**5.2.8**



### NOTES:

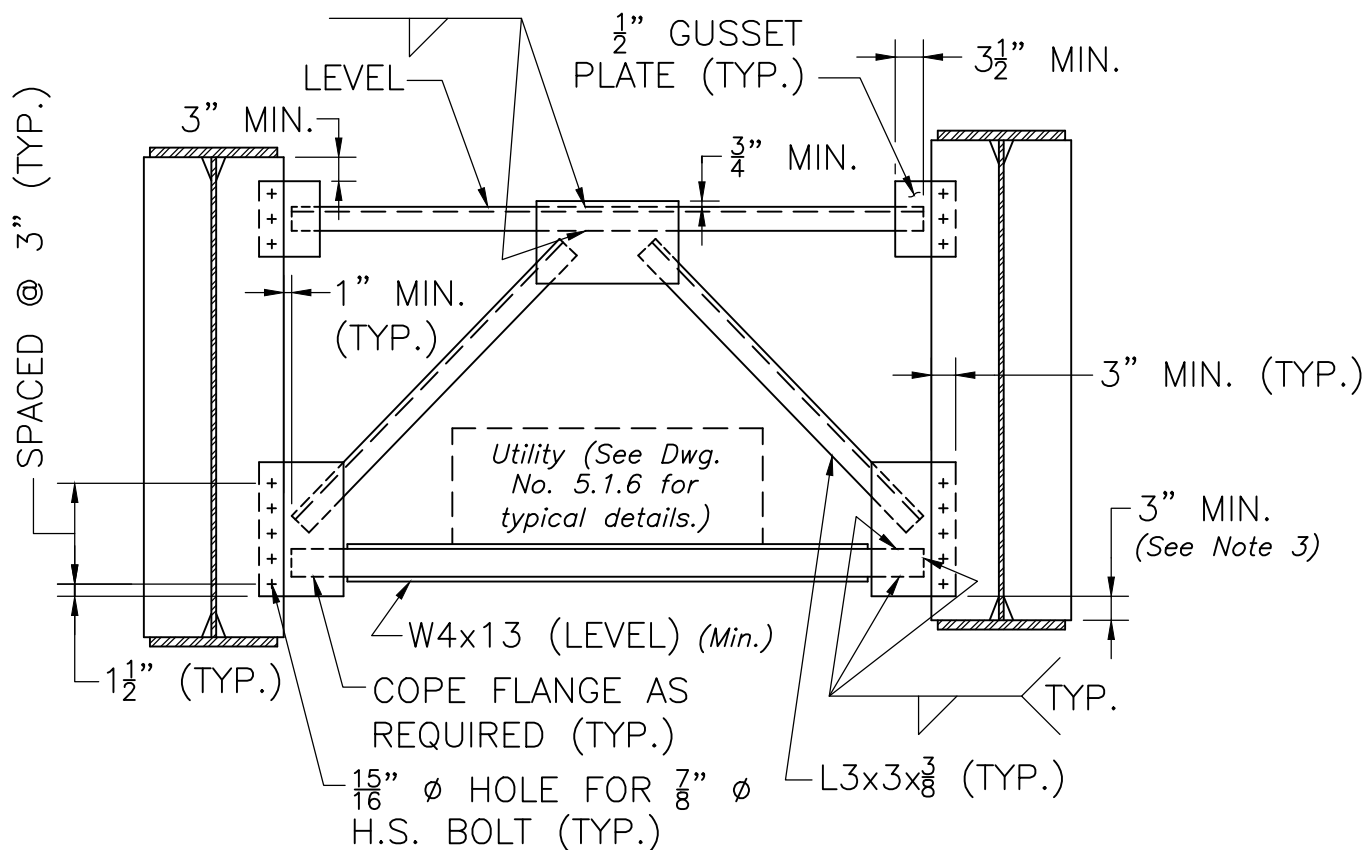
1. SEE CLIP DETAIL ON SHEET X. (See Dwg. No. 5.2.5)
2. TERMINATE FILLET WELDS 1/2" SHORT OF ALL PLATE EDGES.

## INTERMEDIATE CROSS FRAME DETAILS

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

### NOTES:

1. Cross frame shall be as deep as practical. Dimension the location of the angles and bolts (with edge distances) on this detail. Channel, angles, weld sizes, and number of bolts to be as required by design.
2. Maximum spacing of cross frames shall not exceed 25'-0".
3. Size the connection plate width as required for attachment of angles. If connection plates also serve as web stiffeners, plate size shall at a minimum meet AASHTO-LRFD and the Bridge Manual requirements (See Dwg. No. 5.2.2).



### NOTE:

SEE CLIP DETAIL ON SHEET X. (See Dwg. No. 5.2.5)

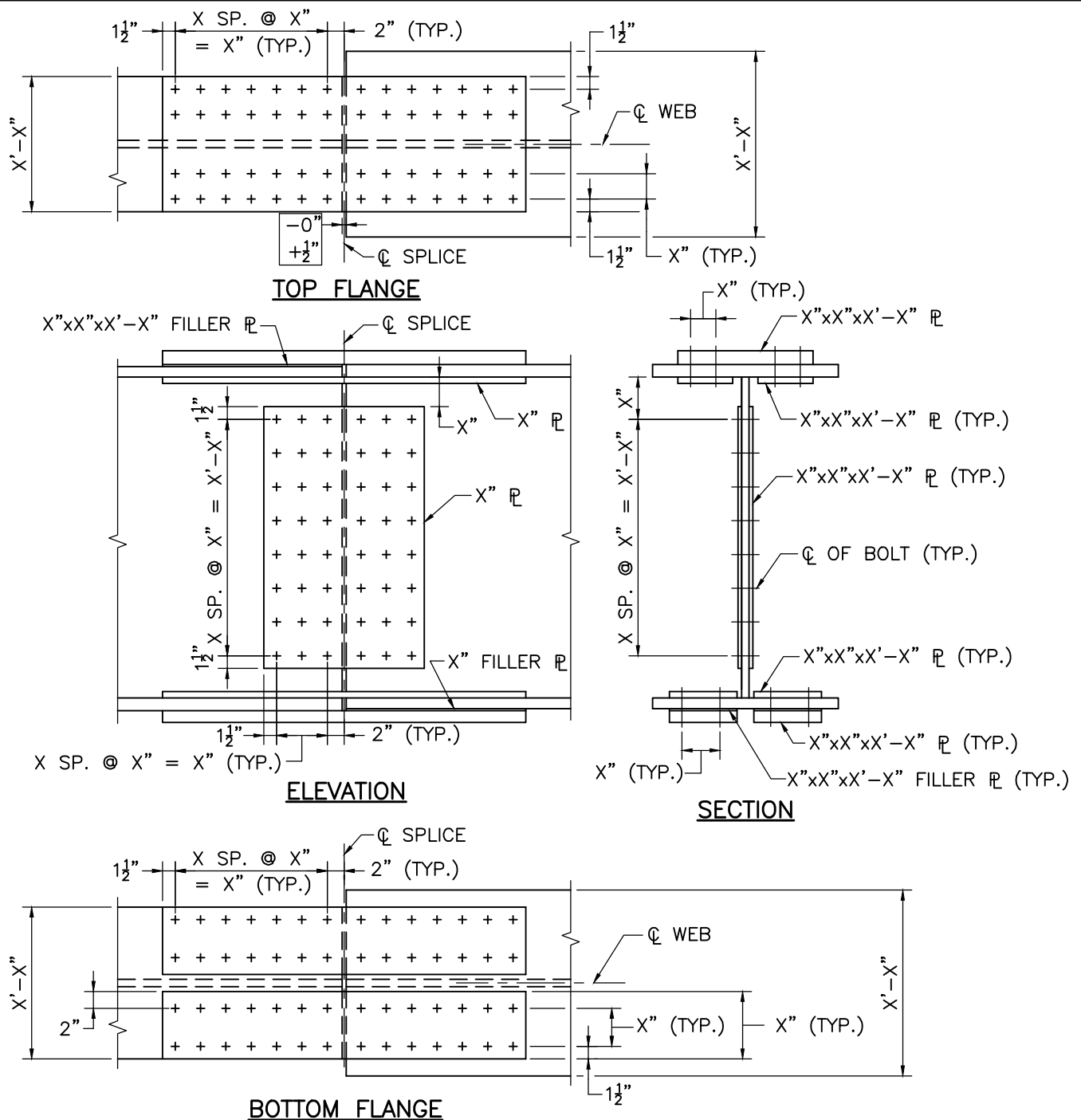
## UTILITY SUPPORT DETAILS AT INTERMEDIATE CROSS FRAMES

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

### NOTES:

1. Modify the details as necessary to suit project.
2. Combine this drawing with the details shown on Dwg. No. 5.2.11.
3. Intermediate support frames shall be as deep as practical. Dimension the location of the angles, support, and bolt holes (with edge distances) on this detail.
4. Size the connection plate width as required for the attachment of angles and support. If the connection plates also serve as web stiffeners, plate size shall at a minimum meet AASHTO-LRFD and the Bridge Manual requirements (see Dwg. No. 5.2.2).
5. A minimal size of the utility support beam is shown. Actual size shall be as required by design.



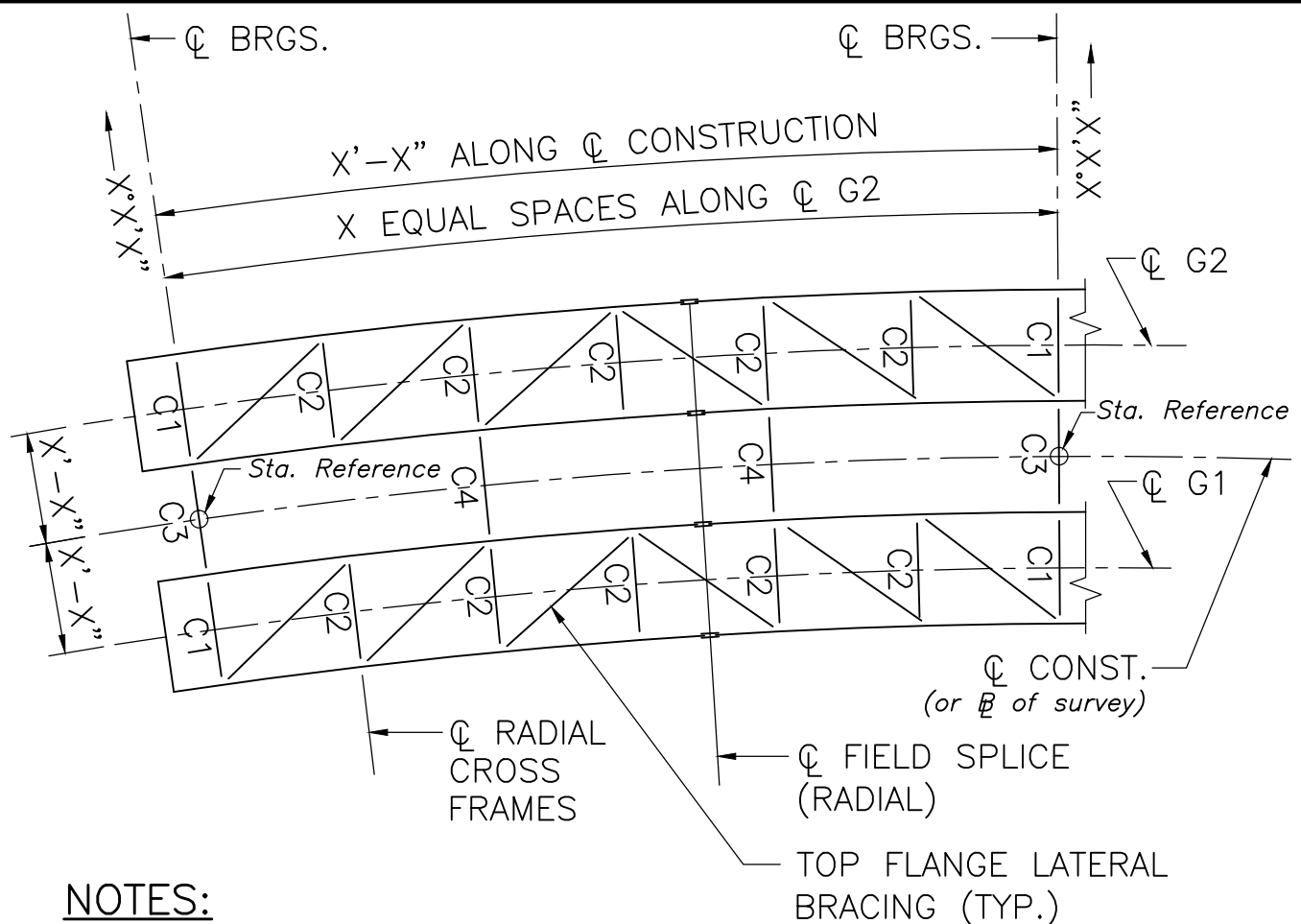


#### NOTES:

1. BOLTED FIELD SPLICES SHALL BE CONSIDERED SLIP CRITICAL CONNECTIONS WITH CLASS B FAYING SURFACES. (*Change to Class C for galvanized surfaces.*)
2. + DENOTES 7/8" Ø ASTM A325 HIGH STRENGTH BOLT IN 15/16" Ø HOLE.
3. THICKNESS DIFFERENCES OF 1/8" OR LESS DO NOT REQUIRE FILLER PLATES. FILLER PLATES SHALL CONFORM TO AASHTO M 270 GRADE 50W OR ASTM A606. (*Include where required.*)
4. ONE ROW OF STUD SHEAR CONNECTORS SHALL BE PLACED ALONG THE CENTERLINE OF THE TOP FLANGE SPLICE PLATE.

#### BOLTED FIELD SPLICE DETAILS

SCALE: 1" = 1'-0"



### NOTES:

1. C1 = TYPICAL INTERIOR END CROSS FRAME.  
C2 = TYPICAL INTERIOR INTERMEDIATE CROSS FRAME.  
C3 = TYPICAL EXTERIOR END CROSS FRAME.  
C4 = TYPICAL EXTERIOR INTERMEDIATE CROSS FRAME.
2. SEE SHEET X FOR CROSS FRAME AND UTILITY SUPPORT DETAILS.
3. THE MAIN LOAD CARRYING MEMBERS ARE XXX.

## FRAMING PLAN

### NOTES:

SCALE:  $\frac{1}{8}" = 1'-0"$

1. See additional notes on Dwg. No.'s 5.2.1. and 5.2.2.
  2. Exterior cross frame spacing shall be governed by design requirements.
  3. Framing plan shows preferred top flange internal bracing configuration.
  4. Space cross frames along center line of longest girder.
  5. Radial layout preferred.
  6. For those bridges with East and West abutments, the girders shall be numbered consecutively starting from the Southern most girder to the Northern most and the spans shall be numbered consecutively from the West abutment to the East abutment.
  7. For those bridges with North and South abutments, the girders shall be numbered consecutively starting from the Western most girder to the Eastern most and the spans shall be numbered consecutively from the South abutment to the North abutment.
- Dimension locations of inspection access hatches in bottom flanges. Provide 1 hatch per steel box girder per substructure.



LRFD BRIDGE  
MANUAL, PART II

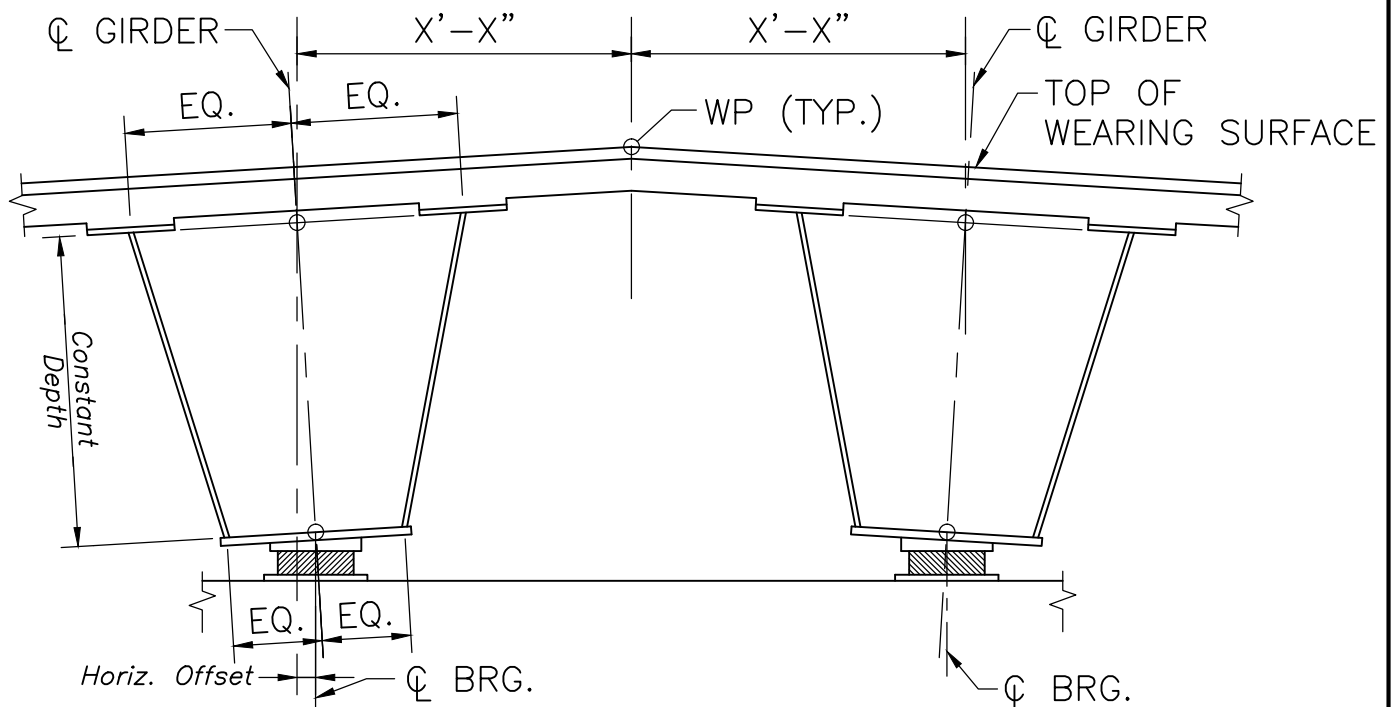
## TYPICAL FRAMING PLAN

STEEL BOX GIRDERS

DATE OF ISSUE  
JUNE 2013

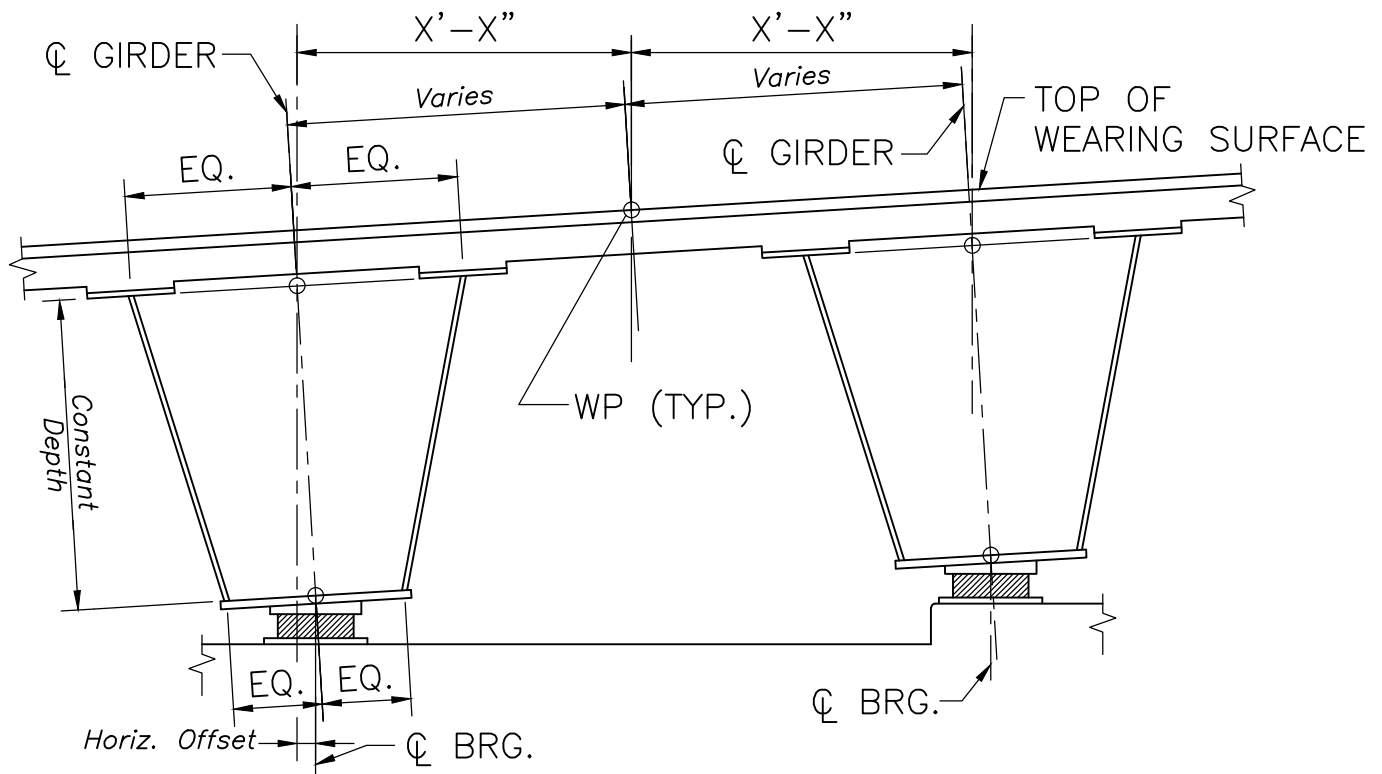
DRAWING NUMBER

**5.3.1**



## CROWNED ROADWAY SECTION

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



## SUPERELEVATED ROADWAY SECTION

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

### NOTES:

1. Rotate boxes to follow cross slope.
2. Maintain constant trapezoidal shape.
3. WP indicates working point. Working points shall be defined on Construction Drawings.



LRFD BRIDGE  
MANUAL, PART II

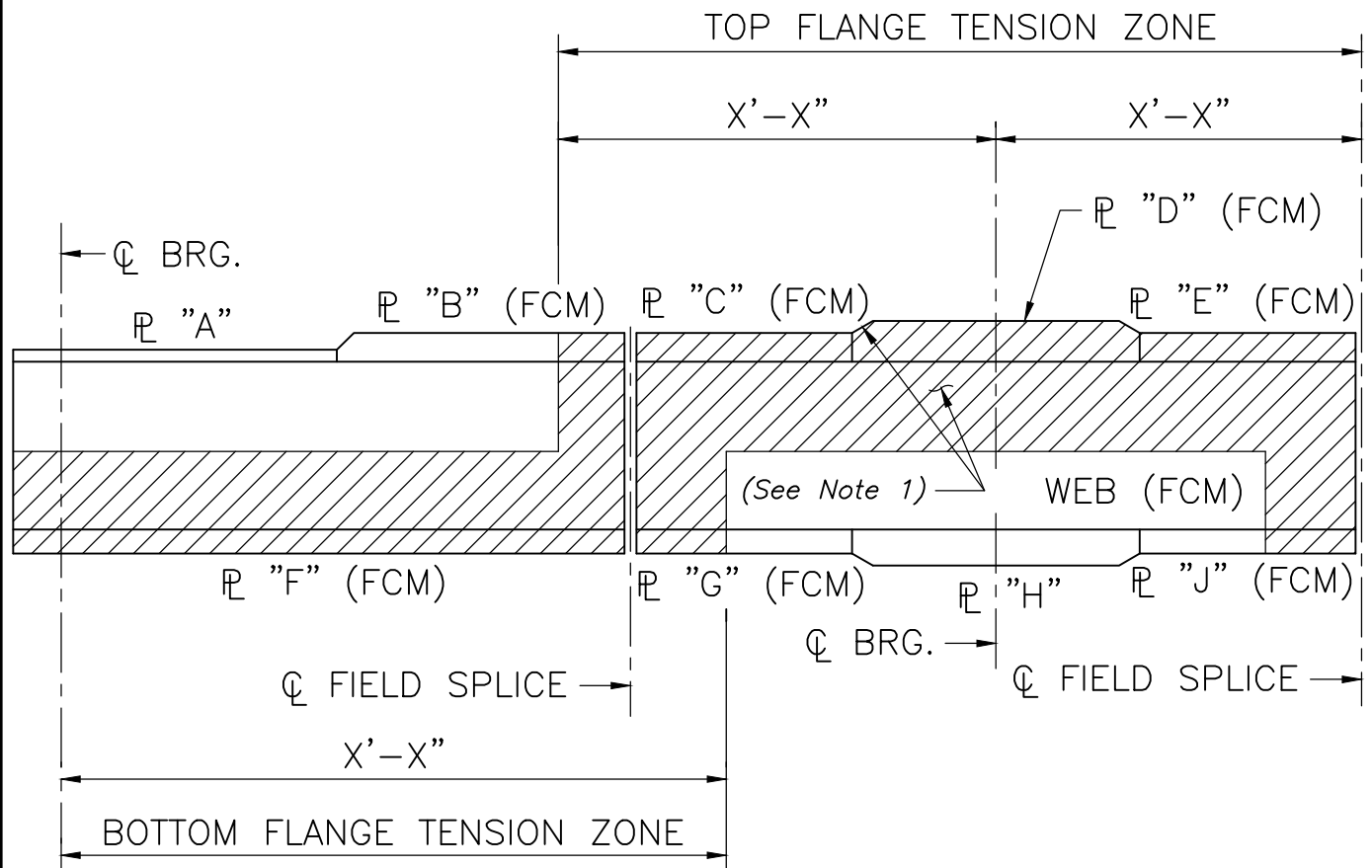
## TYPICAL GEOMETRY

STEEL BOX GIRDERS

DATE OF ISSUE  
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DRAWING NUMBER

**5.3.2**



### NOTES:

1. FCM DENOTES FRACTURE CRITICAL MEMBERS OR MEMBER COMPONENTS.
2. HATCHED AREA DENOTES TENSION ZONES. WELDS WITHIN THESE ZONES ARE SUBJECT TO FRACTURE CRITICAL TESTING REQUIREMENTS.

## SCHEMATIC GIRDER ELEVATION

NOT TO SCALE

### NOTES:

1. Fracture critical requirements for top flange tension zone apply only to single box girder bridges.
2. Provide a table of plate sizes.



LRFD BRIDGE  
MANUAL, PART II

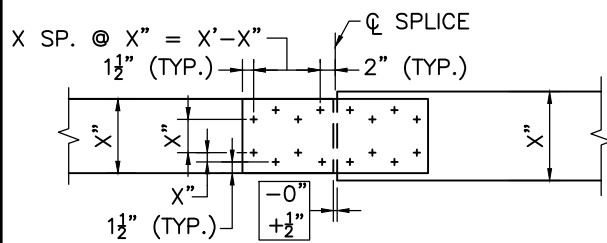
## FRACTURE CRITICAL MEMBERS

STEEL BOX GIRDERS

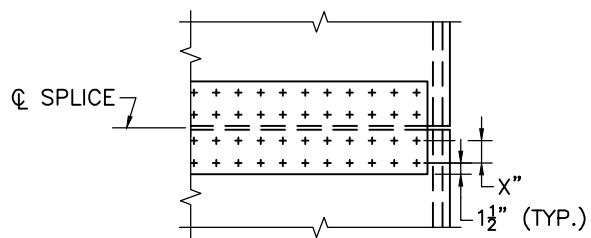
DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

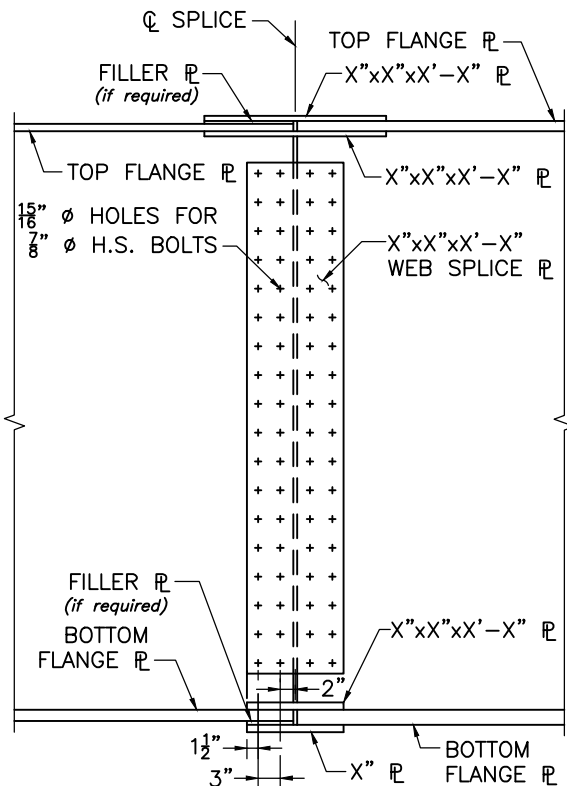
**5.3.3**



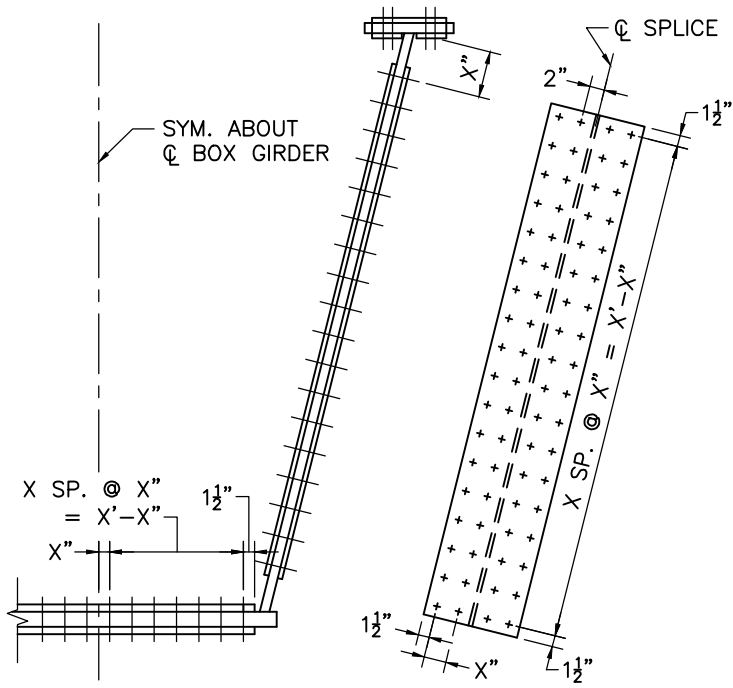
**TOP FLANGE**



**BOTTOM FLANGE**



**ELEVATION**



**SECTION**

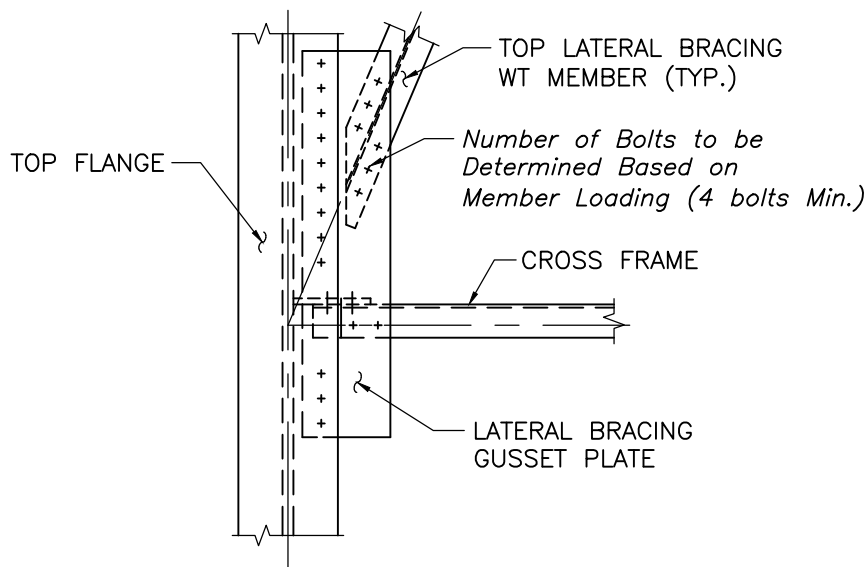
**WEB SPLICE PLATE**

**NOTES:**

1. BOLTED FIELD SPLICES SHALL BE CONSIDERED SLIP-CRITICAL CONNECTIONS WITH CLASS B FAYING SURFACES. (*Change to Class C for galvanized surfaces.*)
2. + DENOTES  $\frac{7}{8}$ "  $\phi$  ASTM A325 HIGH STRENGTH BOLT IN  $\frac{15}{16}$ "  $\phi$  HOLE.
3. THICKNESS DIFFERENCES OF  $\frac{1}{16}$ " OR LESS DO NOT REQUIRE FILLER PLATES. FILLER PLATES SHALL CONFORM TO AASHTO M 270 GRADE 50W OR ASTM A606. (*Include where required.*)
4. ONE ROW OF STUD SHEAR CONNECTORS SHALL BE PLACED ALONG THE CENTERLINE OF THE TOP FLANGE SPLICE PLATES.

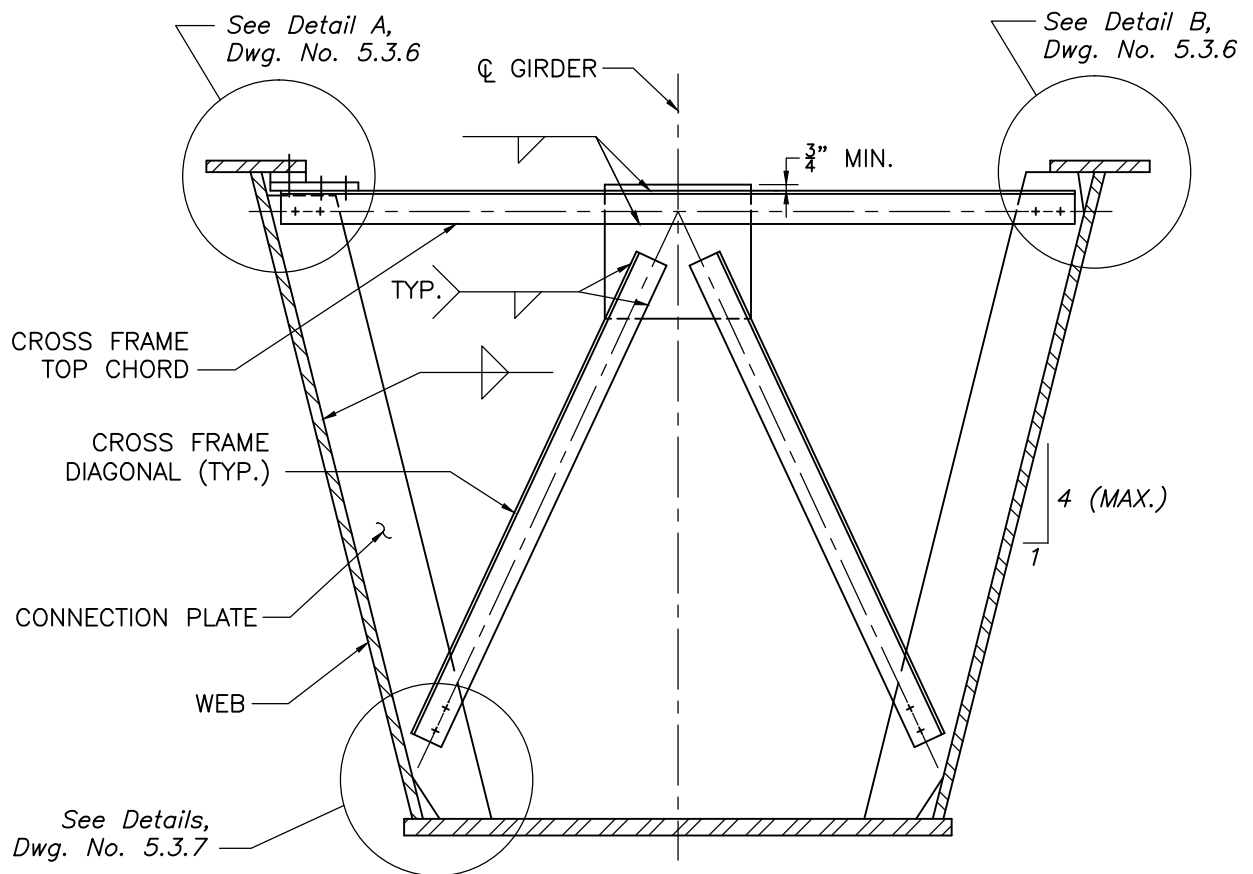
**BOLTED FIELD SPLICE DETAILS**

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



### PARTIAL PLAN

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



### INTERIOR INTERMEDIATE CROSS FRAME DETAILS

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

#### NOTES:

1. The top lateral bracing may be bolted directly to the flange without a gusset plate where the flange width permits.
2. Single angles are preferred for intermediate cross frames. Double angles may be required as the design dictates.
3. Rectangular gusset plates are preferred.



LRFD BRIDGE  
MANUAL, PART II

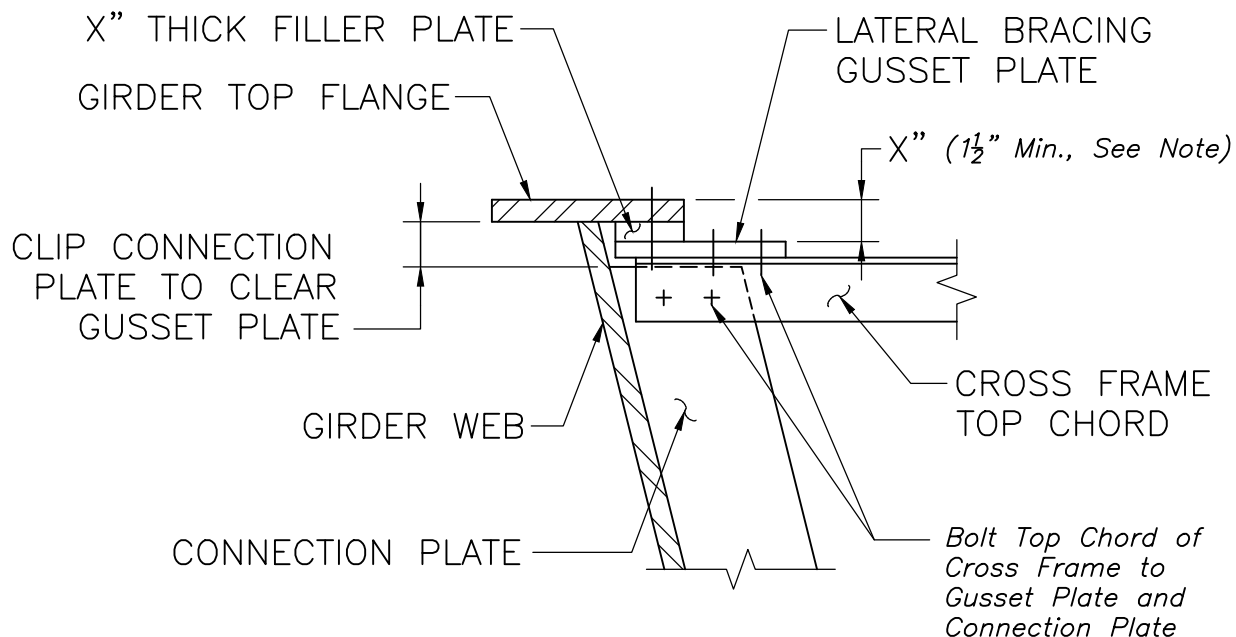
## INTERIOR INTERMEDIATE CROSS FRAME DETAILS

STEEL BOX GIRDERS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

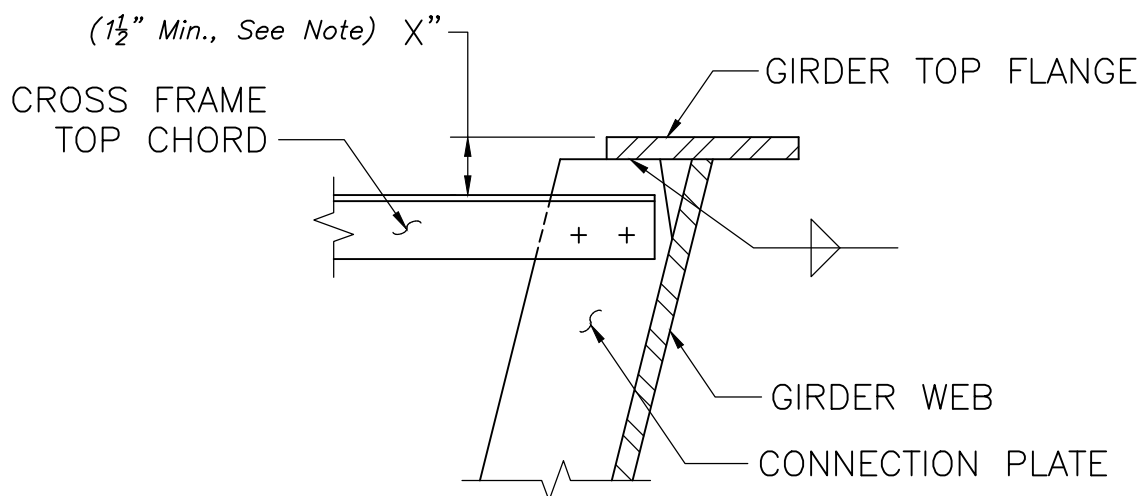
**5.3.5**



WITH LATERAL BRACING

DETAIL A

SCALE: 1" = 1'-0"



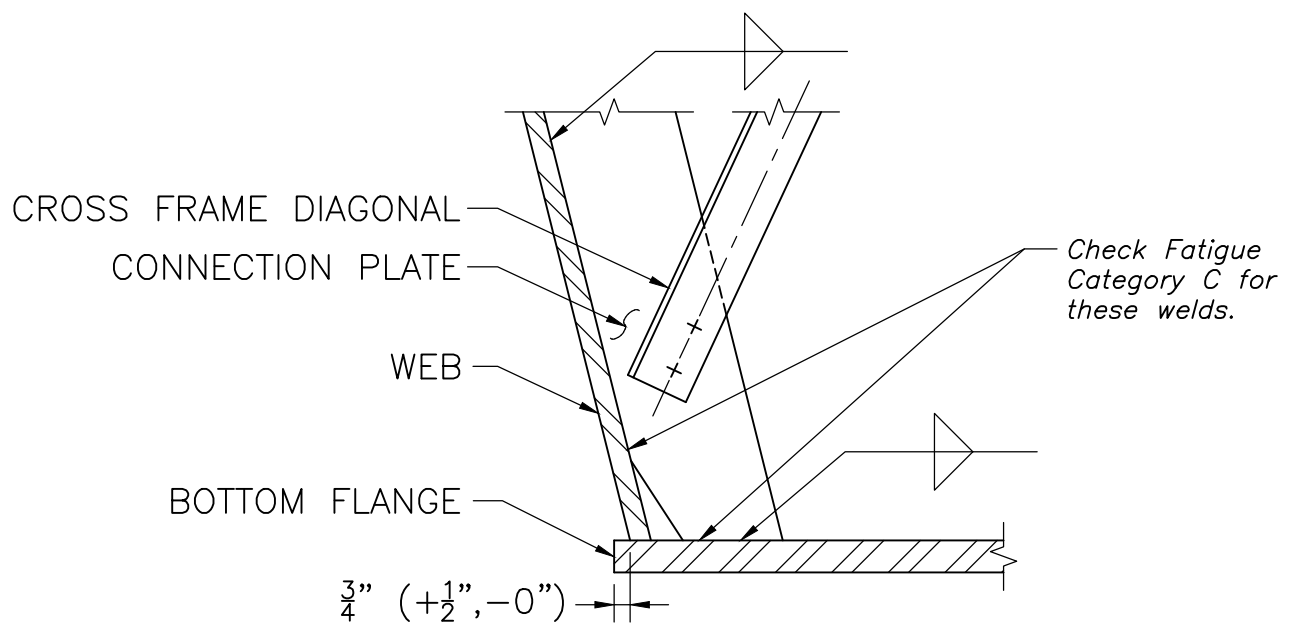
WITHOUT LATERAL BRACING

DETAIL B

SCALE: 1" = 1'-0"

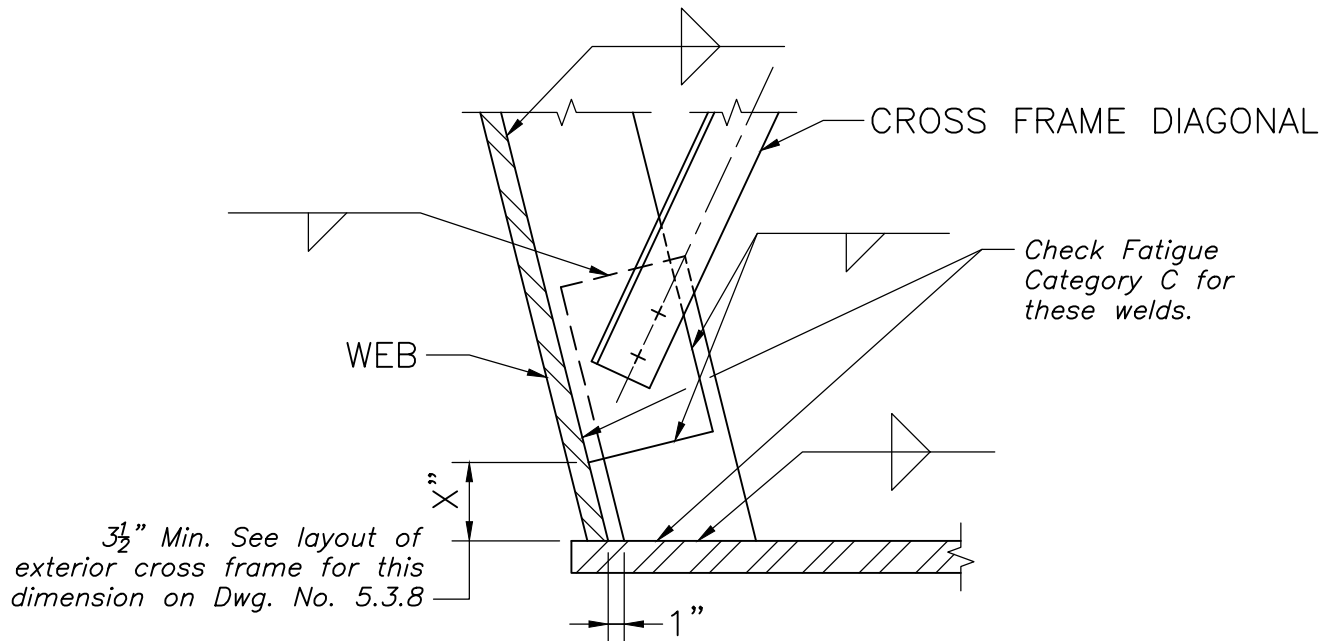
NOTE:

Leave gap to facilitate deck forming. Always keep dimension consistent between cross frames.



## CONNECTION DETAIL

SCALE: 1" = 1'-0"



### NOTES:

1. SEE CLIP DETAIL ON SHEET X. (See Dwg. No. 5.2.5)
2. TERMINATE FILLET WELDS  $\frac{1}{2}''$  SHORT OF ALL PLATE EDGES.

## CONNECTION DETAIL (ALTERNATE)

SCALE: 1" = 1'-0"

### NOTE:

Both details shall be shown on the Construction Drawings.



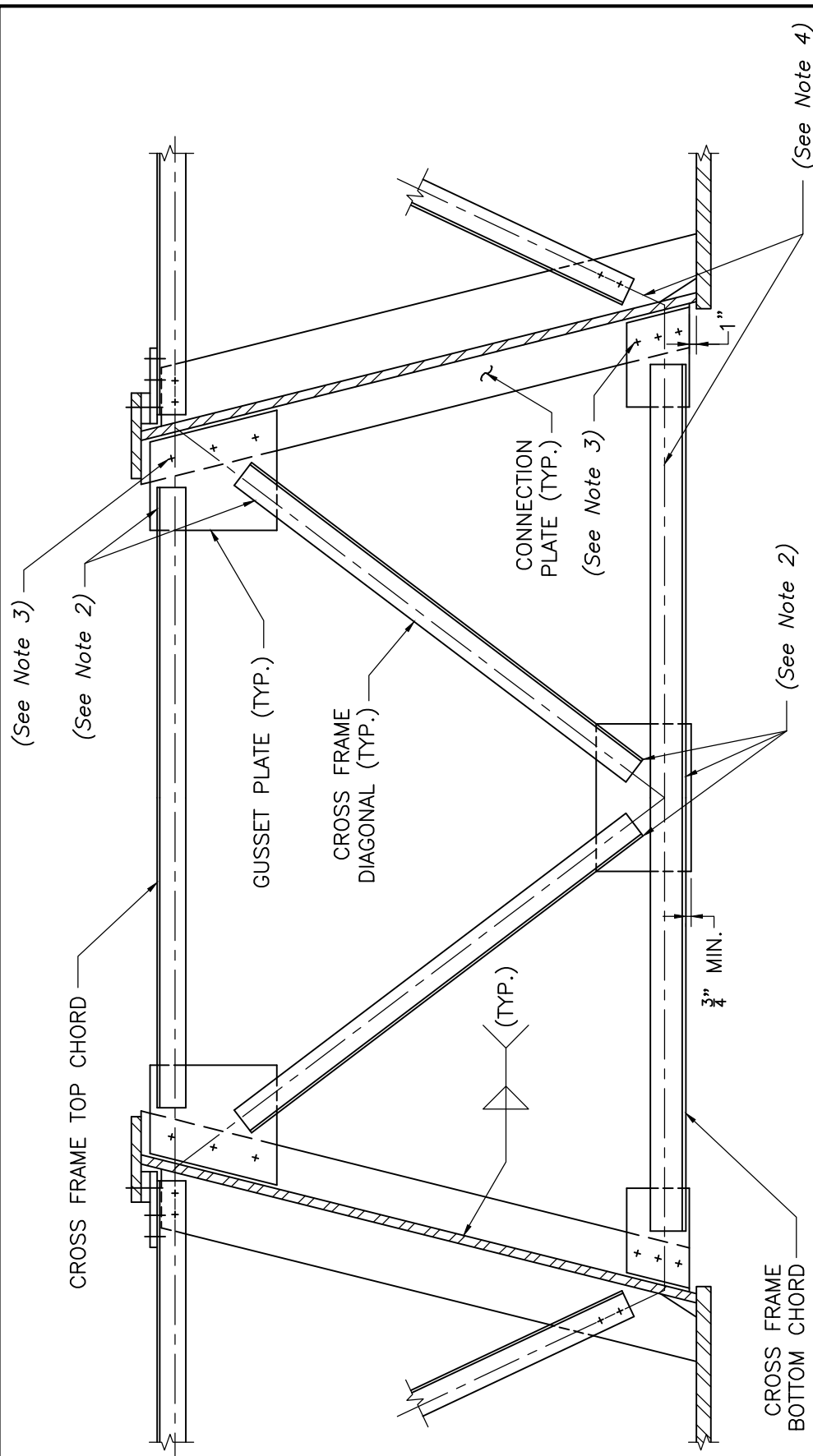
LRFD BRIDGE  
MANUAL, PART II

INT. INTERMEDIATE CROSS FRAME  
CONNECTION DETAILS AT BOTTOM  
STEEL BOX GIRDERS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

**5.3.7**



## EXTERIOR INTERMEDIATE CROSS FRAME

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

### NOTES:

1. The interior cross frame members shall be designed to accommodate the forces from the exterior cross frames.
2. Weld all angles to gusset plates with fillet welds on near side only.
3. Minimum number of bolts shown. Actual number of bolts shall be determined by design.
4. Line of action for interior and exterior cross frame members shall be coincident to the centerline of web.



LRFD BRIDGE  
MANUAL, PART II

## EXTERIOR INTERMEDIATE CROSS FRAME STEEL BOX GIRDERS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

**5.3.8**

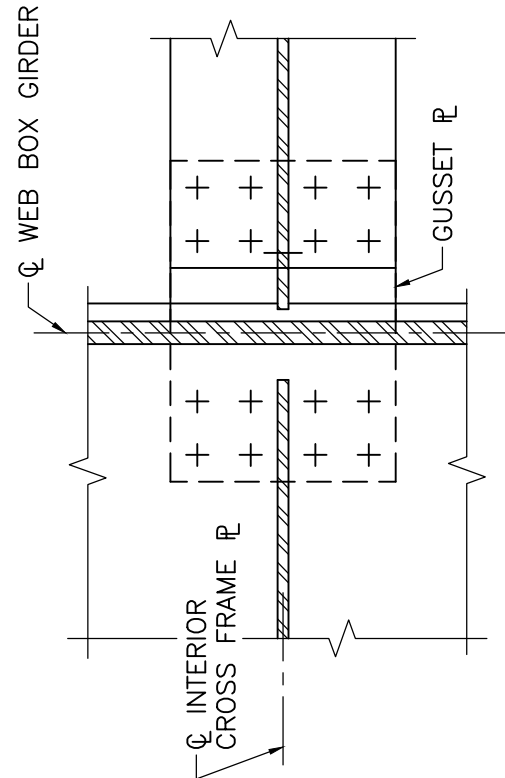
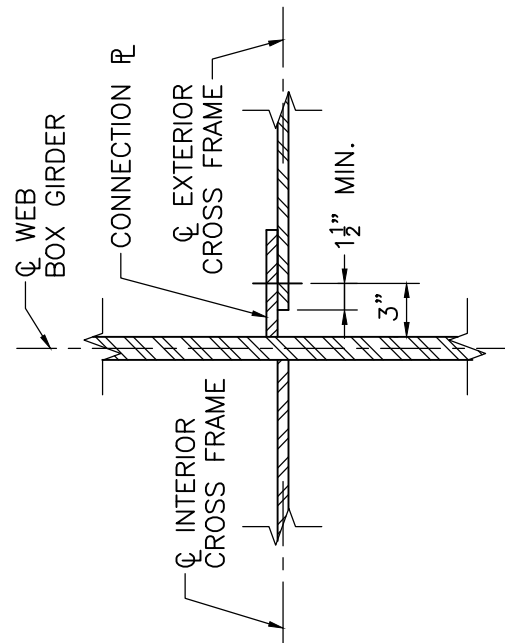
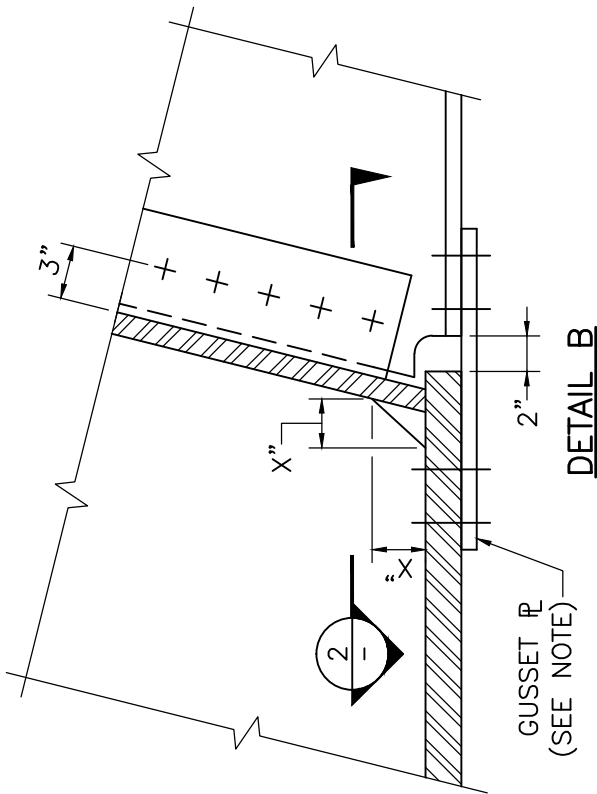
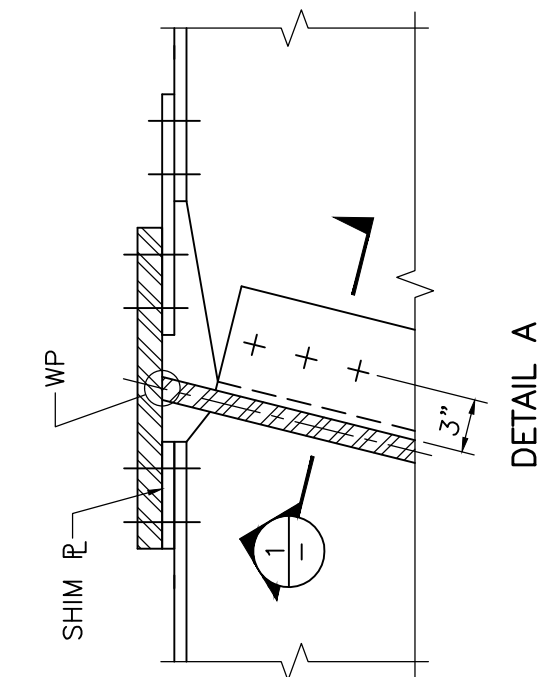


# END CROSS FRAME CONNECTION DETAILS

STEEL BOX GIRDER

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER  
**5.3.10**

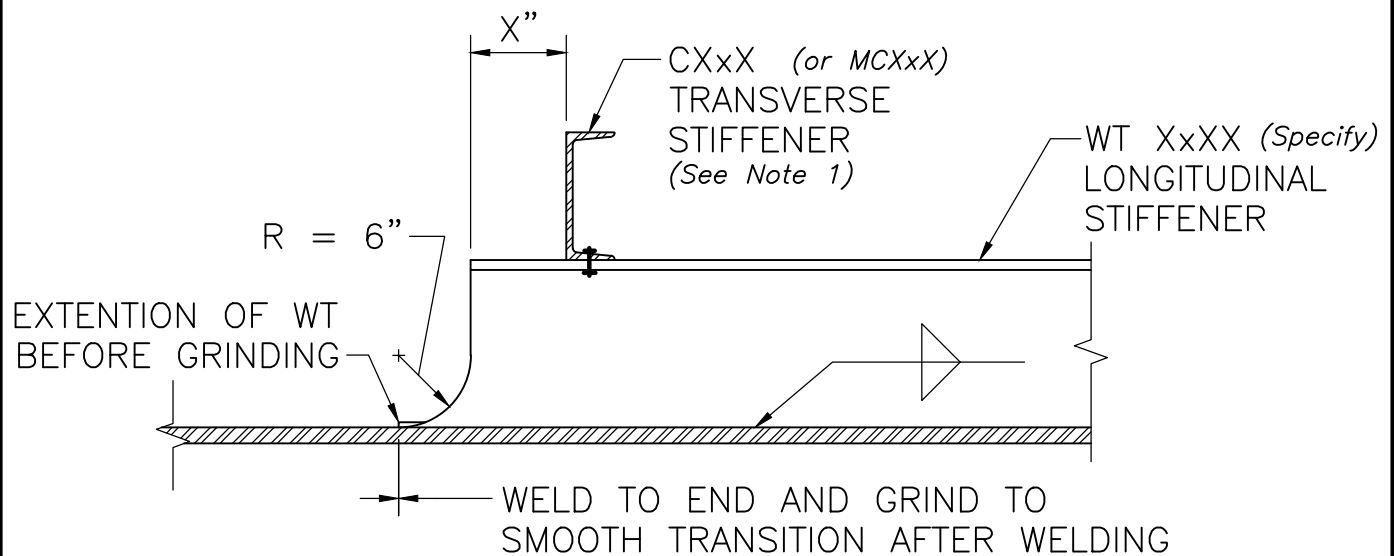


**NOTE:**

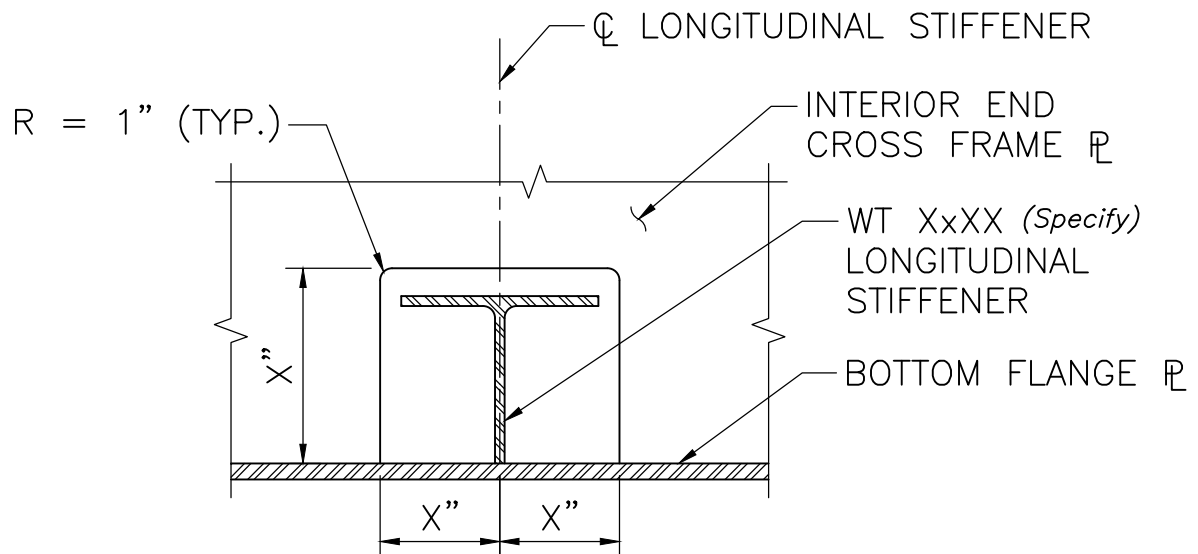
BEND PLATE AS REQUIRED WHEN CONNECTING CROSS FRAME BETWEEN BOXES WITH VARYING CROSS SLOPE.

## END CROSS FRAME CONNECTION DETAILS

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



## BOTTOM FLANGE LONGITUDINAL STIFFENER TERMINUS DETAIL NOT TO SCALE



## BOTTOM FLANGE LONGITUDINAL STIFFENER/PIER CROSS FRAME INTERFACE NOT TO SCALE

### NOTES:

1. Refer to AASHTO-LRFD for additional information regarding size and location of the transverse stiffener and it's connection to the longitudinal stiffener. Show location of transverse stiffener on framing plan.
2. Longitudinal stiffeners are typically only required for wider than normal box girders and the bearing stiffener details shown on Dwg. No. 5.3.9 will need to be modified to accommodate this detail.



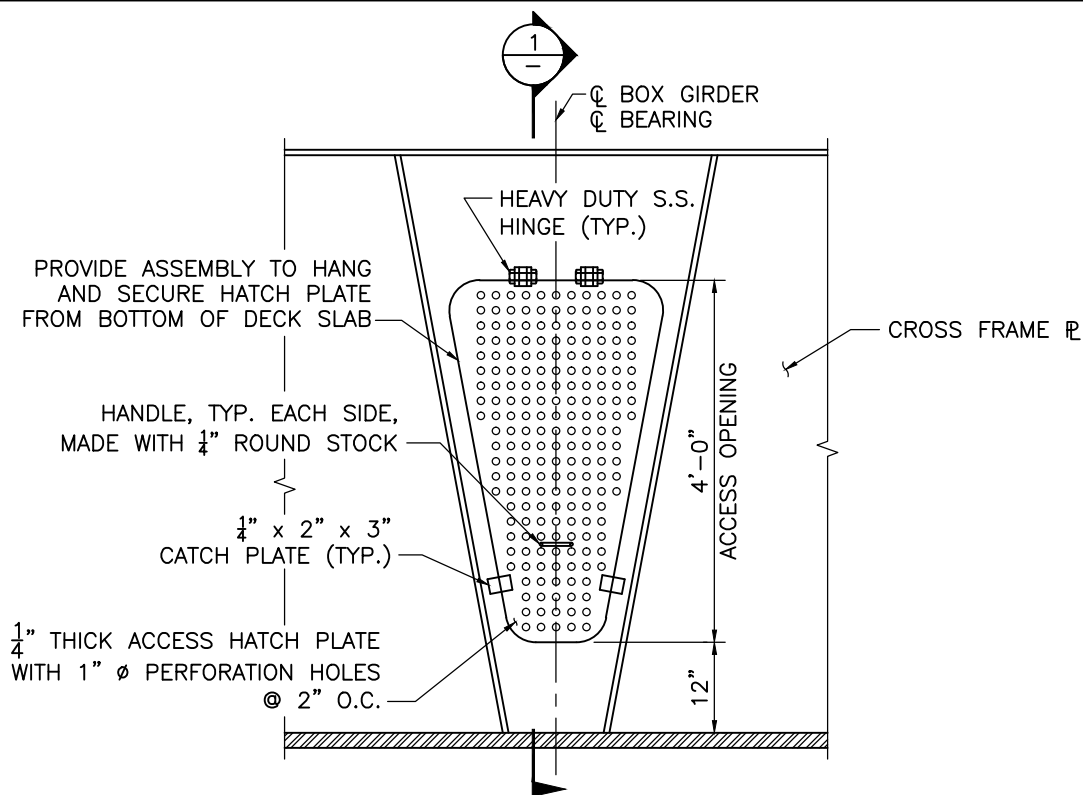
LRFD BRIDGE  
MANUAL, PART II

## LONGITUDINAL STIFFENER DETAILS STEEL BOX GIRDER

DATE OF ISSUE  
JUNE 2013

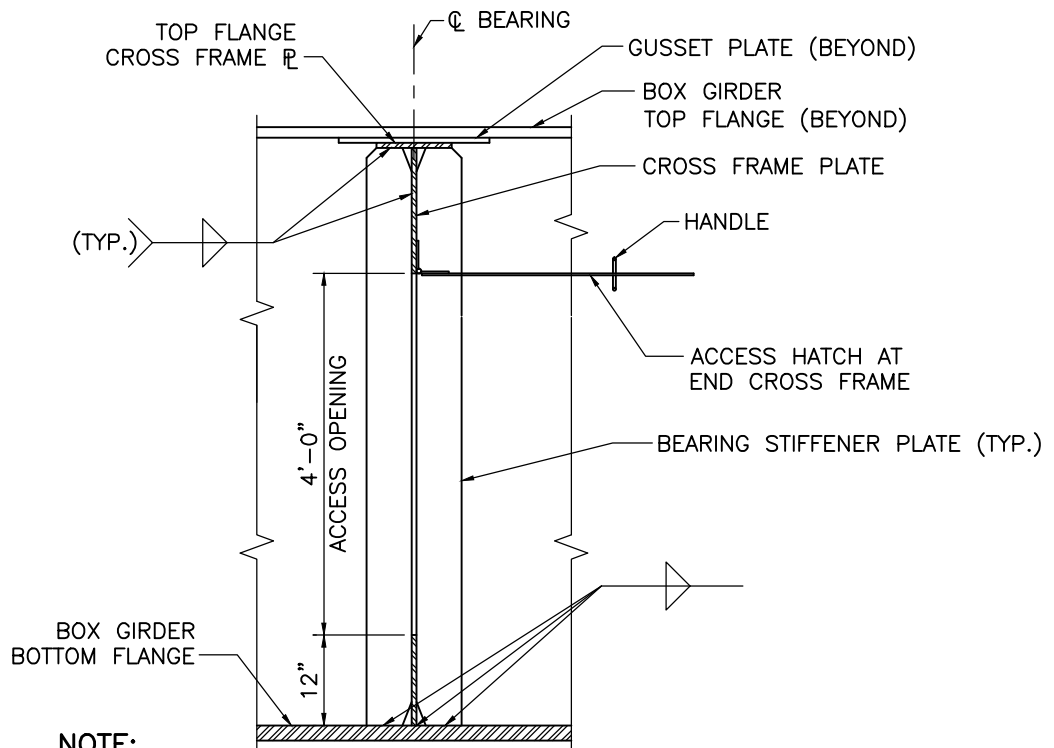
DRAWING NUMBER

**5.3.11**



### ACCESS HATCH AT INTERIOR END CROSS FRAME

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



#### NOTE:

ABUTMENT END CROSS FRAME SHOWN. PIER END CROSS FRAME SIMILAR.  
(Include this note for multiple span bridges)

### SECTION 1

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



LRFD BRIDGE  
MANUAL, PART II

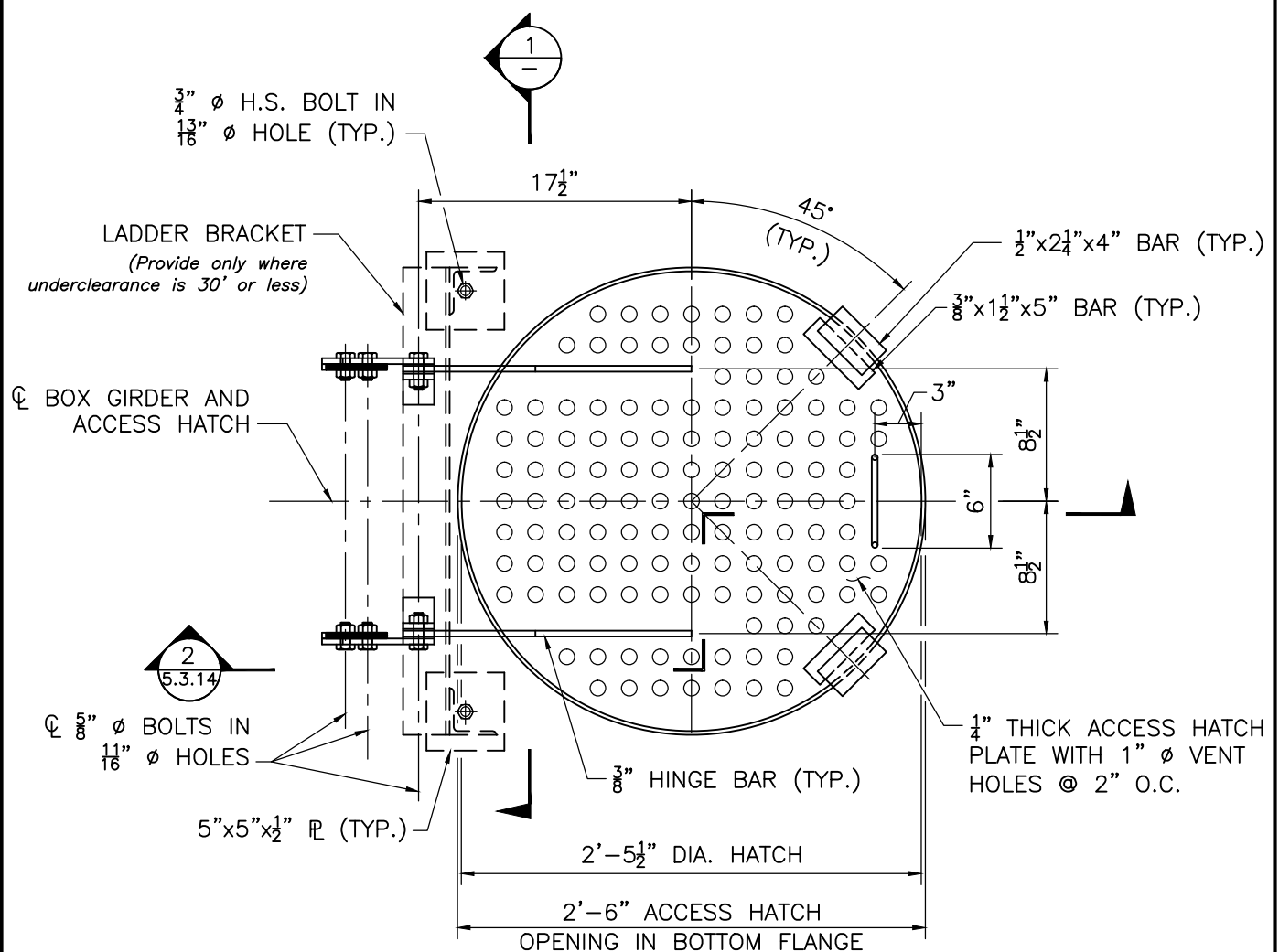
## END CROSS FRAME ACCESS HATCH DETAILS

STEEL BOX GIRDERS

DATE OF ISSUE  
JUNE 2013

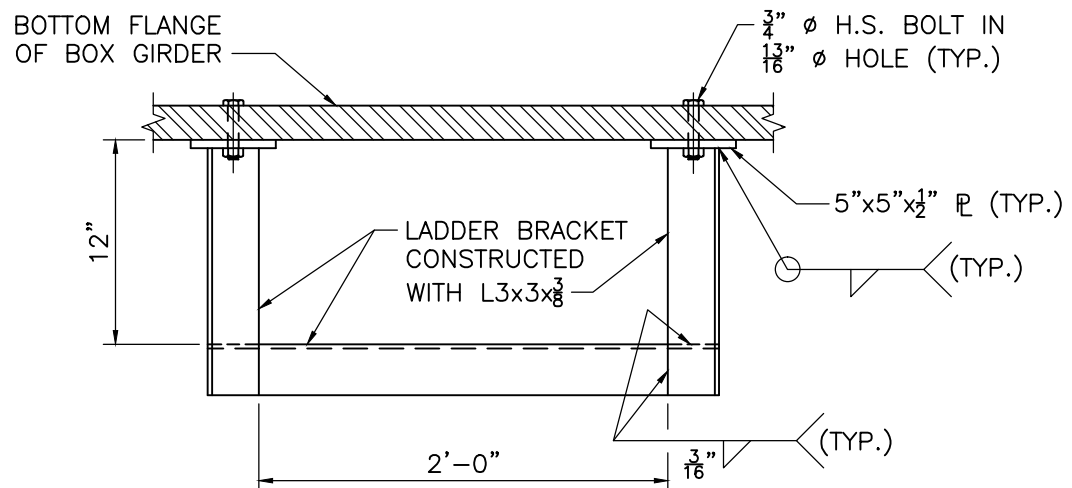
DRAWING NUMBER

**5.3.12**



## INSPECTION ACCESS HATCH PLAN

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



## SECTION 1

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



LRFD BRIDGE  
MANUAL, PART II

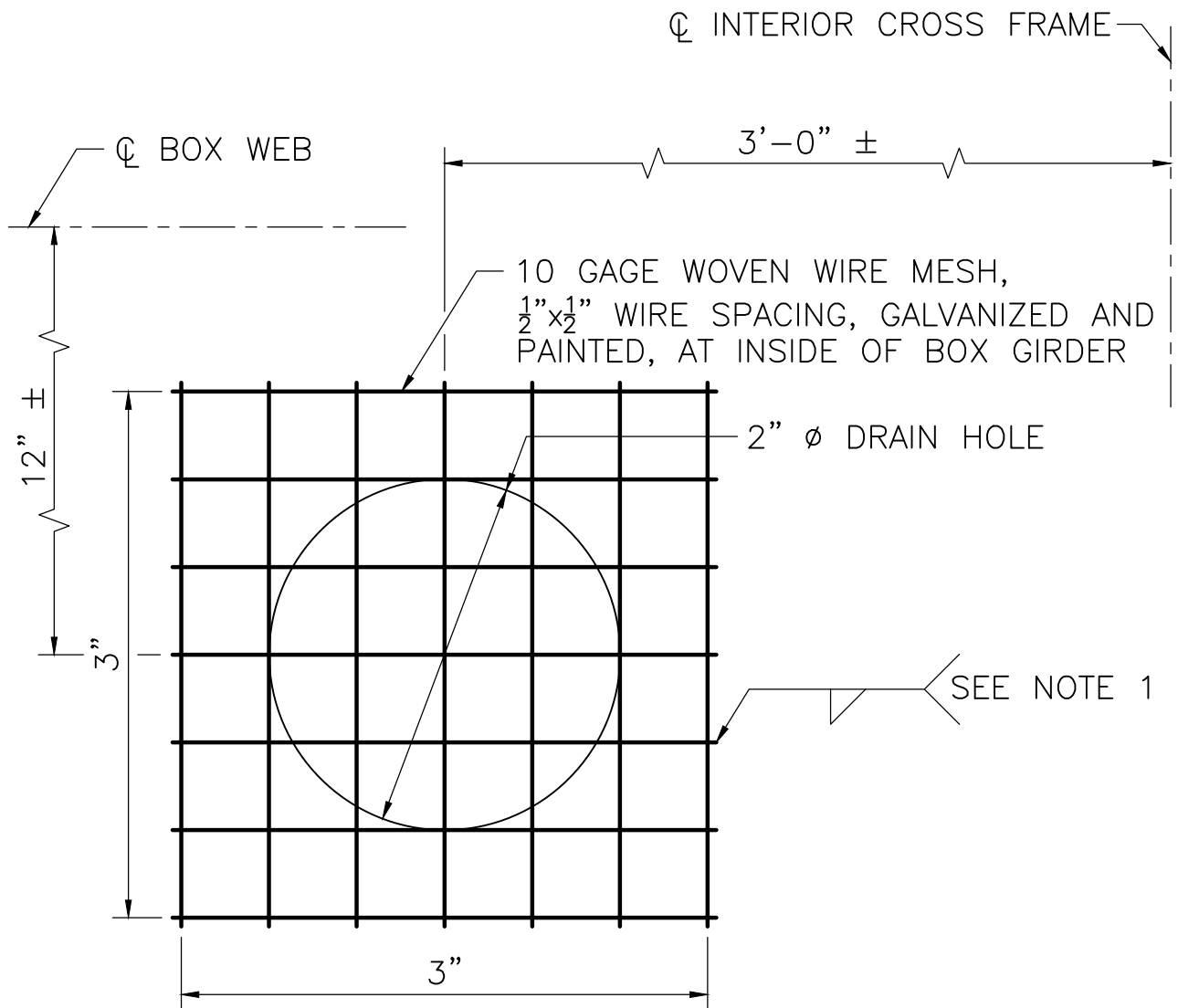
# INSPECTION ACCESS HATCH DETAILS STEEL BOX GIRDERS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

**5.3.13**



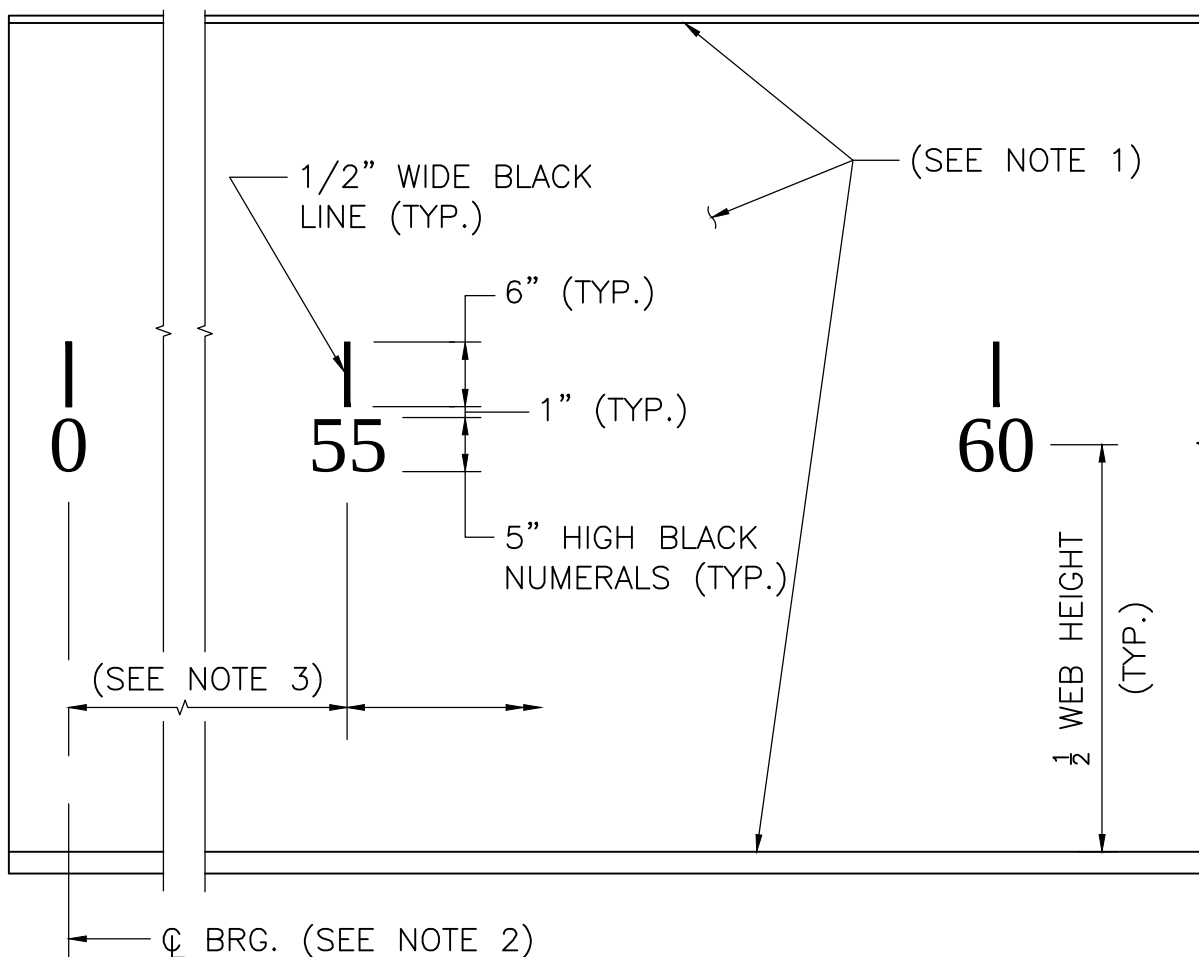


### NOTES:

1. TACK WELD ENDS OF WIRE MESH TO BOTTOM FLANGE.
2. DRAIN HOLE SHALL BE LOCATED IN BOTTOM FLANGE OF EACH BOX GIRDER AT THE LOW END OF SPAN AND LOW SIDE OF BOX OF EACH SPAN.

## DRAIN HOLE DETAILS

NOT TO SCALE



### NOTES:

1. THE INTERIOR OF ALL BOX GIRDERS, INCLUDING ALL STRUCTURAL STEEL COMPONENTS WITHIN EACH BOX GIRDER (SUCH AS DIAPHRAGMS, CROSS-FRAMES, CONNECTION PLATES, ETC.) SHALL BE PAINTED GLOSS WHITE (FEDERAL STANDARD 595B, COLOR NO. 17925).
- 2a. ZERO DISTANCE REFERENCE LINE LOCATED AT WEST CENTERLINE OF BEARING. *(for bridges with East and West abutments)*
- 2b. ZERO DISTANCE REFERENCE LINE LOCATED AT SOUTH CENTERLINE OF BEARING. *(for bridges with North and South abutments)*
3. INDICATE DISTANCES SEQUENTIALLY AT FIVE (5) FOOT INTERVALS WITHOUT INTERRUPTION FULL LENGTH WITHIN EACH BOX GIRDER WITH BLACK LINES AND NUMERALS ON LEFT WEB.
4. DO NOT CARRY OVER THE MEASURED DISTANCE SEQUENCE BETWEEN SEPARATE BOX GIRDERS WITHIN THE SAME GIRDER LINE OVER PIER(S).

## INTERIOR PAINTING REQUIREMENTS

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



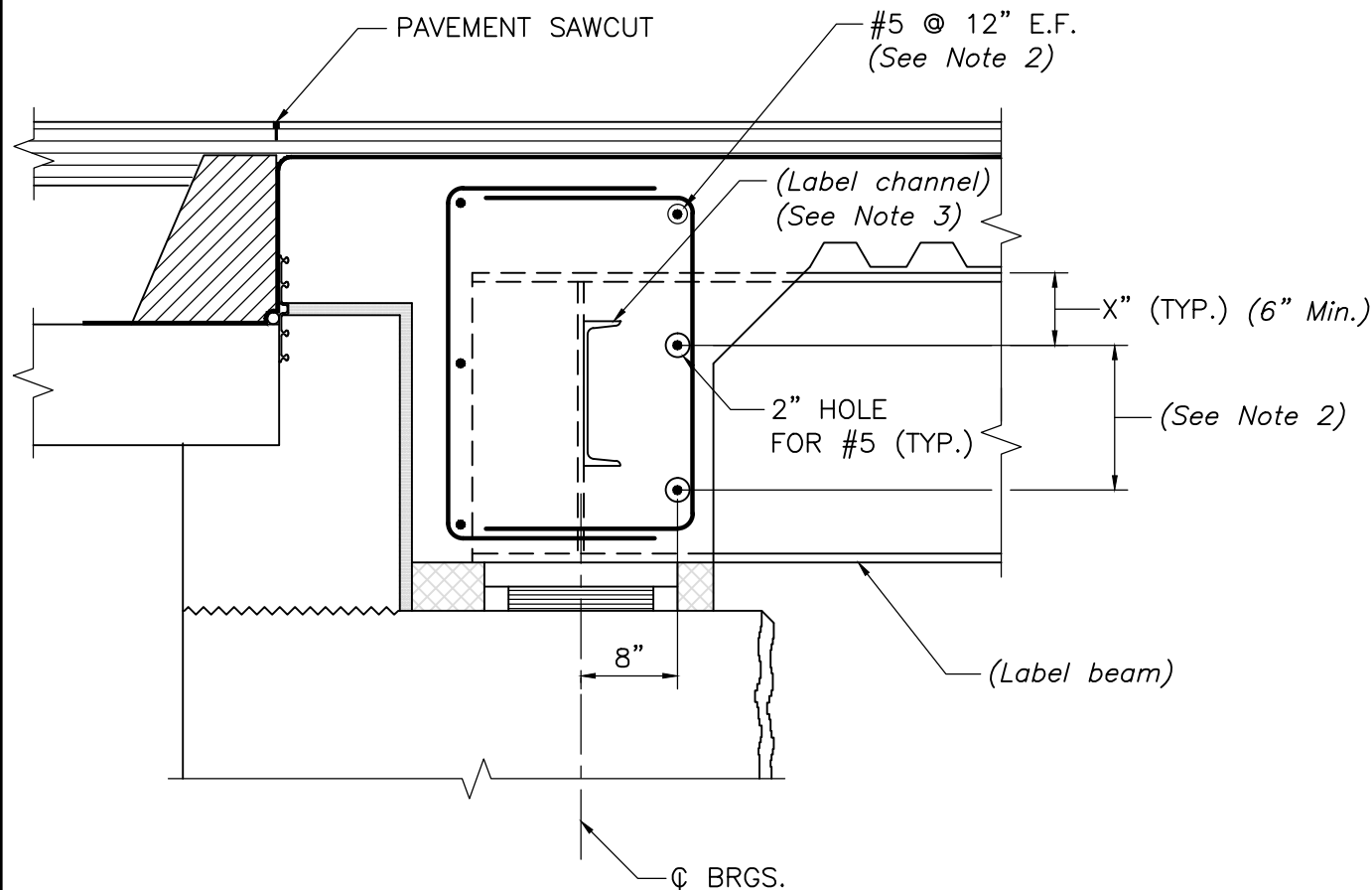
LRFD BRIDGE  
MANUAL, PART II

## INTERIOR PAINTING REQUIREMENTS STEEL BOX GIRDERS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

**5.3.16**



## DETAILS AT ABUTMENT – ROADWAY SECTION

SCALE: 1" = 1'-0"

### NOTES:

1. Modify the generic Roadway/Sidewalk Section details of Dwg. No.'s 3.7.9 and 3.7.10 as shown above for steel stringer bridges.
2. 12" spacing typical. 10" min., if required for proper distribution of reinforcement.
3. If stage construction is present, omit end diaphragms in the affected bays and provide additional reinforcing that is to be spliced using dowel bar splicers.



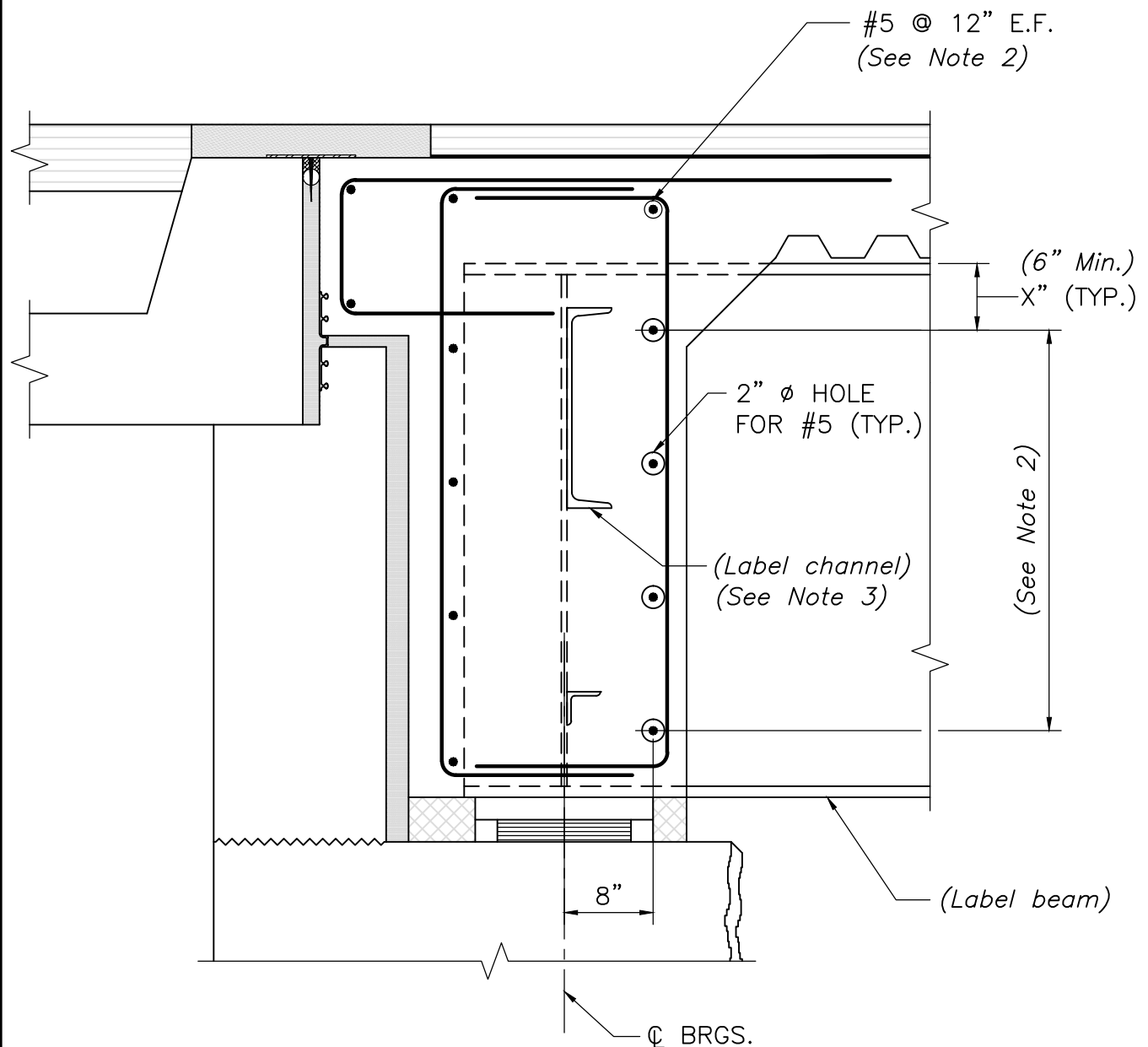
LRFD BRIDGE  
MANUAL, PART II

## ROADWAY SECTION WITH PAVEMENT SAWCUT ABUTMENT DETAILS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

**5.4.1**



## DETAILS AT ABUTMENT – ROADWAY SECTION

SCALE: 1" = 1'-0"

### NOTES:

1. Modify the generic Roadway/Sidewalk Section details of Dwg. No.'s 3.7.14 and 3.7.15 as shown above for steel stringer bridges.
2. 12" spacing typical. 10" min., if required for proper distribution of reinforcement.
3. If stage construction is present, omit end diaphragms in the affected bays and provide additional reinforcing that is to be spliced using dowel bar splicers.



LRFD BRIDGE  
MANUAL, PART II

ROADWAY SECTION WITH  
ASPHALTIC BRIDGE JOINT  
ABUTMENT DETAILS

DATE OF ISSUE  
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DRAWING NUMBER

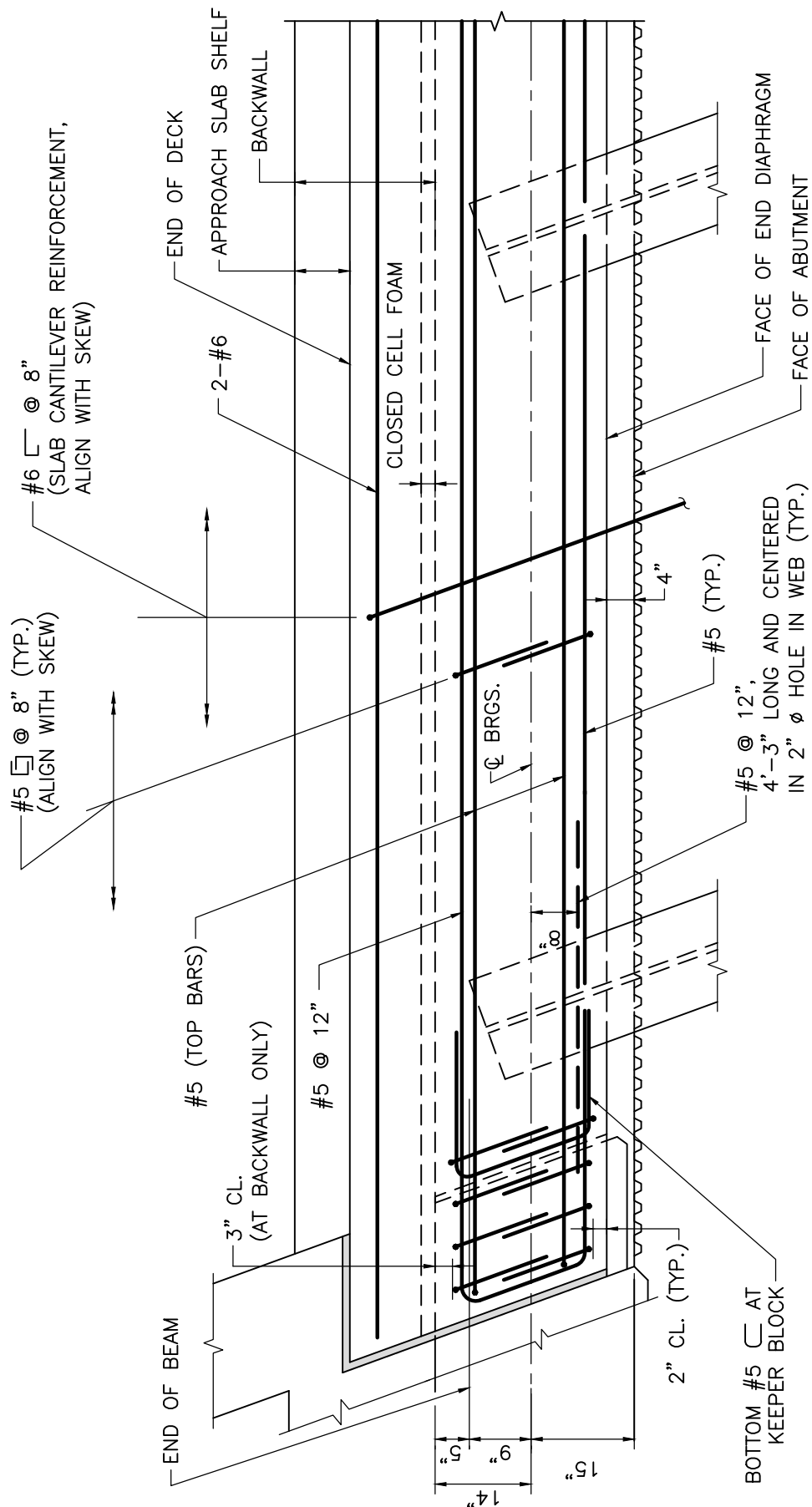
**5.4.2**

# END DIAPHRAGM PLAN

## ABUTMENT DETAILS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER  
**5.4.3**



TYPICAL INTERIOR BAY

AT KEEPER BLOCK/CURTAIN WALL

### END DIAPHRAGM PLAN

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



# PLAN OF PIER CAP FOR CONTINUOUS BEAMS

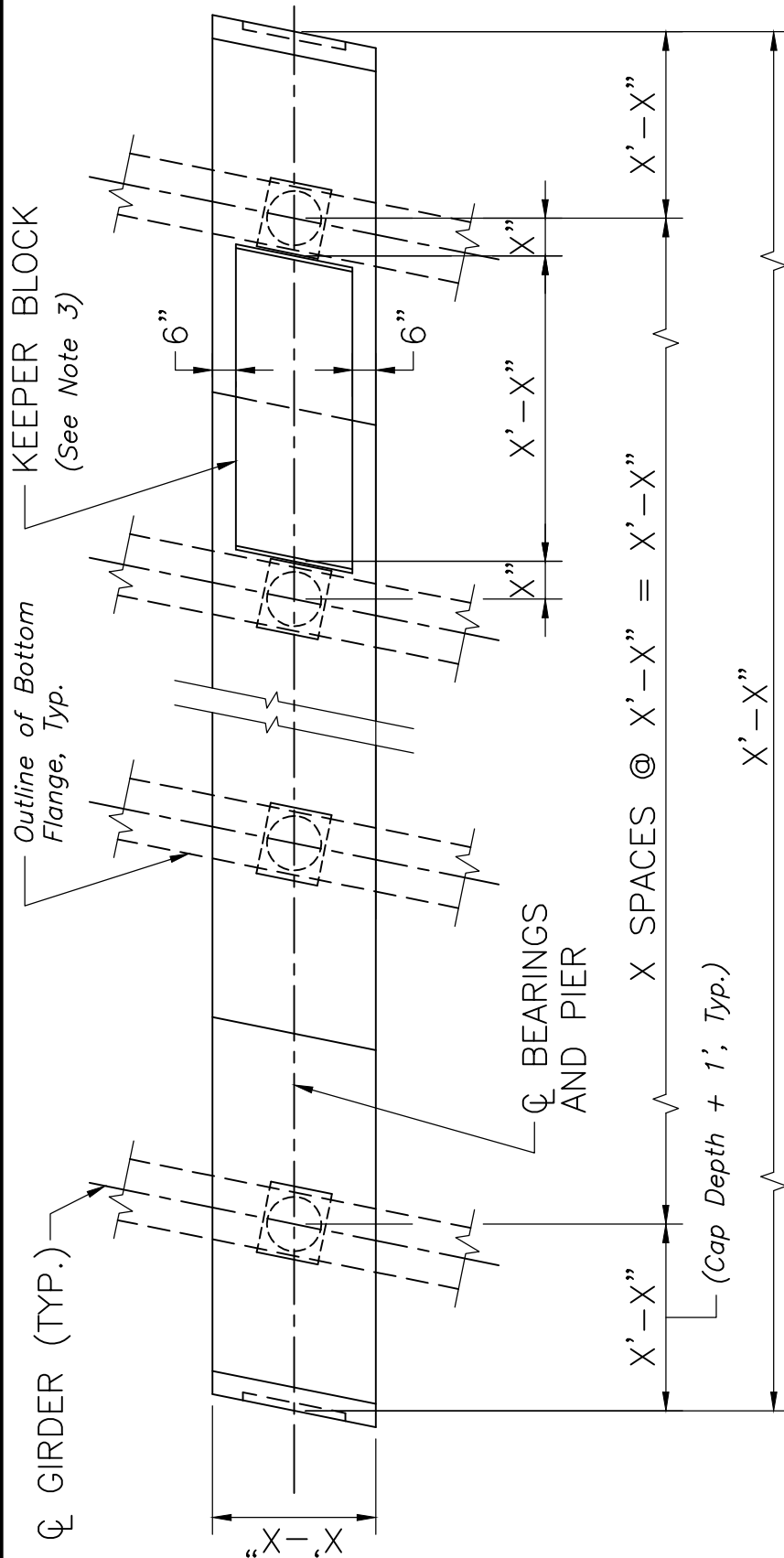
PIER DETAILS

DATE OF ISSUE

JUNE 2013

DRAWING NUMBER

**5.5.1**



BRIDGE WITHOUT  
KEEPER BLOCK

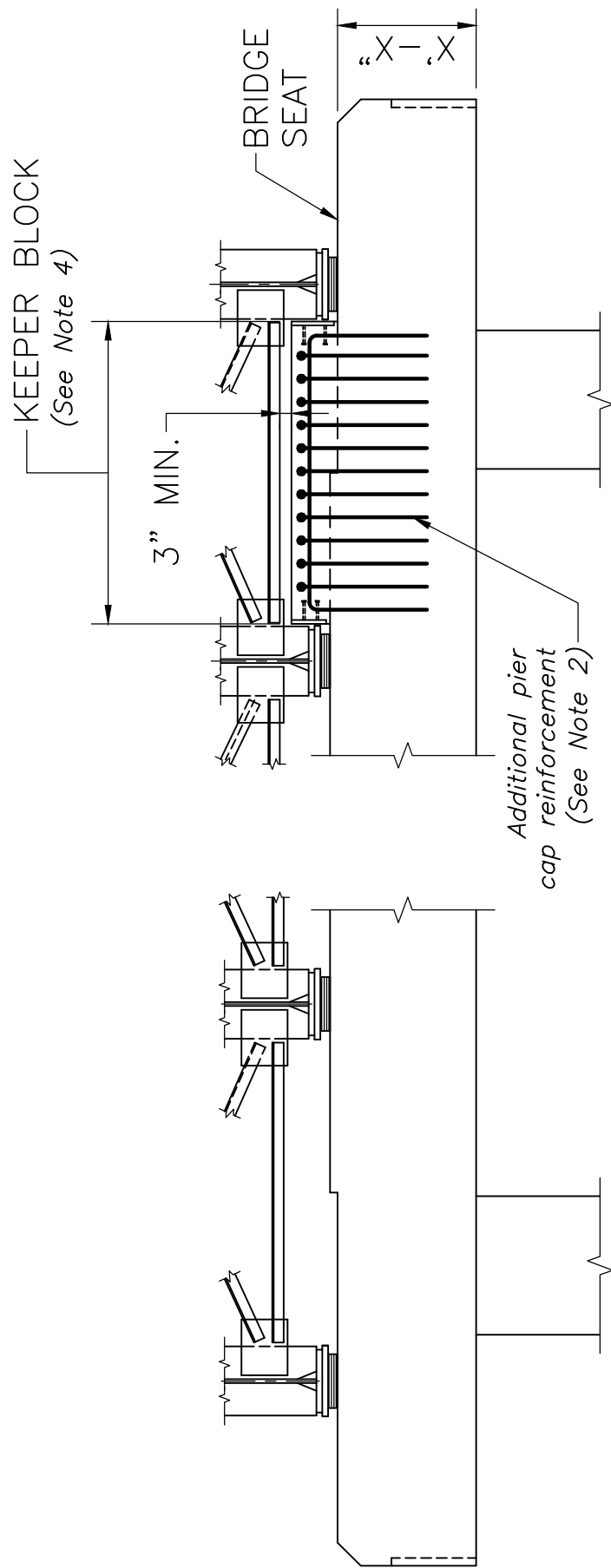
BRIDGE WITH  
KEEPER BLOCK

## PLAN OF PIER CAP

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

### NOTES:

1. 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.
2. Plate girders shown, rolled beams are similar.
3. The actual number of keeper blocks shall be determined by design.



BRIDGE WITHOUT  
KEEPER BLOCK

BRIDGE WITH  
KEEPER BLOCK

## SECTION THRU PIER CAP

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

### NOTES:

1. Remainder of pier and pier reinforcement omitted for clarity.
2. Additional pier cap reinforcement shall be designed as a restraint for transverse seismic loads.
3. Transverse section shall be drawn without breaks and to scale on the Construction Drawings and all reinforcement shall be included.
4. For keeper block details see Dwg. No. 5.5.3 and 5.5.4.
5. For pier details see Chapter 3.



LRFD BRIDGE  
MANUAL, PART II

## SECTION THRU PIER CAP

PIER DETAILS

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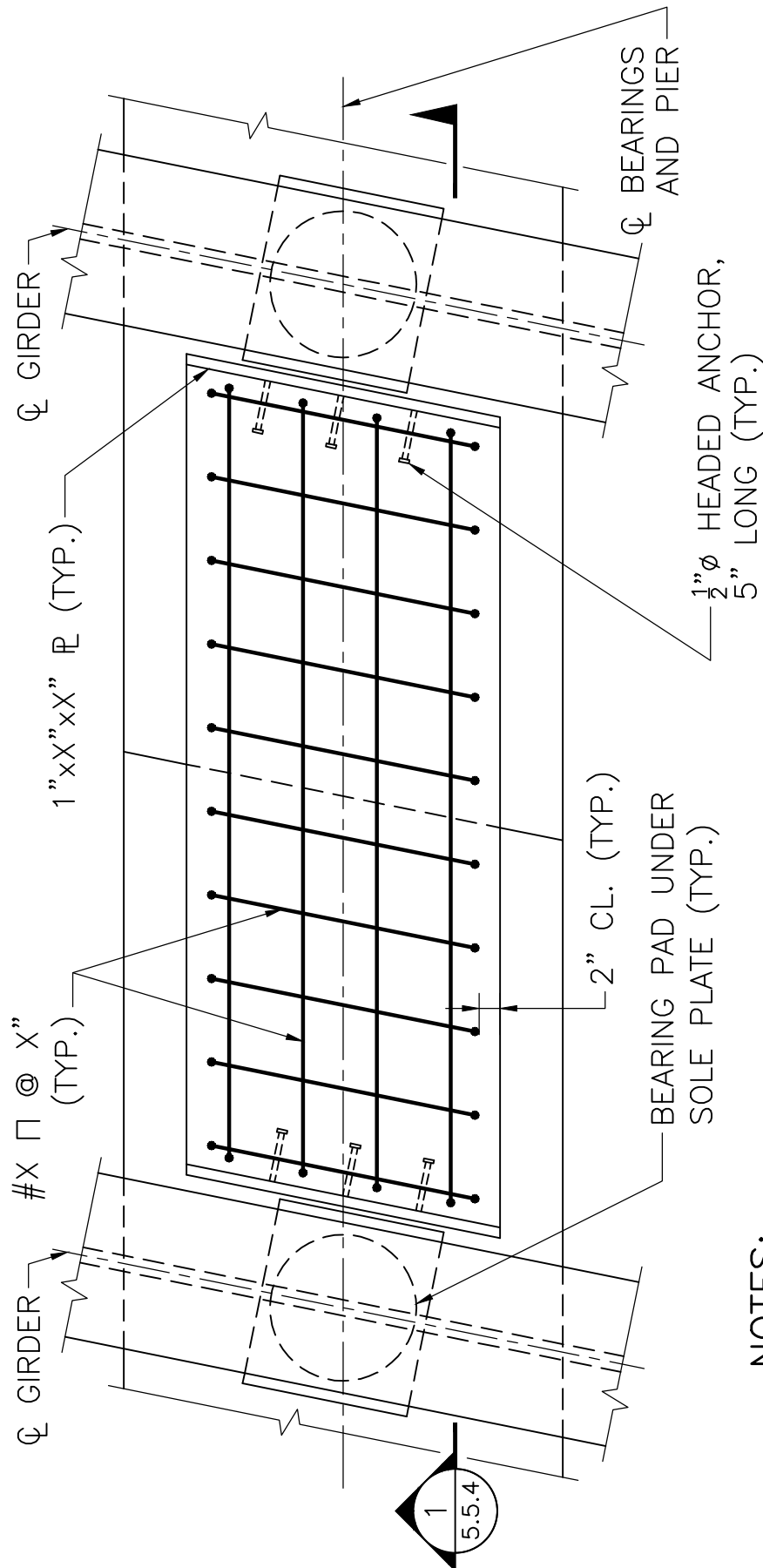
**5.5.2**

# PLAN OF KEEPER BLOCK

PIER DETAILS

DATE OF ISSUE  
 JUNE 2013

DRAWING NUMBER  
**5.5.3**



## NOTES:

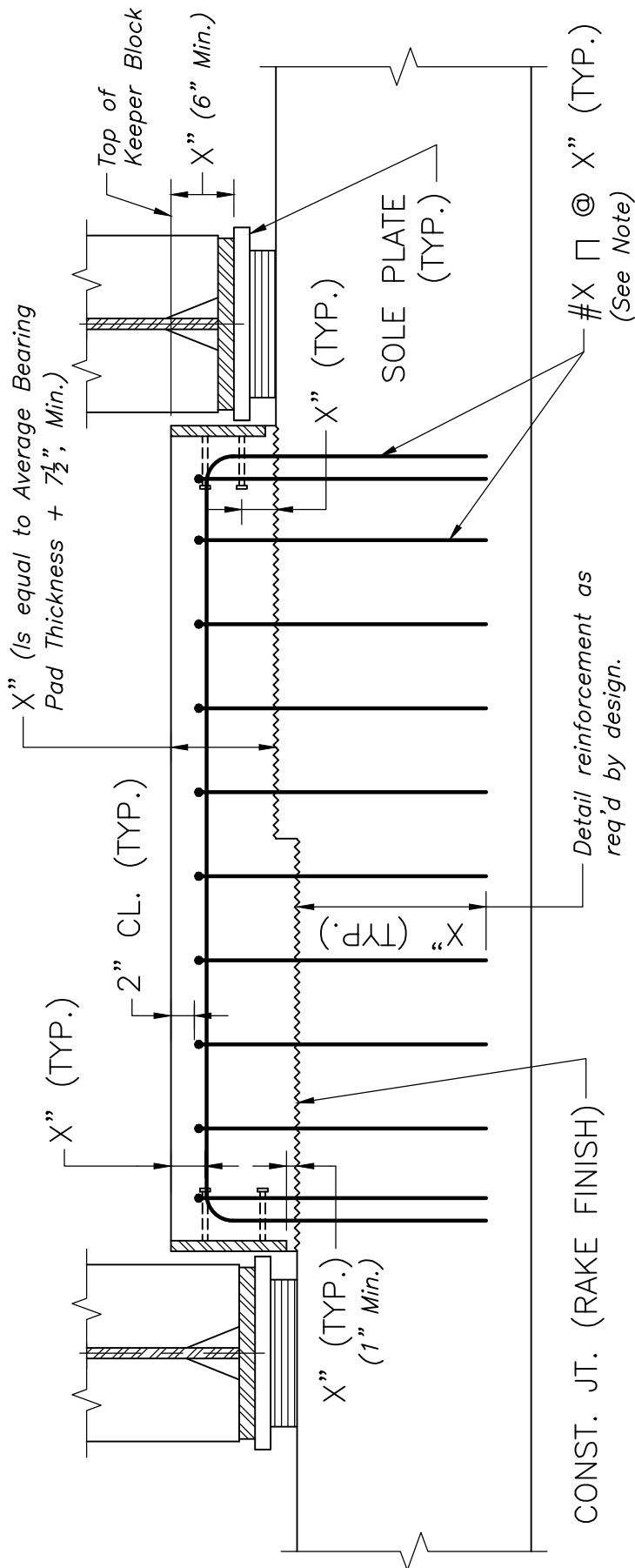
1. KEEPER BLOCKS SHALL BE CAST BEFORE BEAMS ARE SET.
2. STEEL PLATES EMBEDDED IN KEEPER BLOCK SHALL BE HOT-DIP GALVANIZED.

## PLAN OF KEEPER BLOCK

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

### NOTE:

Reinforcement configuration shown is conceptual. The Designer shall determine bar size and spacing as required by the actual design.



### NOTE:

TOP OF INTERMEDIATE KEEPER BLOCK SHALL BE TROWELED SMOOTH.

## SECTION 1

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

### NOTE:

Design as shear friction reinforcement to resist transverse seismic loads. Reinforcement shown is conceptual. The Designer shall determine bar size and spacing as required by the actual design.



LRFD BRIDGE  
MANUAL, PART II

## KEEPER BLOCK VERTICAL SECTION PIER DETAILS

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**5.5.4**

NOTES:

1. The Theoretical Camber shall be shown on the Construction Drawings by either a camber diagram or a table. Provide a minimum number of different camber diagrams for all beams in a given span. Group beams within a span whose maximum total camber does not vary by more than  $\frac{1}{8}$ ".
2. The Camber shall be specified by equally spaced ordinates at the mid-length of the segment to be curved and by as many additional points as necessary to be defined clearly.
3. In the calculation for the Minimum Theoretical Camber, do not include camber tolerances. Do not show tolerances on the Construction Drawings.
4. The minimum Theoretical Camber shall be a sum of the following values:  
X = 100% Dead Load Deflection  
Y = Vertical Curve Camber (See Notes 3 and 4 below)  
Z = Additional Camber (from the Table below)

**ADDITIONAL CAMBER – "Z"**

| Profile Grade  | Simple Span                      | Multiple Simple Spans            | Multiple Spans Continuous        |
|----------------|----------------------------------|----------------------------------|----------------------------------|
| Vertical Curve | $\frac{1}{16}$ " per 10' of Span | 0                                | 0                                |
| Tangent        | $\frac{1}{8}$ " per 10' of Span  | $\frac{1}{16}$ " per 10' of Span | $\frac{1}{16}$ " per 10' of Span |

**CAMBER TABLE**

| BM. NO. |                     | SPAN NO. X    |      |      |      |      |      |      |      |      |      |                    |
|---------|---------------------|---------------|------|------|------|------|------|------|------|------|------|--------------------|
|         |                     | CL BRG. ABUT. | 0.1L | 0.2L | 0.3L | 0.4L | 0.5L | 0.6L | 0.7L | 0.8L | 0.9L | CL BRG. ABUT./PIER |
| 1       | STEEL DL DEFLECTION |               |      |      |      |      |      |      |      |      |      |                    |
|         | CONC. DL DEFLECTION |               |      |      |      |      |      |      |      |      |      |                    |
|         | S.D.L. DEFLECTION   |               |      |      |      |      |      |      |      |      |      |                    |
|         | VERT. CURVE CAMBER  |               |      |      |      |      |      |      |      |      |      |                    |
|         | ADDITIONAL CAMBER   |               |      |      |      |      |      |      |      |      |      |                    |
|         | TOTAL CAMBER        |               |      |      |      |      |      |      |      |      |      |                    |
| 2       | STEEL DL DEFLECTION |               |      |      |      |      |      |      |      |      |      |                    |
|         | CONC. DL DEFLECTION |               |      |      |      |      |      |      |      |      |      |                    |
|         | S.D.L. DEFLECTION   |               |      |      |      |      |      |      |      |      |      |                    |
|         | VERT. CURVE CAMBER  |               |      |      |      |      |      |      |      |      |      |                    |
|         | ADDITIONAL CAMBER   |               |      |      |      |      |      |      |      |      |      |                    |
|         | TOTAL CAMBER        |               |      |      |      |      |      |      |      |      |      |                    |

NOTES:

1. Camber values shall be shown in inches.
2. Expand the table, as necessary, for additional beams and spans.
3.  $Y = B2 - (B1 + B3)/2$  where:  
B1 = Final top of roadway elevation @ CL of Bearing @ Support #1  
B2 = Final top of roadway elevation @ mid span of the beam  
B3 = Final top of roadway elevation @ CL of Bearing @ Support #2
4. Y = 0 for a Negative Vertical Curve.



LRFD BRIDGE  
MANUAL, PART II

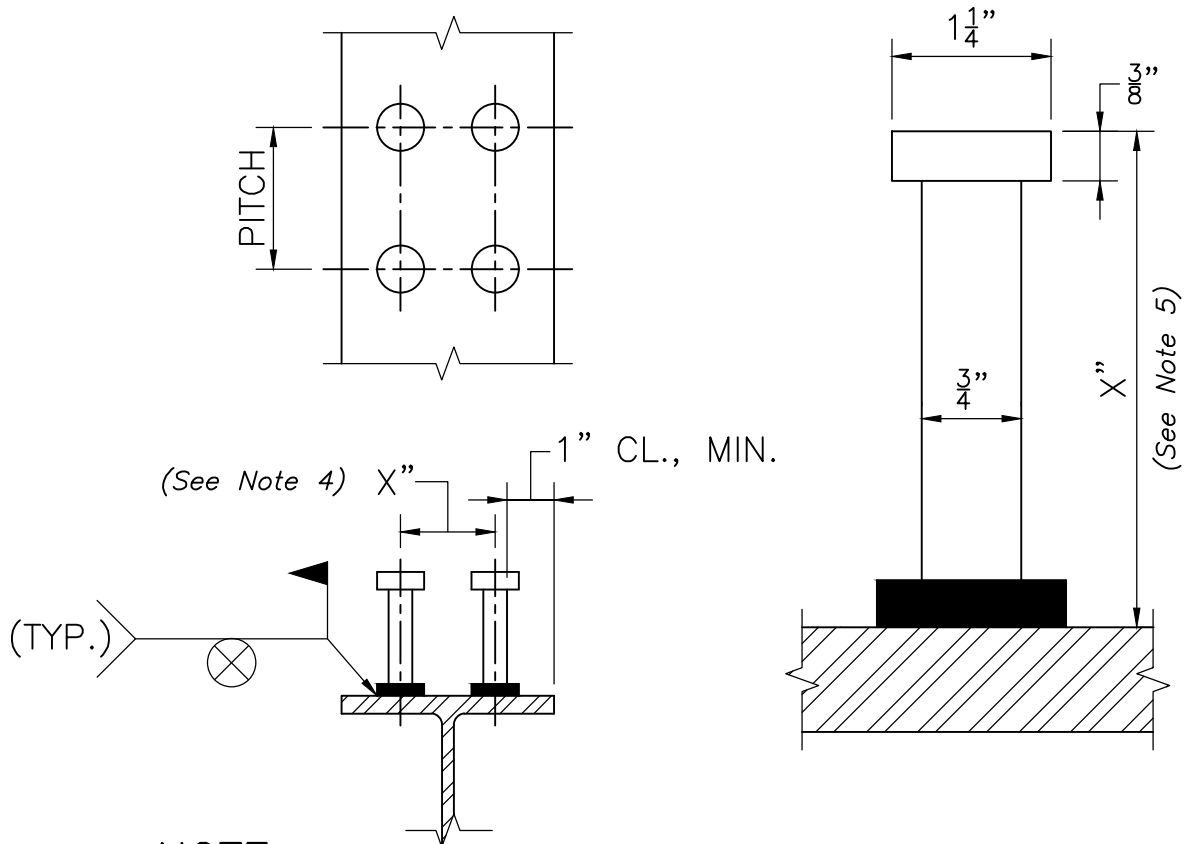
**CAMBER**

MISCELLANEOUS DETAILS

DATE OF ISSUE  
JUNE 2013

DRAWING NUMBER

**5.6.1**



**NOTE:**

$\frac{7}{8}$ "  $\phi$  STUDS MAY BE SUBSTITUTED FOR  $\frac{3}{4}$ "  $\phi$  STUDS BY ADJUSTING THE PITCH TO PROVIDE AN EQUIVALENT CROSS-SECTIONAL AREA PER FOOT.

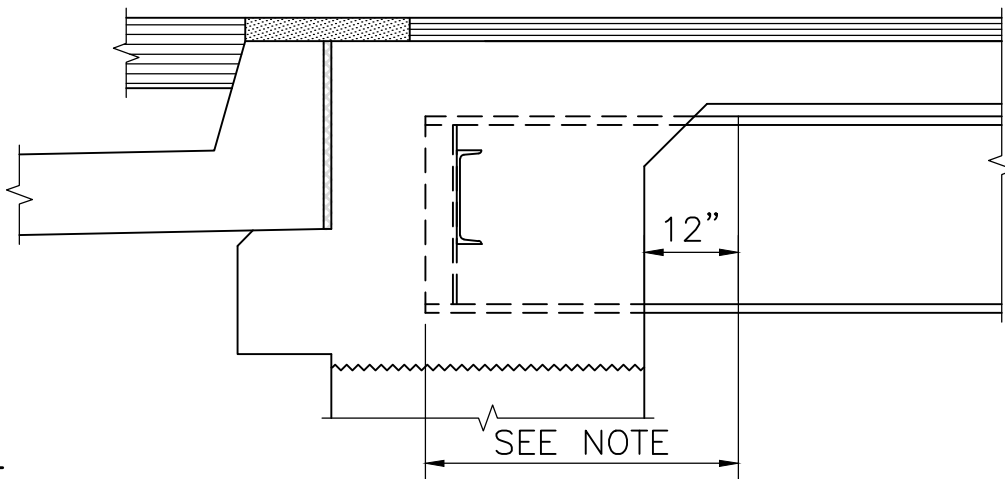
## STUD SHEAR CONNECTORS

NOT TO SCALE

**NOTES:**

1. All shear connectors shall be designed according to the AASHTO-LRFD.
2. In the case where the beam haunch exceeds 6", the AASHTO-LRFD embedment provisions may not be met. The plane between the deck slab and haunch shall be checked for shear resistance. If additional resistance is required, stirrups shall be designed across the plane rather than lengthening the stud connectors.
3. The pitch of the studs need not be made in multiples of the spacing of transverse steel reinforcement in the deck slab; however, the stud's alignment shall be parallel to that of the transverse reinforcement.
4. The minimum pitch shall be as per AASHTO-LRFD. The maximum pitch shall be 2'-0". Indicate the stud spacing and orientation on the Construction Drawings in the beam elevation views.
5. Studs heights are available in 1" increments (4" Min.).

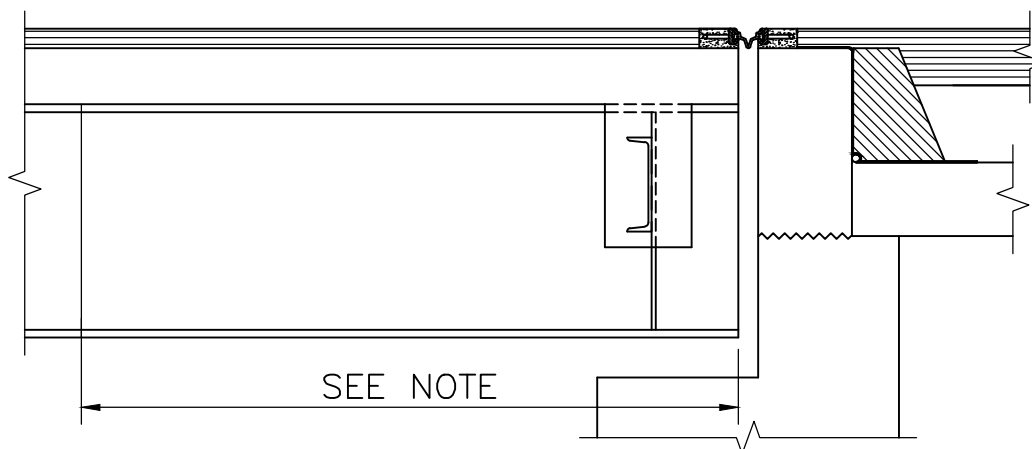




**NOTE:**

THE UNPAINTED WEATHERING STEEL STRINGER (or girder) AND ATTACHED PLATES EMBEDDED IN THE ABUTMENT (or in the concrete end diaphragm) AND WITHIN 12" OF THE ABUTMENT FACE (or face of the concrete end diaphragm) SHALL BE PAINTED IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS. THE FINISH COAT COLOR SHALL MATCH COLOR CHIP NO. 30045 OF FEDERAL STANDARD 595B. THE STEEL DIAPHRAGM SHALL NOT BE PAINTED.

(TO BE USED WITH CHAPTERS 3 AND 12 ABUTMENT DETAILS)



**NOTE:**

ALL UNPAINTED WEATHERING STEEL INCLUDING STEEL DIAPHRAGMS WITHIN 1.5 TIMES THE GIRDER DEPTH (7'-0" MIN.) OF BRIDGE EXPANSION JOINTS SHALL BE PAINTED IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS. THE FINISH COAT COLOR SHALL MATCH COLOR CHIP NO. 30045 OF FEDERAL STANDARD 595B.

(TO BE USED WITH NON-BRIDGE MANUAL OLD STYLE DECK JOINTS)

## LIMITS OF PAINTED WEATHERING STEEL

NOTES:

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

1. Modify Integral Abutment detail shown for type of bridge being used.
2. Include applicable detail on Construction Drawings for unpainted weathering steel beam bridges.



LRFD BRIDGE  
MANUAL, PART II

# PAINT LIMITS FOR WEATHERING STEEL BRIDGES

MISCELLANEOUS DETAILS

DATE OF ISSUE  
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DRAWING NUMBER

**5.6.4**