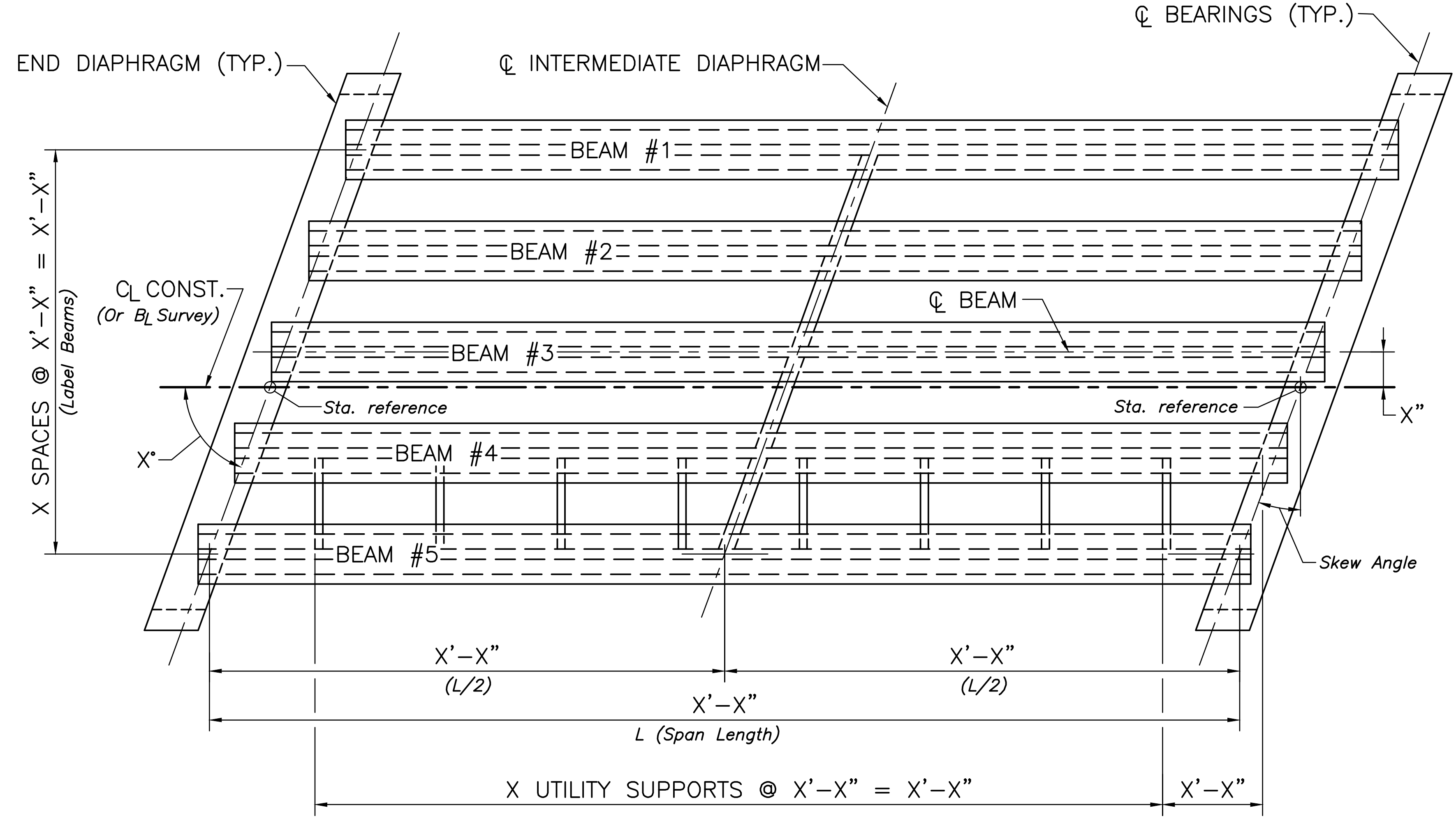


## FRAMING PLAN

SCALE: (1/8" = 1'–0" Min.)

*NOTES:*

1. *Framing plan shall be drawn full length without breaks and to scale on the Construction Drawings. Label beam types and include North Arrow.*
2. *No intermediate diaphragms required for spans of 80' or less.*
3. *Ends of NEBT's shall be square, but end diaphragms shall follow skew of bridge.*
4. *For utility support spacing requirements, see Dwg. No. 6.1.17.*
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.*

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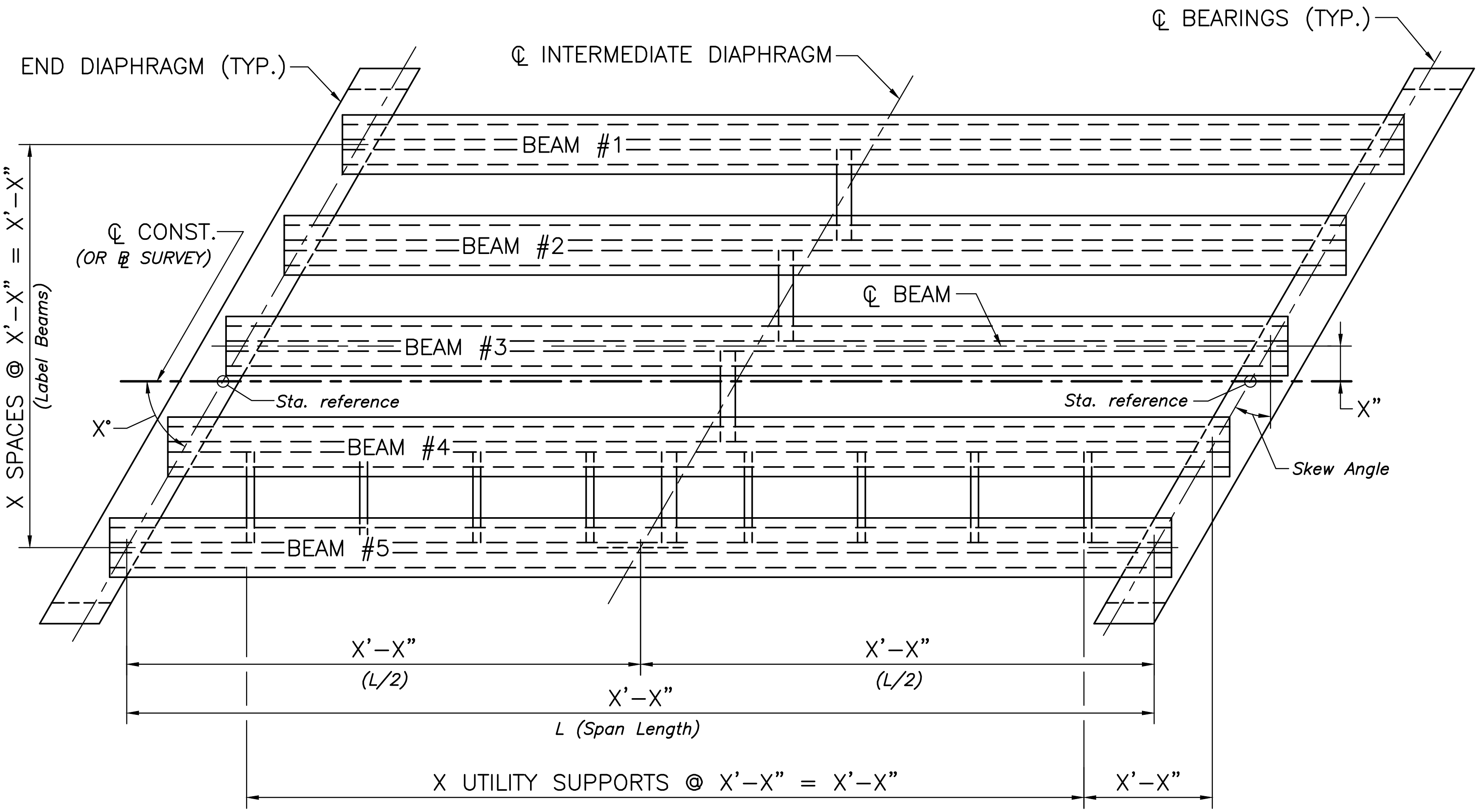
LRFD BRIDGE MANUAL, PART II

# FRAMING PLAN (SKEW ≤ 30°)

PRECAST CONCRETE NEBT BEAMS

DATE OF ISSUE
JUNE 2013

DRAWING NUMBER
**6.1.1**




## FRAMING PLAN

SCALE: (1/8" = 1'–0" Min.)

*NOTES:*

1. *Framing plan shall be drawn full length without breaks and to scale on the Construction Drawings. Label beam types and include North Arrow.*
2. *No intermediate diaphragms required for spans of 80' or less.*
3. *Ends of NEBT's shall be square, but end diaphragms shall follow skew of bridge.*
4. *For utility support spacing requirements, see Dwg. No. 6.1.17.*
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.*

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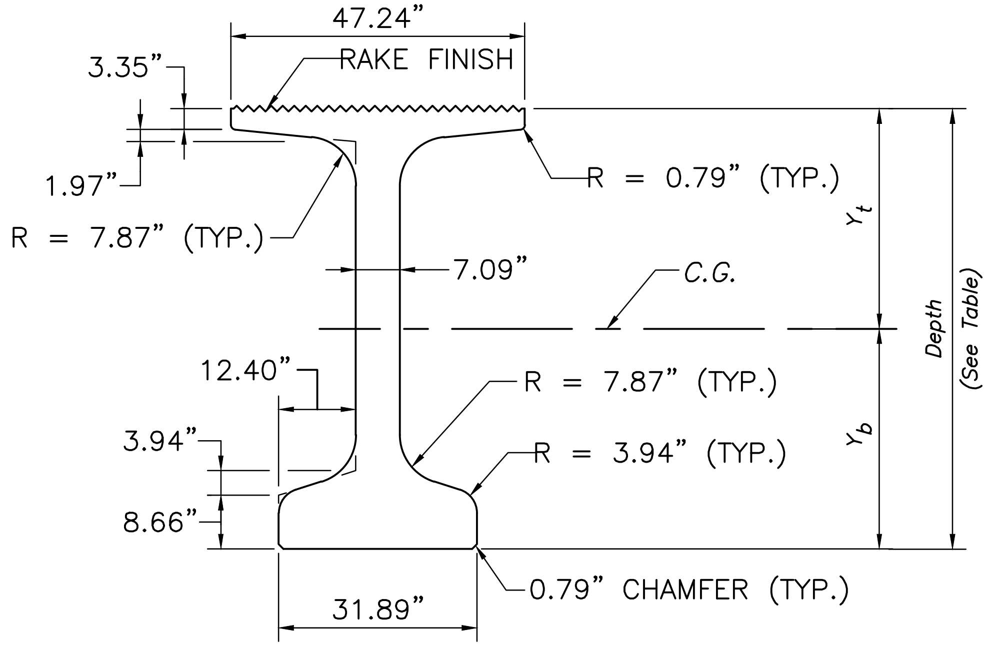
LRFD BRIDGE MANUAL, PART II

# FRAMING PLAN (SKEW > 30°)

PRECAST CONCRETE NEBT BEAMS

DATE OF ISSUE
JUNE 2013

DRAWING NUMBER
**6.1.2**




## *BEAM PROPERTIES*

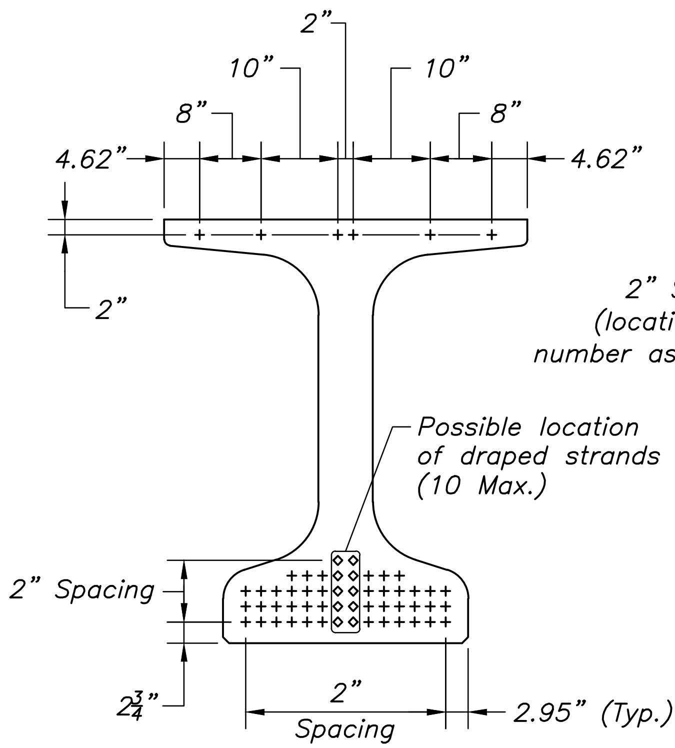
| Beam Type | Depth (in) | Weight (Lbs./Ft) | Area ($in^2$) | Ix c.g. ($in^4$) | Iy c.g. ($in^4$) | Yt (in) | Yb (in) | St ($in^3$) | Sb ($in^3$) |
|---|---|---|---|---|---|---|---|---|---|
| NEBT 1000 | 39.37 | 778 | 746 | 149196 | 61745 | 20.35 | 19.02 | 7332 | 7844 |
| NEBT 1200 | 47.24 | 835 | 801 | 238089 | 61985 | 24.61 | 22.63 | 9675 | 10516 |
| NEBT 1400 | 55.12 | 894 | 857 | 353169 | 62225 | 28.86 | 26.26 | 12237 | 13449 |
| NEBT 1600 | 62.99 | 952 | 913 | 492515 | 62465 | 33.03 | 29.96 | 14911 | 16439 |
| NEBT 1800 | 70.87 | 1010 | 969 | 660691 | 62706 | 37.2 | 33.66 | 17761 | 19663 |

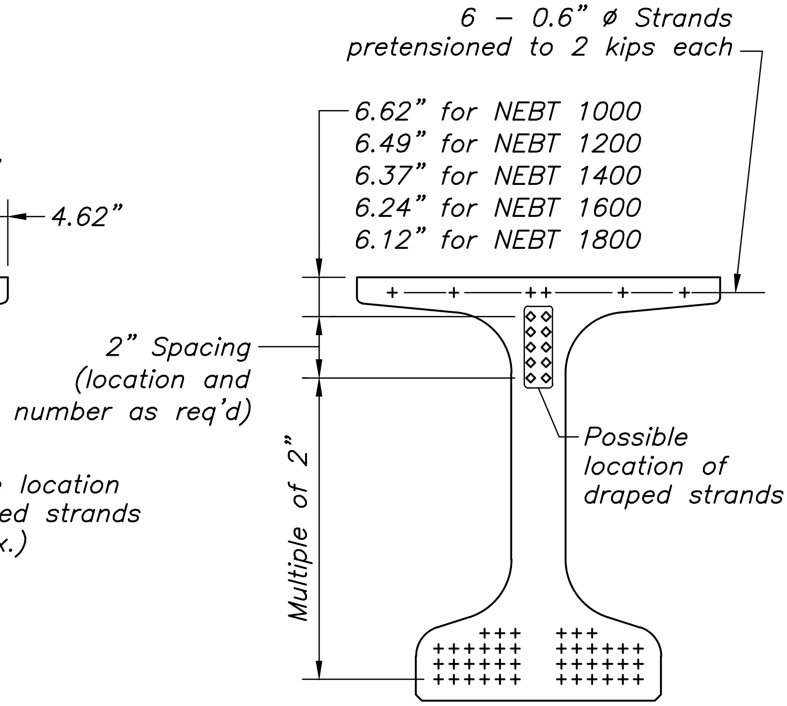
## *MAXIMUM SPAN LENGTHS (ft.)*

| Beam Type | Beam Spacing | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 5 ft. | 6 ft. | 7 ft. | 8 ft. | 9 ft. | 10 ft. | 11 ft. | 12 ft. | 13 ft. |
| NEBT 1000 | 86 | 80 | 77 | 71 | 69 | 66 | 64 | 61 | 59 |
| NEBT 1200 | 100 | 96 | 90 | 86 | 82 | 79 | 74 | 71 | 68 |
| NEBT 1400 | 113 | 108 | 103 | 98 | 93 | 89 | 85 | 81 | 78 |
| NEBT 1600 | 126 | 120 | 114 | 108 | 104 | 99 | 94 | 90 | 87 |
| NEBT 1800 | 139 | 131 | 124 | 119 | 113 | 108 | 103 | 99 | 95 |

*NOTES:*

1. *Above drawing is not to scale.*
2. *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 (Cast–in–Place Composite Deck)*
   - *Interior Girders with no skew.*
   - *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 CF–PL3 Barrier was assumed on the bridge.*
   - *3.5" thick HMA wearing surface.*
   - *0.6" diameter low relaxation strands.*




## STRAND LOCATION MIDSPAN

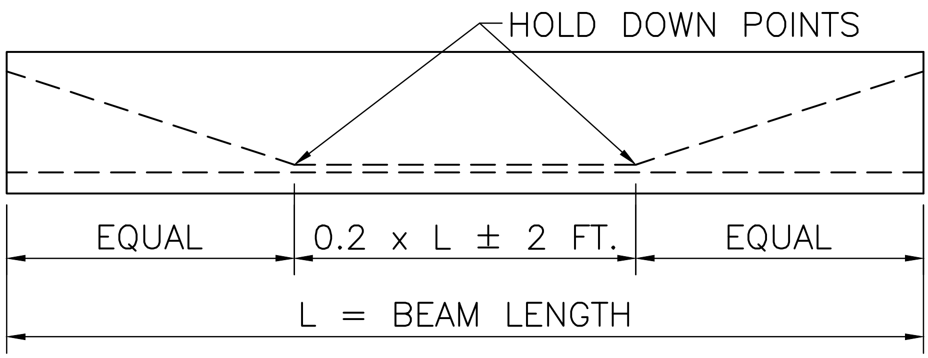
NOT TO SCALE

## STRAND LOCATION END OF BEAM

NOT TO SCALE

NOTES:

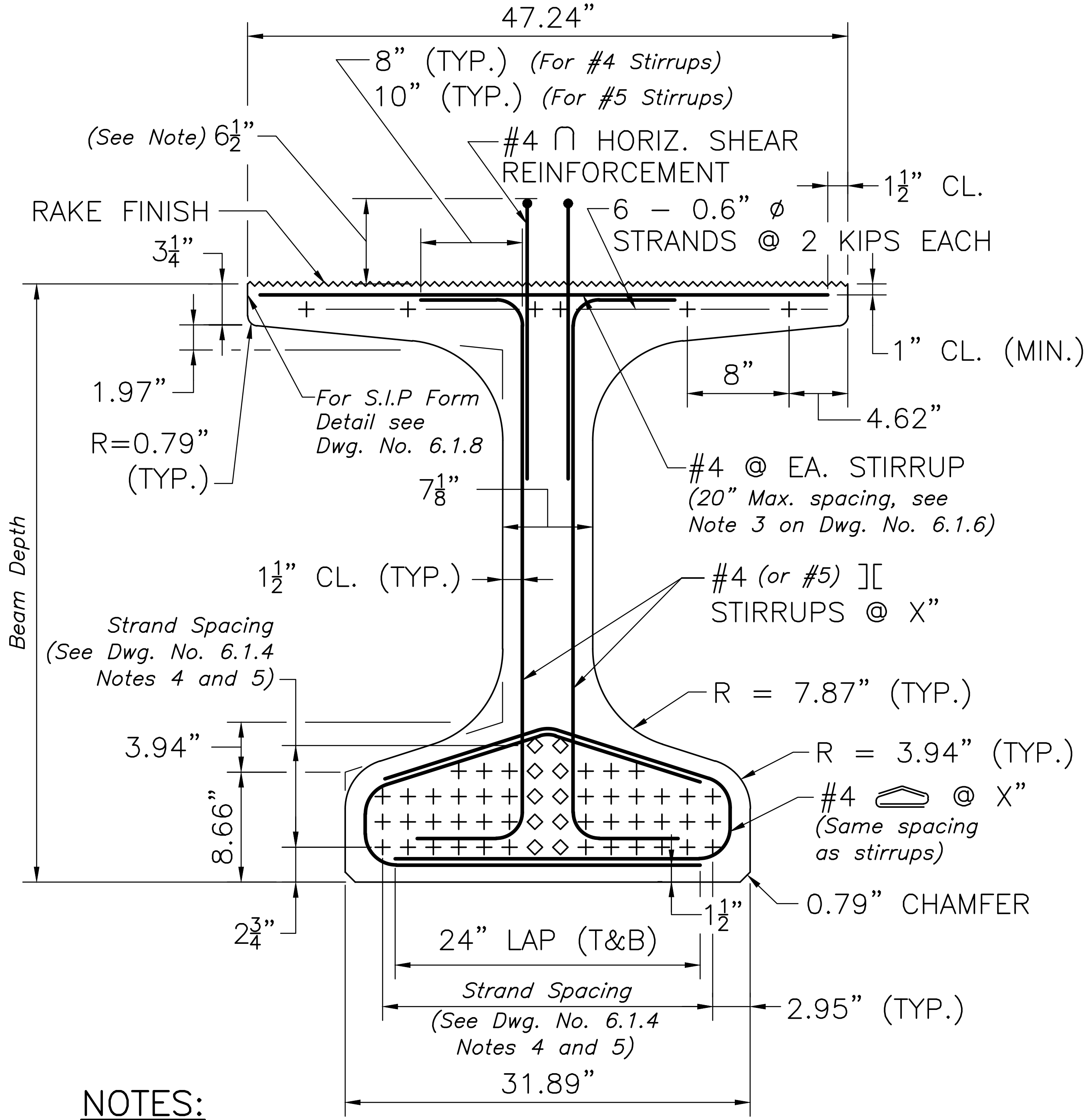
1. + Denotes straight strands.
2. ◇ Denotes draped strands. The total hold down force of all draped strands for each beam should not exceed 75% of the total beam weight.
3. ⊕ Denotes debonded strands (none shown above). Where debonded strands are used, no more than 25% of the total number of strands 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 number and location of the strands shall be as required by design.
5. The Designer shall provide the midspan and end of beam strand pattern on the Construction Drawings.




## HOLD DOWN POINTS FOR DRAPED STRANDS

NOT TO SCALE

| | | |
|---|---|---|
| massDOT Massachusetts Department of Transportation Highway Division<br>LRFD BRIDGE MANUAL, PART II | STRAND LOCATIONS AND HOLD DOWN DETAILS<br>PRECAST CONCRETE NEBT BEAMS | DATE OF ISSUE<br>JUNE 2013<br>DRAWING NUMBER<br>**6.1.4** |




## NOTES:

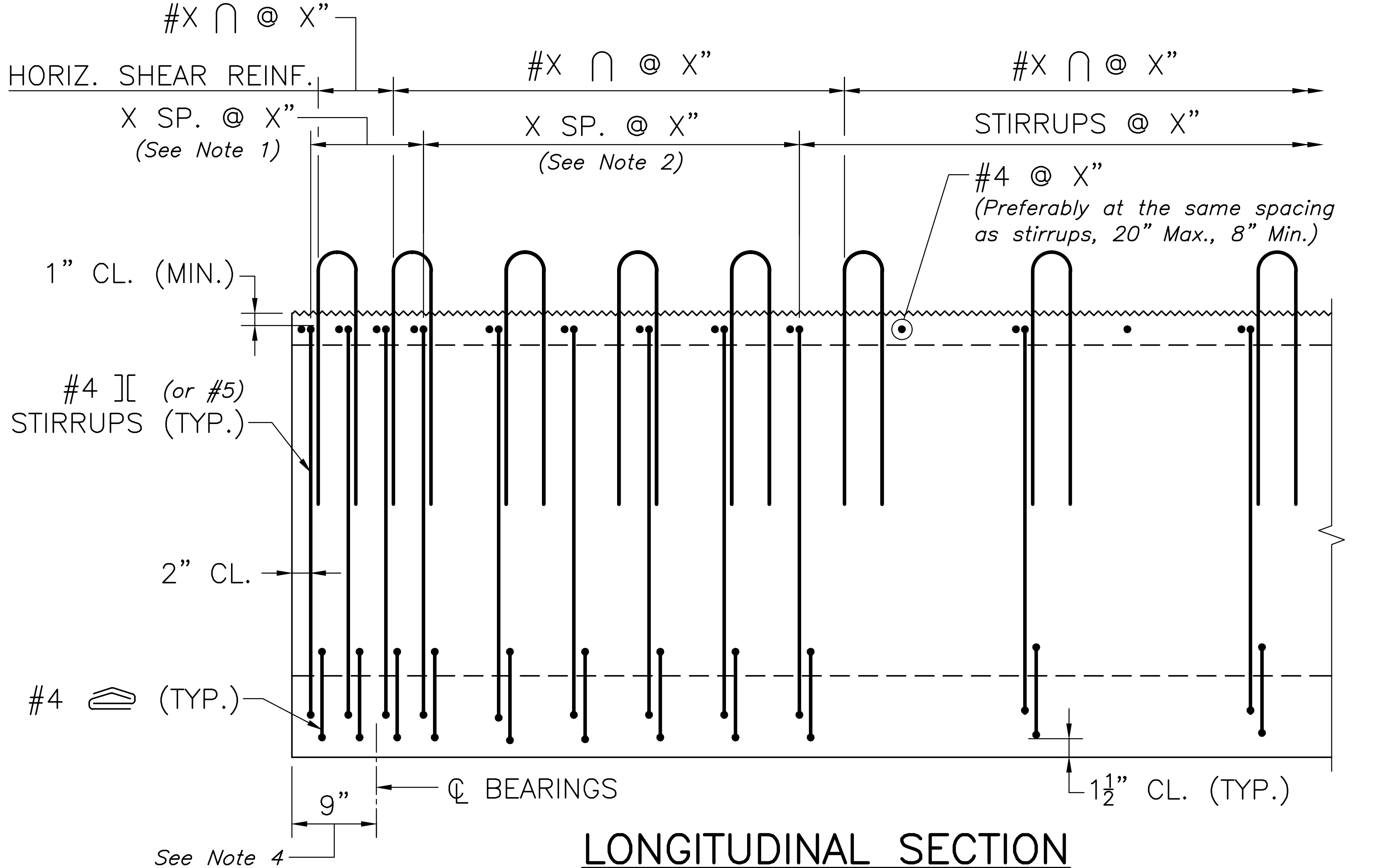
1. + DENOTES STRAIGHT STRANDS.
2. ◇ DENOTES DRAPED STRANDS.
3. ⊕ DENOTES DEBONDED STRANDS. *(None shown above.)*

## TYPICAL SECTION

SCALE: 1" = 1'–0"

*NOTE:*
*Embedment Length of the Horizontal Shear Reinforcement into the deck may need to be increased in cases with large blocking depths. The Designer shall ensure that at least 2" clear cover is maintained to the top of the deck at all locations. The embedment length shown does not produce full development.*

| | | |
|---|---|---|
| massDOT Massachusetts Department of Transportation Highway Division<br>LRFD BRIDGE MANUAL, PART II | TYPICAL SECTION<br><br>PRECAST CONCRETE NEBT BEAMS | DATE OF ISSUE<br>JUNE 2013<br>DRAWING NUMBER<br>**6.1.5** |




# LONGITUDINAL SECTION

SCALE: $\frac{3}{4}$" = 1'–0"

*NOTES:*

1. *The vertical stirrups within h/4 of the end of the beam shall satisfy the requirements of AASHTO–LRFD, Article 5.10.10.*
2. *See Part I of the Bridge Manual for guidelines for the design of stirrups near the support.*
3. *The 20" maximum spacing for #4 bars in the NEBT top flange is based on a 10 feet beam spacing, 10" deck thickness, and a 50 psf construction live load. If any of these conditions are exceeded, the designer shall verify the required reinforcement spacing.*
4. *If the bearing exceeds 16" in diameter, set this dimension equal to (Bearing Diameter/2 + 1")*

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LRFD BRIDGE MANUAL, PART II

LONGITUDINAL SECTION

PRECAST CONCRETE NEBT BEAMS

DATE OF ISSUE
JUNE 2013

DRAWING NUMBER
**6.1.6**

# PRESTRESS NOTES:

1. ALL PRETENSIONING ELEMENTS SHALL BE 0.6" ø, UNCOATED, SEVEN–WIRE, LOW RELAXATION STEEL STRANDS AND SHALL CONFORM TO AASHTO M 203.

2. THE NOMINAL TENSILE STRENGTH OF THE PRETENSIONING STRANDS SHALL BE 270 KSI.

3. THE INITIAL TENSION PER 0.6" ø STRAND SHALL BE 44 KIPS, EXCEPT THE SIX STRANDS IN THE TOP FLANGE WHICH SHALL BE TENSIONED TO 2 KIPS.

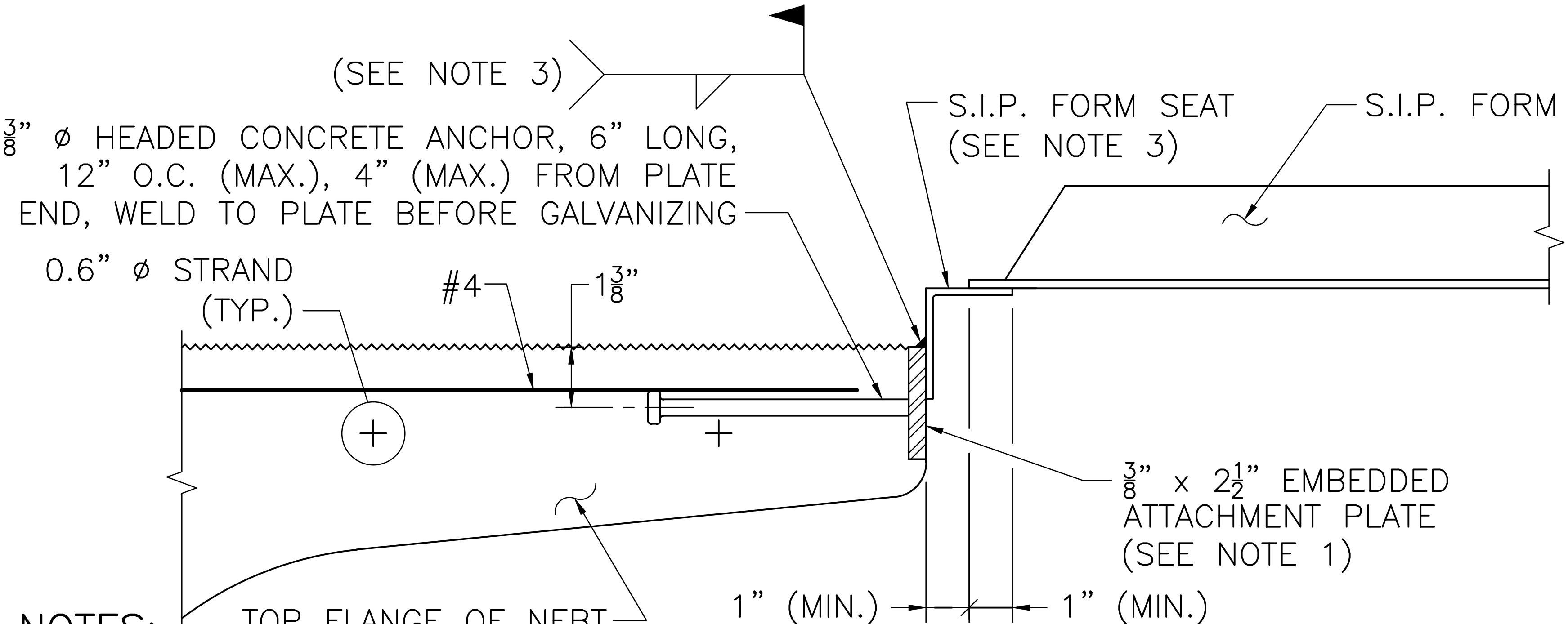
4. THE MINIMUM 28 DAY COMPRESSIVE STRENGTH SHALL BE 6500 PSI. *(See Note)*

5. NO PRESTRESS SHALL BE TRANSFERRED TO THE CONCRETE UNTIL IT HAS ATTAINED A COMPRESSIVE STRENGTH, AS SHOWN BY A CYLINDER TEST, OF AT LEAST 4500 PSI. *(See Note 1)*

6. THE TOP OF ALL BEAMS SHALL BE GIVEN A RAKED 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:*
*If required by design, HP concrete with a compressive strength of 8000 psi may be used with the permission of the Director of Bridges and Structures. A Special Provision will be required in this case. See the prestressed concrete section of Part I of this Manual.*




NOTES:

1. EMBEDDED ATTACHMENT PLATES SHALL BE HOT–DIP GALVANIZED AASHTO M 270 GRADE 36 STEEL. THE PLATES SHALL BE IN LENGTHS FROM 3' TO 13' WITH PIECES BUTTED TOGETHER WITHOUT END CONNECTIONS FOR FULL LENGTH OF BEAM. THE HEADED ANCHORS SHALL BE ATTACHED TO THE PLATES PRIOR TO GALVANIZING.

2. HEADED ANCHORS SHALL CONFORM TO M8.04.1 FOR MATERIAL REQUIREMENTS ONLY.

3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DESIGN OF THE S.I.P. FORM SEAT AND WELD.

4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVING THE CONCRETE LAITANCE FROM THE ATTACHMENT PLATE BEFORE INSTALLING THE S.I.P. FORMS.

## STAY–IN–PLACE FORM ATTACHMENT DETAIL

SCALE: 3" = 1'–0"

*NOTE:*

*When the clear span between flanges exceeds 6'–6", the Designer shall verify anchor spacing and embedded plate thickness.*

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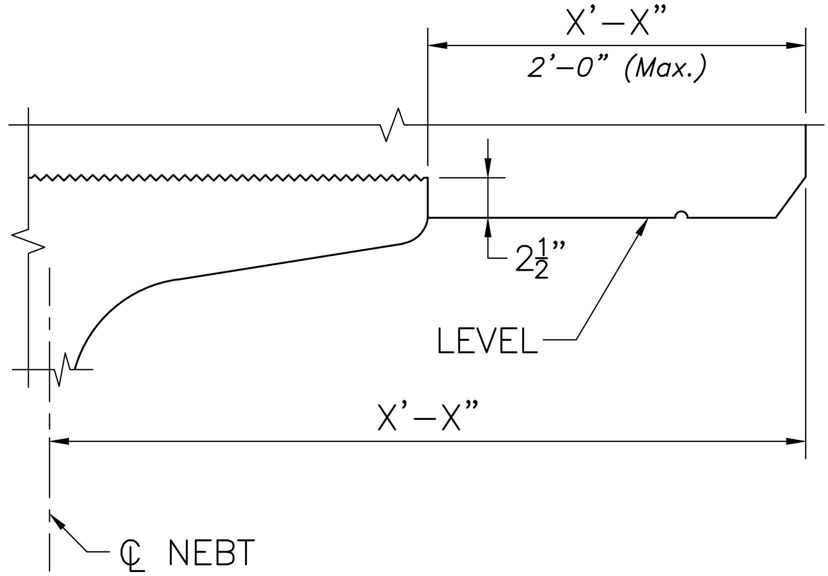
LRFD BRIDGE MANUAL, PART II

# STAY–IN–PLACE FORM ATTACHMENT DETAIL

PRECAST CONCRETE NEBT BEAMS

DATE OF ISSUE
JUNE 2013

DRAWING NUMBER
**6.1.8**



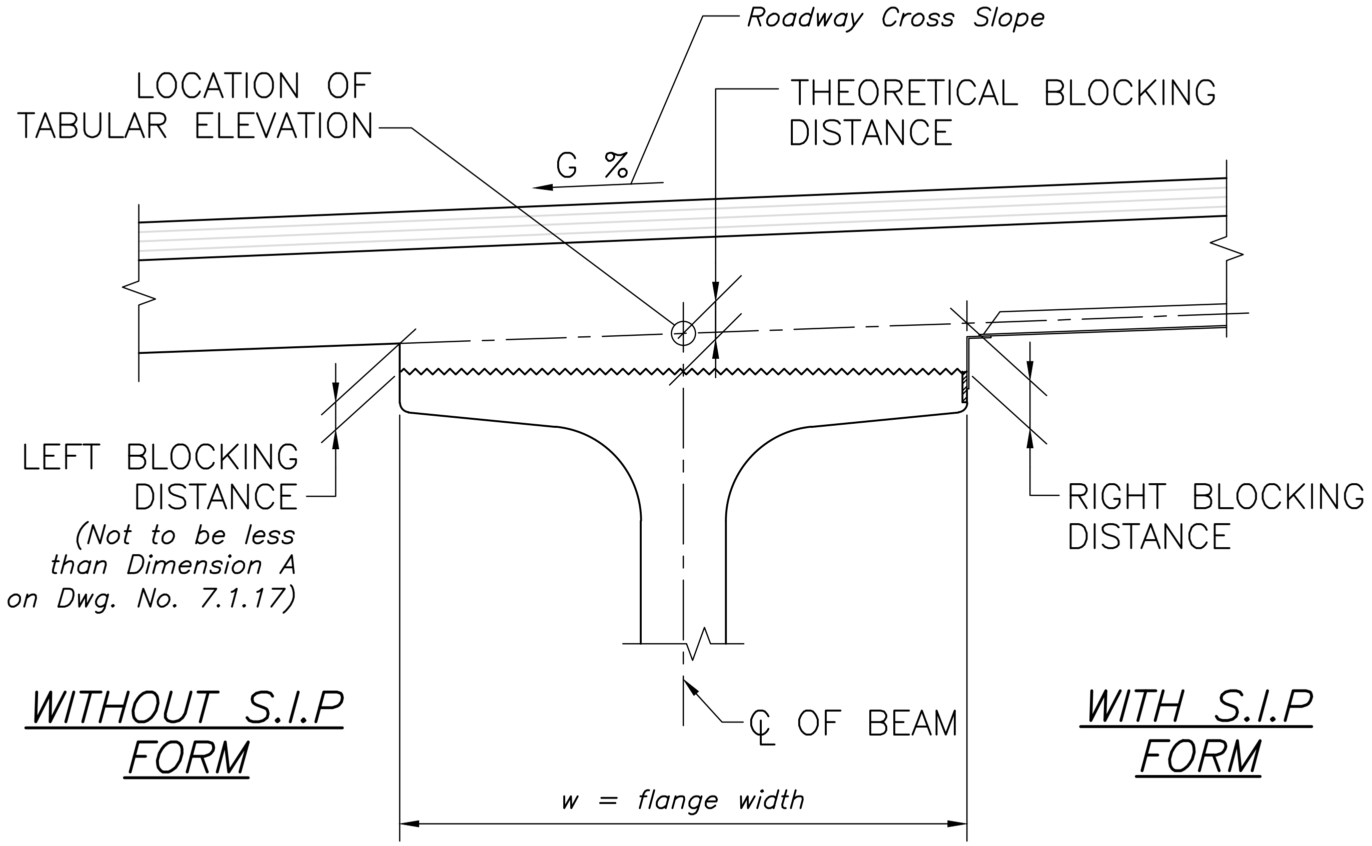

## SLAB OVERHANG AT FASCIA BEAM

SCALE: 1" = 1'–0"

*NOTE:*

*Modify the deck slab overhang details as depicted for steel stringer bridges in the relevant Chapter 9 drawings as shown above, when using NEBT beams.*

| | | |
|---|---|---|
| massDOT Massachusetts Department of Transportation Highway Division<br>LRFD BRIDGE MANUAL, PART II | SLAB OVERHANG AT FASCIA BEAM<br>PRECAST CONCRETE NEBT BEAMS | DATE OF ISSUE<br>JUNE 2013<br>DRAWING NUMBER<br>**6.1.9** |




## NOTES:

1. THE RIGHT AND LEFT ORIENTATION IS TAKEN LOOKING UPSTATION ALONG THE BEAM.

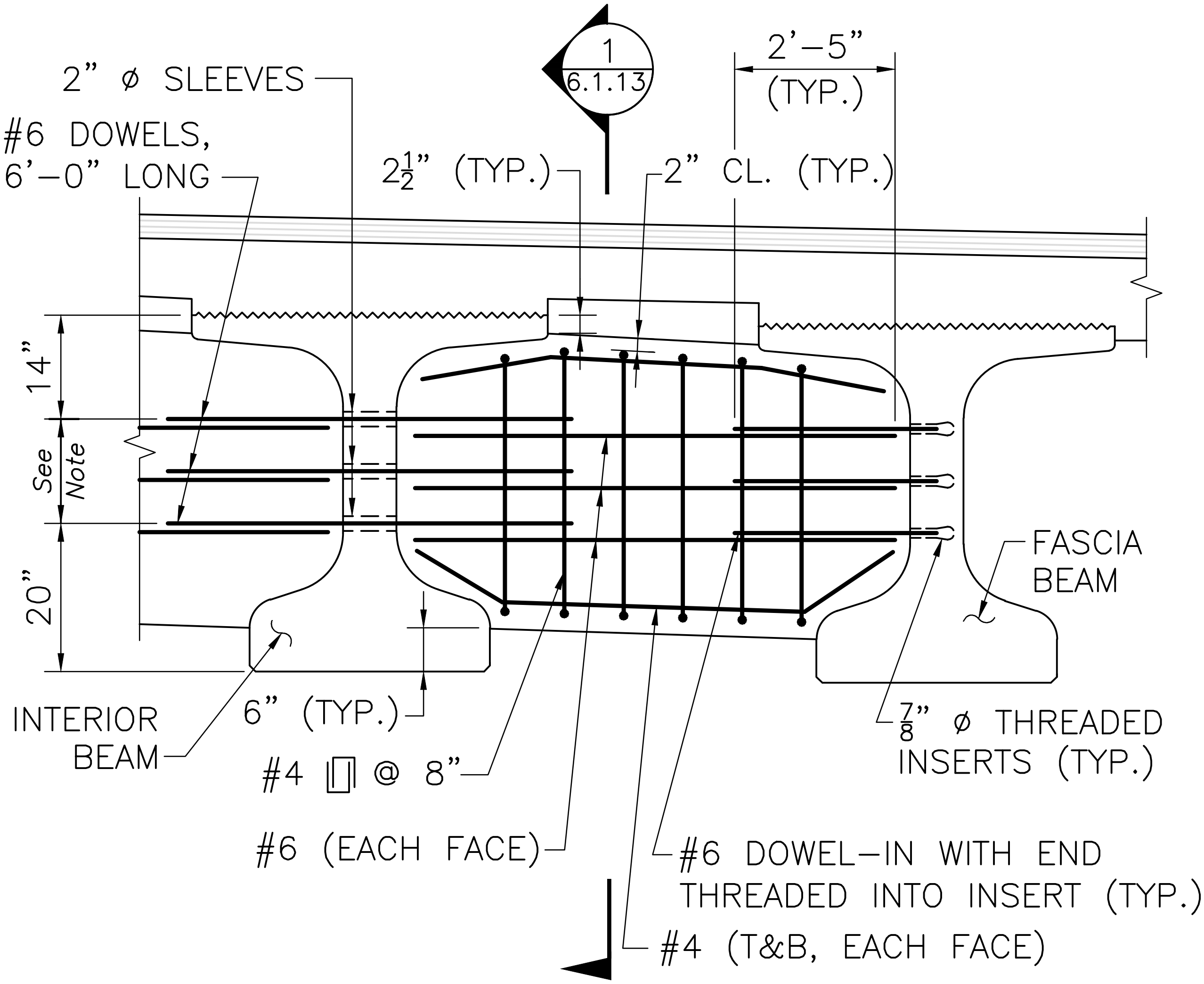
2. RIGHT BLOCKING DISTANCE = THEORETICAL BLOCKING DISTANCE + "R"
   LEFT BLOCKING DISTANCE = THEORETICAL BLOCKING DISTANCE + "L"

# HAUNCH DETAIL

SCALE: $\frac{3}{4}$"= 1'–0"

*NOTES:*

1. *The haunch detail above shows both methods of deck construction, i.e. with S.I.P. forms and w/o S.I.P. forms. The Designer shall modify the detail as required to suite the actual project.*
2. *For bridges with NEBT beams, use the above Haunch Detail in place of the one on Dwg. No. 7.1.17. Also, modify the note on Dwg. No. 7.1.17 to say "Theoretical" instead of "Actual" blocking distance.*
3. *For the above detail:*
   *"R" = G/100 x w/2*
   *"L" = –G/100 x w/2*
   *Since "R" and "L" vary with changes in the roadway cross slope, it is advisable to provide a table of "R" and "L" values for each beam or group of beams for each roadway cross slope situation. Always show "R" and "L" with their correct algebraic sign.*




## NOTES:

1. SLEEVES AND INSERTS SHALL BE ALIGNED WITH DIAPHRAGM SKEWS AS SHOWN ON THE FRAMING PLAN.

2. ⅞" ø THREADED INSERTS SHALL BE CAST INTO THE PRECAST BEAMS BY THE FABRICATOR AND SHALL PROVIDE A MINIMUM NOMINAL TENSILE RESISTANCE OF 21.0 KIPS AND A MINIMUM NOMINAL SHEAR RESISTANCE OF 21.0 KIPS IN 3000 PSI CONCRETE.

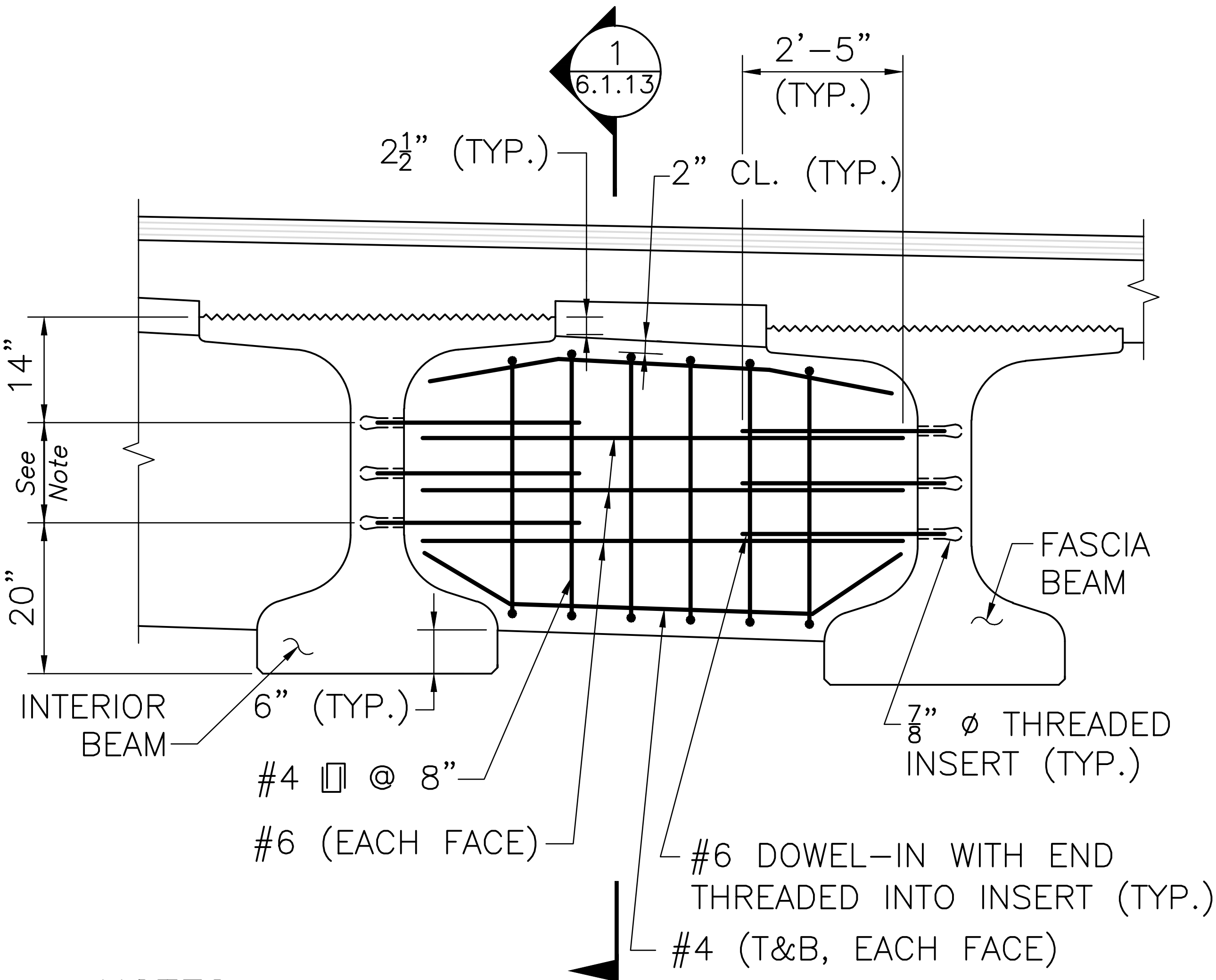
## TYPICAL INTERMEDIATE DIAPHRAGM

SCALE: ½" = 1'–0"

*NOTE:*

*For NEBT 1000 use 1 dowel at midbeam.*
*For NEBT 1200 and NEBT 1400, use 2 dowels.*
*For NEBT 1600 and NEBT 1800, use 3 dowels equally spaced.*

| massDOT Massachusetts Department of Transportation Highway Division<br>LRFD BRIDGE MANUAL, PART II | INTERMEDIATE DIAPHRAGM DETAIL (SKEW ⩽ 30°)<br>PRECAST CONCRETE NEBT BEAMS | DATE OF ISSUE<br>JUNE 2013<br>DRAWING NUMBER<br>**6.1.11** |
|---|---|---|




NOTES:

1. $\frac{7}{8}$" ø THREADED INSERTS SHALL BE CAST INTO THE PRECAST BEAMS BY THE FABRICATOR AND SHALL PROVIDE A MINIMUM NOMINAL TENSILE RESISTANCE OF 21.0 KIPS AND A MINIMUM NOMINAL SHEAR RESISTANCE OF 21.0 KIPS IN 3000 PSI CONCRETE.

2. INSERTS SHALL BE SET PERPENDICULAR TO THE NEBT WEB.

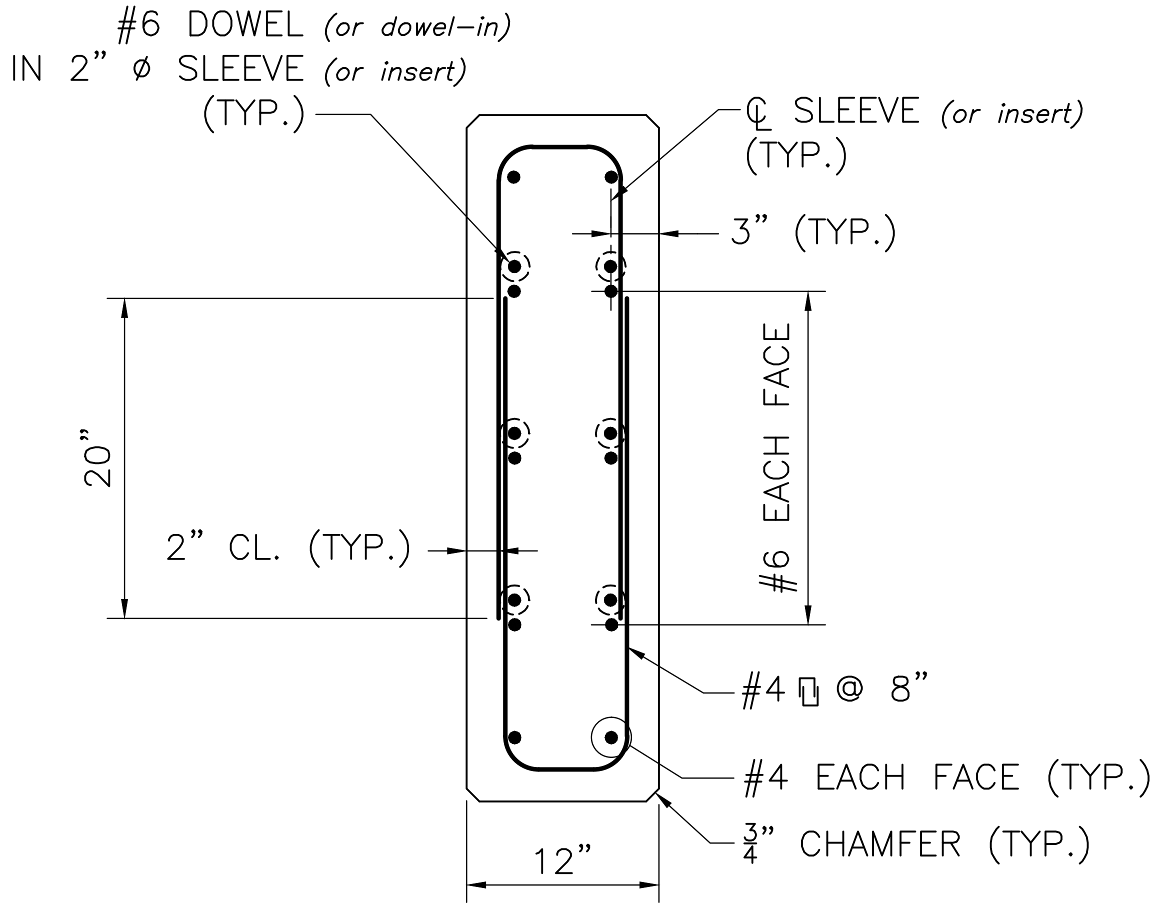
## TYPICAL INTERMEDIATE DIAPHRAGM

SCALE: $\frac{1}{2}$" = 1'–0"

*NOTE:*

*For NEBT 1000 use 1 insert at midbeam.*
*For NEBT 1200 and NEBT 1400, use 2 inserts.*
*For NEBT 1600 and NEBT 1800, use 3 inserts equally spaced.*

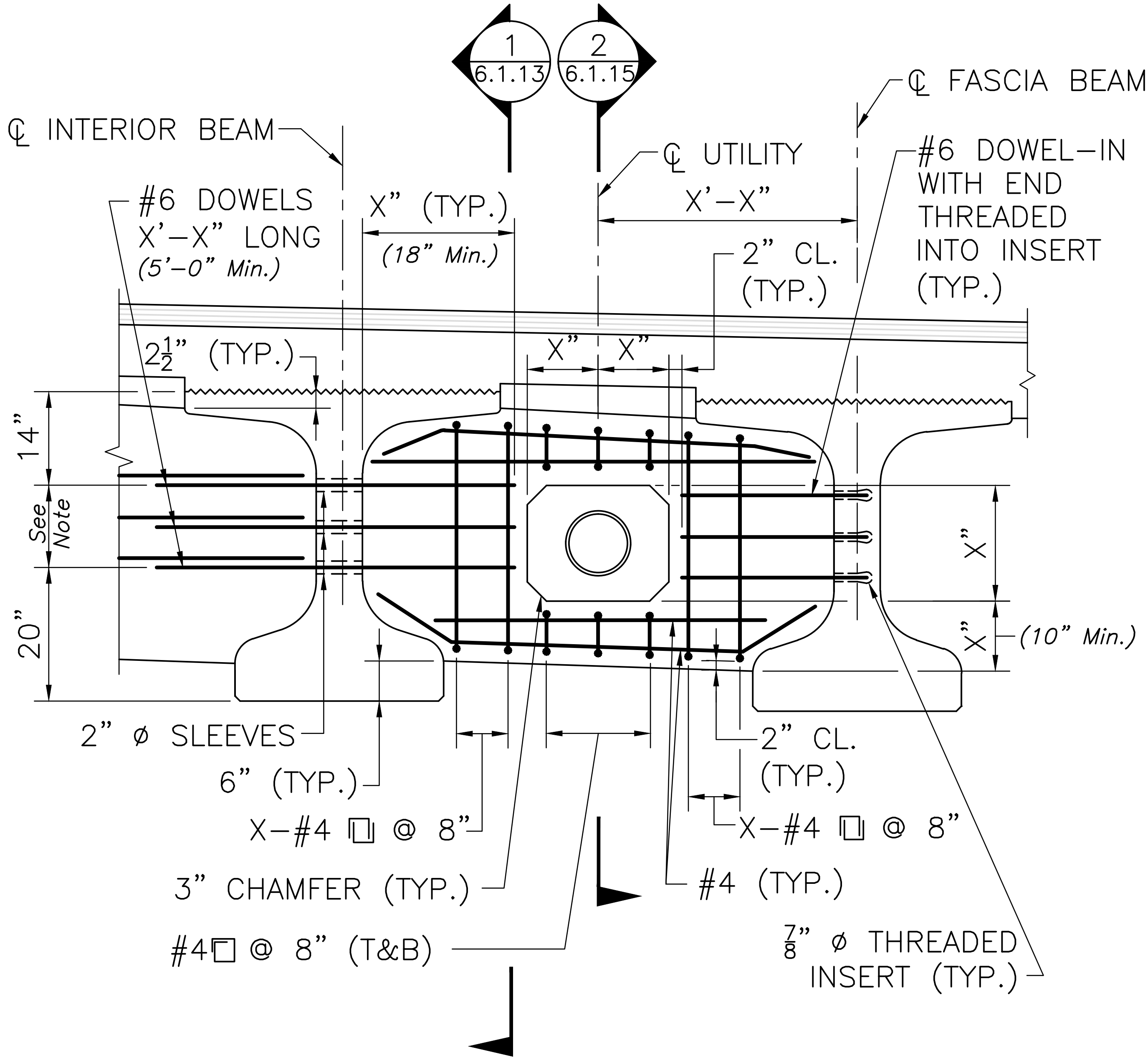
| | | |
|---|---|---|
| massDOT Massachusetts Department of Transportation Highway Division<br>LRFD BRIDGE MANUAL, PART II | INTERMEDIATE DIAPHRAGM DETAIL (SKEW > 30°)<br>PRECAST CONCRETE NEBT BEAMS | DATE OF ISSUE<br>JUNE 2013<br>DRAWING NUMBER<br>**6.1.12** |




## SECTION 1

SCALE: 1" = 1'-0"

| | | |
|---|---|---|
| massDOT Massachusetts Department of Transportation Highway Division<br>LRFD BRIDGE MANUAL, PART II | INTERMEDIATE DIAPHRAGM<br>TYPICAL SECTION<br>PRECAST CONCRETE NEBT BEAMS | DATE OF ISSUE<br>JUNE 2013<br>DRAWING NUMBER<br>**6.1.13** |




(For Construction Notes see Dwg. No. 6.1.11)

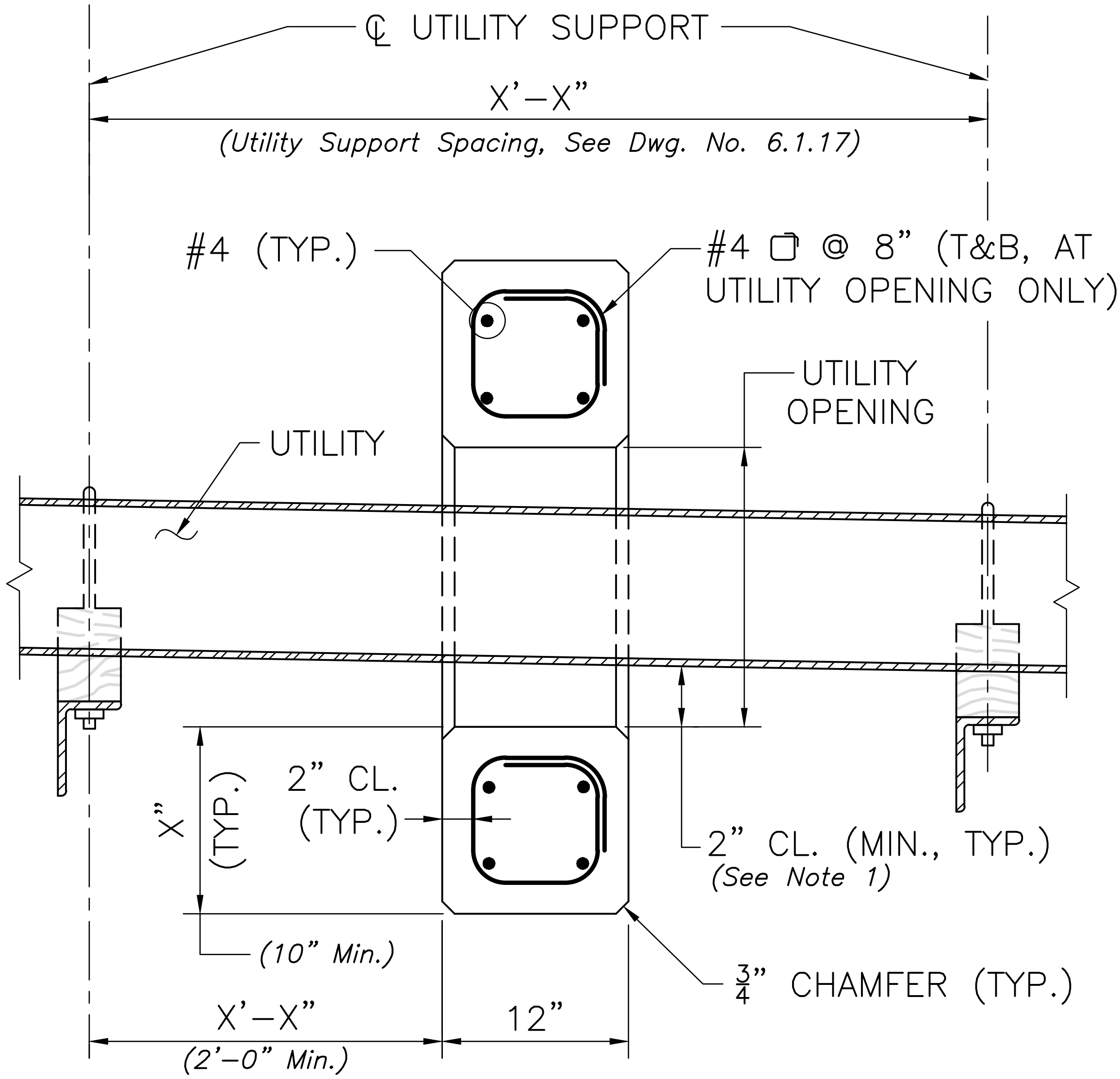
# TYPICAL INTERMEDIATE DIAPHRAGM WITH UTILITY

SCALE: ½" = 1'–0"

*NOTES:*

1. *For NEBT 1000, use 1 dowel at mid–beam.*
   *For NEBT 1200 and NEBT 1400, use 2 dowels.*
   *For NEBT 1600 and NEBT 1800, use 3 dowels equally spaced.*
2. *Detail shown is for skews ⩽ 30°. For skews > 30°, modify this detail for interior beam using inserts as shown on Dwg. No. 6.1.12 and use Construction Notes on that drawing.*
3. *The type of utility shown is conceptual and shall be modified to accommodate the actual type.*

| | | |
|---|---|---|
| massDOT Massachusetts Department of Transportation Highway Division<br>LRFD BRIDGE MANUAL, PART II | INTERMEDIATE DIAPHRAGM DETAIL WITH UTILITY<br>PRECAST CONCRETE NEBT BEAMS | DATE OF ISSUE<br>JUNE 2013<br>DRAWING NUMBER<br>**6.1.14** |



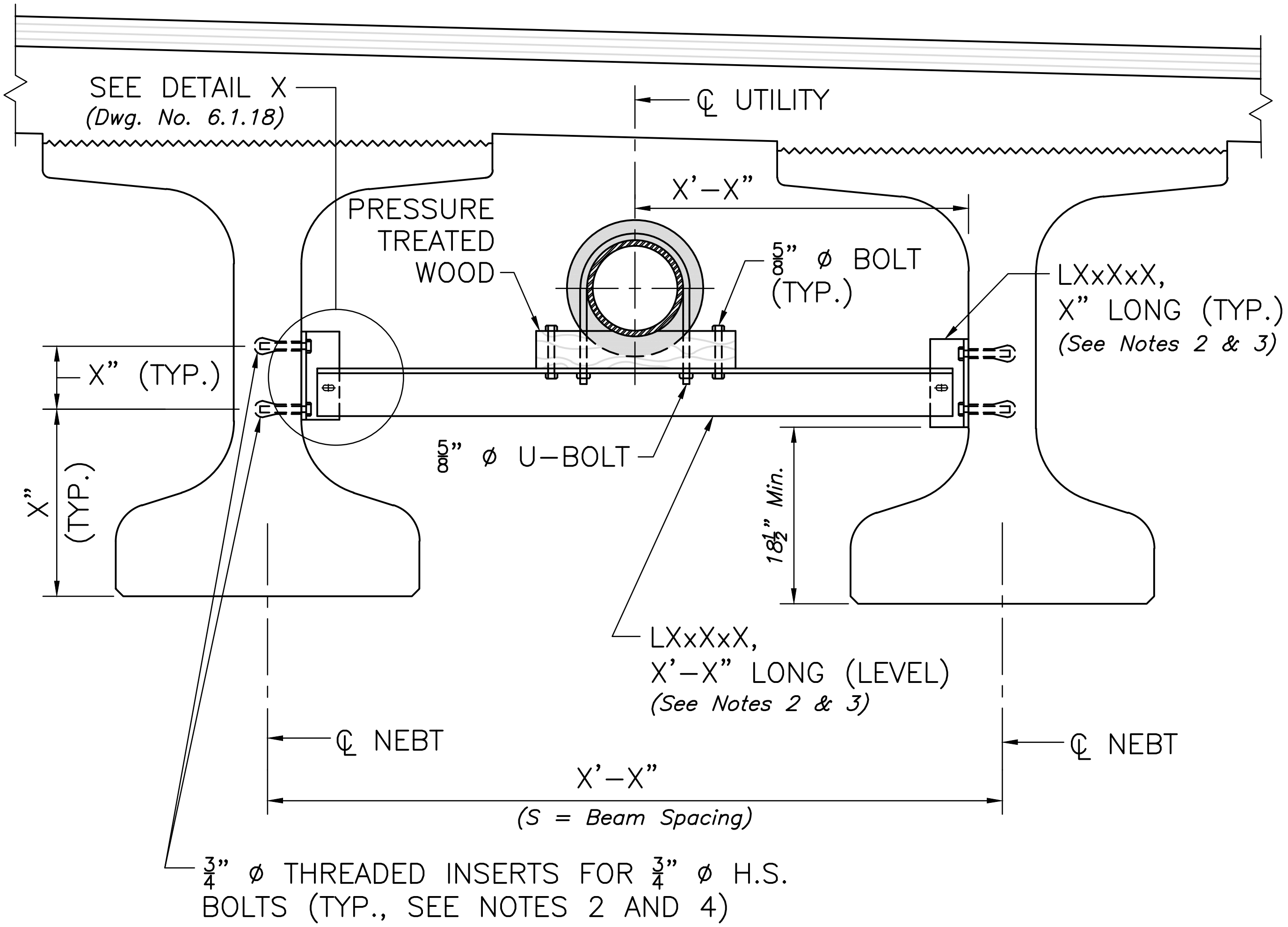

## SECTION 2

SCALE: 1" = 1'–0"

*NOTES:*

1. *The Designer shall verify that the clearances required by utilities are maintained.*
2. *The type of utility is conceptual, and shall be modified to accommodate the actual type.*

| | | |
|---|---|---|
| massDOT Massachusetts Department of Transportation Highway Division<br>LRFD BRIDGE MANUAL, PART II | INTERMEDIATE DIAPHRAGM SECTION WITH UTILITY<br>PRECAST CONCRETE NEBT BEAMS | DATE OF ISSUE<br>JUNE 2013<br>DRAWING NUMBER<br>**6.1.15** |




## NOTES:

1. ALL STRUCTURAL STEEL FOR UTILITY SUPPORTS SHALL CONFORM TO AASHTO M 270 GRADE 36. ALL STRUCTURAL STEEL AND FASTENERS SHALL BE HOT–DIP GALVANIZED IN ACCORDANCE WITH AASHTO M 111 AND M 232.

2. THE $\frac{3}{4}$" Ø THREADED INSERTS FOR $\frac{3}{4}$" Ø H.S. 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.
*(The Designer shall determine the required insert capacities if S > 12 feet).*
3. THE UTILITY SUPPORT ANGLE SHALL BE ERECTED WITH THE LONG LEG VERTICAL.

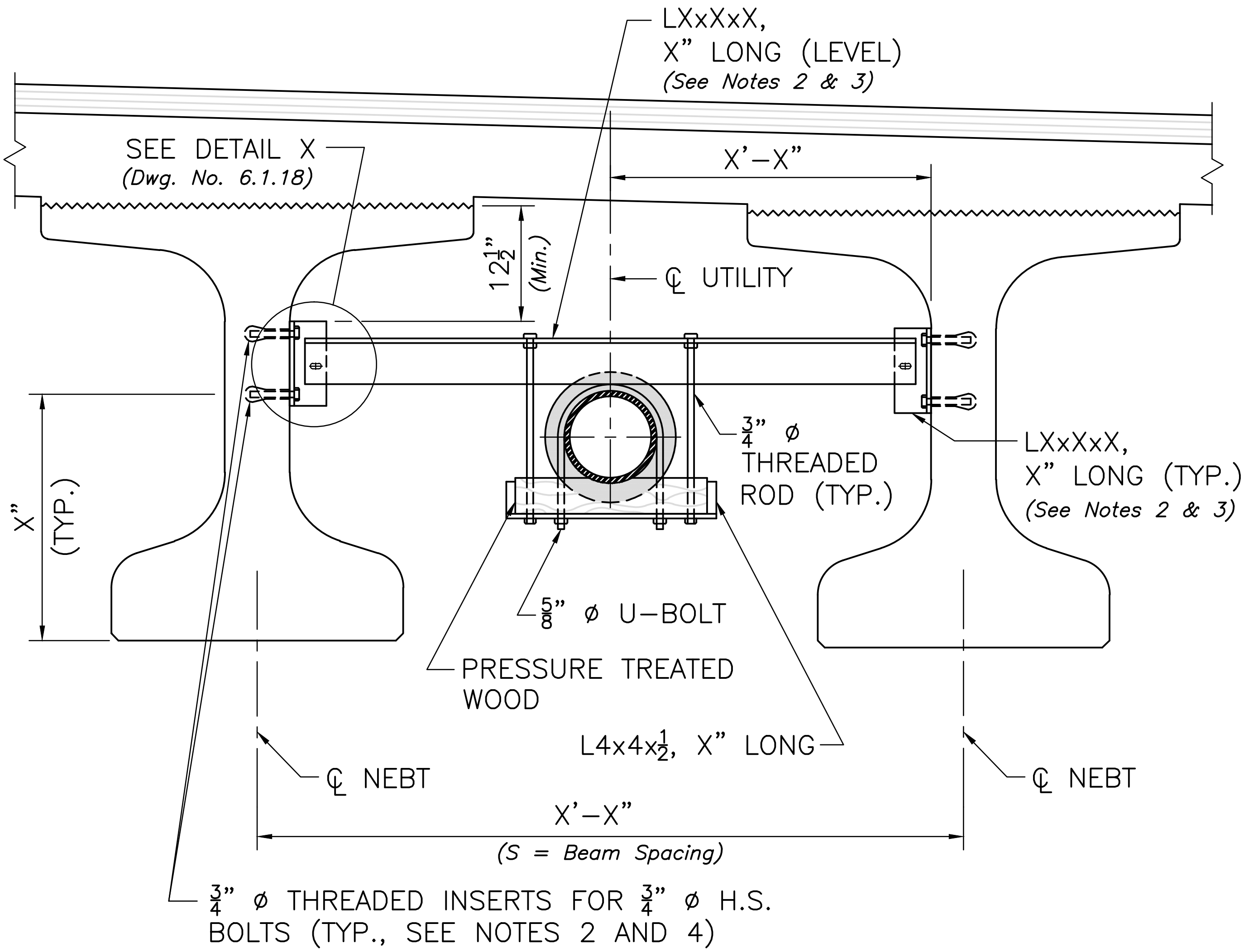
4. INSERTS SHALL BE POSITIONED TO AVOID INTERFERENCE WITH PRESTRESSING STRANDS.

## UTILITY BAY DETAILS

SCALE: $\frac{3}{4}$" = 1'–0"

*NOTE:*
*See Dwg. No. 6.1.17 For Designer Notes.*

| massDOT Massachusetts Department of Transportation Highway Division<br>LRFD BRIDGE MANUAL, PART II | UTILITY BAY DETAILS (PREFERRED)<br>PRECAST CONCRETE NEBT BEAMS | DATE OF ISSUE<br>JUNE 2013<br>DRAWING NUMBER<br>**6.1.16** |
|---|---|---|




## NOTES:

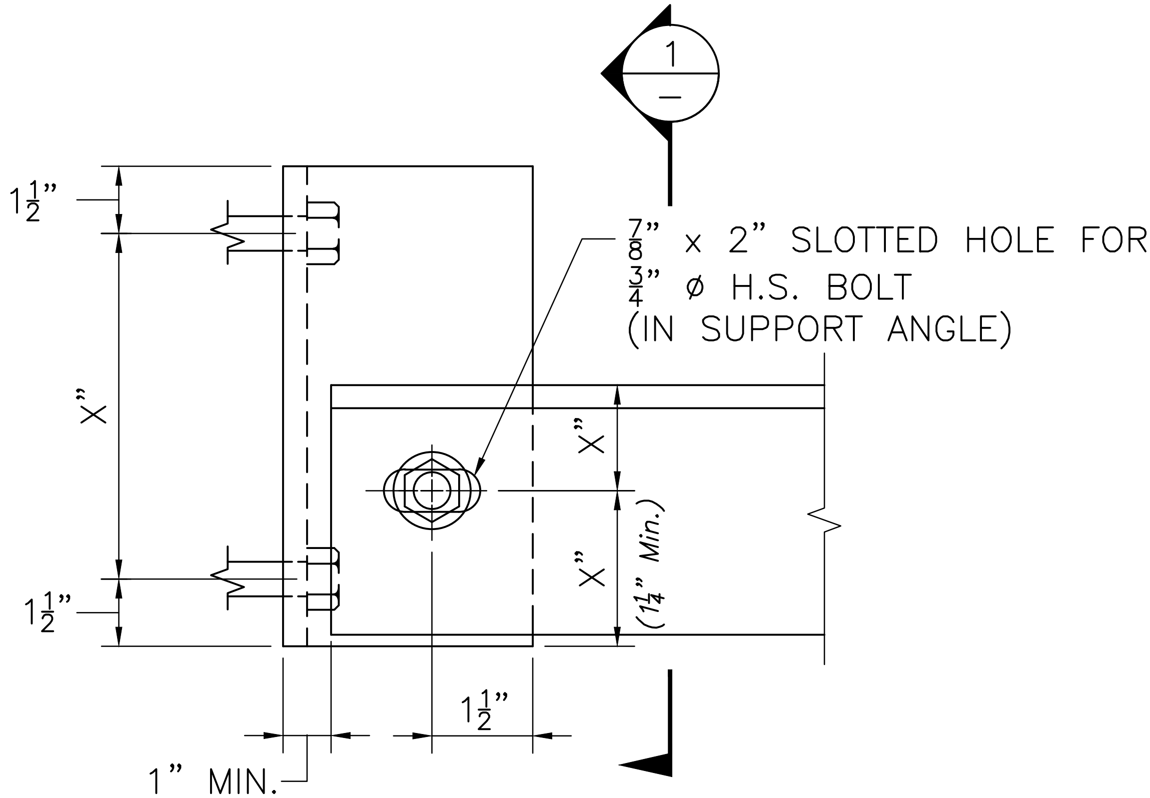
*(See Dwg. No. 6.1.16 for Constructions Notes)*

## UTILITY BAY DETAILS

SCALE: ¾" = 1'–0"

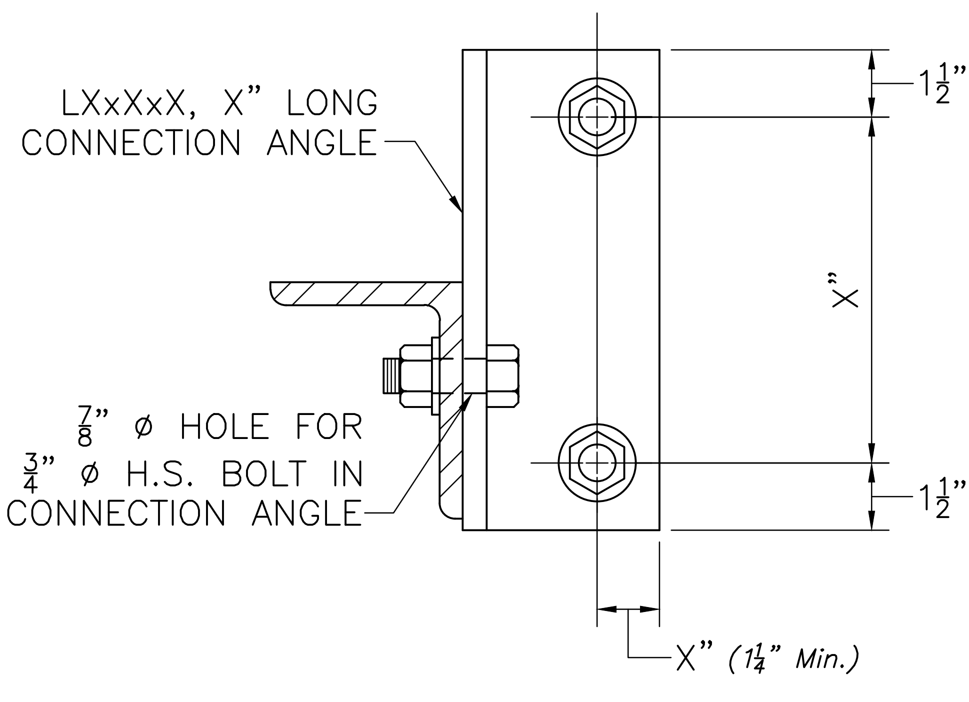
*NOTES:*

1. *The type of utility shown is conceptual and shall be modified to accommodate the actual type.*
2. *For S < 6'–6" use L5x3½x½*
   *For 6'–6" ≤ S ≤ 12'–0" use L6x4x⅝*
   *For S > 12'–0" to be designed by Designer*
3. *Maximum utility support spacing = 11'–6" and the maximum total utility weight is 250 lbs/ft. If either of these limits are exceeded, the Designer shall design the support angle.*
4. *The connection angles attached to the NEBT web are positioned to clear the NEBT curvature.*
5. *The alternate utility support detail shown above shall be used where the size of utility precludes the use of the preferred detail of Dwg. No. 6.1.16. The Designer may need to modify the interior diaphragm when using this detail as well.*




## DETAIL X

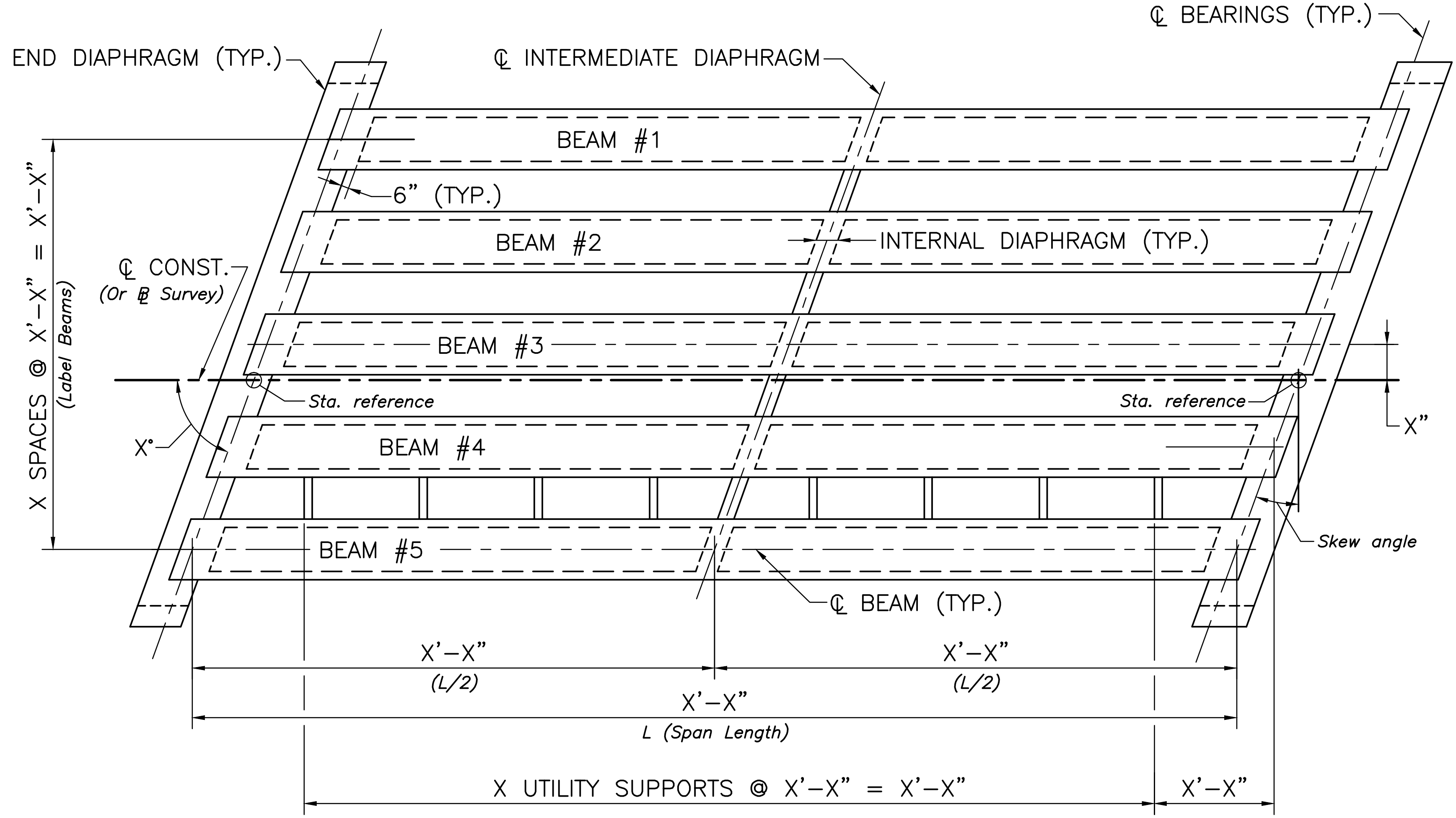
SCALE: 3" = 1'–0"




## SECTION 1

SCALE: 3" = 1'–0"

| | | |
|---|---|---|
| massDOT Massachusetts Department of Transportation Highway Division<br>LRFD BRIDGE MANUAL, PART II | UTILITY SUPPORT DETAILS<br>PRECAST CONCRETE NEBT BEAMS | DATE OF ISSUE<br>JUNE 2013 |
| | | DRAWING NUMBER<br>**6.1.18** |



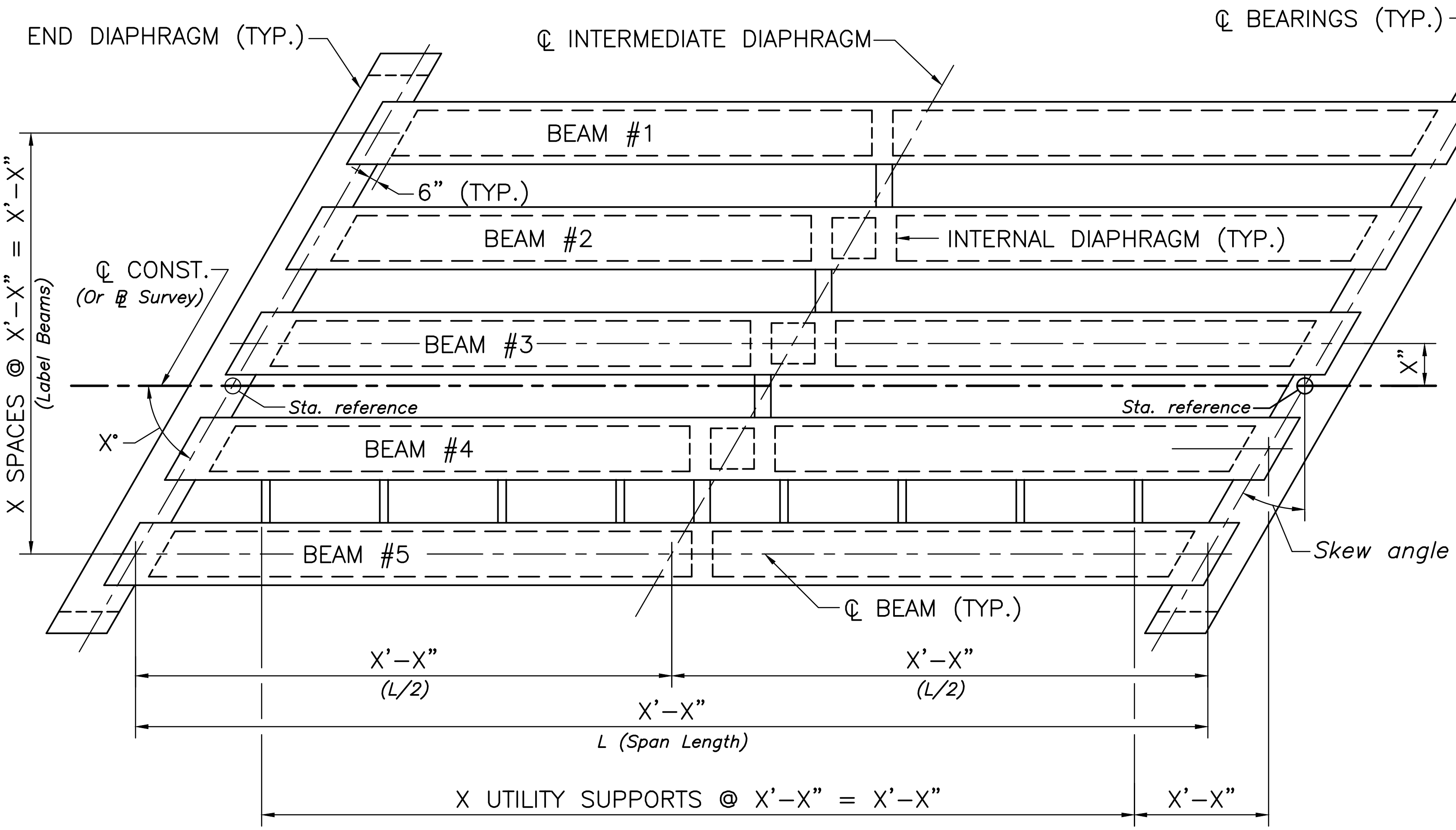

## FRAMING PLAN

SCALE: (1/8" = 1'–0" Min.)

*NOTES:*

1. *Framing plan shall be drawn full length without breaks and to scale on the Construction Drawings. Label beam types and include North Arrow.*
2. *No intermediate diaphragms required for spans of 80' or less.*
3. *End diaphragms, ends of beams and ends of voids shall follow skew of bridge.*
4. *For utility support spacing requirements, see Dwg. No. 6.2.20.*
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.*

| | | |
|---|---|---|
| massDOT Massachusetts Department of Transportation Highway Division<br>LRFD BRIDGE MANUAL, PART II | FRAMING PLAN<br>(SKEW ≤ 30°)<br>PRECAST CONCRETE BOX BEAMS | DATE OF ISSUE<br>JUNE 2013<br>DRAWING NUMBER<br>**6.2.1** |




## FRAMING PLAN

SCALE: (⅛" = 1'–0" Min.)

*NOTES:*

1. *Framing plan shall be drawn full length without breaks and to scale on the Construction Drawings. Label beam types and include North Arrow.*
2. *No intermediate diaphragms required for spans of 80' or less.*
3. *End diaphragms, ends of beams and ends of voids shall follow skew of bridge.*
4. *For utility support spacing requirements, see Dwg. No. 6.2.20.*
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.*

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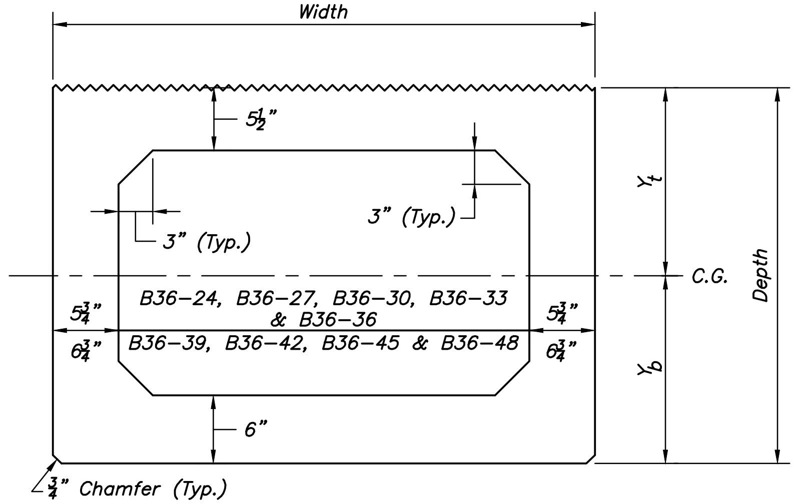
LRFD BRIDGE MANUAL, PART II

# FRAMING PLAN (SKEW > 30°)

PRECAST CONCRETE BOX BEAMS

DATE OF ISSUE
JUNE 2013

DRAWING NUMBER
**6.2.2**




## BEAM PROPERTIES

| BEAM TYPE | WIDTH (in) | DEPTH (in) | AREA ($in^2$) | I ($in^4$) | $Y_b$ (in) | $Y_t$ (in) | $S_b$ ($in^3$) | $S_t$ ($in^3$) | WEIGHT (lbs/ft) |
|---|---|---|---|---|---|---|---|---|---|
| B36–24 | 35.5 | 24 | 569 | 37392 | 11.89 | 12.11 | 3145 | 3088 | 593 |
| B36–27 | 35.5 | 27 | 604 | 51478 | 13.37 | 13.63 | 3850 | 3777 | 629 |
| B36–30 | 35.5 | 30 | 638 | 68281 | 14.85 | 15.15 | 4598 | 4507 | 665 |
| B36–33 | 35.5 | 33 | 673 | 87958 | 16.33 | 16.67 | 5386 | 5276 | 701 |
| B36–36 | 35.5 | 36 | 707 | 110661 | 17.81 | 18.19 | 6213 | 6084 | 736 |
| B36–39 | 35.5 | 39 | 797 | 140025 | 19.33 | 19.67 | 7244 | 7119 | 830 |
| B36–42 | 35.5 | 42 | 837 | 170514 | 20.82 | 21.18 | 8190 | 8051 | 872 |
| B36–45 | 35.5 | 45 | 878 | 204772 | 22.31 | 22.69 | 9178 | 9025 | 915 |
| B36–48 | 35.5 | 48 | 918 | 242981 | 23.80 | 24.20 | 10209 | 10041 | 956 |

## MAXIMUM SPAN LENGTHS

| BEAM TYPE | Beam Spacing | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 5 ft. | 6 ft. | 7 ft. | 8 ft. | 9 ft. | 10 ft. | 11 ft. | 12 ft. | 13 ft. |
| B36–24 | 59 | 56 | 53 | 49 | 47 | 45 | 44 | 40 | 38 |
| B36–27 | 64 | 60 | 58 | 54 | 52 | 50 | 47 | 45 | 43 |
| B36–30 | 69 | 65 | 63 | 59 | 56 | 54 | 53 | 48 | 46 |
| B36–33 | 76 | 71 | 67 | 64 | 61 | 59 | 56 | 53 | 51 |
| B36–36 | 81 | 76 | 72 | 69 | 65 | 63 | 61 | 58 | 55 |
| B36–39 | 89 | 83 | 79 | 75 | 72 | 69 | 66 | 63 | 60 |
| B36–42 | 94 | 89 | 84 | 80 | 77 | 73 | 71 | 67 | 63 |
| B36–45 | 100 | 94 | 89 | 85 | 81 | 78 | 75 | 71 | 67 |
| B36–48 | 105 | 99 | 94 | 90 | 86 | 83 | 79 | 75 | 71 |

NOTES:

1. Above drawing is not to scale.
2. 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 (Cast–in–Place Composite Deck)
   - Interior Girders with no skew.
   - 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 CF–PL3 Barrier was assumed on the bridge.
   - 3.5" thick HMA wearing surface.
   - 0.6" diameter low relaxation strands.
3. Weight of beams does not include the weight of the solid sections. Include the weight of the solid sections for design.

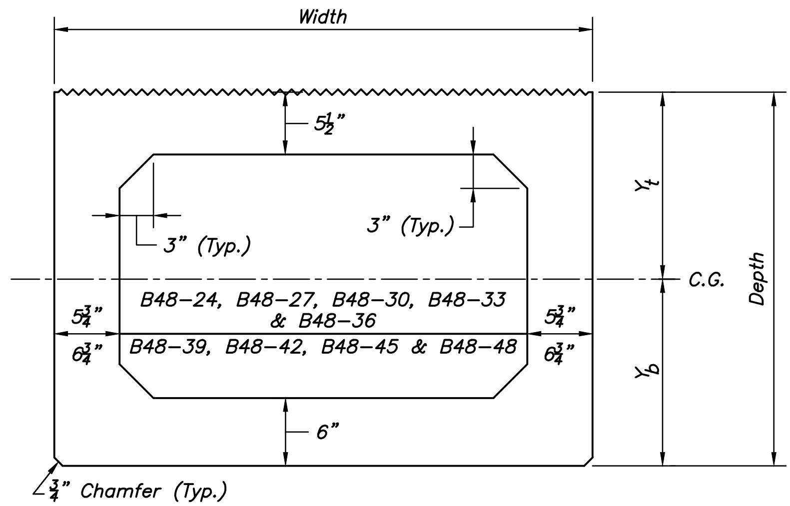


STANDARD 36" WIDE BEAMS

PRECAST CONCRETE BOX BEAMS

DATE OF ISSUE JUNE 2013

DRAWING NUMBER **6.2.3**




## BEAM PROPERTIES

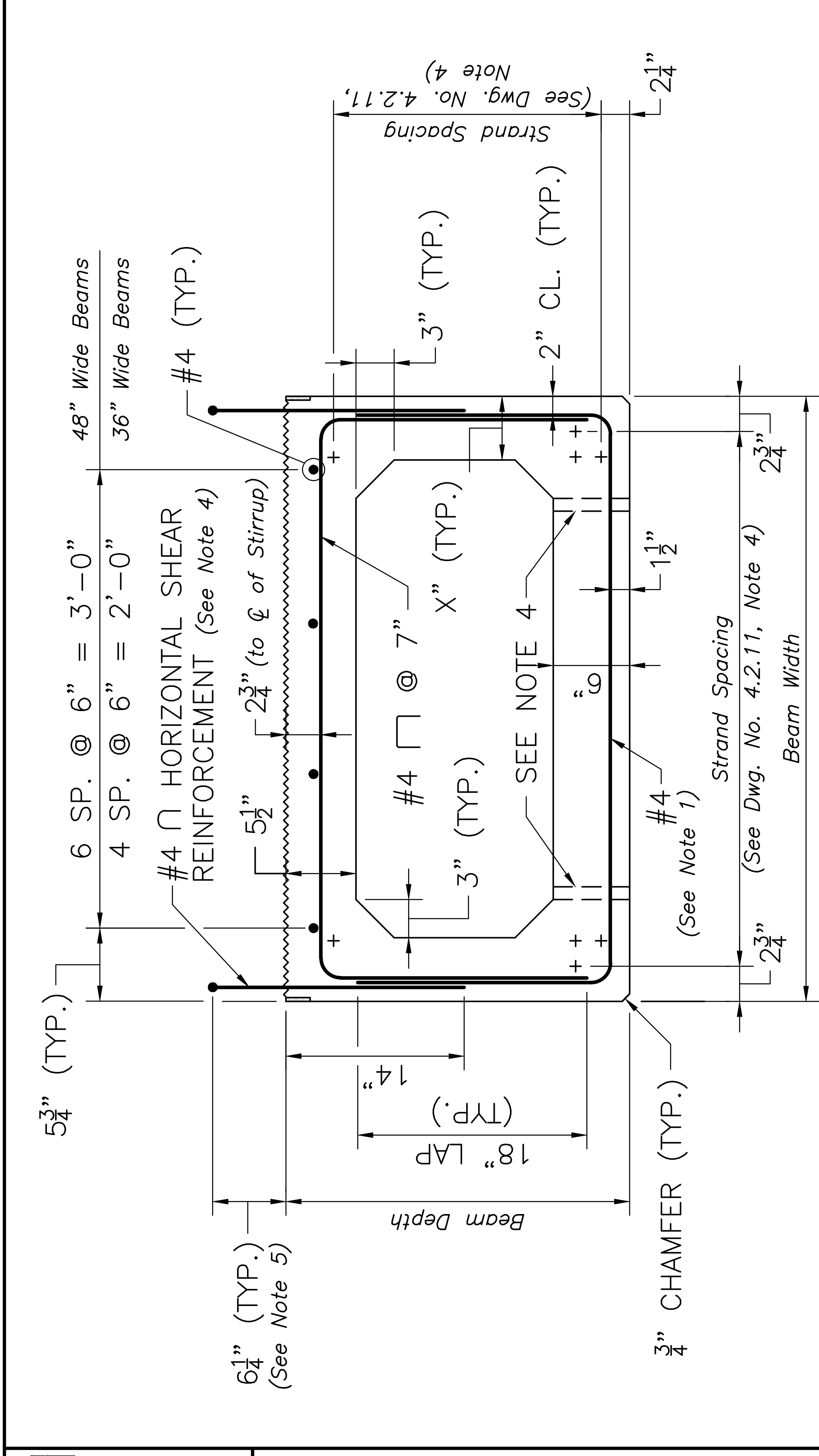
| BEAM TYPE | WIDTH (in) | DEPTH (in) | AREA ($in^2$) | I ($in^4$) | $Y_b$ (in) | $Y_t$ (in) | $S_b$ ($in^3$) | $S_t$ ($in^3$) | WEIGHT (lbs/ft) |
|---|---|---|---|---|---|---|---|---|---|
| B48-24 | 47.5 | 24 | 707 | 49247 | 11.86 | 12.14 | 4152 | 4057 | 736 |
| B48-27 | 47.5 | 27 | 742 | 67415 | 13.33 | 13.67 | 5057 | 4932 | 773 |
| B48-30 | 47.5 | 30 | 776 | 88921 | 14.80 | 15.20 | 6008 | 5850 | 808 |
| B48-33 | 47.5 | 33 | 811 | 113920 | 16.28 | 16.72 | 6998 | 6813 | 845 |
| B48-36 | 47.5 | 36 | 845 | 142567 | 17.76 | 18.24 | 8027 | 7816 | 880 |
| B48-39 | 47.5 | 39 | 935 | 178498 | 19.27 | 19.73 | 9263 | 9047 | 974 |
| B48-42 | 47.5 | 42 | 975 | 216174 | 20.75 | 21.25 | 10418 | 10173 | 1016 |
| B48-45 | 47.5 | 45 | 1016 | 258238 | 22.24 | 22.76 | 11611 | 11346 | 1058 |
| B48-48 | 47.5 | 48 | 1056 | 304874 | 23.72 | 24.28 | 12853 | 12557 | 1100 |

## MAXIMUM SPAN LENGTHS (ft.)

| BEAM TYPE | Beam Spacing | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 5 ft. | 6 ft. | 7 ft. | 8 ft. | 9 ft. | 10 ft. | 11 ft. | 12 ft. | 13 ft. |
| B48-24 | 65 | 62 | 59 | 56 | 54 | 51 | 49 | 48 | 45 |
| B48-27 | 71 | 68 | 64 | 61 | 59 | 57 | 54 | 52 | 50 |
| B48-30 | 79 | 74 | 70 | 66 | 64 | 61 | 59 | 57 | 55 |
| B48-33 | 83 | 80 | 76 | 72 | 69 | 65 | 63 | 61 | 59 |
| B48-36 | 90 | 86 | 81 | 77 | 74 | 71 | 68 | 66 | 62 |
| B48-39 | 97 | 92 | 88 | 83 | 80 | 77 | 74 | 71 | 68 |
| B48-42 | 104 | 98 | 93 | 89 | 85 | 82 | 79 | 76 | 72 |
| B48-45 | 109 | 103 | 98 | 94 | 90 | 86 | 83 | 80 | 76 |
| B48-48 | 115 | 109 | 103 | 99 | 94 | 91 | 88 | 84 | 80 |

NOTES:

1. Above drawing is not to scale.
2. 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 (Cast-in-Place Composite Deck)
   - Interior Girders with no skew.
   - Final Allowable Tension at bottom of beam is equal to 0.0948 f'c ksi.
   - HL-93 Live Load.
   - Time-Dependent Losses of Article 5.9.5.3 of the AASHTO-LRFD were used.
   - The CF-PL3 Barrier was assumed on the bridge.
   - 3.5" thick HMA wearing surface.
   - 0.6" diameter low relaxation strands.
3. Weight of beams does not include the weight of the solid sections. Include the weight of the solid sections for design.




# TYPICAL MIDSPAN SECTION

SCALE: 1" = 1'-0"

## NOTES:

See Dwg. No. 6.2.8 for notes to be included on Construction Drawings.

NOTE: See Dwg. No. 6.2.8 for Designer Notes.

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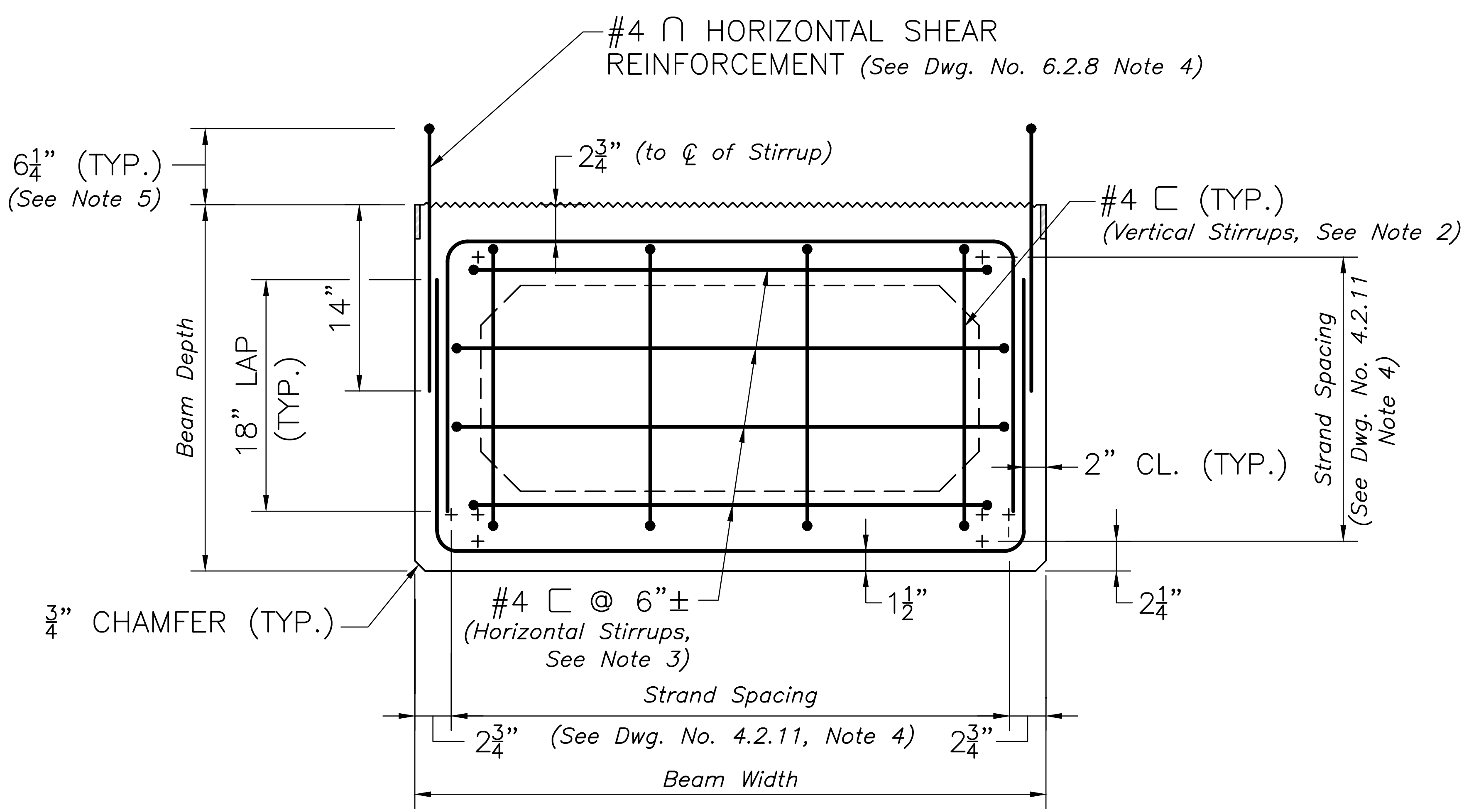
LRFD BRIDGE MANUAL, PART II

# MIDSPAN SECTION

PRECAST CONCRETE BOX BEAMS

DATE OF ISSUE
JUNE 2013

DRAWING NUMBER
**6.2.5**



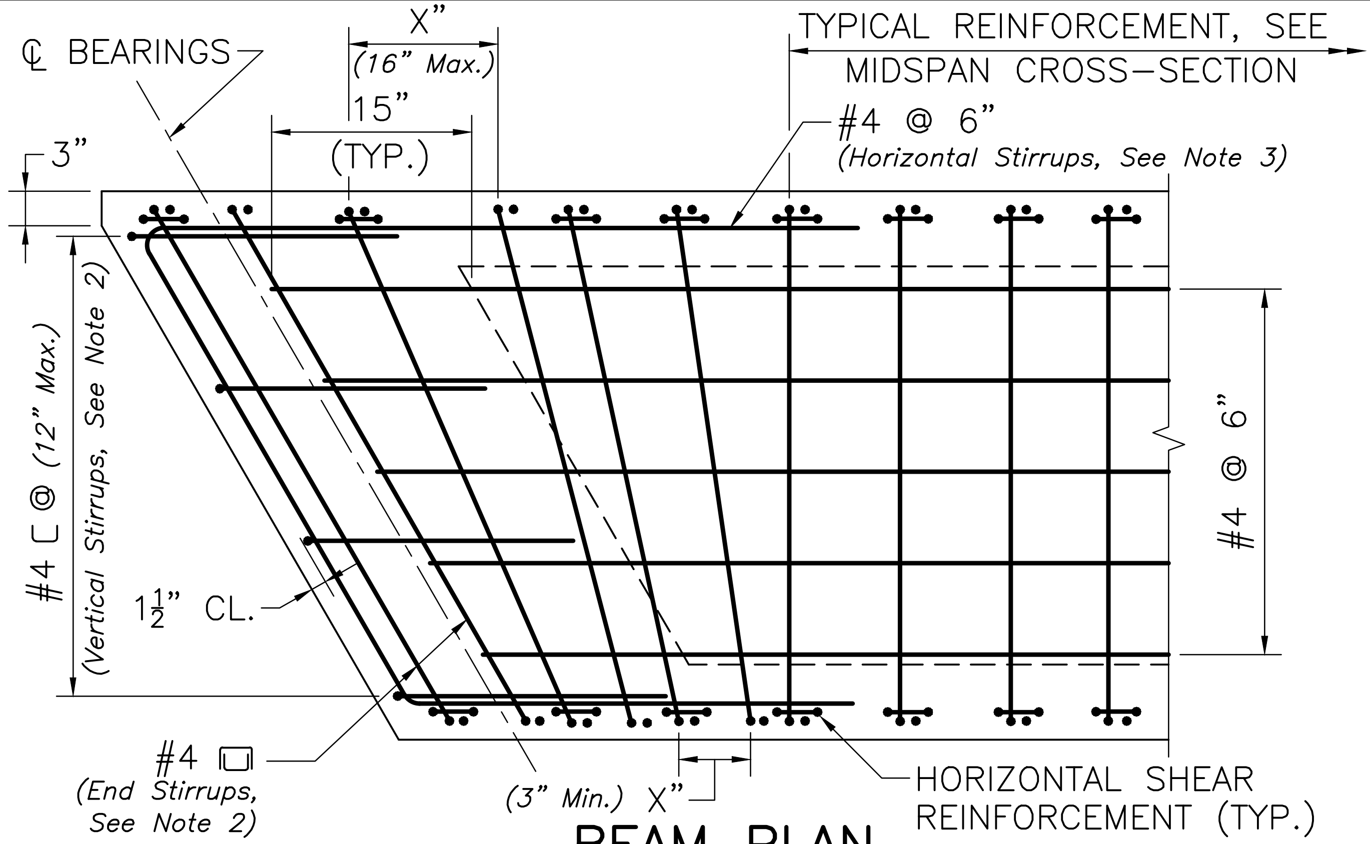

## NOTES:

*(See Dwg. No. 6.2.8 for notes to be included on Construction Drawings.)*

## END OF BEAM SECTION

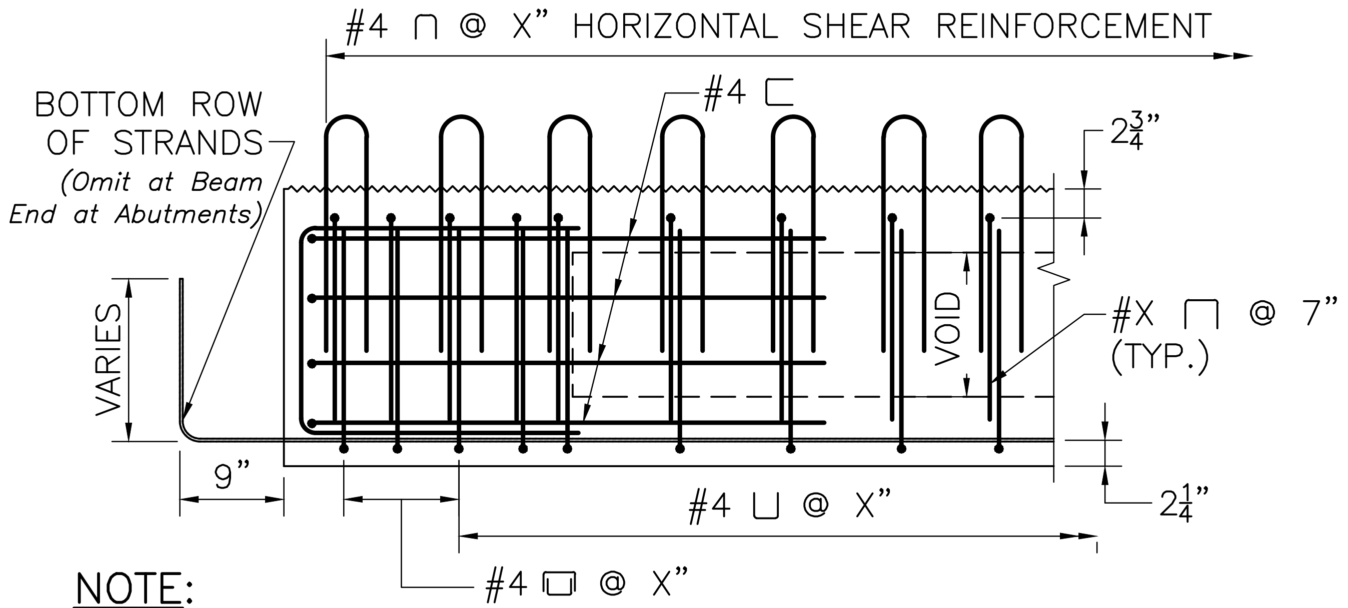
SCALE: 1" = 1'–0"

*NOTE:*
*See Dwg. No. 6.2.8 for Designer Notes.*




## BEAM PLAN

SCALE: $\frac{3}{4}$" = 1'–0"




NOTE:
THE REMAINDER OF THE STRANDS IS NOT SHOWN FOR CLARITY.

## BEAM ELEVATION

SCALE: $\frac{3}{4}$" = 1'–0"

*NOTES:*

1. *The extent of these details should be long enough to indicate typical stirrup spacing throughout the beam.*
2. *See Dwg. 6.2.8 for Designer Notes.*

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LRFD BRIDGE MANUAL, PART II

# BEAM PLAN AND ELEVATION

PRECAST CONCRETE BOX BEAMS

DATE OF ISSUE
JUNE 2013

DRAWING NUMBER
**6.2.7**

## NOTES: *(Include these notes with details shown on Dwg. No's. 6.2.5 and 6.2.6)*

1. + DENOTES STRAIGHT STRANDS.
2. ◇ DENOTES DRAPED STRANDS. *(Include only if needed)*
3. ⊕ DENOTES DEBONDED STRANDS. *(Include only if needed)*
4. 1" ø DRAIN, PLACED AT BOTH ENDS OF VOIDS.
5. SEE BEAM ELEVATION FOR STIRRUP SPACING.

*NOTES: (These notes are for details shown on Dwg. No's. 6.2.5, 6.2.6 and 6.2.7)*

1. *Bottom transverse stirrups shall be placed at a multiple of the top transverse stirrup spacing with a maximum spacing of 14". See prestressed section of Part I of the Bridge Manual for the design of the transverse stirrups.*
2. *See the prestressed section of Part I of the Bridge Manual for the design of the end transverse stirrups and vertical stirrups. The horizontal legs of the vertical stirrups are equal to the depth of the beam and shall be dimensioned on the plan view.*
3. *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.*
4. *Horizontal shear reinforcement shall be designed in accordance with Article 5.8.4 of the AASHTO-LRFD and shall be spaced at the multiple of the transverse stirrups.*
5. *Embedment of horizontal shear reinforcement into the deck slab may need to be increased in cases with large blocking depths. However, the Designer shall ensure that at least 2" clear cover is maintained to the top of deck at all locations. The embedment length shown does not produce full development.*

# PRESTRESS NOTES:

1. ALL PRETENSIONING ELEMENTS SHALL BE 0.6" Ø, UNCOATED, SEVEN–WIRE, LOW RELAXATION STEEL STRANDS AND SHALL CONFORM TO AASHTO M 203.

2. THE NOMINAL TENSILE STRENGTH OF THE PRETENSIONING STRANDS SHALL BE 270 KSI.

3. THE INITIAL TENSION PER 0.6" Ø STRAND SHALL BE 44 KIPS.

4. THE MINIMUM 28 DAY COMPRESSIVE STRENGTH SHALL BE 6500 PSI. *(See Note)*

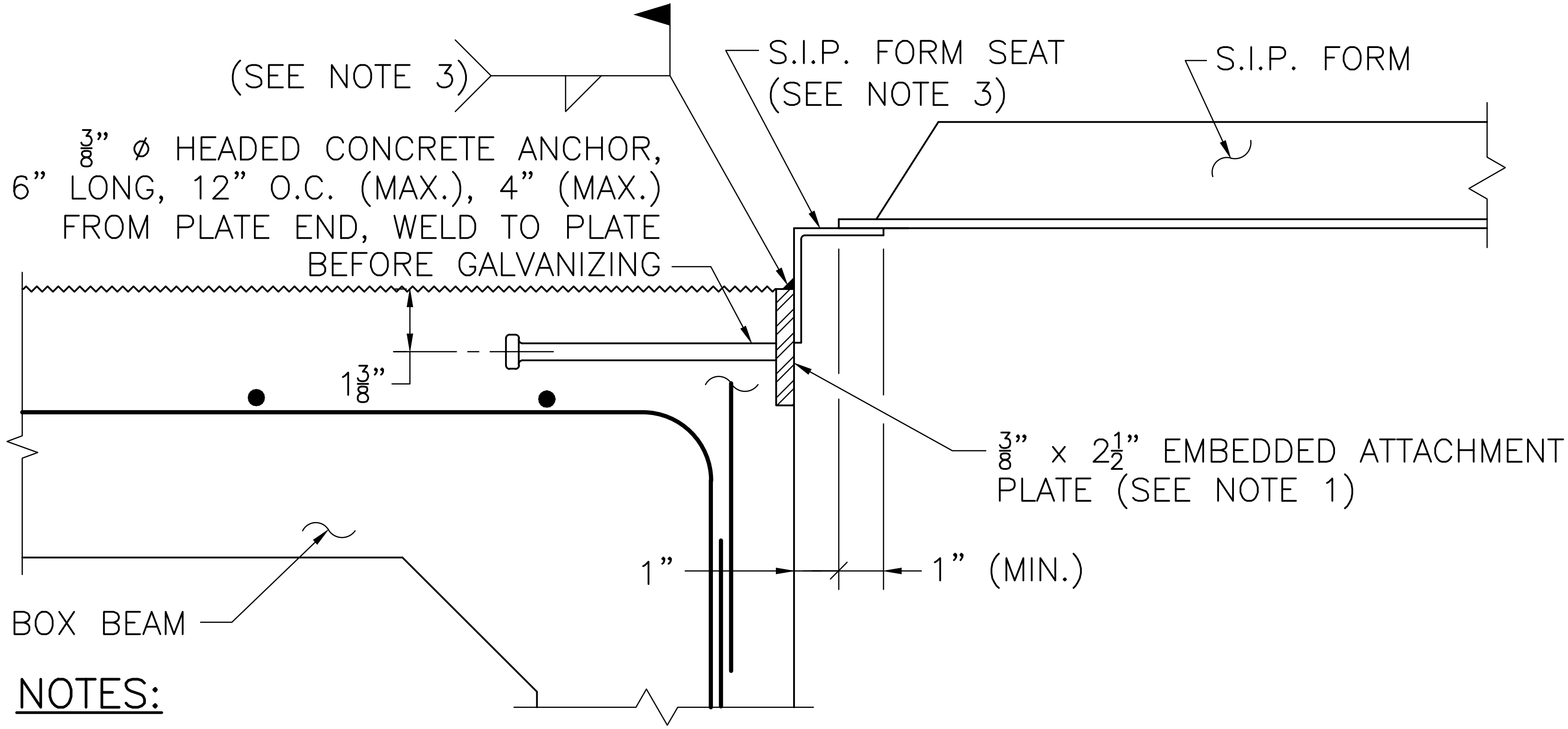
5. NO PRESTRESS SHALL BE TRANSFERRED TO THE CONCRETE UNTIL IT HAS ATTAINED A COMPRESSIVE STRENGTH, AS SHOWN BY A CYLINDER TEST, OF AT LEAST 4500 PSI. *(See Note)*

6. THE TOP OF ALL BEAMS SHALL BE GIVEN A RAKED 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:*

*If required by design, HP concrete with a compressive strength of 8000 psi may be used with the permission of the Director of Bridges and Structures. A Special Provision will be required in this case.*




## NOTES:

1. EMBEDDED ATTACHMENT PLATES SHALL BE HOT–DIP GALVANIZED AASHTO M 270 GRADE 36 STEEL. THE PLATES SHALL BE IN LENGTHS FROM 3' TO 12' WITH PIECES BUTTED TOGETHER WITHOUT END CONNECTIONS FOR FULL LENGTH OF BEAM. THE HEADED ANCHORS SHALL BE ATTACHED TO THE PLATES PRIOR TO GALVANIZING.
2. HEADED ANCHORS SHALL CONFORM TO M8.04.1 FOR MATERIAL REQUIREMENTS ONLY.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DESIGN OF THE S.I.P. FORM SEAT AND WELD.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVING THE CONCRETE LAITANCE FROM THE ATTACHMENT PLATE BEFORE INSTALLING THE S.I.P. FORMS.

## STAY–IN–PLACE FORM ATTACHMENT DETAIL

SCALE: 3" = 1'–0"

*NOTE:*
*When the clear span between beams exceeds 6'–6", the Designer shall verify anchor spacing and embedded plate thickness.*

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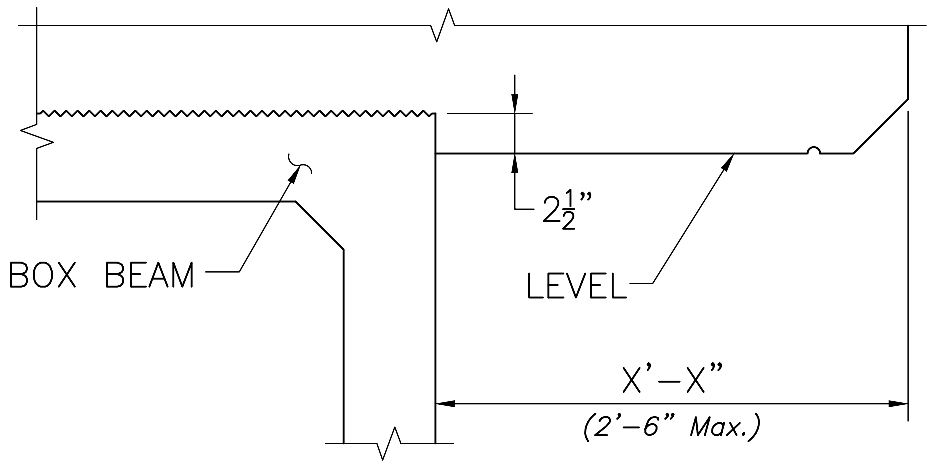
LRFD BRIDGE MANUAL, PART II

# STAY–IN–PLACE FORM ATTACHMENT DETAIL

PRECAST CONCRETE BOX BEAMS

DATE OF ISSUE
JUNE 2013

DRAWING NUMBER
**6.2.10**

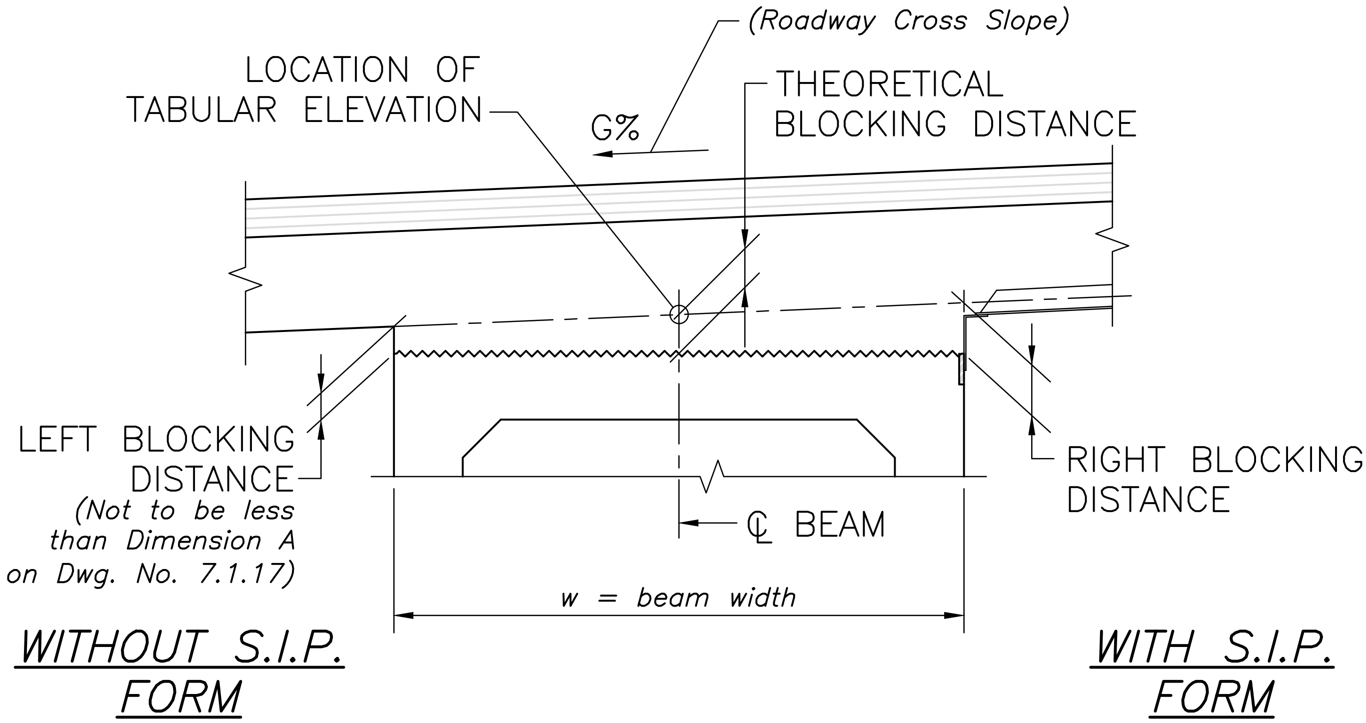



## SLAB OVERHANG AT FASCIA BEAM

SCALE: 1" = 1'–0"

*NOTE:*

*Modify the deck slab overhang details as depicted for Steel Stringer Bridges in the relevant Chapter 9 drawings as shown above, when using Spread Box Beams.*




NOTES:

1. THE RIGHT AND LEFT ORIENTATION IS TAKEN LOOKING UPSTATION ALONG THE BEAM.

2. RIGHT BLOCKING DISTANCE = THEORETICAL BLOCKING DISTANCE + "R"
LEFT BLOCKING DISTANCE = THEORETICAL BLOCKING DISTANCE + "L"

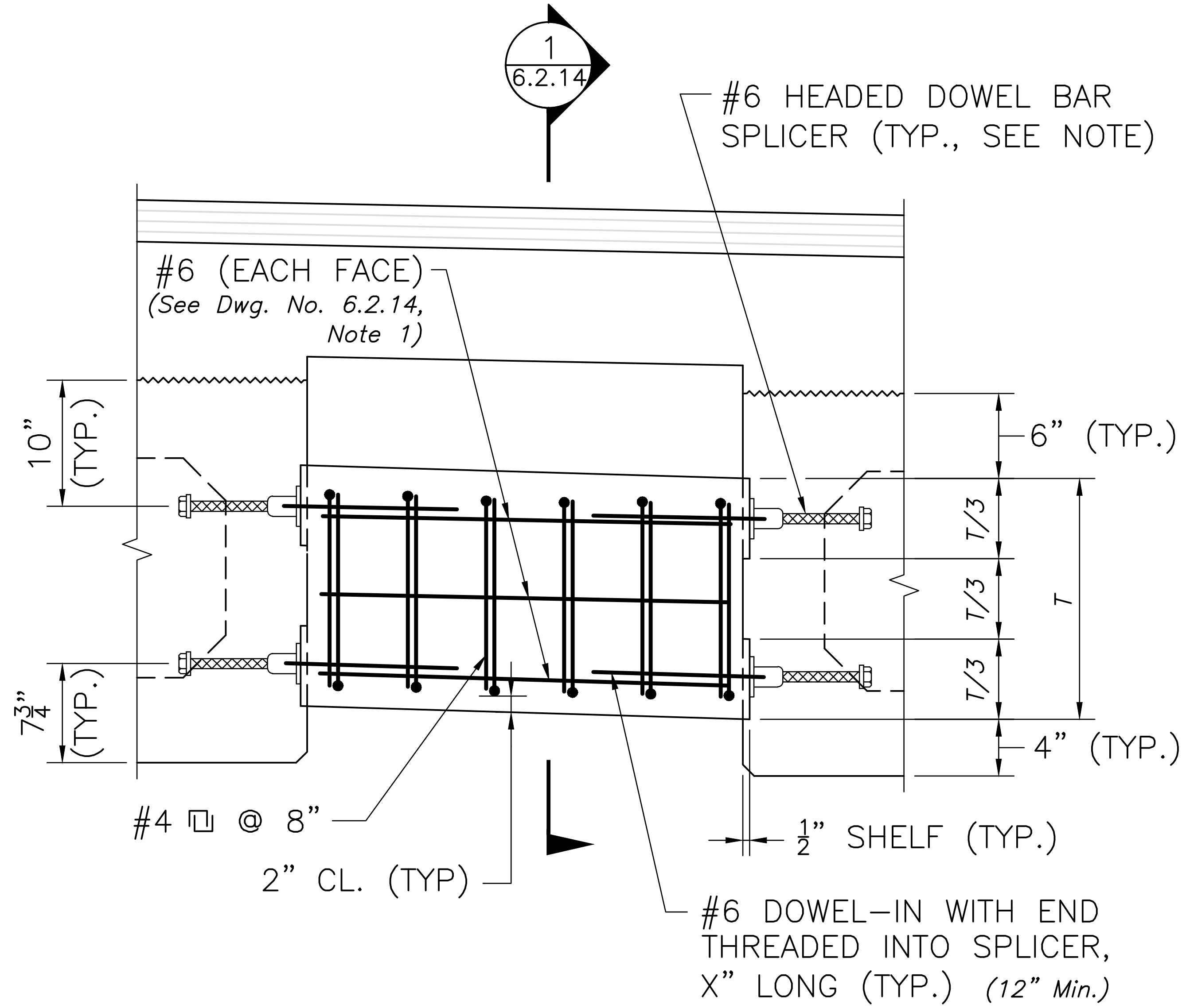
## HAUNCH DETAIL

SCALE: $\frac{3}{4}$" = 1'–0"

*NOTES:*

1. *The haunch detail above shows both methods of deck construction, i.e. with S.I.P. forms and w/o S.I.P. forms. The Designer shall modify the detail as required to suite the actual project.*
2. *For Spread Box Beam bridges, use the above Haunch Detail in place of the one on Dwg. No. 7.1.17. Also modify the note on Dwg. No. 7.1.17 to say "Theoretical" instead of "Actual" blocking distance.*
3. *For the above detail:*
   *"R" = G/100 x w/2*
   *"L" = –G/100 x w/2*
   *Since "R" and "L" vary with changes in the roadway cross slope, it is advisable to provide a table of "R" and "L" values for each beam or group of beams for each roadway cross slope situation. Always show "R" and "L" with their correct algebraic sign.*

| | | |
|---|---|---|
| massDOT Massachusetts Department of Transportation Highway Division<br>LRFD BRIDGE MANUAL, PART II | HAUNCH DETAIL<br>PRECAST CONCRETE BOX BEAMS | DATE OF ISSUE<br>JUNE 2013<br>DRAWING NUMBER<br>**6.2.12** |



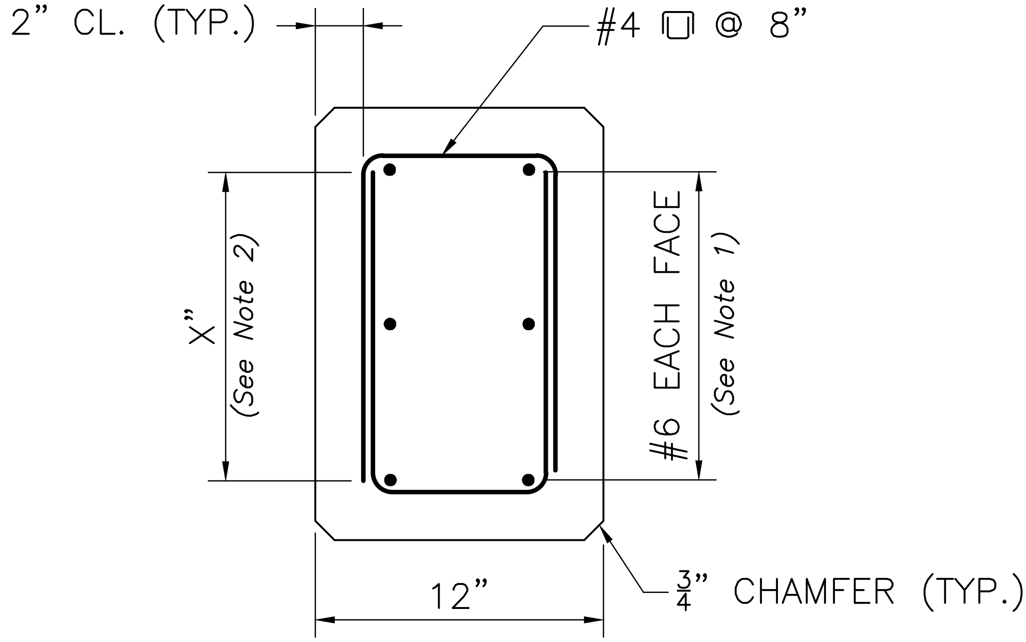

NOTE:

#6 HEADED DOWEL BAR SPLICERS SHALL BE CAST INTO THE PRECAST BEAMS BY THE FABRICATOR. THEY SHALL BE EMBEDDED AS REQUIRED TO PROVIDE A MINIMUM NOMINAL TENSILE RESISTANCE OF 39.0 KIPS AS SPECIFIED BY THE MANUFACTURER.

## INTERMEDIATE DIAPHRAGM

SCALE: 1" = 1'-0"

| | | |
|---|---|---|
| massDOT Massachusetts Department of Transportation Highway Division<br>LRFD BRIDGE MANUAL, PART II | INTERMEDIATE DIAPHRAGM<br>PRECAST CONCRETE BOX BEAMS | DATE OF ISSUE<br>JUNE 2013<br>DRAWING NUMBER<br>**6.2.13** |



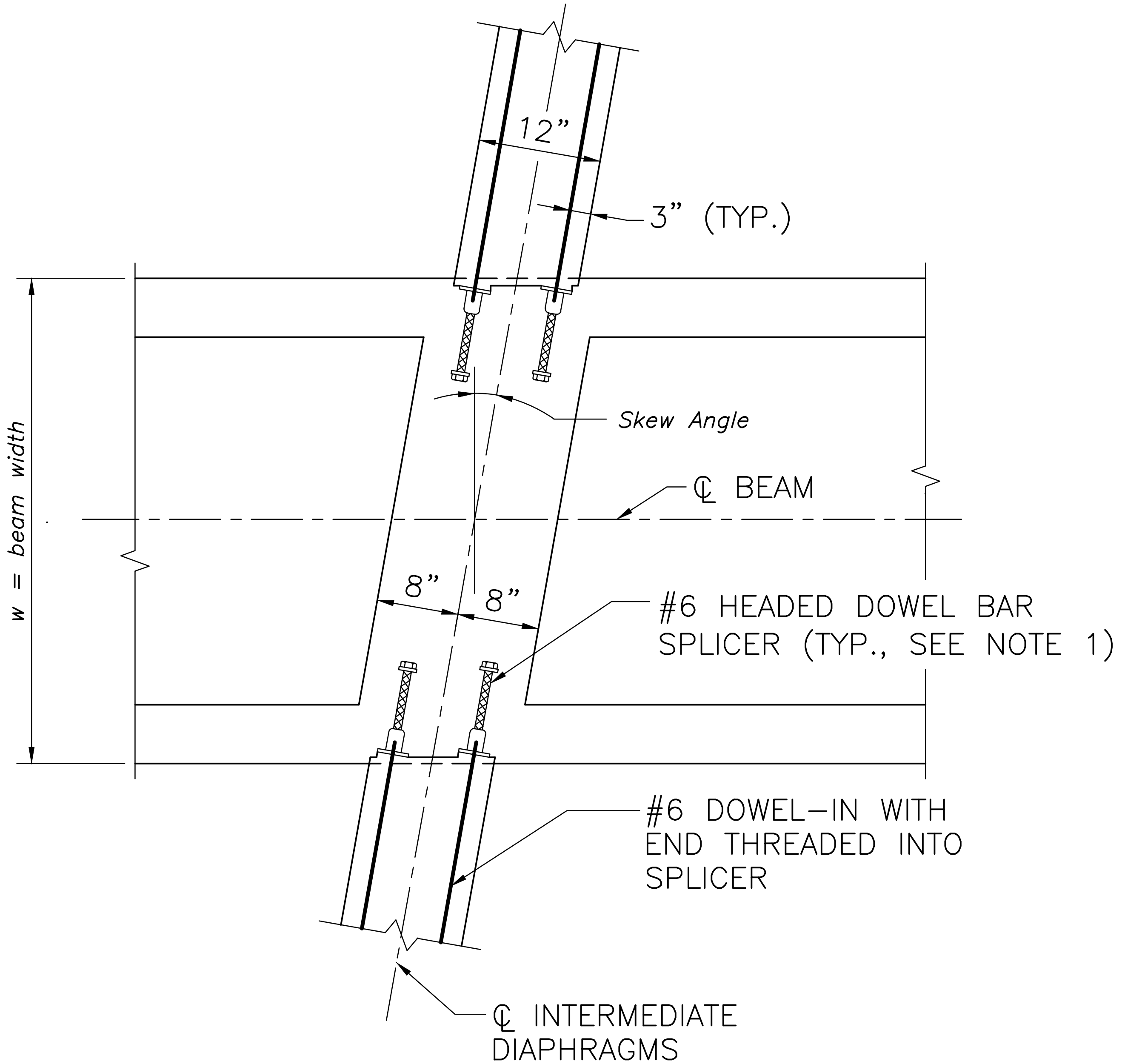

## SECTION 1

SCALE: $1\frac{1}{2}$" = 1'–0"

*NOTES:*

1. *Provide #6 bars by beam designation as follows:*
   *B–24 and B–27 beams: 3 bars each face*
   *B–30, B–33, B–36 and B–39 beams: 4 bars each face*
   *B–42, B–45 and B–48 beams: 5 bars each face*
2. *Lap shall be either 20" or full height of diaphragm minus 4", whichever is smaller. The Designer shall specify the lap length on the plans.*

| | | |
|---|---|---|
| massDOT Massachusetts Department of Transportation Highway Division<br>LRFD BRIDGE MANUAL, PART II | INTERMEDIATE DIAPHRAGM SECTION<br>PRECAST CONCRETE BOX BEAMS | DATE OF ISSUE<br>JUNE 2013<br>DRAWING NUMBER<br>**6.2.14** |




## NOTES:

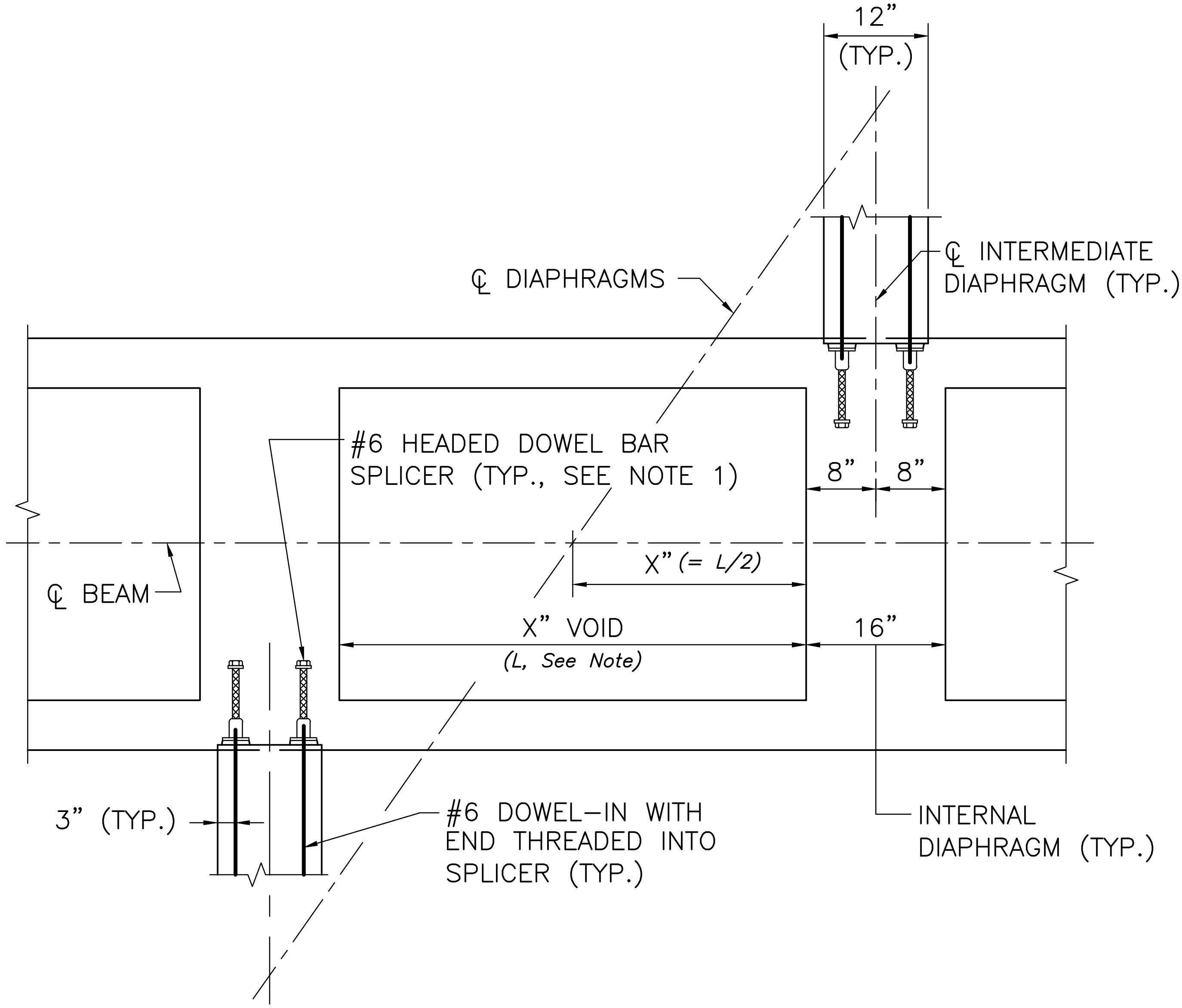
1. HEADED REINFORCEMENT BAR SPLICERS SHALL BE ALIGNED WITH THE SKEW OF THE INTERMEDIATE DIAPHRAGMS.

2. NOT ALL DIAPHRAGM REINFORCEMENT IS SHOWN FOR CLARITY.

## INTERNAL DIAPHRAGM

SCALE: $\frac{3}{4}$" = 1'–0"

| massDOT Massachusetts Department of Transportation Highway Division<br>LRFD BRIDGE MANUAL, PART II | INTERNAL DIAPHRAGM<br>(SKEW $\leqslant$ 30°)<br>PRECAST CONCRETE BOX BEAMS | DATE OF ISSUE<br>JUNE 2013<br>DRAWING NUMBER<br>**6.2.15** |
|---|---|---|




NOTES:

1. HEADED REINFORCEMENT BAR SPLICERS SHALL BE SET PERPENDICULAR TO THE FACE OF THE BEAM.

2. NOT ALL INTERMEDIATE DIAPHRAGM REINFORCEMENT IS SHOWN FOR CLARITY.

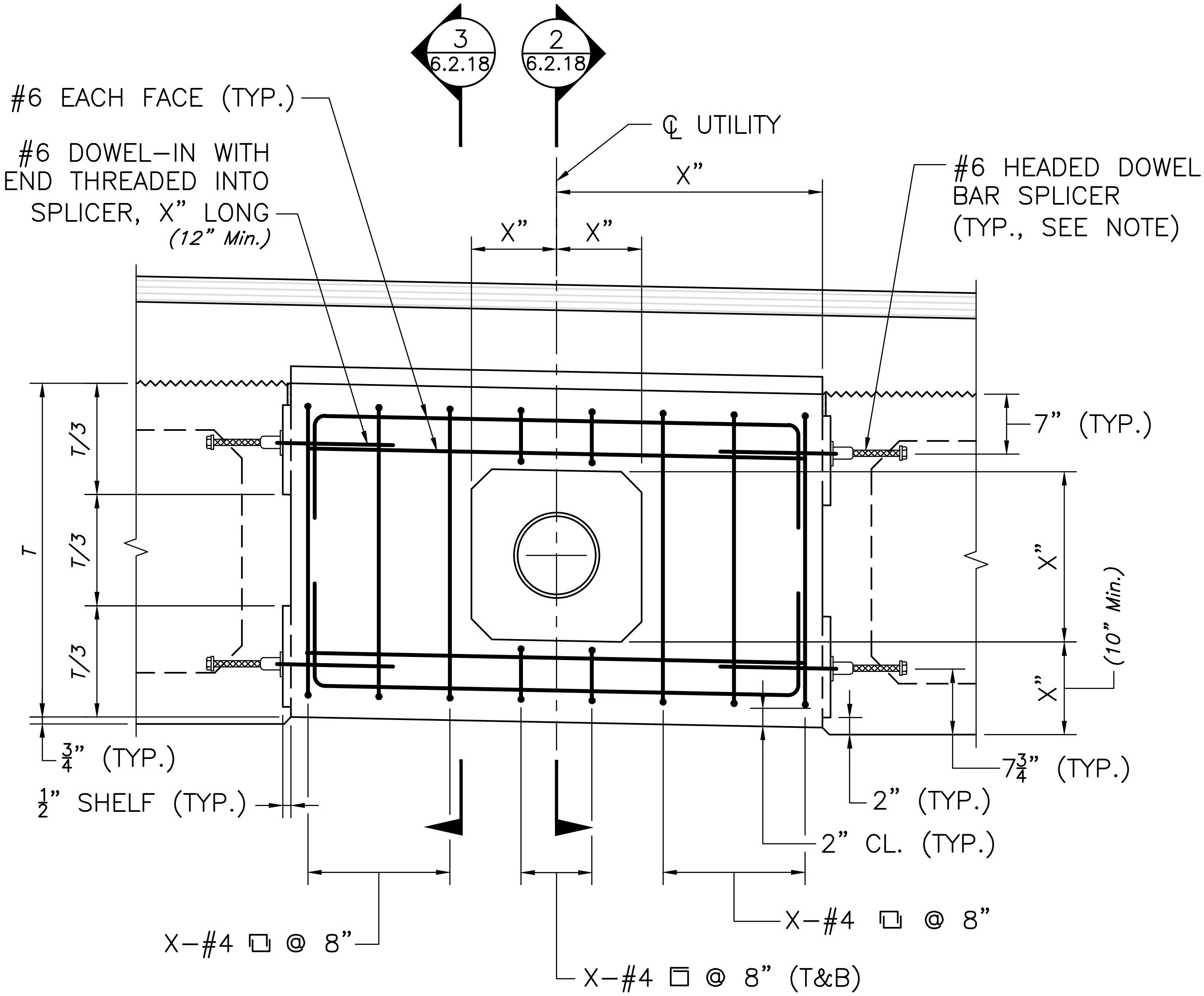
## INTERNAL DIAPHRAGM

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

*NOTE:*

*Minimum length of void is equal to 2'. If this minimum dimension cannot be met, omit void and combine the internal diaphragms into one solid block. Include weight of this block in design calculations.*

| | | |
|---|---|---|
| massDOT Massachusetts Department of Transportation Highway Division<br>LRFD BRIDGE MANUAL, PART II | INTERNAL DIAPHRAGM<br>(SKEW > 30°)<br>PRECAST CONCRETE BOX BEAMS | DATE OF ISSUE<br>JUNE 2013<br>DRAWING NUMBER<br>**6.2.16** |




NOTE:

#6 HEADED DOWEL BAR SPLICERS SHALL BE CAST INTO THE PRECAST BEAMS BY THE FABRICATOR. THEY SHALL BE EMBEDDED AS REQUIRED TO PROVIDE A MINIMUM NOMINAL TENSILE RESISTANCE OF 39.6 KIPS AS SPECIFIED BY THE MANUFACTURER.

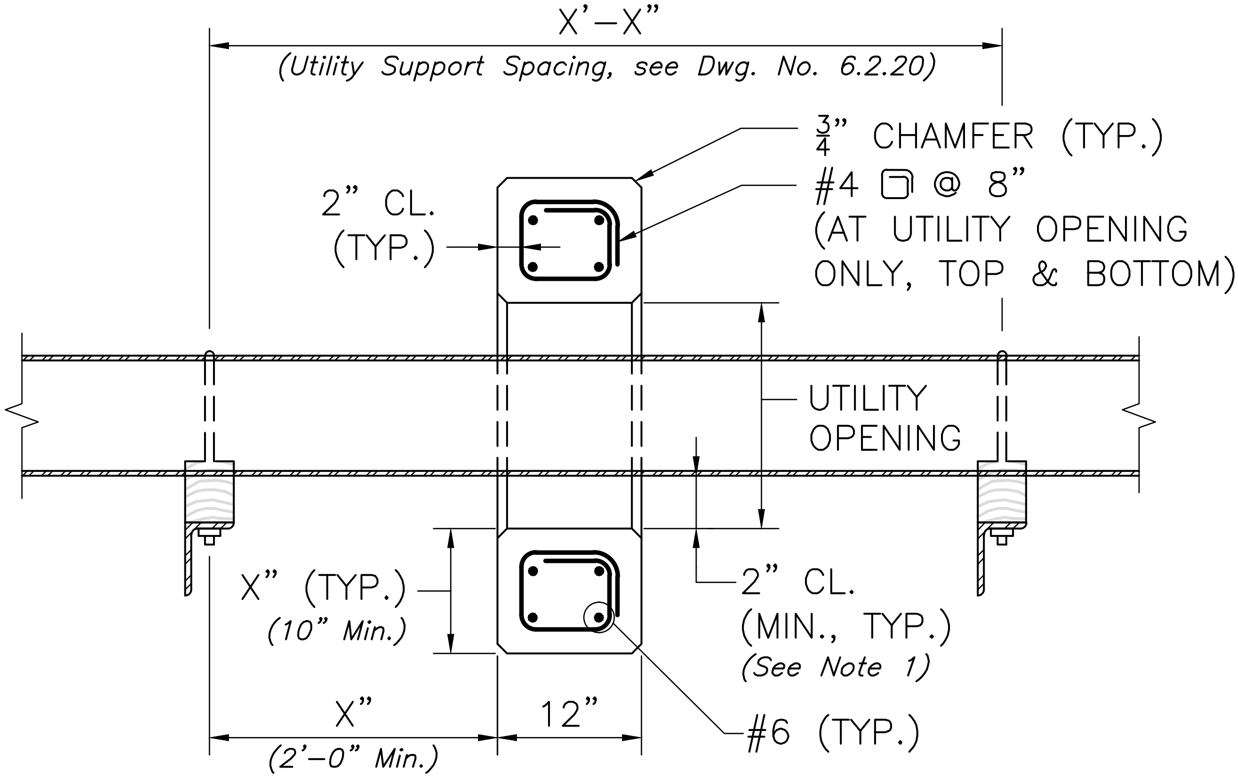
## INTERMEDIATE DIAPHRAGM WITH UTILITY

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

*NOTES:*

1. *In case of utility, the intermediate diaphragms shall be omitted for B-24, B-27, B-30 and B-33 beams. For deeper beams, the intermediate diaphragm may still have to be modified depending on the size of utility. The Designer shall consider modifying the diaphragm to an inverted U and designing the reinforcement as a frame.*
2. *The type of utility shown is conceptual and shall be modified to accommodate the actual type.*

| | | |
|---|---|---|
| massDOT Massachusetts Department of Transportation Highway Division<br>LRFD BRIDGE MANUAL, PART II | INTERMEDIATE DIAPHRAGM WITH UTILITY<br>PRECAST CONCRETE BOX BEAMS | DATE OF ISSUE<br>JUNE 2013<br>DRAWING NUMBER<br>**6.2.17** |

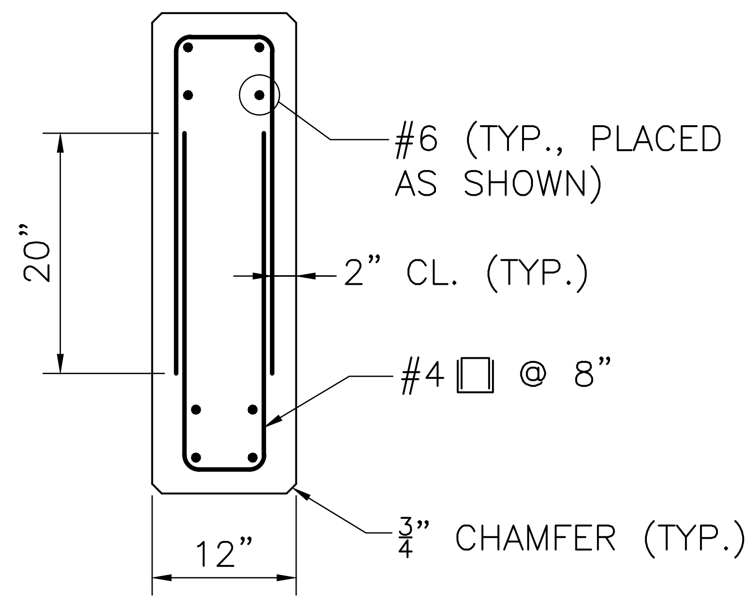



## SECTION 2

SCALE: 3/4" = 1'–0"

*NOTES:*

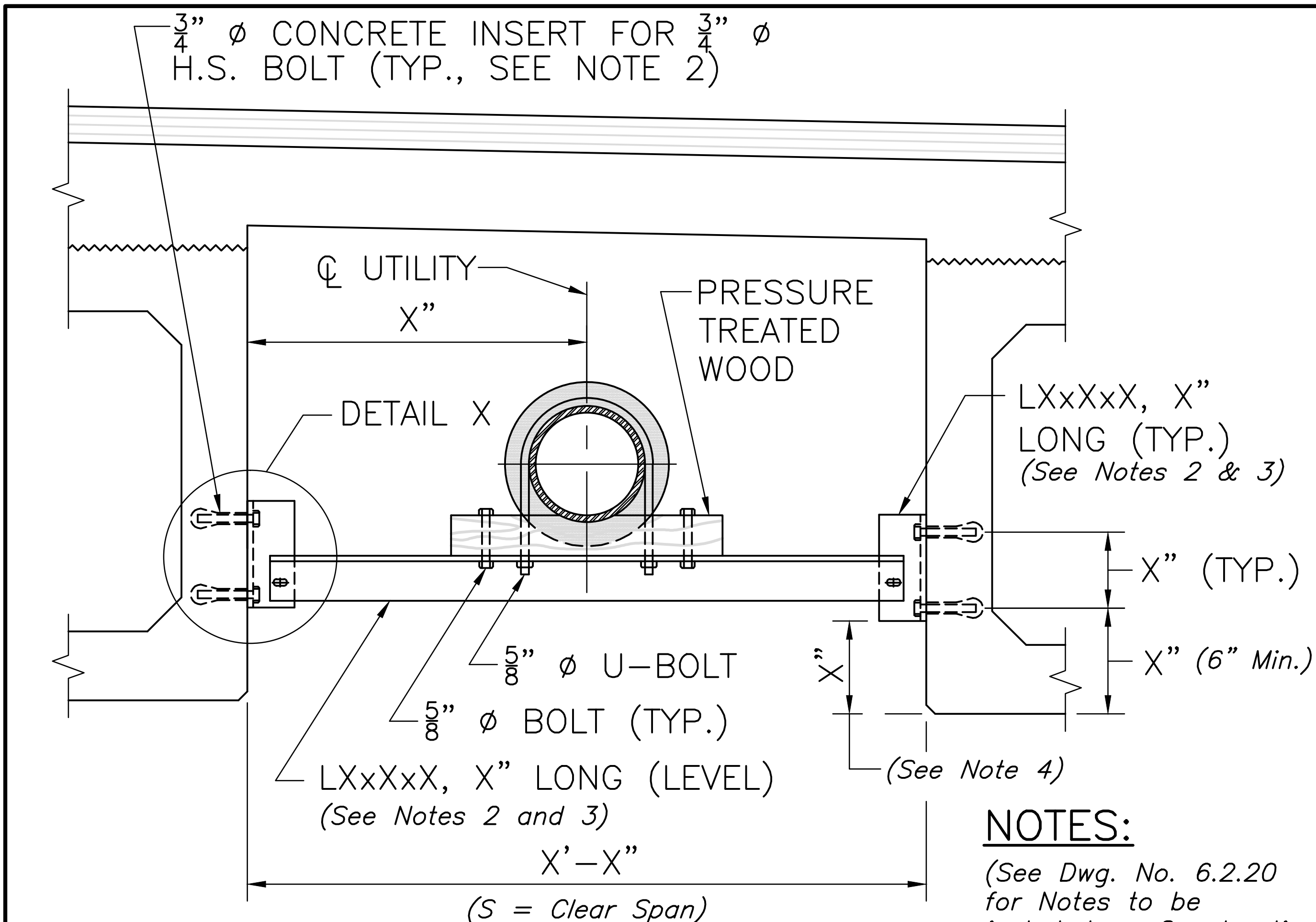
1. *The Designer shall verify that the clearances required by utilities are maintained.*
2. *The type of utility shown is conceptual and shall be modified to accommodate the actual type.*




## SECTION 3

SCALE: 3/4" = 1'–0"

| massDOT Massachusetts Department of Transportation Highway Division<br>LRFD BRIDGE MANUAL, PART II | INTERMEDIATE DIAPHRAGM SECTIONS WITH UTILITY<br>PRECAST CONCRETE BOX BEAMS | DATE OF ISSUE<br>JUNE 2013<br>DRAWING NUMBER<br>**6.2.18** |
|---|---|---|




## UTILITY SUPPORT DETAIL

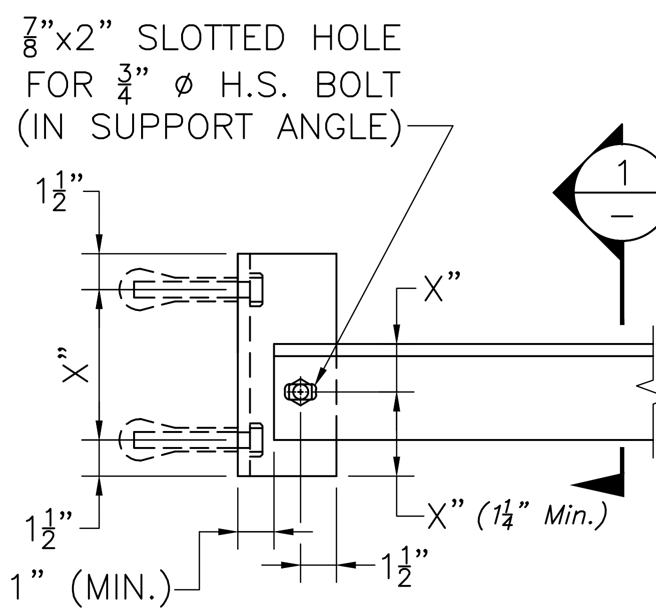
SCALE: 3/4" = 1'–0"

## NOTES:

*(See Dwg. No. 6.2.20 for Notes to be included on Construction Drawings)*

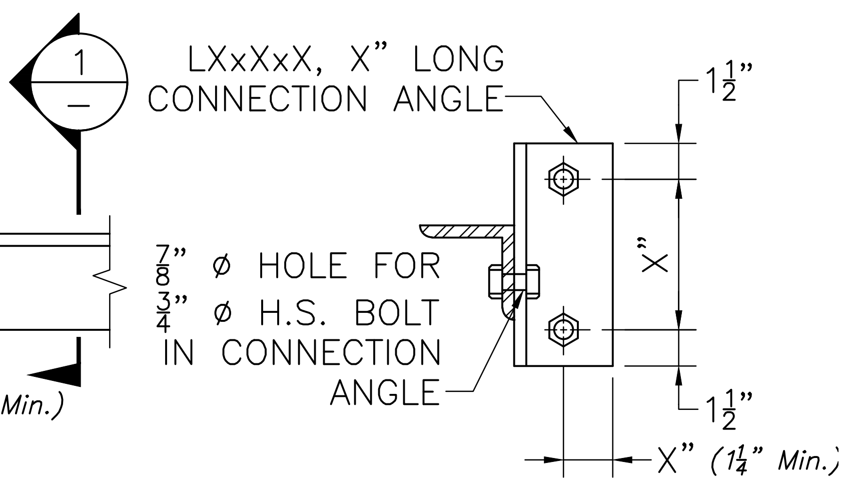
*NOTES:*

*See Dwg. No. 6.2.20 for Designer Notes.*




## DETAIL X

SCALE: 1 1/2" = 1'–0"




## SECTION 1

SCALE: 1 1/2" = 1'–0"

| | | |
|---|---|---|
| massDOT Massachusetts Department of Transportation Highway Division<br>LRFD BRIDGE MANUAL, PART II | UTILITY SUPPORT DETAILS<br>PRECAST CONCRETE BOX BEAMS | DATE OF ISSUE<br>JUNE 2013<br>DRAWING NUMBER<br>**6.2.19** |

## NOTES: *(Include these Notes with details shown on Dwg. No. 6.2.19)*

1. ALL STRUCTURAL STEEL FOR UTILITY SUPPORTS SHALL CONFORM TO AASHTO M 270 GRADE 36. ALL STRUCTURAL STEEL AND FASTENERS SHALL BE HOT–DIP GALVANIZED IN ACCORDANCE WITH AASHTO M 111 AND M 232.

2. $\frac{3}{4}$" ø THREADED INSERTS FOR $\frac{3}{4}$" ø H.S. 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.
   *(The Designer shall determine the required insert capacities if S > 12')*

3. THE UTILITY SUPPORT ANGLE SHALL BE ERECTED WITH THE LONG LEG VERTICAL.

4. INSERTS SHALL BE POSITIONED TO AVOID INTERFERENCE WITH PRESTRESSING STRANDS.

*NOTES: (These Notes are for details shown on Dwg. No. 6.2.19)*

1. *The type of utility shown is conceptual and shall be modified to accommodate the actual type.*
2. *For S < 6'–6" use L5x3$\frac{1}{2}$x$\frac{1}{2}$*
   *For 6'–6" ≤ S ≤ 12'–0" use L6x4x$\frac{5}{8}$*
   *For S > 12'–0" to be designed by Designer*
3. *Maximum utility support spacing = 11'–6" and the maximum total utility weight = 250 lbs/ft. If either of these limits is exceeded, the Designer shall design the support angle.*
4. *The preferred dimension from the bottom of the beam to the bottom of the connection angle is 4". However, if more vertical clearance is required due to the size of the utility, this dimension can be reduced to $\frac{3}{4}$".*
5. *If more horizontal clearance is required, use a coped WT section with a bolt on both sides of the stem in place of the connection angle.*

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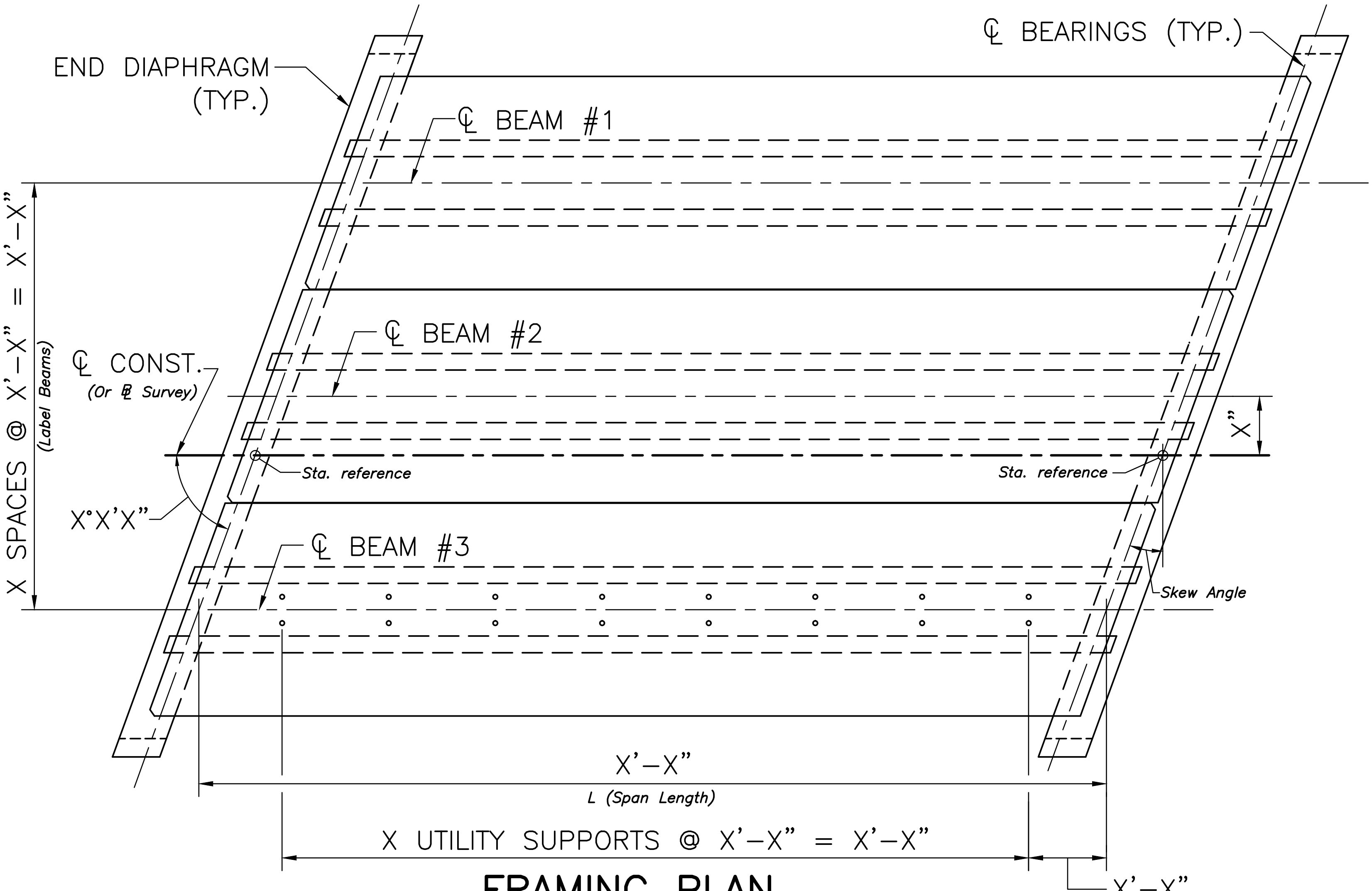
|---|---|---|
| massDOT Massachusetts Department of Transportation Highway Division<br>LRFD BRIDGE MANUAL, PART II | UTILITY SUPPORT NOTES<br><br>PRECAST CONCRETE BOX BEAMS | DATE OF ISSUE<br>JUNE 2013<br><br>DRAWING NUMBER<br>**6.2.20** |




# FRAMING PLAN

SCALE: (1/8" = 1'–0" Min.)

NOTES:

1. Framing plan shall be drawn full length without breaks and to scale on the Construction Drawings. Label beam types and include North Arrow.
2. Ends of beams and end diaphragms shall follow the skew of a bridge.
3. For utility support spacing requirements, see Dwg. No. 6.3.11.
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.

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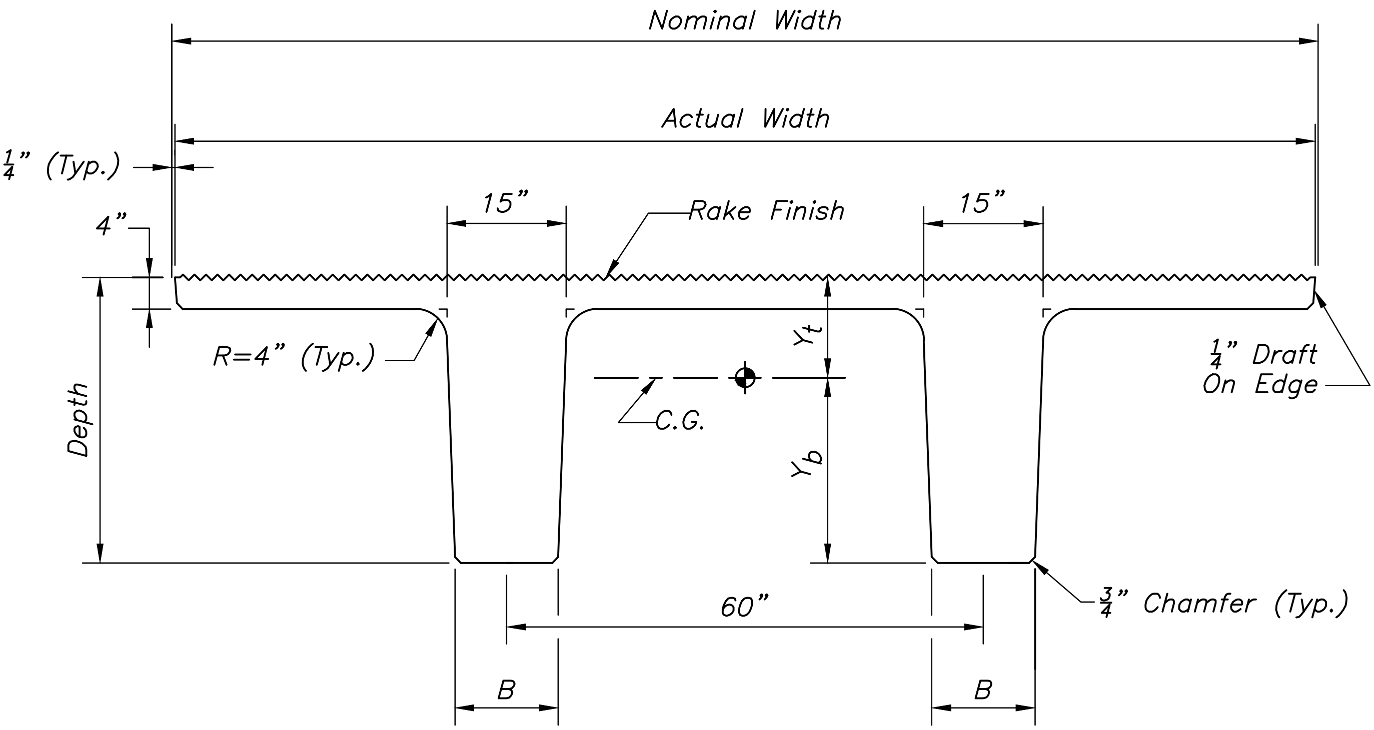
LRFD BRIDGE MANUAL, PART II

FRAMING PLAN

PRECAST CONCRETE NEXT F BEAMS

DATE OF ISSUE
JUNE 2013

DRAWING NUMBER
**6.3.1**




## STANDARD NEXT F BEAM

NOT TO SCALE

NOTES:

1. For beam section properties see Dwg. No. 6.3.3. The properties shown are based on 6" increment intervals. Variation between these limits is allowed in order to construct a bridge to the required width. The variation in width is accomplished by varying the overhang dimensions. The designer will need to calculate beam properties for beams that are not equal to the widths listed.
2. The actual width of the beam takes into account a nominal ½" wide gap between beams to account for tolerances. The spacing of beams on a typical bridge shall be at the nominal spacing.
3. Bridges with small curvature can be built using these sections by varying the overhang of the fascia beams along the length. Interior beams should always be symmetrical about the vertical axis. Non-symmetrical sections are possible, however the beam may require a special design with a non-symmetrical strand pattern.
4. The ends of the beams should be skewed for skewed bridges. The acute corners of the flange overhangs should be chamfered 6"x6" in order to minimize casting and handling damage.

| | | |
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| massDOT Massachusetts Department of Transportation Highway Division<br>LRFD BRIDGE MANUAL, PART II | STANDARD NEXT F BEAM SERIES TYPICAL DIMENSIONS<br>PRECAST CONCRETE NEXT F BEAMS | DATE OF ISSUE<br>JUNE 2013<br>DRAWING NUMBER<br>6.3.2 |

# NEXT F BEAM PROPERTIES

| BEAM TYPE | WIDTH (in) | | DEPTH (in) | B (in) | AREA ($in^2$) | I ($in^4$) | $Y_b$ (in) | $Y_t$ (in) | $S_b$ ($in^3$) | $S_t$ ($in^3$) | WEIGHT (lbs/ft) | MAX. SPAN (ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Nominal | Actual | | | | | | | | | | |
| 96" WIDE BEAMS | | | | | | | | | | | | |
| NEXT 24F | 96 | 95.5 | 24 | 13.75 | 972 | 51905 | 14.94 | 9.06 | 3475 | 5730 | 1013 | 62 |
| NEXT 28F | 96 | 95.5 | 28 | 13.50 | 1082 | 80037 | 17.23 | 10.77 | 4646 | 7432 | 1128 | 70 |
| NEXT 32F | 96 | 95.5 | 32 | 13.25 | 1190 | 116036 | 19.50 | 12.50 | 5951 | 9283 | 1240 | 78 |
| NEXT 36F | 96 | 95.5 | 36 | 13.00 | 1296 | 160602 | 21.75 | 14.25 | 7384 | 11271 | 1350 | 85 |
| 102" WIDE BEAMS | | | | | | | | | | | | |
| NEXT 24F | 102 | 101.5 | 24 | 13.75 | 996 | 53105 | 15.11 | 8.89 | 3515 | 5974 | 1038 | 61 |
| NEXT 28F | 102 | 101.5 | 28 | 13.50 | 1106 | 81875 | 17.42 | 10.58 | 4701 | 7739 | 1153 | 69 |
| NEXT 32F | 102 | 101.5 | 32 | 13.25 | 1214 | 118662 | 19.71 | 12.29 | 6021 | 9656 | 1265 | 78 |
| NEXT 36F | 102 | 101.5 | 36 | 13.00 | 1320 | 164167 | 21.97 | 14.03 | 7473 | 11702 | 1375 | 85 |
| 108" WIDE BEAMS | | | | | | | | | | | | |
| NEXT 24F | 108 | 107.5 | 24 | 13.75 | 1020 | 54250 | 15.27 | 8.73 | 3553 | 6215 | 1063 | 61 |
| NEXT 28F | 108 | 107.5 | 28 | 13.50 | 1130 | 83636 | 17.60 | 10.40 | 4753 | 8042 | 1178 | 68 |
| NEXT 32F | 108 | 107.5 | 32 | 13.25 | 1238 | 121188 | 19.91 | 12.09 | 6087 | 10024 | 1290 | 76 |
| NEXT 36F | 108 | 107.5 | 36 | 13.00 | 1344 | 167606 | 22.22 | 13.81 | 7544 | 12137 | 1400 | 85 |
| 114" WIDE BEAMS | | | | | | | | | | | | |
| NEXT 24F | 114 | 113.5 | 24 | 13.75 | 1043 | 55345 | 15.42 | 8.58 | 3590 | 6451 | 1087 | 60 |
| NEXT 28F | 114 | 113.5 | 28 | 13.50 | 1154 | 85326 | 17.78 | 10.22 | 4799 | 8349 | 1203 | 68 |
| NEXT 32F | 114 | 113.5 | 32 | 13.25 | 1262 | 123619 | 20.10 | 11.90 | 6151 | 10389 | 1315 | 75 |
| NEXT 36F | 114 | 113.5 | 36 | 13.00 | 1368 | 170925 | 22.41 | 13.59 | 7628 | 12578 | 1425 | 84 |
| 120" WIDE BEAMS | | | | | | | | | | | | |
| NEXT 24F | 120 | 119.5 | 24 | 13.75 | 1068 | 56391 | 15.57 | 8.43 | 3622 | 6690 | 1113 | 57 |
| NEXT 28F | 120 | 119.5 | 28 | 13.50 | 1178 | 86948 | 17.94 | 10.06 | 4847 | 8643 | 1228 | 65 |
| NEXT 32F | 120 | 119.5 | 32 | 13.25 | 1286 | 125960 | 20.28 | 11.72 | 6212 | 10748 | 1340 | 73 |
| NEXT 36F | 120 | 119.5 | 36 | 13.00 | 1392 | 174131 | 22.59 | 13.41 | 7709 | 12986 | 1450 | 81 |
| 126" WIDE BEAMS | | | | | | | | | | | | |
| NEXT 24F | 126 | 125.5 | 24 | 13.75 | 1092 | 57393 | 15.71 | 8.29 | 3654 | 6924 | 1138 | 57 |
| NEXT 28F | 126 | 125.5 | 28 | 13.50 | 1202 | 88506 | 18.11 | 9.89 | 4888 | 8950 | 1253 | 64 |
| NEXT 32F | 126 | 125.5 | 32 | 13.25 | 1310 | 128217 | 20.46 | 11.54 | 6267 | 11111 | 1365 | 73 |
| NEXT 36F | 126 | 125.5 | 36 | 13.00 | 1416 | 177230 | 22.78 | 13.22 | 7781 | 13407 | 1475 | 79 |
| 132" WIDE BEAMS | | | | | | | | | | | | |
| NEXT 24F | 132 | 131.5 | 24 | 13.75 | 1116 | 58353 | 15.85 | 8.15 | 3682 | 7160 | 1163 | 57 |
| NEXT 28F | 132 | 131.5 | 28 | 13.50 | 1226 | 90005 | 18.26 | 9.74 | 4930 | 9241 | 1278 | 64 |
| NEXT 32F | 132 | 131.5 | 32 | 13.25 | 1334 | 130393 | 20.63 | 11.37 | 6321 | 11469 | 1390 | 72 |
| NEXT 36F | 132 | 131.5 | 36 | 13.00 | 1440 | 180226 | 22.97 | 13.03 | 7847 | 13832 | 1500 | 79 |
| 138" WIDE BEAMS | | | | | | | | | | | | |
| NEXT 24F | 138 | 137.5 | 24 | 13.75 | 1140 | 59274 | 15.98 | 8.02 | 3710 | 7391 | 1188 | 55 |
| NEXT 28F | 138 | 137.5 | 28 | 13.50 | 1250 | 91447 | 18.41 | 9.59 | 4968 | 9536 | 1303 | 63 |
| NEXT 32F | 138 | 137.5 | 32 | 13.25 | 1358 | 132494 | 20.80 | 11.20 | 6370 | 11830 | 1415 | 71 |
| NEXT 36F | 138 | 137.5 | 36 | 13.00 | 1464 | 183125 | 23.09 | 12.84 | 7931 | 14263 | 1525 | 79 |
| 144" WIDE BEAMS | | | | | | | | | | | | |
| NEXT 24F | 144 | 143.5 | 24 | 13.75 | 1164 | 60159 | 16.10 | 7.90 | 3737 | 7616 | 1213 | 54 |
| NEXT 28F | 144 | 143.5 | 28 | 13.50 | 1274 | 92836 | 18.55 | 9.45 | 5005 | 9824 | 1328 | 63 |
| NEXT 32F | 144 | 143.5 | 32 | 13.25 | 1382 | 134523 | 20.96 | 11.04 | 6419 | 12186 | 1440 | 70 |
| NEXT 36F | 144 | 143.5 | 36 | 13.00 | 1488 | 186000 | 23.34 | 12.66 | 7970 | 14692 | 1550 | 78 |

NOTE:
See Dwg. No. 6.3.4 for maximum span length design assumptions.

*NOTES:*

*Maximum span lengths are approximate and based on the following assumptions:*

- *f'c = 8000 psi (Precast)*
- *f'ci = 6000 psi (Precast)*
- *f'c = 4000 psi (8" cast-in-place composite deck)*
- *Final allowable tension at bottom of beam is equal to 0.0948 f'c ksi.*
- *HL-93 Live Load*
- *Time-Dependent Losses of Article 5.9.5.3 of the AASHTO-LRFD were used.*
- *The S3-TL4 railing was assumed on the bridge with safety curbs.*
- *3" thick HMA wearing surface.*
- *Four beam cross section with two design lanes was assumed for design of 96"-114" wide beams.*
- *Three beam cross section with two design lanes was assumed for design of 120"-144" wide beams.*
- *Interior beam with no skew.*
- *No utility loads.*
- *Load Distribution was calculated based on Section 3.5.4 of Part I of the Bridge Manual.*
- *0.6" diameter low relaxation strands.*

| | | |
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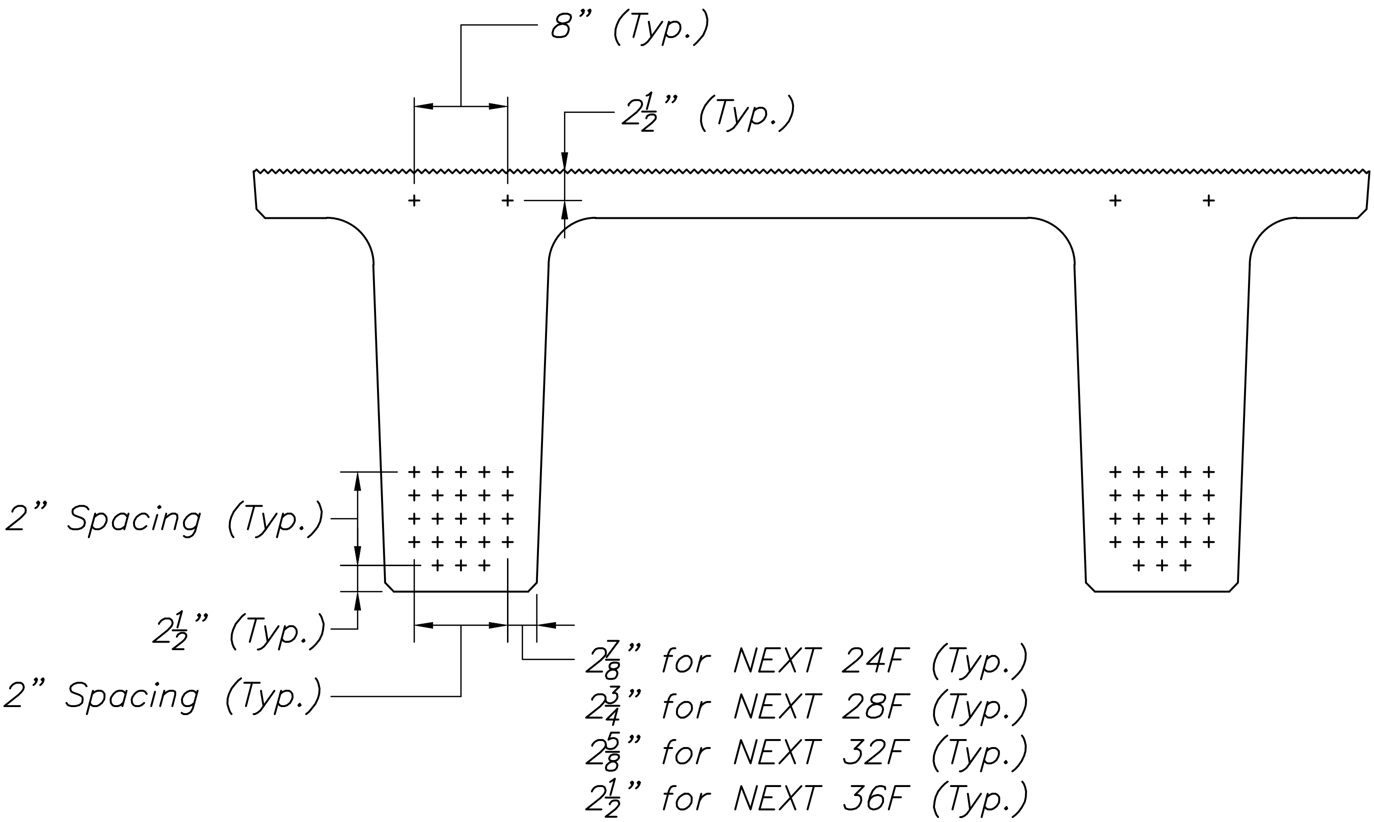
| massDOT Massachusetts Department of Transportation Highway Division<br>LRFD BRIDGE MANUAL, PART II | NEXT F BEAM SERIES<br>DESIGN ASSUMPTIONS<br>PRECAST CONCRETE NEXT F BEAMS | DATE OF ISSUE<br>JUNE 2013<br>DRAWING NUMBER<br>**6.3.4** |




## STANDARD NEXT F BEAM STRAND LOCATIONS

NOT TO SCALE

NOTES:

1. The 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. The actual number of strands and their location within the above pattern shall be as required by design.
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 shall be at least 4" apart, both vertically and horizontally. Outer–most 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. Draped strands are not permitted.
5. The Designer shall verify that the strands will not interfere with the transverse ties.
6. See Dwg. No. 6.3.6 for notes to be included on the Construction Drawings.

| | | |
|---|---|---|
| massDOT Massachusetts Department of Transportation Highway Division<br>LRFD BRIDGE MANUAL, PART II | MAXIMUM NUMBER OF STRANDS AND STRAND LOCATIONS<br>PRECAST CONCRETE NEXT F BEAMS | DATE OF ISSUE JUNE 2013<br>DRAWING NUMBER **6.3.5** |

## PRESTRESS NOTES:

1. ALL PRETENSIONING ELEMENTS SHALL BE 0.6" Ø, UNCOATED, SEVEN-WIRE, LOW RELAXATION STEEL STRANDS AND SHALL CONFORM TO AASHTO M 203.

2. THE NOMINAL TENSILE STRENGTH OF THE PRETENSIONING STRANDS SHALL BE 270 KSI.

3. THE INITIAL TENSION PER 0.6" Ø STRAND SHALL BE 44 KIPS.

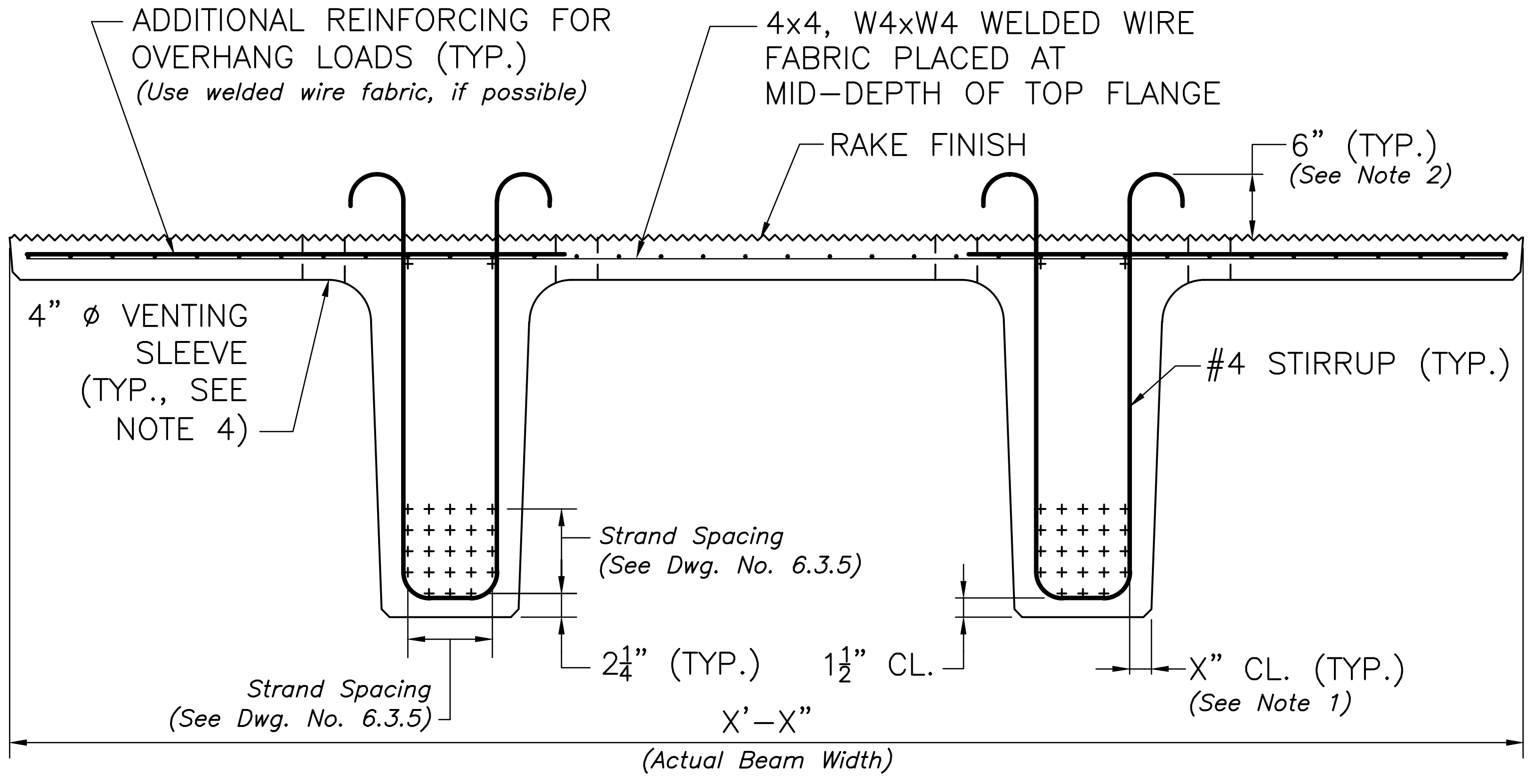
4. THE MINIMUM 28 DAY COMPRESSIVE STRENGTH SHALL BE 8000 PSI.

5. NO PRESTRESS SHALL BE TRANSFERRED TO THE CONCRETE UNTIL IT HAS ATTAINED A COMPRESSIVE STRENGTH, AS SHOWN BY A CYLINDER TEST, OF AT LEAST 6000 PSI.

6. THE TOP OF ALL BEAMS SHALL BE GIVEN A RAKED 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.

8. TO CONTROL CRACKING AT THE END OF THE BEAM, THE PRECASTER SHALL DEBOND APPROXIMATELY 50% OF THE STRANDS FOR THE FIRST 6" FROM THE END OF THE BEAM. TO MEET THIS REQUIREMENT ONLY IN THIS 6" END REGION OF THE BEAM, DEBONDED STRANDS MAY BE ADJACENT STRANDS HORIZONTALLY AND VERTICALLY.




NOTES:

1. + DENOTES STRAIGHT STRANDS.
2. ⊕ DENOTES DEBONDED STRANDS. (NONE SHOWN ABOVE)
3. SEE BEAM PLAN AND BEAM ELEVATIONS FOR STIRRUP SPACING.
4. 4" ø VENTING SLEEVES SHALL BE PLACED 6" FROM THE FACE OF ABUTMENT AND ADJACENT TO THE RADII.

## TYPICAL MIDDLE SECTION

SCALE: $\frac{3}{4}$" = 1'–0"

*NOTES:*

1. *X = 2" for NEXT 24F & NEXT 28F Beams, X = $1\frac{3}{4}$" for NEXT 32F & NEXT 36F Beams.*
2. *The Designer shall ensure that at least 2" clear cover is maintained to the top of the deck at all locations. The embedment shown does not produce full development.*
3. *4" venting sleeves shall be used to prevent formation of air voids during concrete placement.*

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LRFD BRIDGE MANUAL, PART II

# TYPICAL BEAM SECTION

PRECAST CONCRETE NEXT F BEAMS

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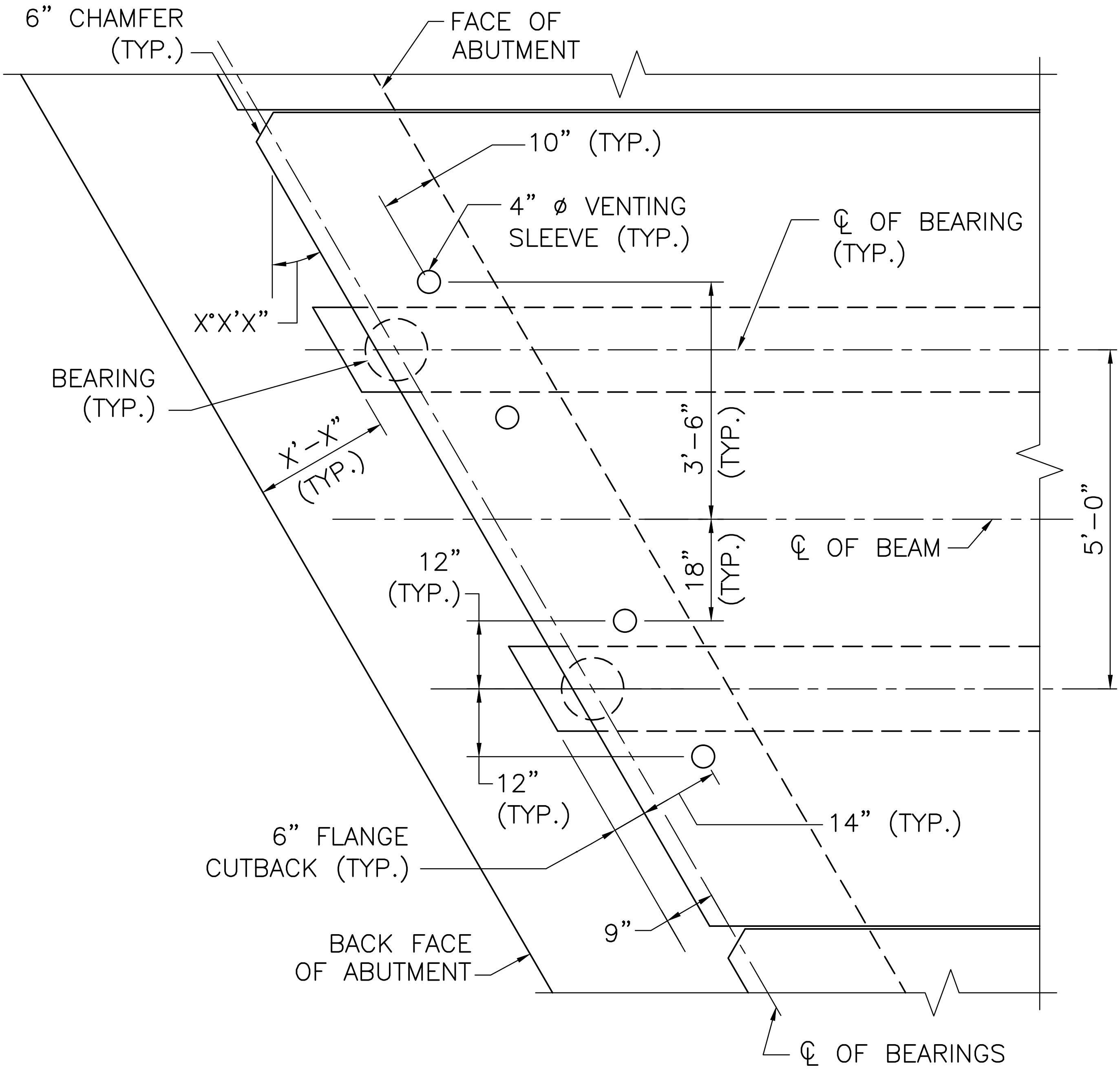
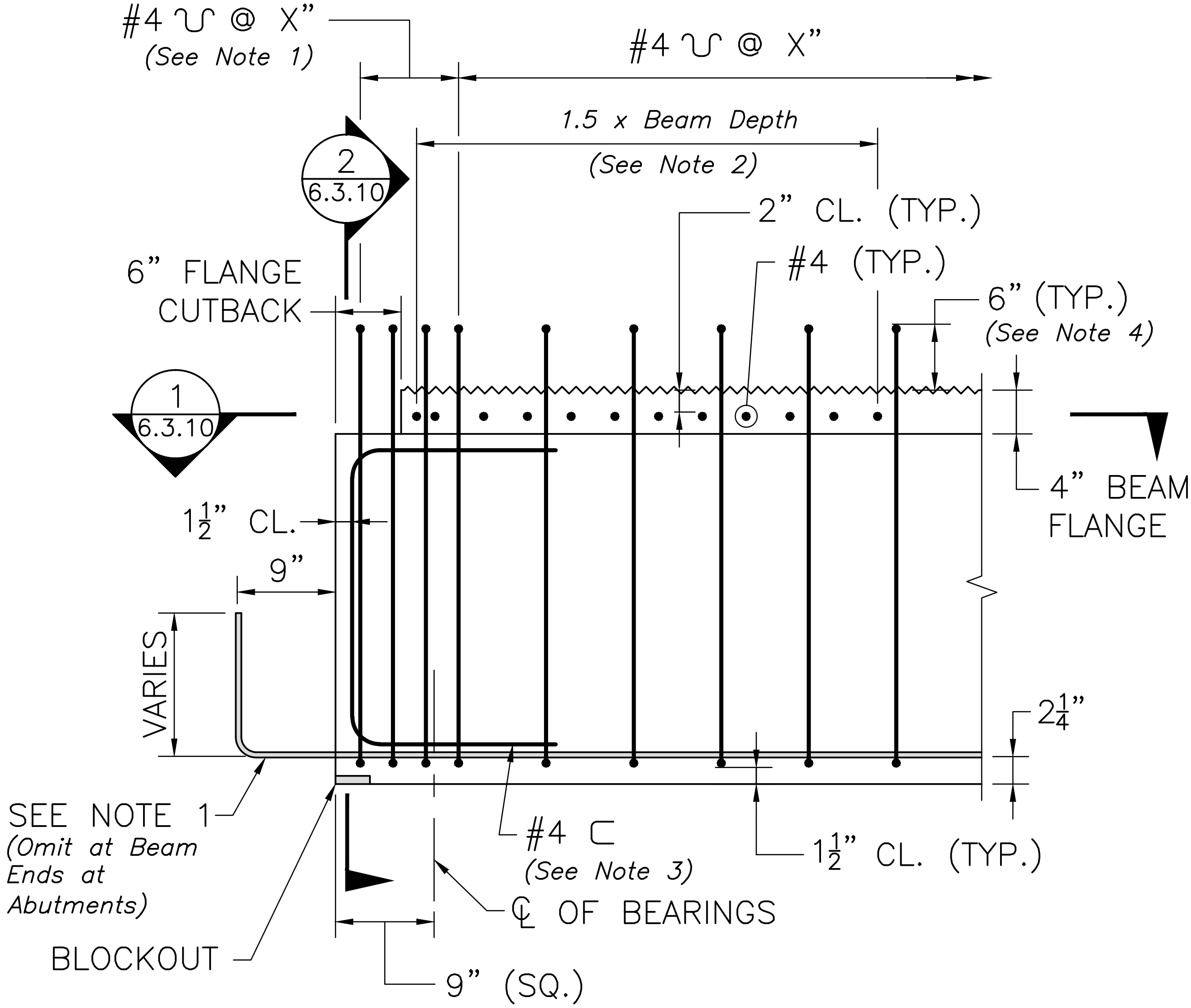
DRAWING NUMBER
**6.3.7**




## END OF BEAM PLAN

SCALE: $\frac{1}{2}$" = 1'–0"

| massDOT Massachusetts Department of Transportation Highway Division<br>LRFD BRIDGE MANUAL, PART II | END OF BEAM PLAN<br><br>PRECAST CONCRETE NEXT F BEAMS | DATE OF ISSUE<br>JUNE 2013<br>DRAWING NUMBER<br>**6.3.8** |
|---|---|---|




## NOTES:

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

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

# END OF BEAM LONGITUDINAL SECTION

SCALE: $\frac{3}{4}$" = 1'–0"

*NOTES:*

1. *The vertical stirrups within (Beam Depth)/4 of the end of the beam shall satisfy the requirements of AASHTO–LRFD, Article 5.10.10.*
2. *Place 2 – #4 Bars at the beam end, then #4 @ 6" in the top flange to minimize the potential for top flange end cracking during release and handling.*
3. *The horizontal leg lengths of the stirrups shall equal the depth of the beam and shall be dimensioned on the plan view.*
4. *The Designer shall ensure that at least 2" clear cover is maintained to the top of the deck at all locations. The embedment shown does not produce full development.*

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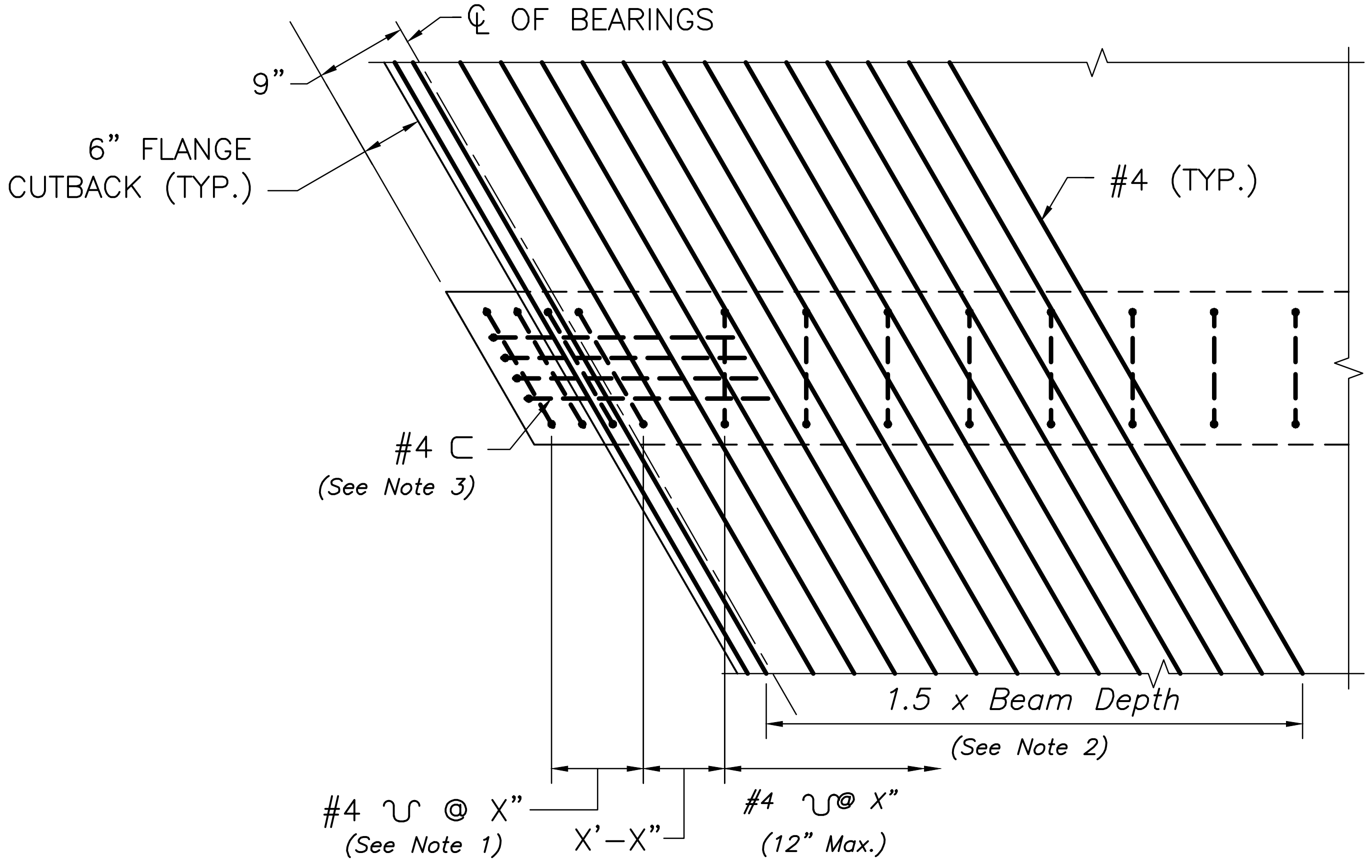
|---|---|---|

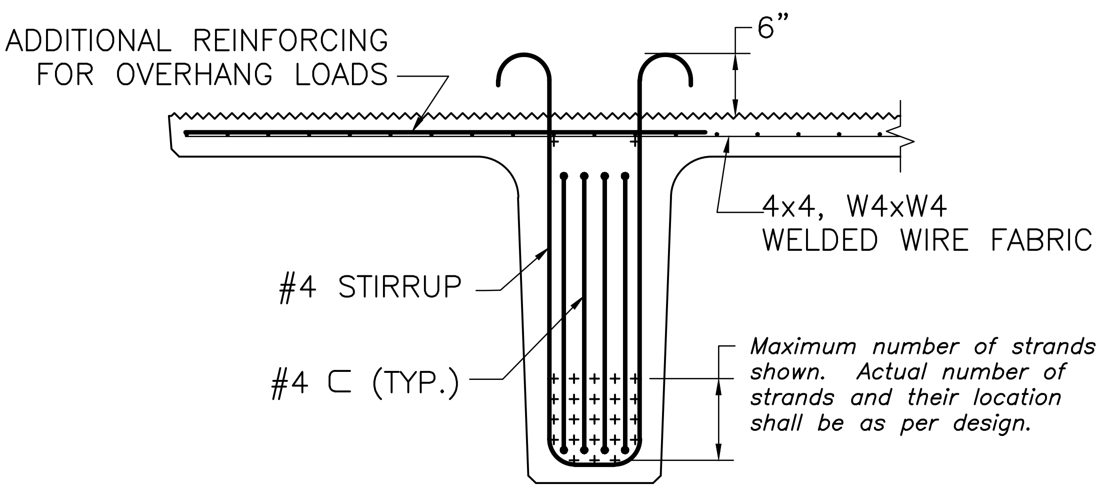



NOTE:

STRANDS NOT SHOWN FOR CLARITY.

## SECTION 1

SCALE: $\frac{3}{4}$" = 1'–0"

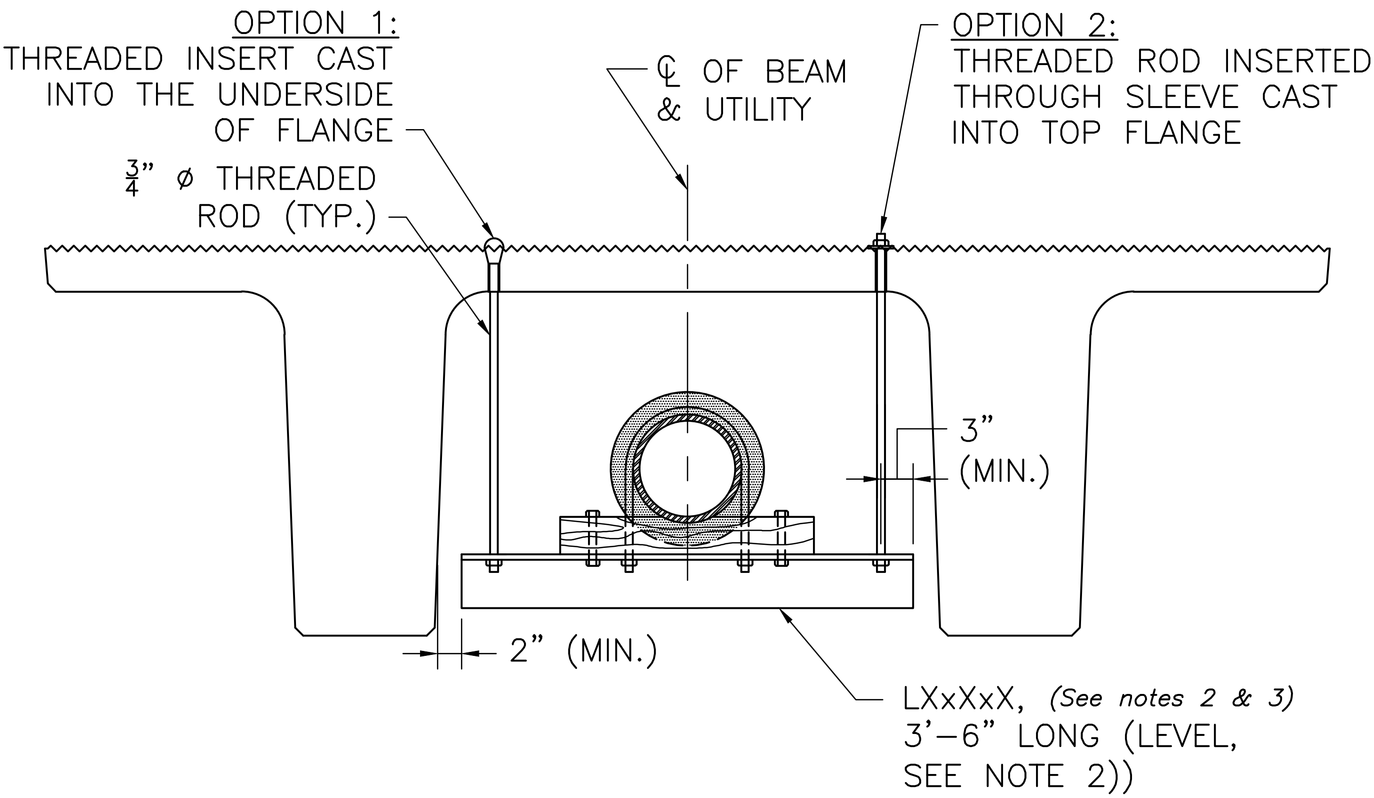



## SECTION 2

SCALE: $\frac{3}{4}$" = 1'–0"

*NOTE:*
*See Dwg. No. 6.3.9 for Designer Notes.*

| | | |
|---|---|---|
| massDOT Massachusetts Department of Transportation Highway Division<br>LRFD BRIDGE MANUAL, PART II | END OF BEAM HORIZONTAL AND VERTICAL SECTIONS<br>PRECAST CONCRETE NEXT F BEAMS | DATE OF ISSUE<br>JUNE 2013<br>DRAWING NUMBER<br>**6.3.10** |




## UTILITY SUPPORT DETAILS

SCALE: ¾" = 1'–0"

## NOTES:

1. ALL STRUCTURAL STEEL FOR UTILITY SUPPORTS SHALL CONFORM TO AASHTO M 270 GRADE 36. ALL STRUCTURAL STEEL AND FASTENERS SHALL BE HOT–DIP GALVANIZED IN ACCORDANCE WITH AASHTO M 111 AND M 232.

2. THE UTILITY SUPPORT ANGLE SHALL BE ERECTED WITH THE LONG LEG VERTICAL.

*NOTES:*

1. *The type of utility shown is conceptual and shall be modified to accommodate the actual type.*
2. *For S < 6'–6" use L5x3½x½*
   *For 6'–6" ≤ S ≤ 12'–0" use L6x4x⅝*
   *For S > 12'–0" to be designed by Designer*
3. *Maximum utility support spacing = 11'–6" and the maximum total utility weight is 250 lbs/ft. If either limits are exceeded, the Designer shall design the threaded rod.*

| massDOT Massachusetts Department of Transportation Highway Division LRFD BRIDGE MANUAL, PART II | UTILITY SUPPORT DETAILS<br>PRECAST CONCRETE NEXT F BEAMS | DATE OF ISSUE JUNE 2013<br>DRAWING NUMBER **6.3.11** |
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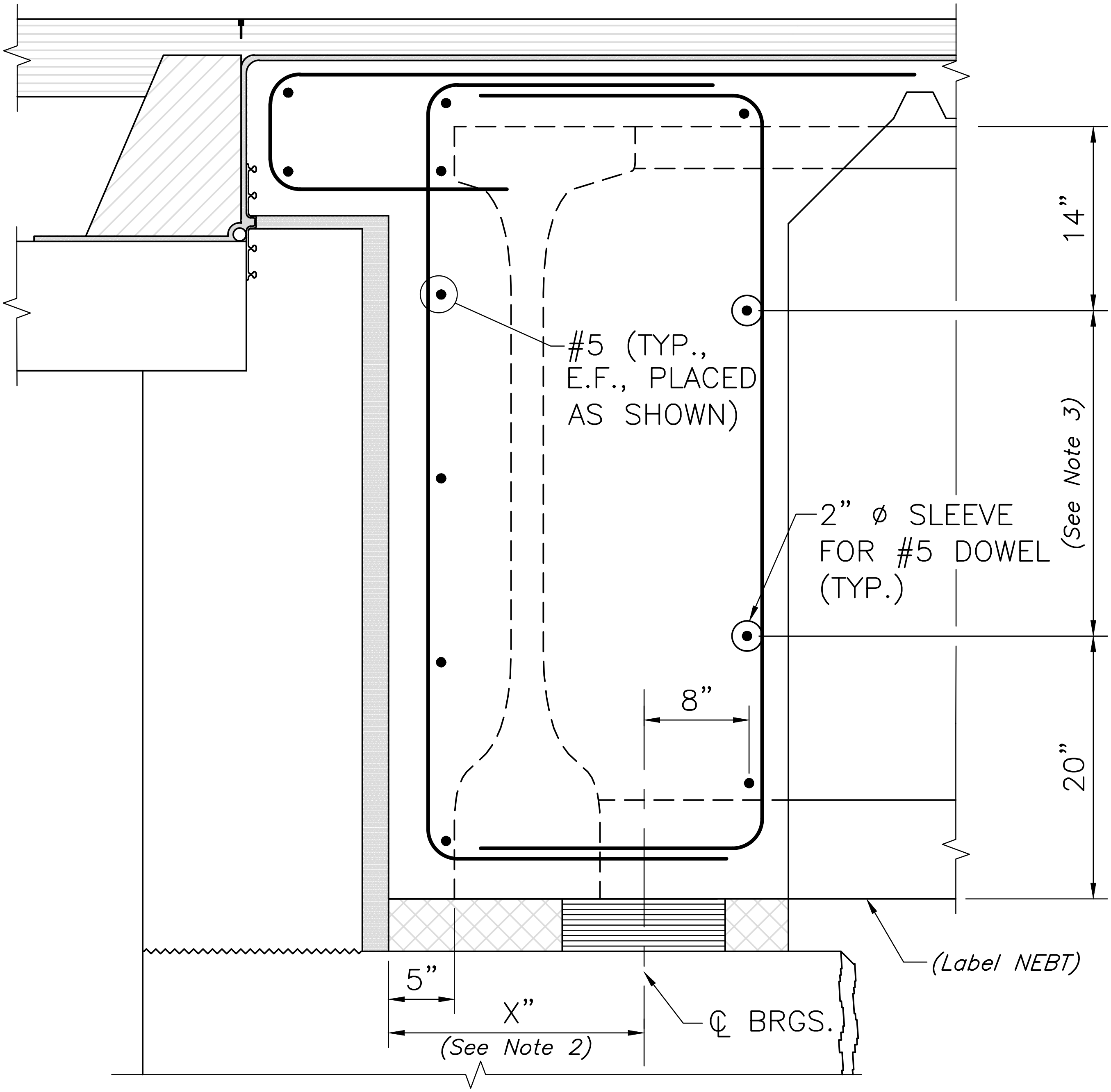


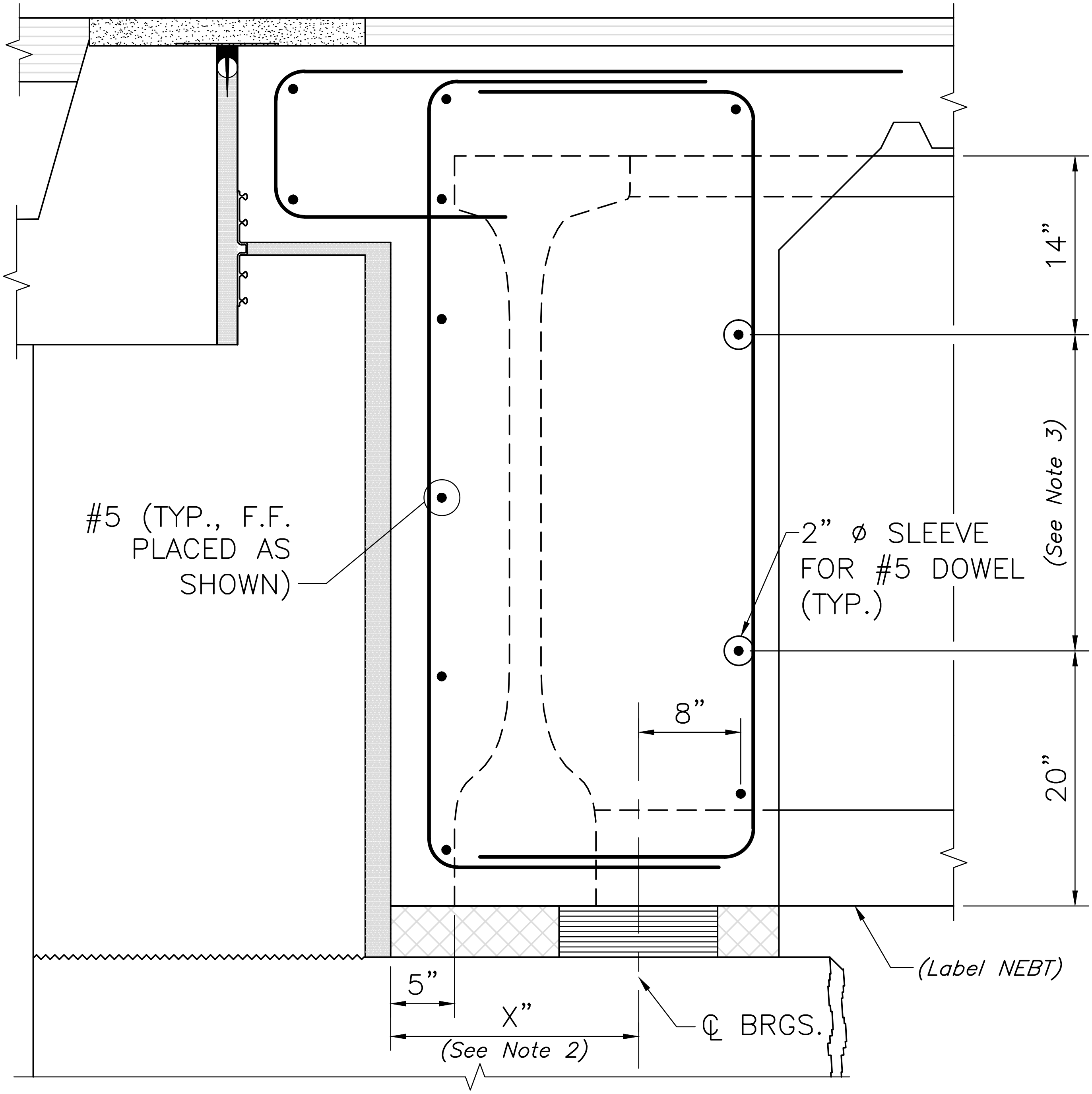

# DETAILS AT ABUTMENT – ROADWAY SECTION

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 NEBT beams.*
2. *Set this dimension as follows based on the skew:*
   *17" for 0° ≤ skew ≤ 10°*
   *20" for 10° < skew ≤ 25°*
   *22½" for 25° < skew ≤ 45°*
   *Designer will have to determine this dimension for skews over 45°.*
3. *For NEBT 1000, use 1 sleeve at mid–height. For NEBT 1200 and NEBT 1400, use 2 sleeves. For NEBT 1600 and NEBT 1800, use 3 sleeves equally spaced.*

| | | |
|---|---|---|
| massDOT Massachusetts Department of Transportation Highway Division<br>LRFD BRIDGE MANUAL, PART II | NEBT'S – RDWY. SECTION W/ PAVEMENT SAWCUT<br>ABUTMENT DETAILS | DATE OF ISSUE<br>JUNE 2013<br>DRAWING NUMBER<br>**6.4.1** |



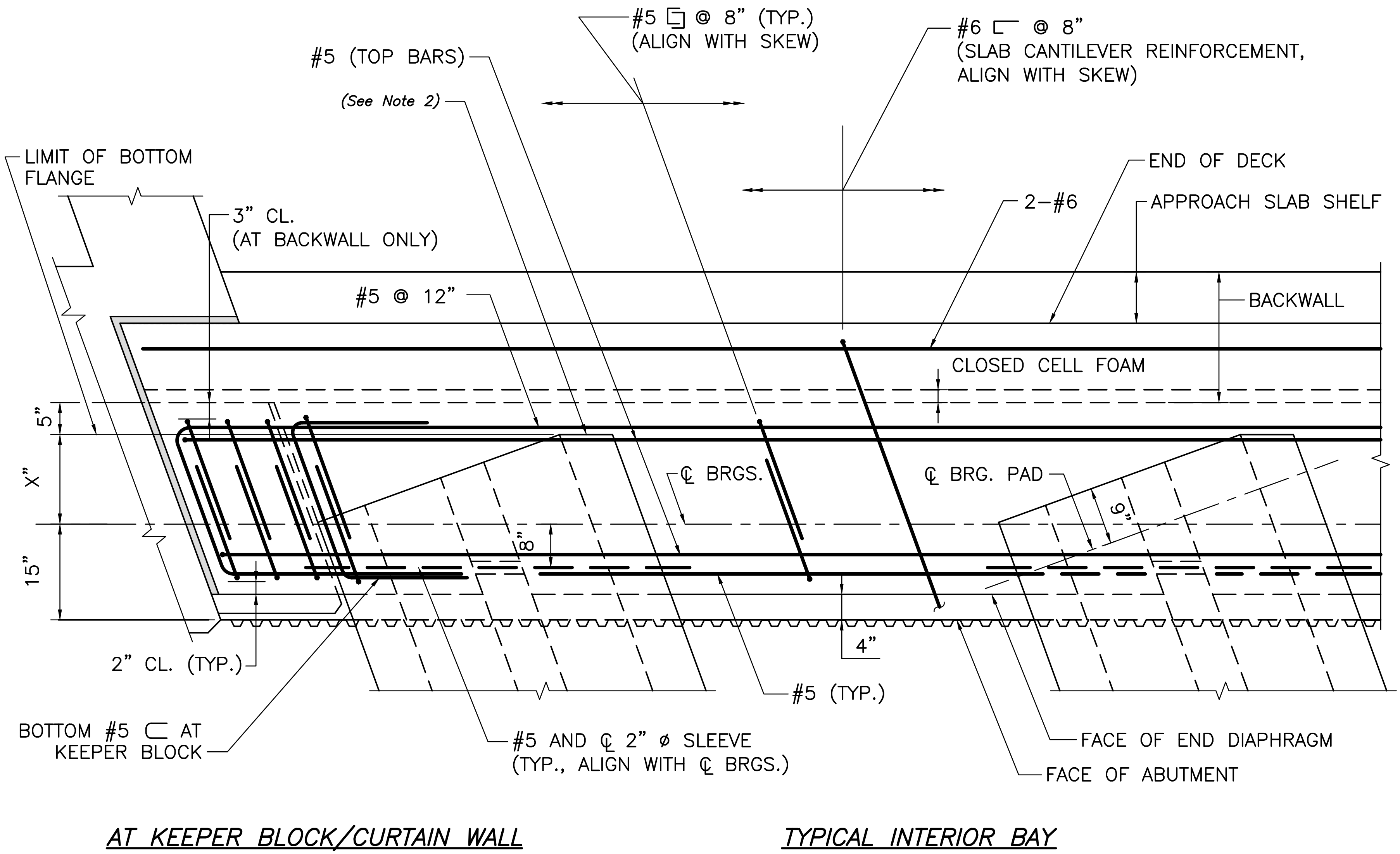

# DETAILS AT ABUTMENT – ROADWAY SECTION

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 NEBT beams.*
2. *Set this dimension as follows based on the skew:*
   *17" for 0° ≤ skew ≤ 10°*
   *20" for 10° < skew ≤ 25°*
   *22½" for 25° < skew ≤ 45°*
   *Designer will have to determine this dimension for skews over 45°.*
3. *For NEBT 1000, use 1 sleeve at mid–height. For NEBT 1200 and NEBT 1400, use 2 sleeves. For NEBT 1600 and NEBT 1800, use 3 sleeves equally spaced.*

| | | |
|---|---|---|
| massDOT Massachusetts Department of Transportation Highway Division<br>LRFD BRIDGE MANUAL, PART II | NEBT'S – RDWY. SECTION W/ ASPHALTIC BRIDGE JT.<br>ABUTMENT DETAILS | DATE OF ISSUE<br>JUNE 2013<br>DRAWING NUMBER<br>**6.4.2** |




## END DIAPHRAGM PLAN

SCALE: $\frac{3}{4}$" = 1'–0"

*NOTES:*

1. *Detail shown is for NEBT beam bridge with pavement sawcut. Modify drawing as needed for the actual system being used.*
2. *Designer must verify if top flange must be coped to ensure a 5" minimum clearance to backwall. If required, the Designer shall note it on Construction Drawings.*

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LRFD BRIDGE MANUAL, PART II

# NEBT'S – END DIAPHRAGM PLAN

ABUTMENT DETAILS

DATE OF ISSUE
JUNE 2013

DRAWING NUMBER
**6.4.3**

massDOT Massachusetts Department of Transportation Highway Division

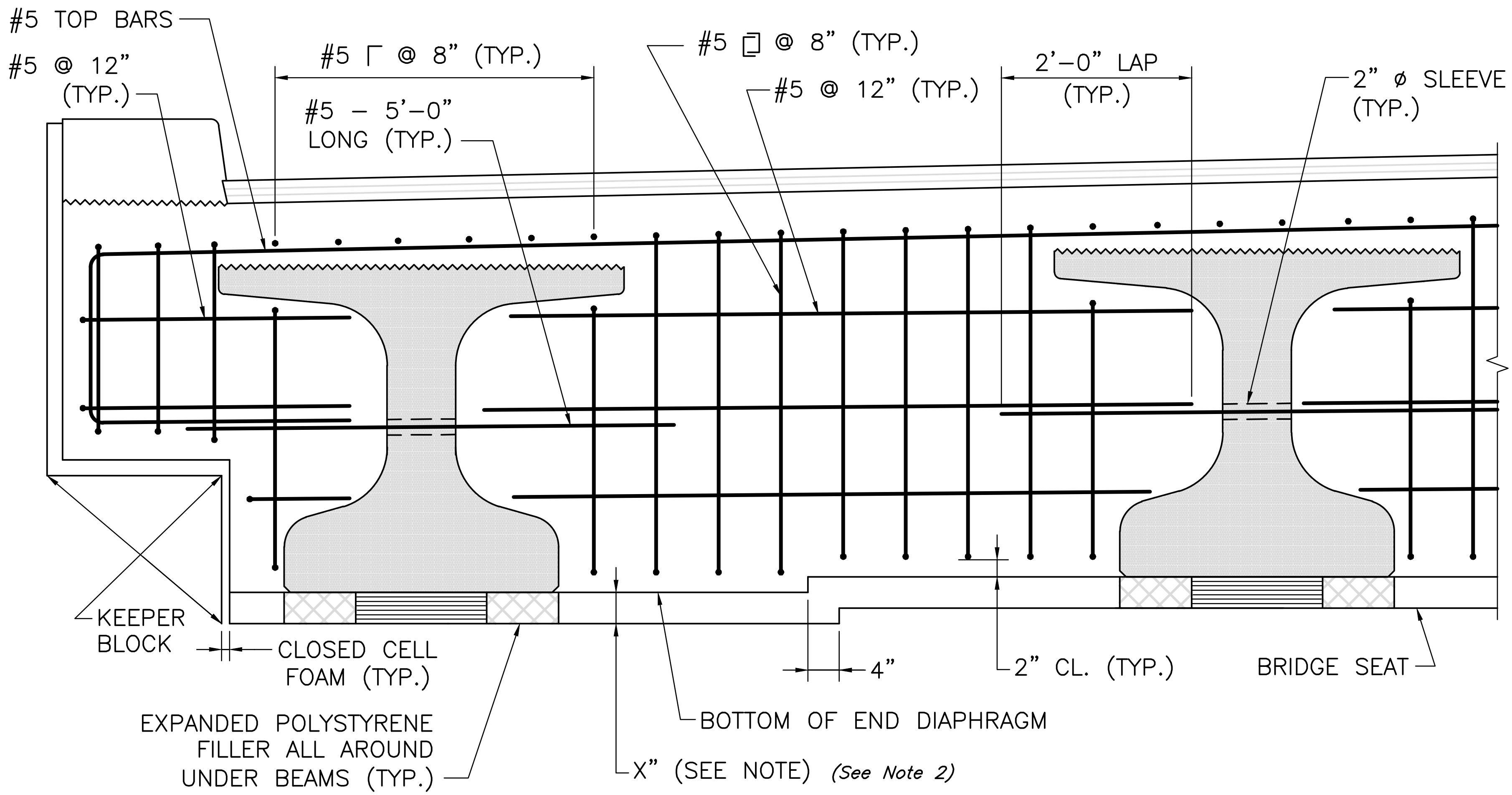
LRFD BRIDGE MANUAL, PART II

# NEBT'S – END DIAPHRAGM ELEVATION

ABUTMENT DETAILS

DATE OF ISSUE JUNE 2013

DRAWING NUMBER **6.4.4**




*AT KEEPER BLOCK/CURTAIN WALL*

*TYPICAL INTERIOR BAY*

**NOTE:**

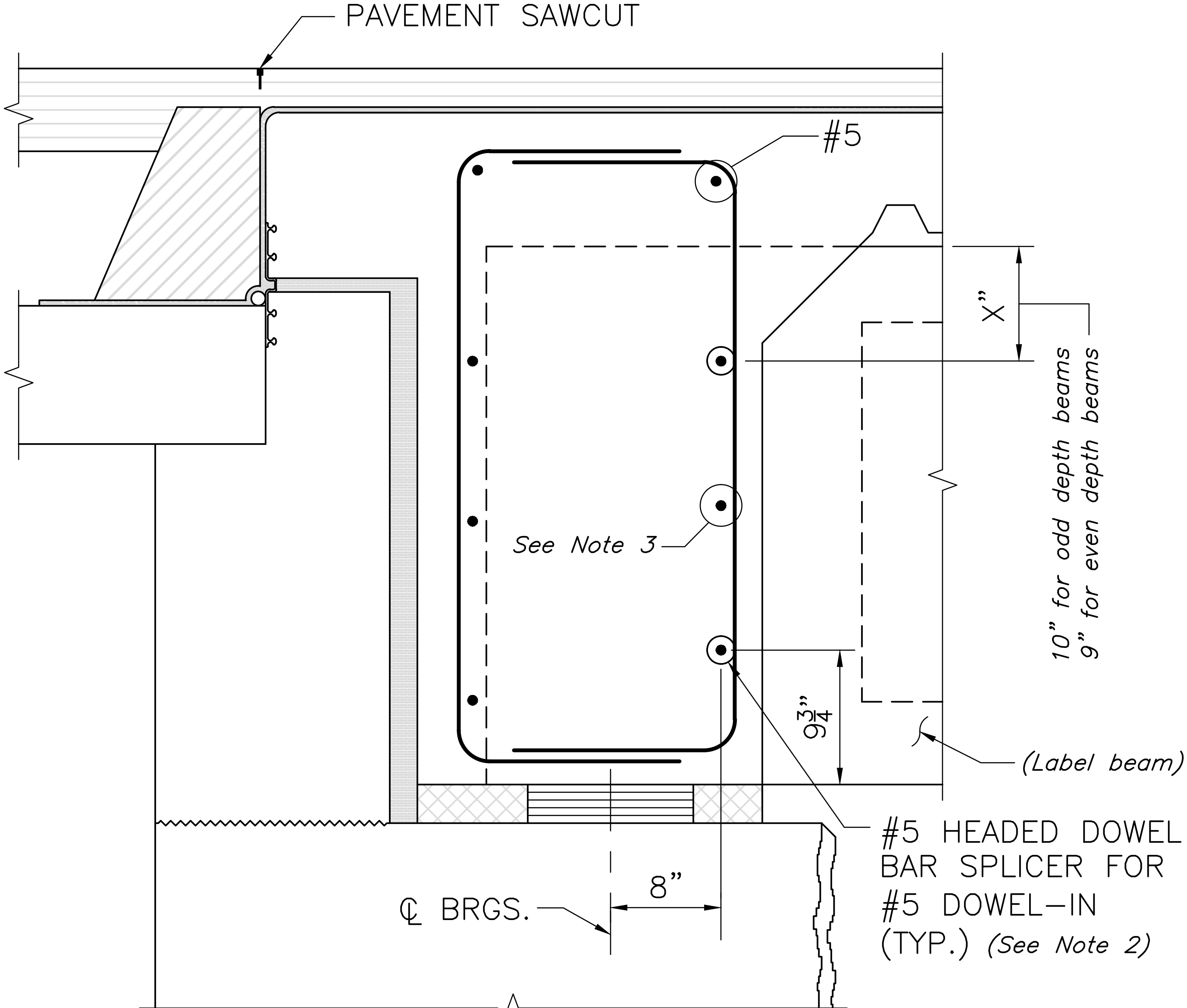
CONTRACTOR MAY USE EXPANDED POLYSTYRENE FILLER OR A REMOVABLE FORM TO FORM THE BOTTOM OF THE END DIAPHRAGM.

## END DIAPHRAGM ELEVATION

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

NOTES:

1. *Detail shown is for NEBT 1000. Modify drawing as needed for the NEBT being used.*
2. *Dimension to be provided is equal to Total Thickness of Bearing.*



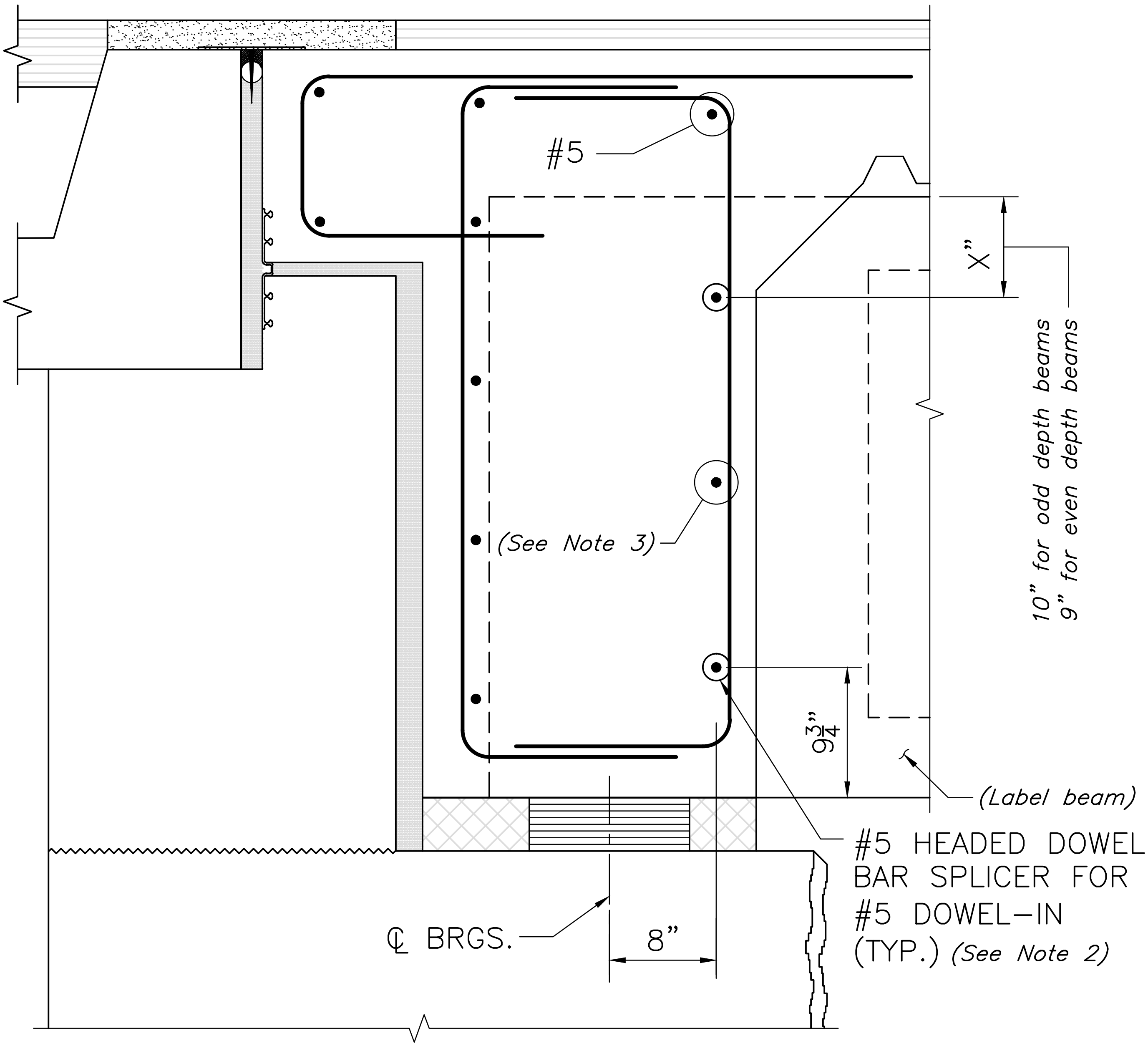

# DETAILS AT ABUTMENT – ROADWAY SECTION

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 spread box beam bridges.*
2. *Provide Headed Dowel Bar Splicers by beam designation as follows:*
   *B–24, B–27 and B–30* — *1 Splicer in midbeam*
   *B–33, B–36, B–39, B–42, B–45 and B–48* — *2 Splicers as shown*
3. *Provide intermediate reinforcing bars by beam designation as follows:*
   *B–24, B–27, B–30 and B–33* — *No intermediate bars*
   *B–36, B–39, B–42, B–45 and B–48* — *1 bar midway between splicers*

| | | |
|---|---|---|
| massDOT Massachusetts Department of Transportation Highway Division<br>LRFD BRIDGE MANUAL, PART II | BOXES – RDWY. SECTION W/ PAVEMENT SAWCUT<br>ABUTMENT DETAILS | DATE OF ISSUE<br>JUNE 2013<br>DRAWING NUMBER<br>**6.4.5** |




## DETAILS AT ABUTMENT – ROADWAY SECTION

SCALE: 1" = 1'–0"

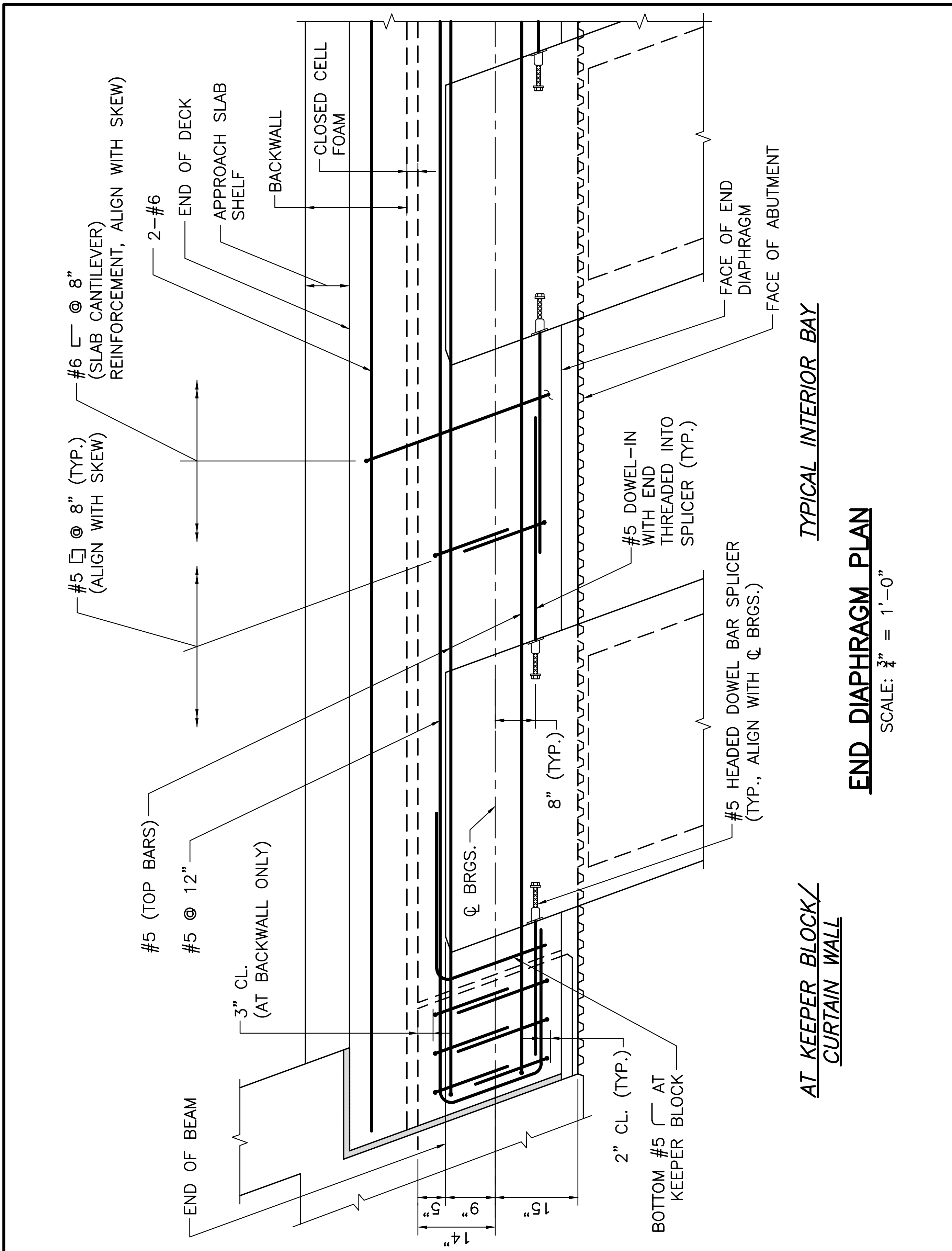
*NOTES:*

1. *Modify the generic Roadway/Sidewalk Section details of Dwg. No.'s 3.7.14 and 3.7.15 as shown above for spread box beam bridges.*
2. *Provide Headed Dowel Bar Splicers by beam designation as follows:*

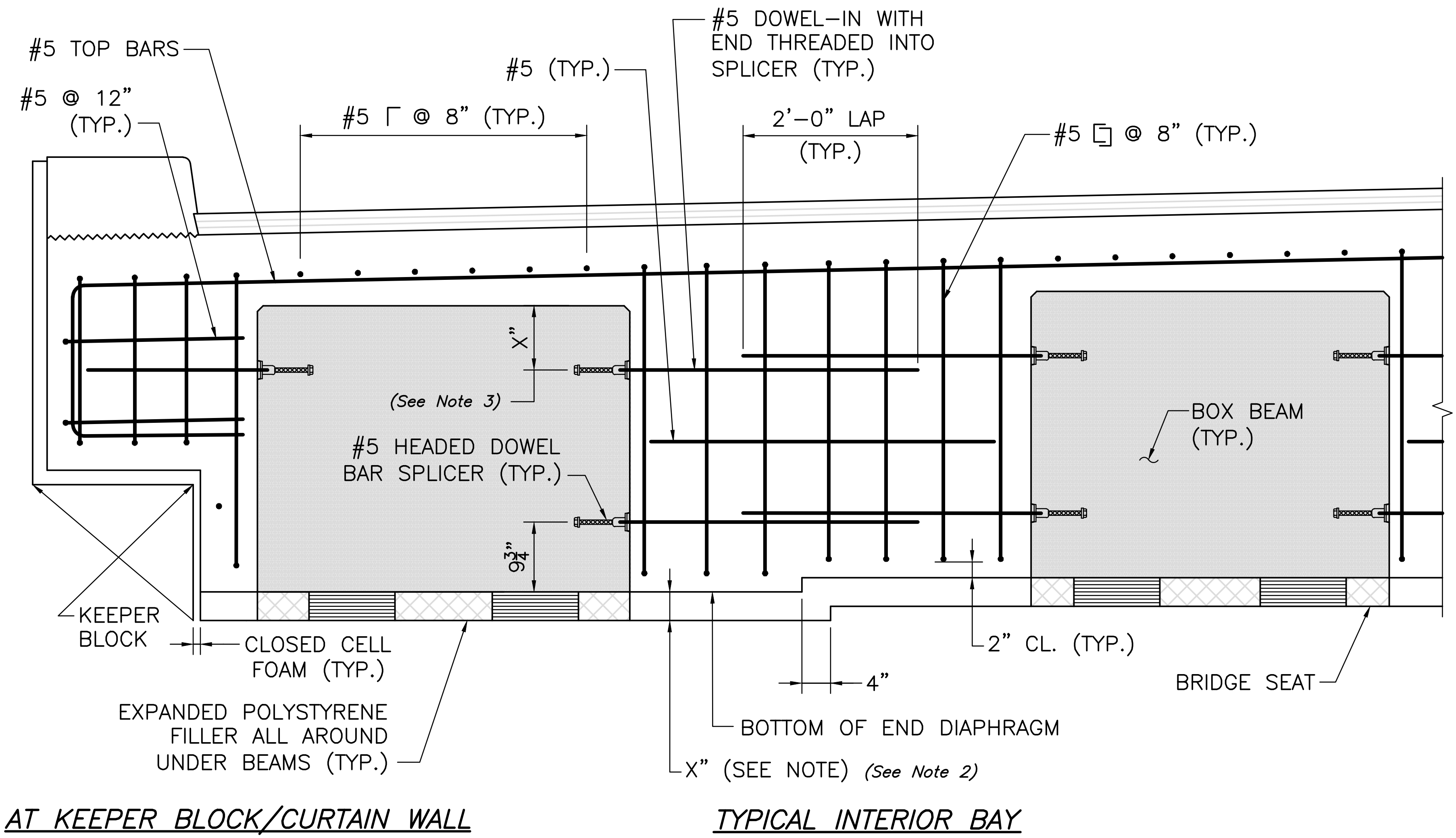
| | |
|---|---|
| *B–24, B–27 and B–30* | *1 Splicer at mid–beam* |
| *B–33, B–36, B–39, B–42, B–45 and B–48* | *2 Splicers, as shown* |

3. *Provide intermediate reinforcing bars by beam designation as follows:*

| | |
|---|---|
| *B–24, B–27, B–30 and B–33* | *No intermediate bars* |
| *B–36, B–39, B–42, B–45, and B–48* | *1 bar midway between splicers* |




| | | |
|---|---|---|
| massDOT Massachusetts Department of Transportation Highway Division<br>LRFD BRIDGE MANUAL, PART II | BOXES – END DIAPHRAGM PLAN<br>ABUTMENT DETAILS | DATE OF ISSUE<br>JUNE 2013<br>DRAWING NUMBER<br>**6.4.7** |




NOTE:

CONTRACTOR MAY USE EXPANDED POLYSTYRENE FILLER OR A REMOVABLE FORM TO FORM THE BOTTOM OF THE END DIAPHRAGM.

## END DIAPHRAGM ELEVATION

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

NOTES:

1. Detail shown is for beam depths 36" and up. Modify drawing as needed for the actual beams being used.
2. Dimension to be provided is equal to Total Thickness of Bearing.
3. 10" for odd depth beams, 9" for even depth beams.

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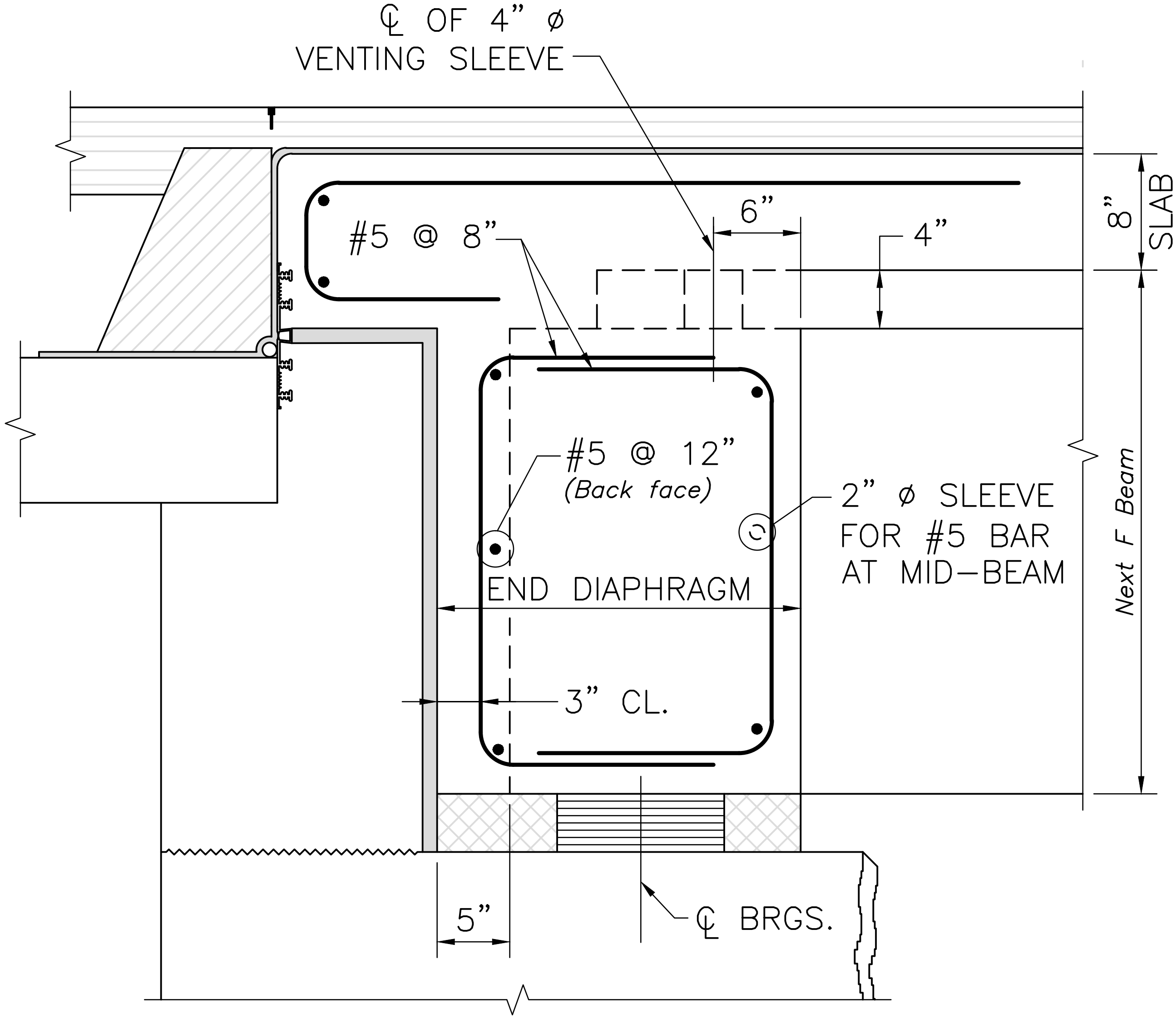
LRFD BRIDGE MANUAL, PART II

# BOXES – END DIAPHRAGM ELEVATION

ABUTMENT DETAILS

DATE OF ISSUE
JUNE 2013

DRAWING NUMBER
**6.4.8**



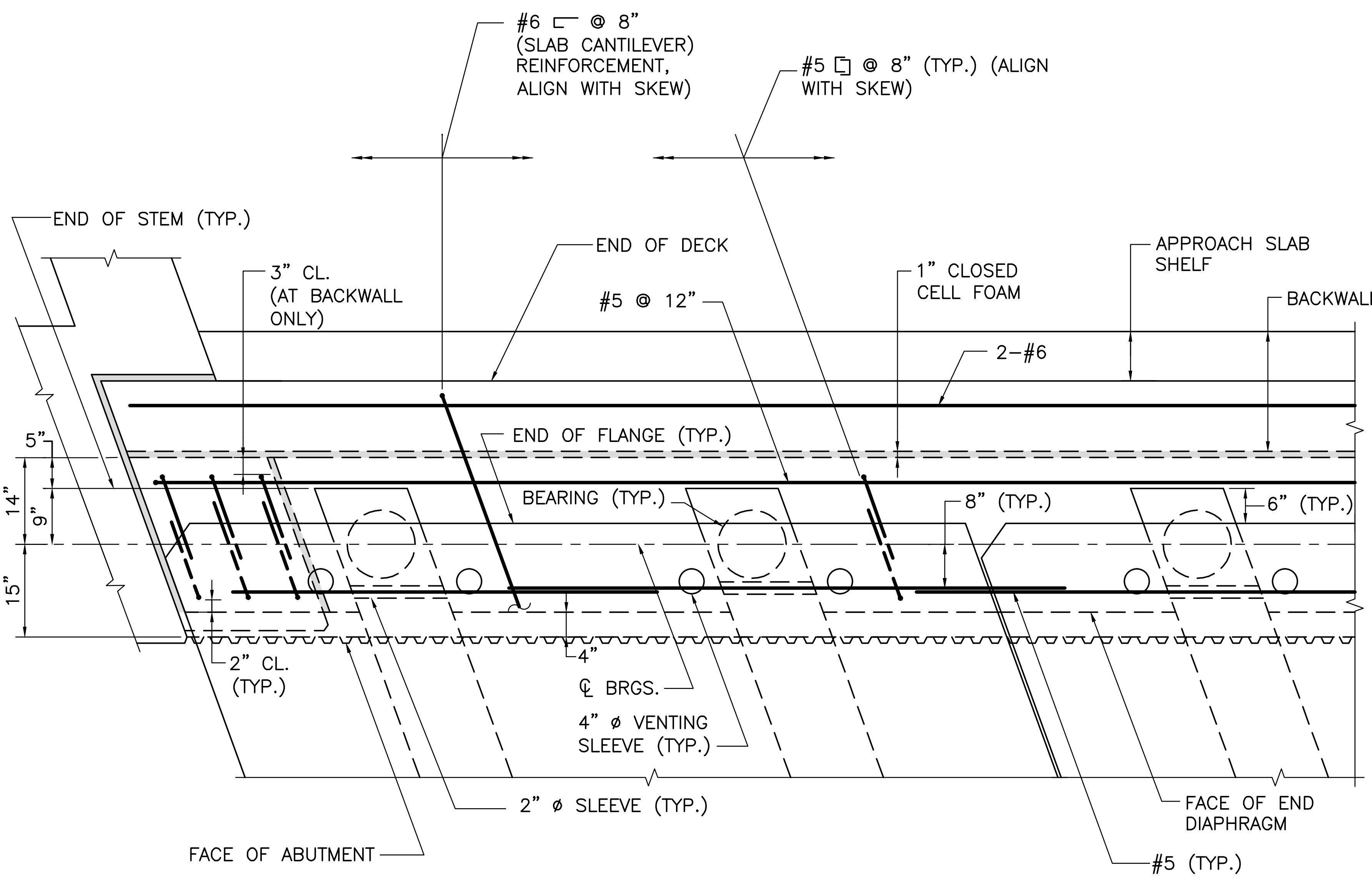

## DETAILS AT ABUTMENT – ROADWAY SECTION

SCALE: 1" = 1'–0"

*NOTE:*

*Modify the generic Roadway/Sidewalk Section details of Dwg. No.'s 3.7.9 and 3.7.10 as shown above for NEXT F beam bridges.*

| massDOT Massachusetts Department of Transportation Highway Division LRFD BRIDGE MANUAL, PART II | NEXT F BEAMS – RDWY. SECTION W/ PAVEMENT SAWCUT<br>ABUTMENT DETAILS | DATE OF ISSUE JUNE 2013<br>DRAWING NUMBER **6.4.9** |
|---|---|---|




## HORIZONTAL SECTION THRU END DIAPHRAGM

SCALE: $\frac{3}{4}$" = 1'–0"

*NOTE:*
*Detail shown is for NEXT Beam bridge with pavement sawcut. Modify drawing as needed for the actual joint system being used.*

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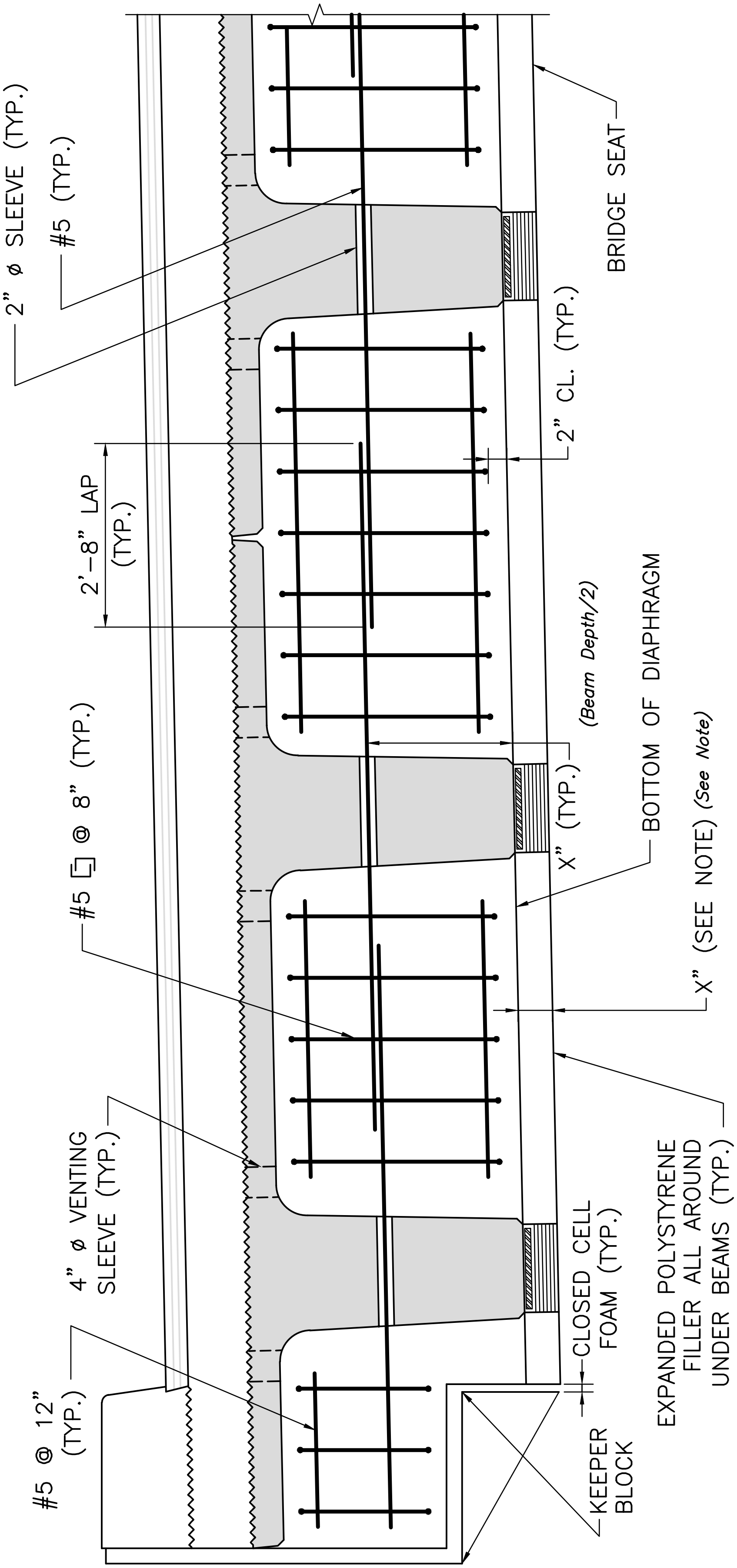
LRFD BRIDGE MANUAL, PART II

# NEXT F BEAMS – HORIZ. SECTION THRU END DIAPHRAGM

ABUTMENT DETAILS

DATE OF ISSUE
JUNE 2013

DRAWING NUMBER
**6.4.10**




NOTES:

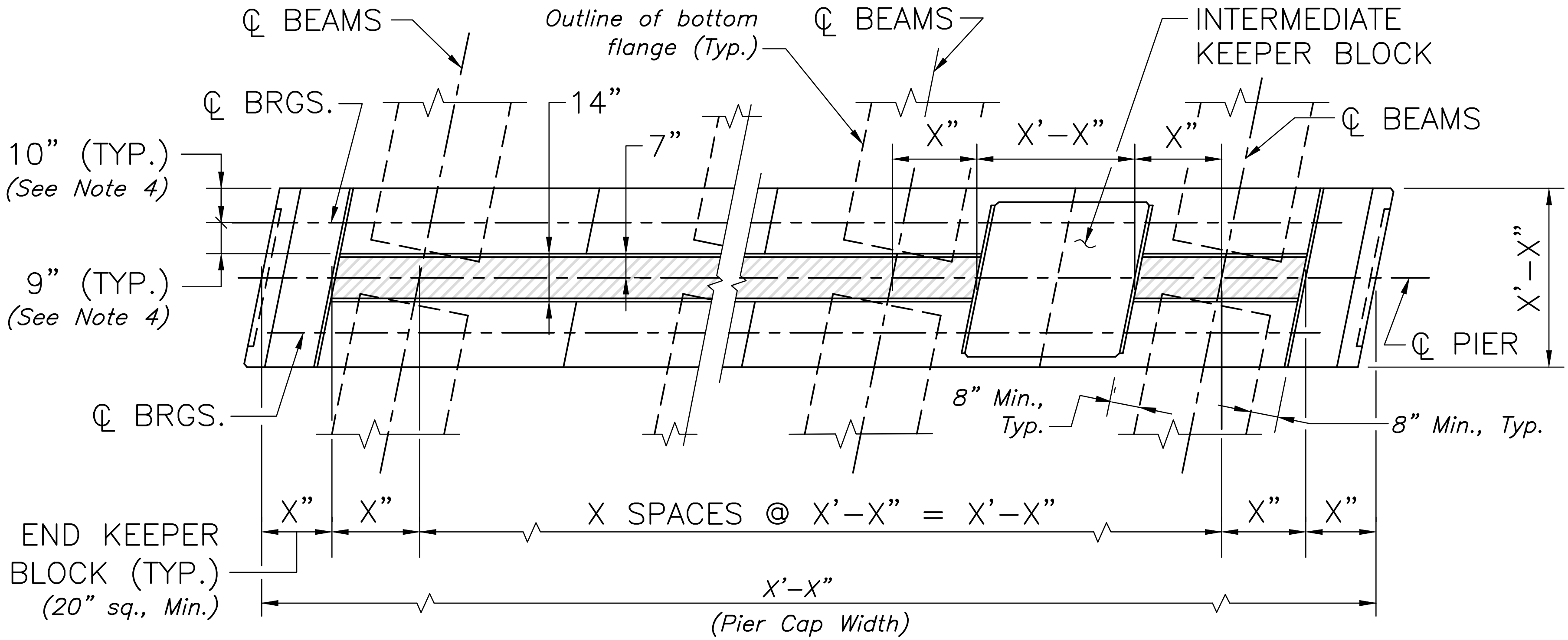
1. CONTRACTOR MAY USE EXPANDED POLYSTYRENE FILLER OR A REMOVABLE FORM TO FORM THE BOTTOM OF THE END DIAPHRAGM.
2. DECK SLAB REINFORCEMENT IS NOT SHOWN FOR CLARITY.

## VERTICAL SECTION THRU END DIAPHRAGM

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

*NOTE:*
*Dimension to be provided is equal to Total Thickness of Bearing.*

| | | |
|---|---|---|
| massDOT Massachusetts Department of Transportation Highway Division<br>LRFD BRIDGE MANUAL, PART II | NEXT F BEAMS – VERTICAL SECTION THRU END DIAPHRAGM<br>ABUTMENT DETAILS | DATE OF ISSUE JUNE 2013<br>DRAWING NUMBER **6.4.11** |




*BRIDGE WITHOUT INTERMEDIATE KEEPER BLOCK*

*BRIDGE WITH INTERMEDIATE KEEPER BLOCK*

NOTES:

1. ▨ DENOTES LIMITS OF 14" BY 12" MIN. DEEP SHEAR KEY.

2. ALL SURFACES OF THE SHEAR KEY SHALL BE LINED WITH 1" THICK CLOSED CELL FOAM.

## PLAN OF PIER CAP

SCALE: $\frac{1}{4}$" = 1'–0"

*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.*
3. *NEBT beams shown, spread box beams are similar.*
4. *If the bearing exceeds 16" in diameter, set the 10" dimension to (Bearing Dia./2 + 2"), and set the 9" dimension to (Bearing Dia./2 + 1").*

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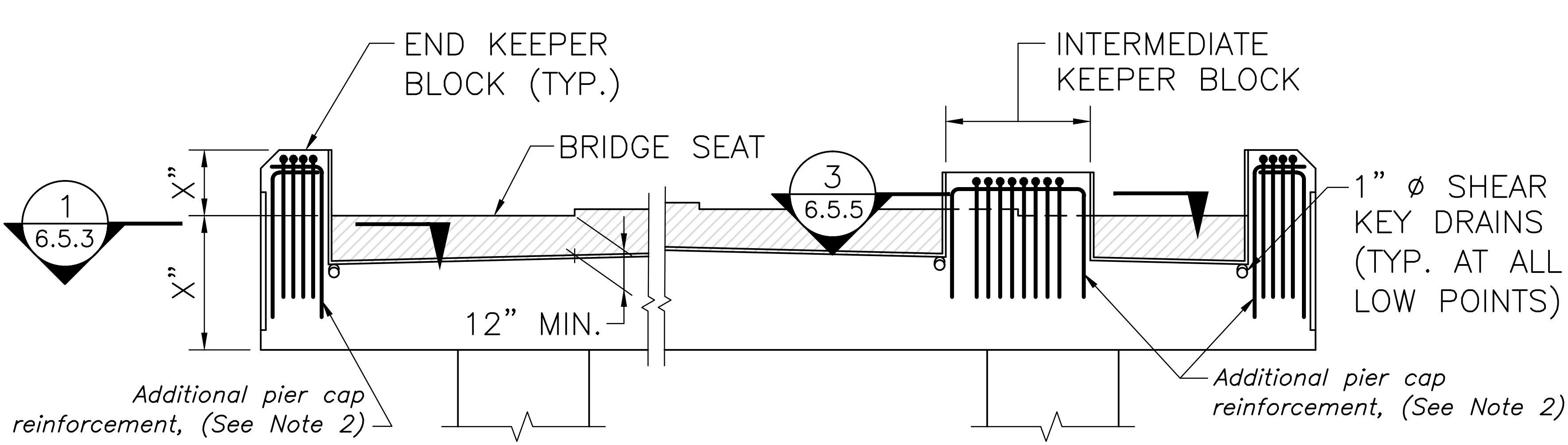
LRFD BRIDGE MANUAL, PART II

PLAN OF PIER CAP

PIER DETAILS

DATE OF ISSUE JUNE 2013

DRAWING NUMBER **6.5.1**




*BRIDGE WITHOUT INTERMEDIATE KEEPER BLOCK*

*BRIDGE WITH INTERMEDIATE KEEPER BLOCK*

NOTES:

1. ▨ DENOTES LIMITS OF 14" BY 12" MIN. DEEP SHEAR KEY.
2. ALL SURFACES OF THE SHEAR KEY SHALL BE LINED WITH 1" THICK CLOSED CELL FOAM.

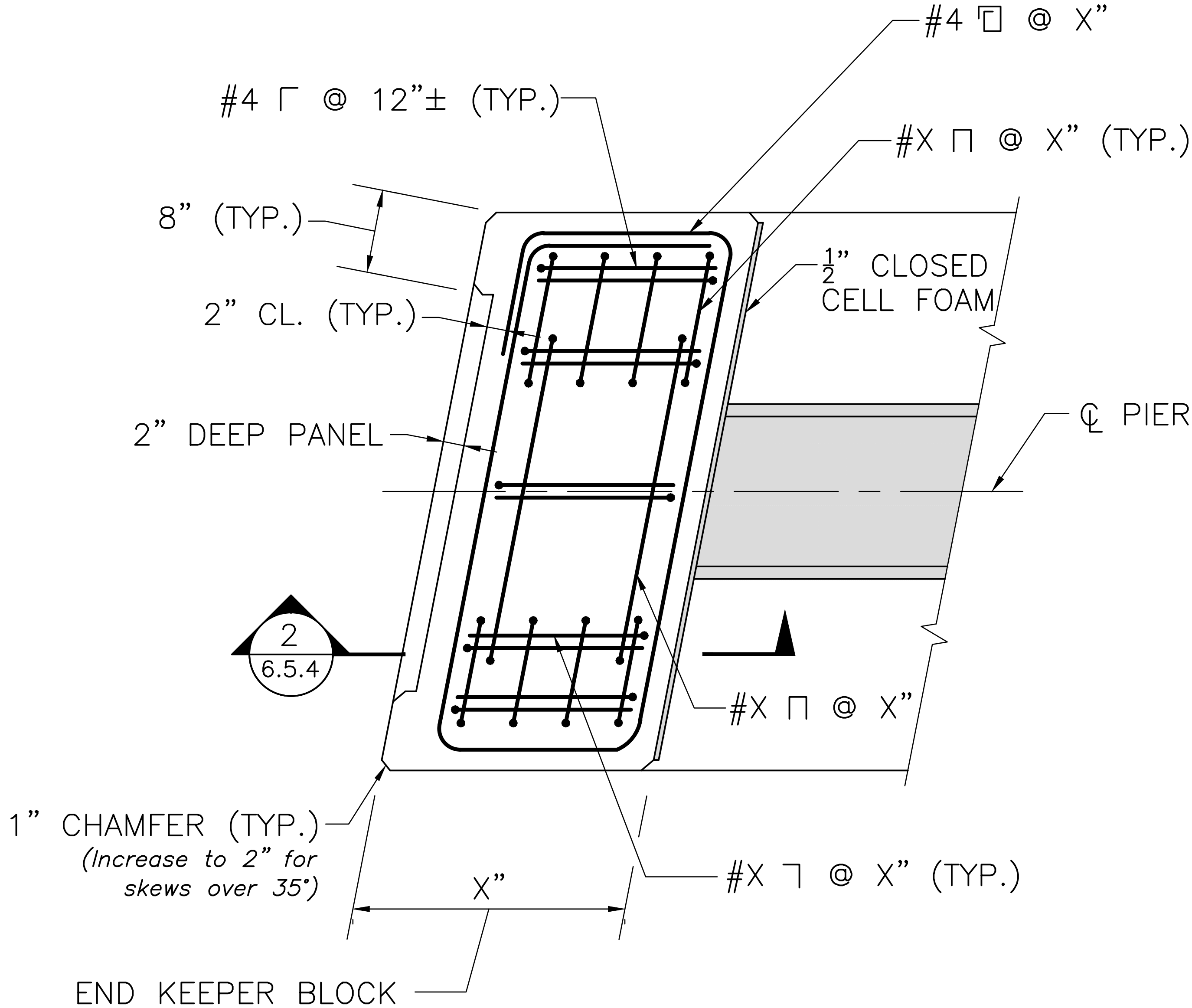
# SECTION THRU PIER CAP

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. *Intermediate keeper blocks should be considered if end keeper blocks are insufficient to resist transverse seismic loads. Do not locate intermediate keeper blocks in utility bays of NEBT beam bridges.*

| | | |
|---|---|---|
| massDOT Massachusetts Department of Transportation Highway Division<br>LRFD BRIDGE MANUAL, PART II | SECTION THRU PIER CAP<br>PIER DETAILS | DATE OF ISSUE<br>JUNE 2013<br>DRAWING NUMBER<br>**6.5.2** |



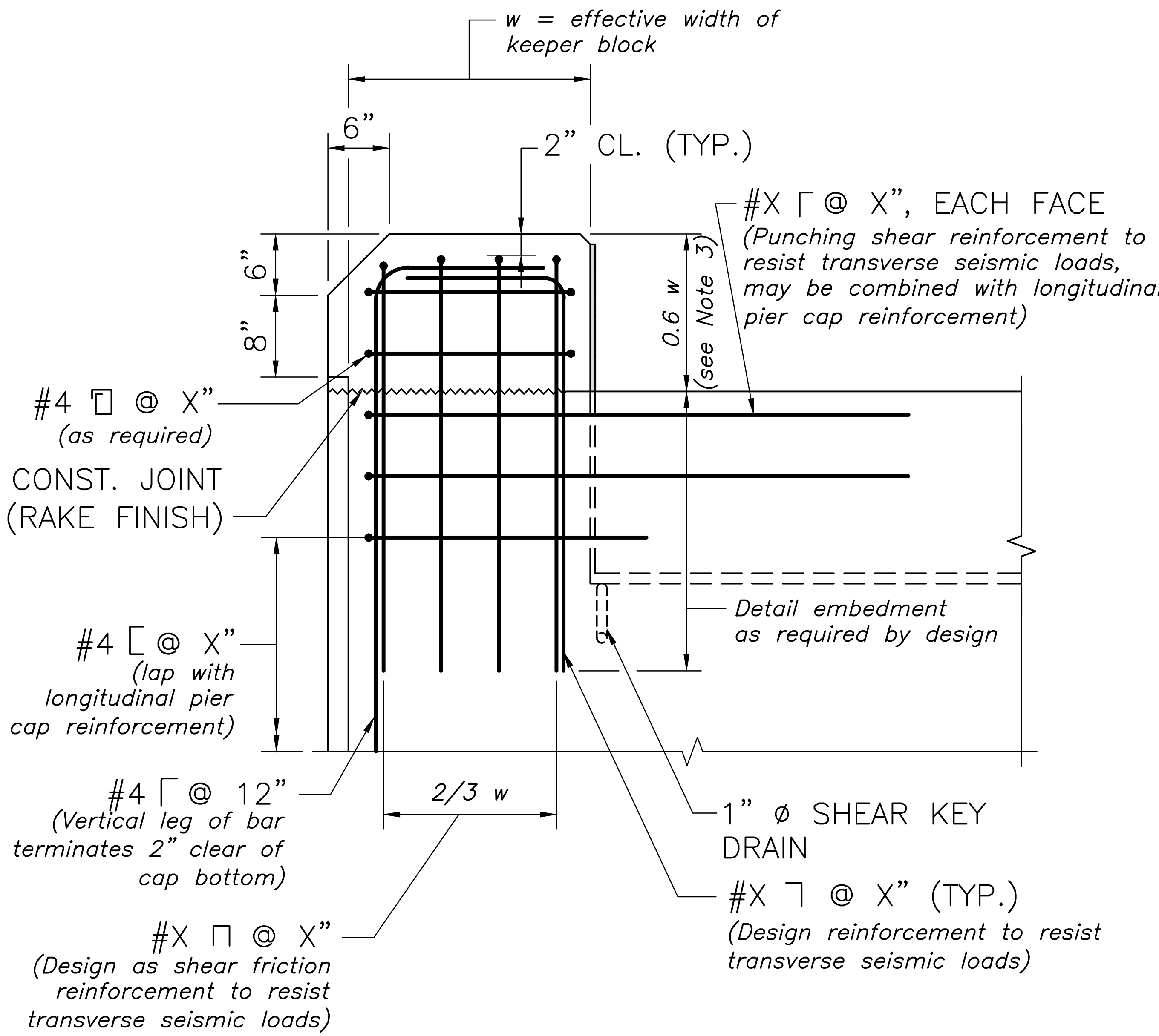

## SECTION 1

SCALE: ¾" = 1'–0"

*NOTE:*

*Reinforcement configuration shown is conceptual. The Designer will modify the arrangement or add additional hoops as required by the actual design. The Designer shall also verify that the reinforcement provided does not duplicate or interfere with the typical pier reinforcement.*

| | | |
|---|---|---|
| massDOT Massachusetts Department of Transportation Highway Division<br>LRFD BRIDGE MANUAL, PART II | PLAN SECTION OF END KEEPER BLOCK<br>PIER DETAILS | DATE OF ISSUE<br>JUNE 2013<br>DRAWING NUMBER<br>**6.5.3** |



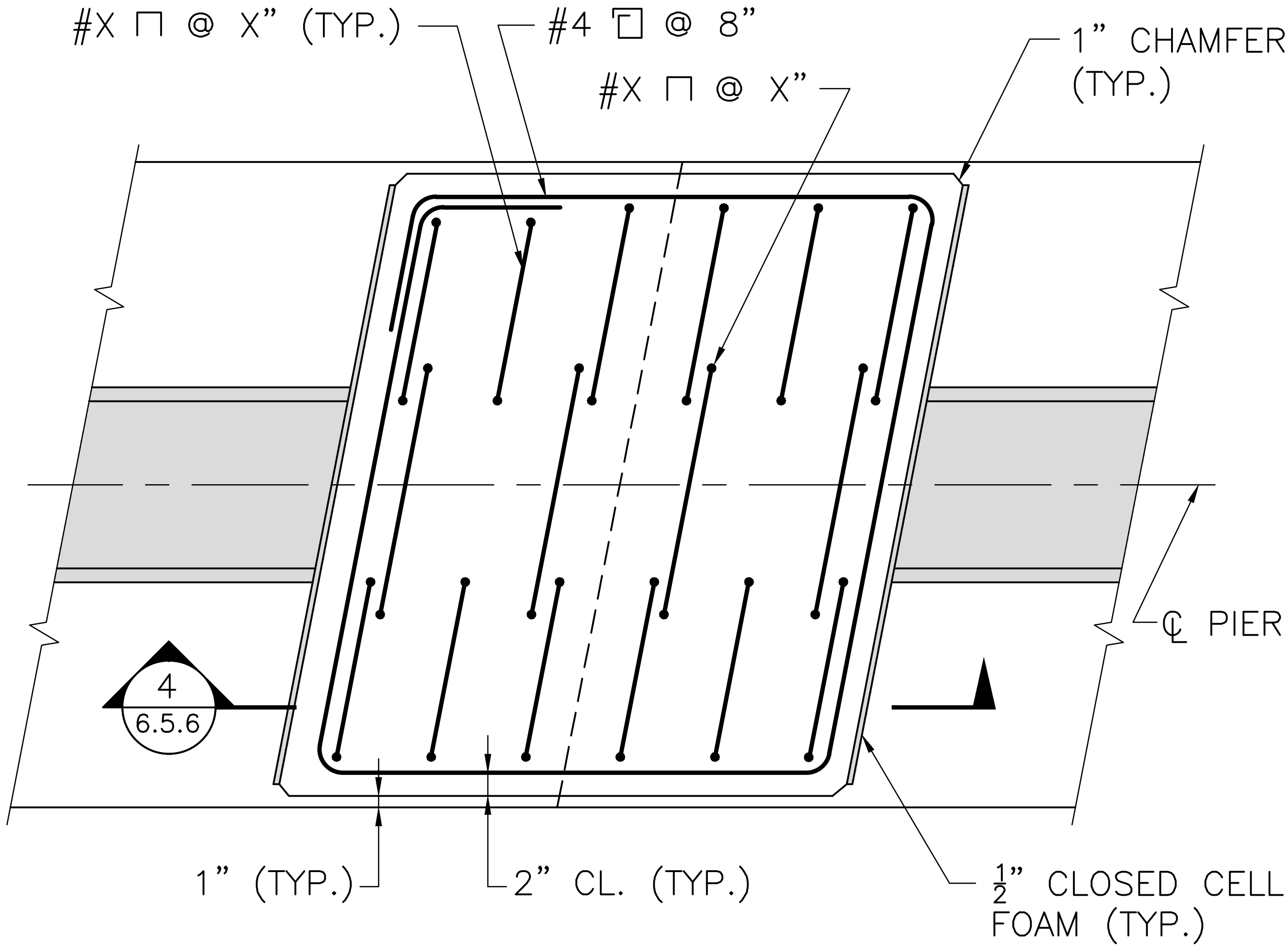

## SECTION 2

SCALE: $\frac{3}{4}$" = 1'–0"

*NOTES:*

1. *Remainder of pier cap reinforcement has been omitted for clarity.*
2. *Reinforcement configuration shown is conceptual. The Designer shall modify the arrangement or add additional hoops as required by the actual design. The Designer shall also verify that the reinforcement provided does not duplicate or interfere with the typical pier reinforcement.*
3. *The minimum height of the keeper block shall extend to the top of the bottom bulb of NEBT.*

| massDOT Massachusetts Department of Transportation Highway Division<br>LRFD BRIDGE MANUAL, PART II | VERTICAL SECTION OF END KEEPER BLOCK<br>PIER DETAILS | DATE OF ISSUE<br>JUNE 2013<br>DRAWING NUMBER<br>**6.5.4** |
|---|---|---|




NOTE:

INTERMEDIATE KEEPER BLOCKS SHALL BE CAST BEFORE BEAMS ARE SET AND THE PIER DIAPHRAGM CONCRETE IS PLACED.

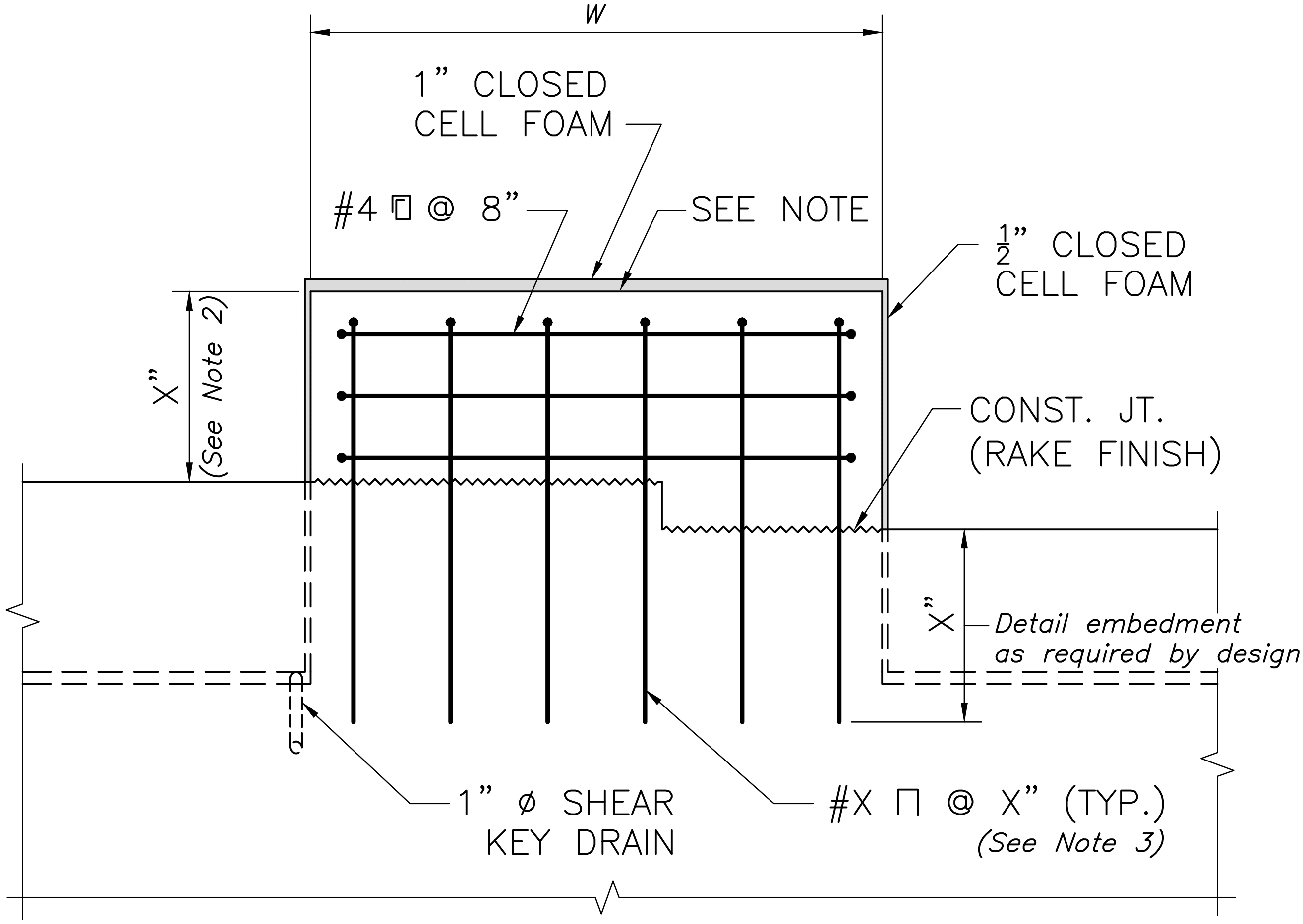
## SECTION 3

SCALE: $\frac{3}{4}$" = 1'–0"

*NOTE:*

*Reinforcement configuration shown is conceptual. The Designer shall modify the arrangement or add additional hoops as required by the actual design. The Designer shall also verify that the reinforcement provided does not duplicate or interfere with the typical pier reinforcement.*

| | | |
|---|---|---|
| massDOT Massachusetts Department of Transportation Highway Division<br>LRFD BRIDGE MANUAL, PART II | INTERMEDIATE KEEPER BLOCK – PLAN SECTION<br>PIER DETAILS | DATE OF ISSUE<br>JUNE 2013<br>DRAWING NUMBER<br>**6.5.5** |




NOTE:

TOP OF INTERMEDIATE KEEPER BLOCK SHALL BE TROWELED SMOOTH PARALLEL TO PROFILE GRADE.

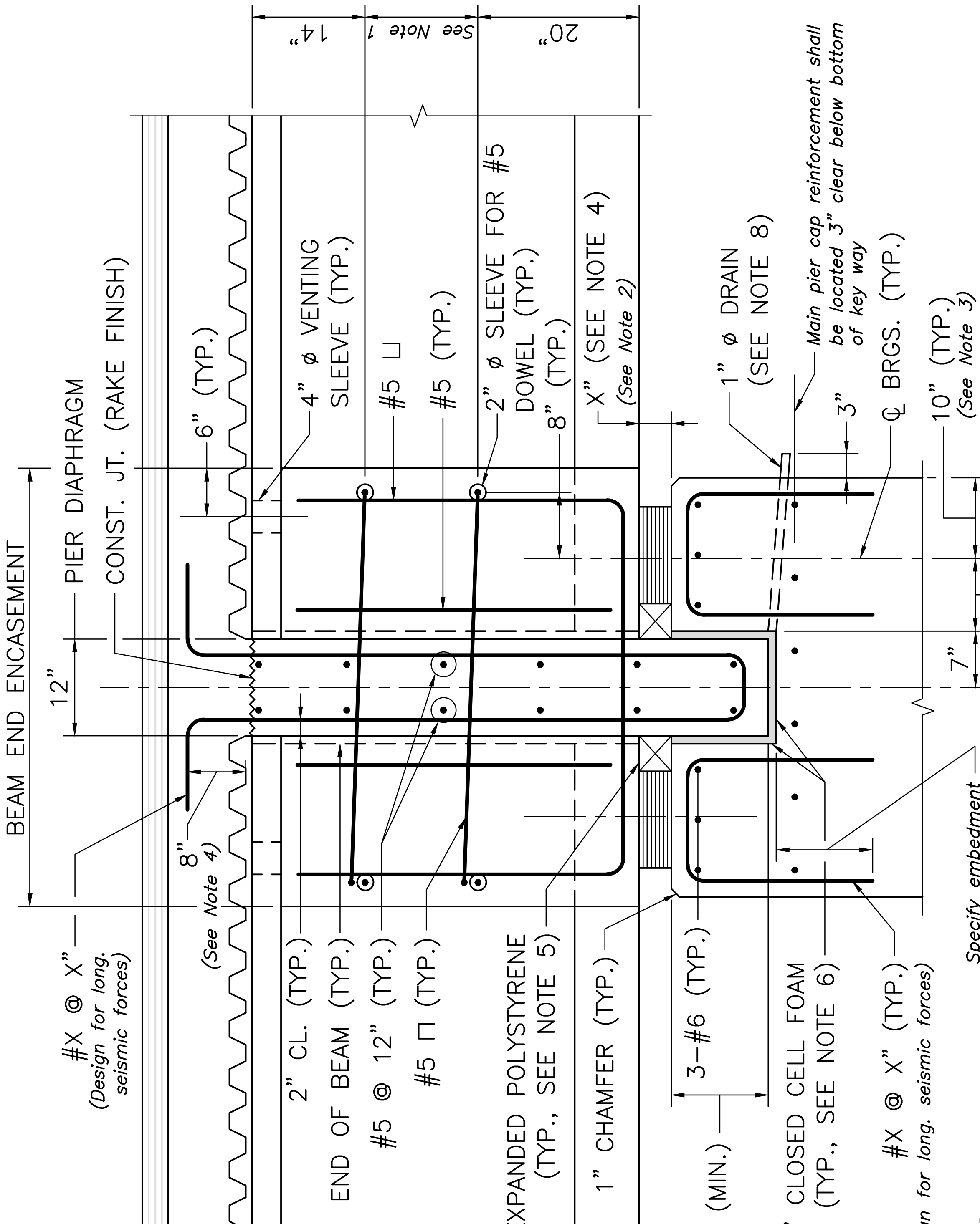
## SECTION 4

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

*NOTES:*

1. *Remainder of pier cap reinforcement has been omitted for clarity.*
2. *Height of keeper block: 10" < h < w/3.*
3. *Design as shear friction reinforcement to resist transverse seismic loads. Reinforcement configuration shown is conceptual. The Designer shall modify the arrangement or add additional hoops as required by the actual design. The Designer shall also verify that the reinforcement provided does not duplicate or interfere with the typical pier reinforcement.*

| | | |
|---|---|---|
| massDOT Massachusetts Department of Transportation Highway Division<br>LRFD BRIDGE MANUAL, PART II | INTERMEDIATE KEEPER BLOCK – VERTICAL SECTION<br>PIER DETAILS | DATE OF ISSUE<br>JUNE 2013<br>DRAWING NUMBER<br>**6.5.6** |




## DETAILS OVER PIER

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

**NOTES:**

(See Dwg. No. 6.5.10 for Notes to be included on Construction Drawings.)

NOTES:

(See Dwg. No. 6.5.10 for Designer Notes.)

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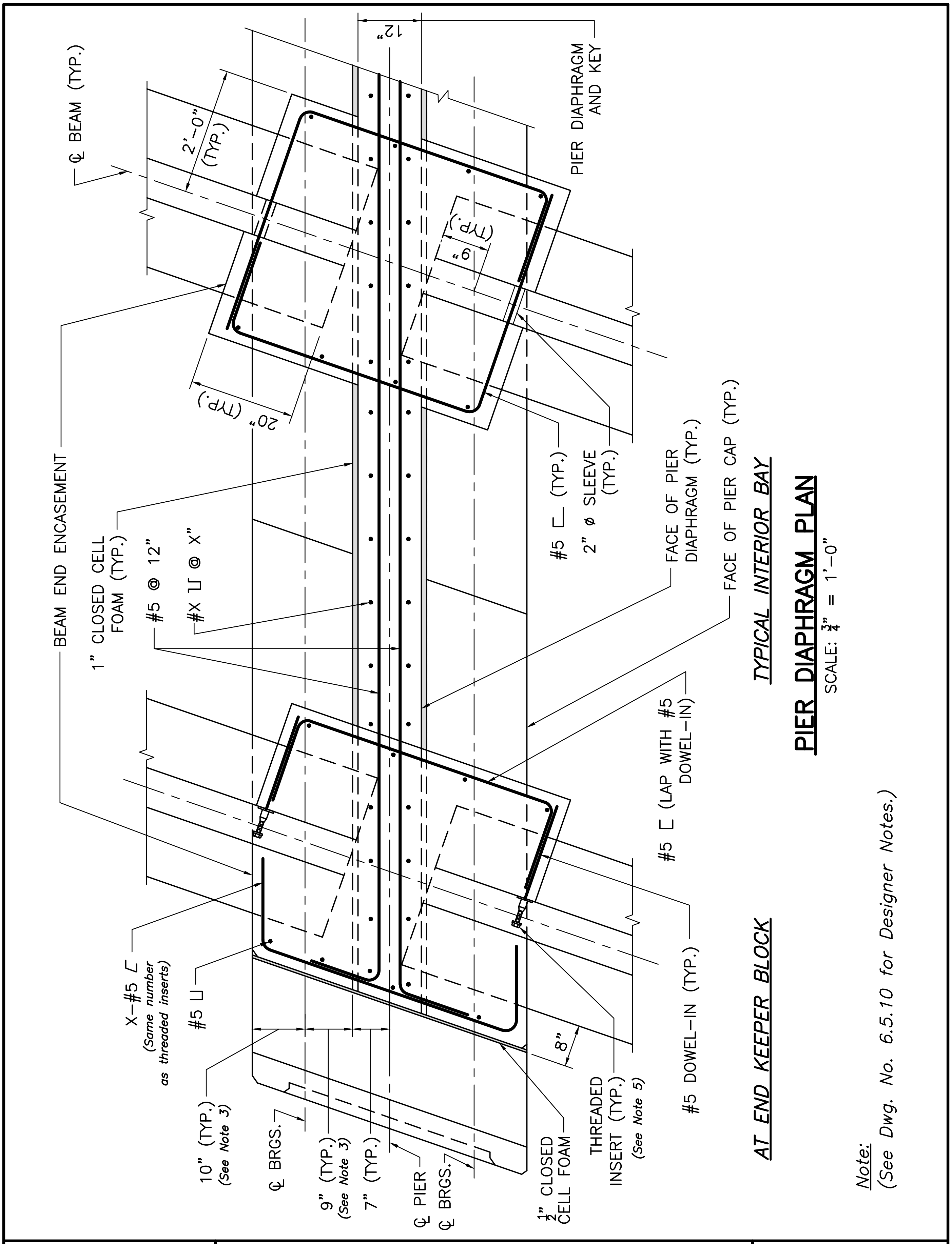
LRFD BRIDGE MANUAL, PART II

# DETAILS OVER PIER FOR NEBT BEAMS

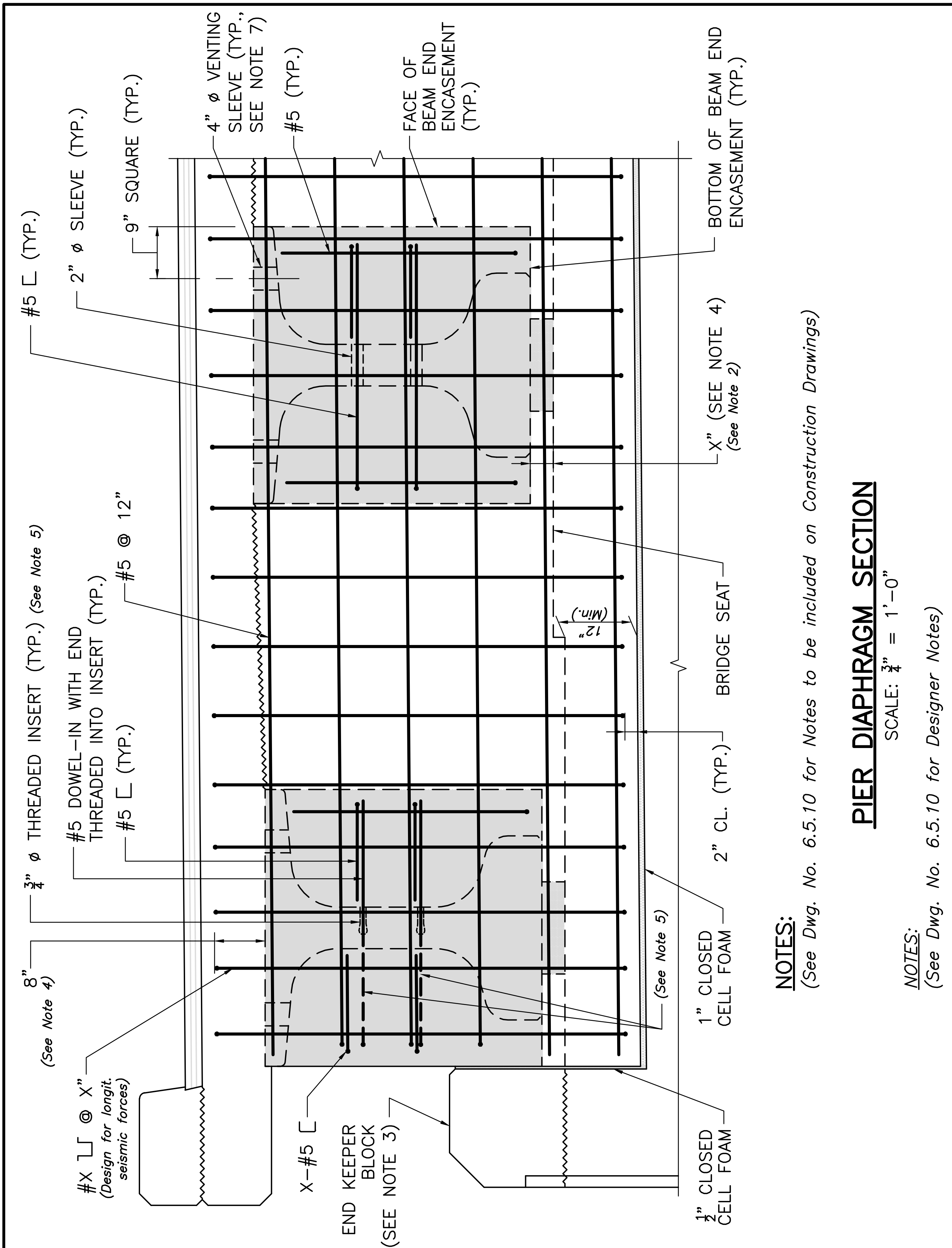
PIER DETAILS

DATE OF ISSUE
JUNE 2013

DRAWING NUMBER
**6.5.7**




| | | |
|---|---|---|
| massDOT Massachusetts Department of Transportation Highway Division<br>LRFD BRIDGE MANUAL, PART II | PIER DIAPHRAGM PLAN FOR NEBT BEAMS<br>PIER DETAILS | DATE OF ISSUE<br>JUNE 2013<br>DRAWING NUMBER<br>**6.5.8** |

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LRFD BRIDGE MANUAL, PART II

# PIER DIAPHRAGM SECTION FOR NEBT BEAMS

PIER DETAILS

DATE OF ISSUE
JUNE 2013

DRAWING NUMBER
**6.5.9**

# DETAILS OVER PIER NOTES:

*(Include these Notes with details shown on Dwg. No.'s 6.5.7, 6.5.8, and 6.5.9)*

1. ALL REINFORCEMENT SHOWN IN THESE DETAILS SHALL BE COATED.

2. ALL PIER DIAPHRAGM AND BEAM END ENCASEMENT CONCRETE SHALL BE 4000 PSI, $\frac{3}{4}$ IN, 585 HP CEMENT CONCRETE.

3. END KEEPER BLOCKS *(and intermediate keeper blocks, if any)* SHALL BE CAST BEFORE BEAMS ARE SET AND PIER DIAPHRAGM AND BEAM END ENCASEMENT ARE CAST.

4. CONTRACTOR MAY USE EXPANDED POLYSTYRENE FILLER OR A REMOVABLE FORM TO FORM THE BOTTOM OF THE BEAM END ENCASEMENT.

5. PLACE EXPANDED POLYSTYRENE FILLER UNDER THE BOTTOM FLANGE AT THE EDGE OF THE SHEAR KEY.

6. PRIOR TO PLACING PIER DIAPHRAGM CONCRETE, LINE ALL SURFACES OF THE SHEAR KEY WITH CLOSED CELL FOAM AS SHOWN. PIER DIAPHRAGM CONCRETE MAY NOT COME IN DIRECT CONTACT WITH THE PIER CAP CONCRETE MASONRY.

7. PROVIDE VENTING SLEEVES IN THE TOP FLANGE OF THE NEBT BEAMS AS SHOWN.

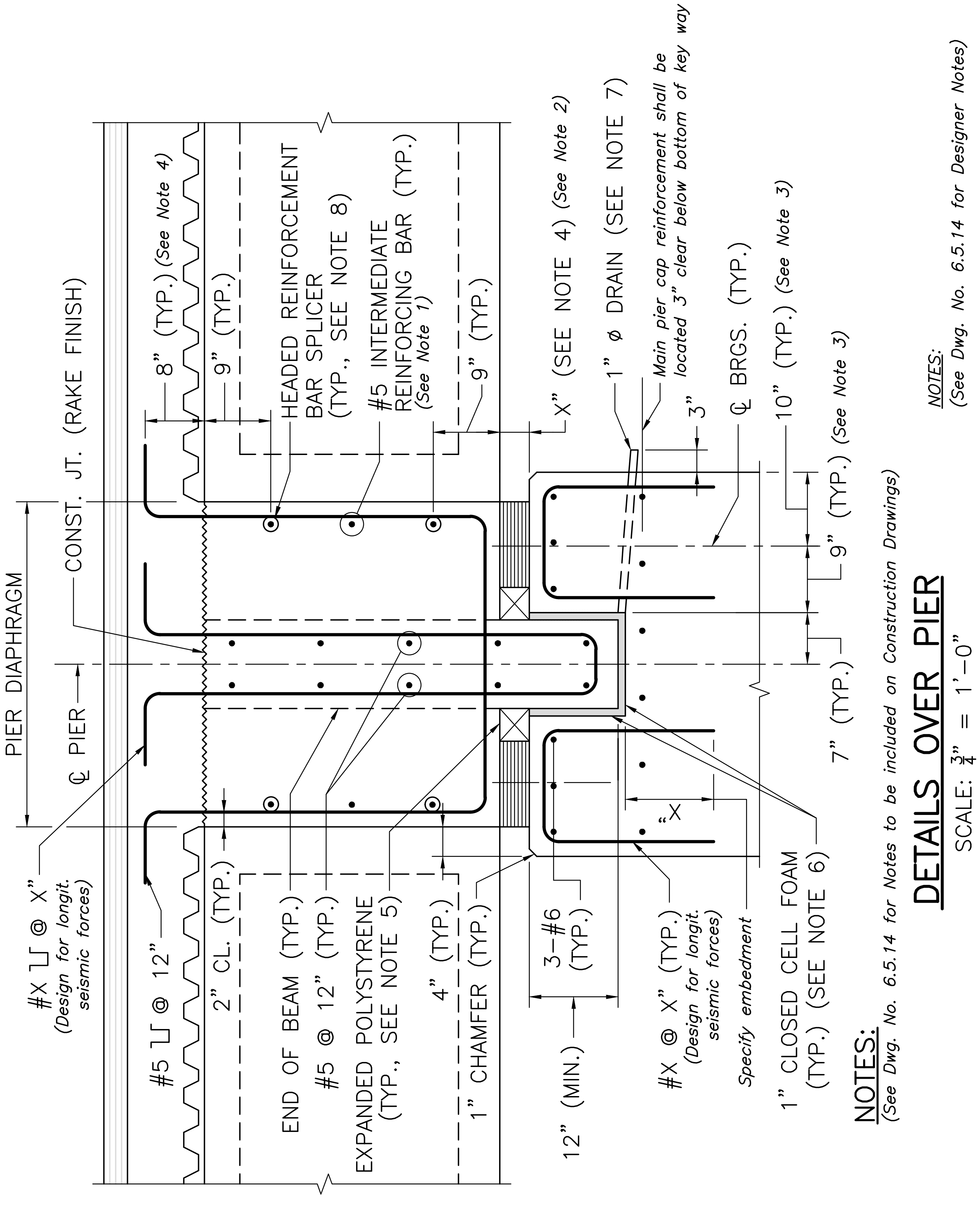
8. SLOPE SHEAR KEY DRAIN 5% MIN. TOWARDS FACE OF PIER CAP.

9. $\frac{3}{4}$" ø THREADED INSERTS FOR #5 REINFORCING BARS SHALL BE CAST-IN-PLACE IN THE PRECAST BEAMS BY THE FABRICATOR AND SHALL PROVIDE A MINIMUM NOMINAL TENSILE RESISTANCE OF 17 KIPS AND A MINIMUM NOMINAL SHEAR RESISTANCE OF 17 KIPS IN 3000 PSI CONCRETE.

*NOTES:*

1. *For NEBT 1000 use 1 dowel at midbeam,*
   *For NEBT 1200 and NEBT 1400, use 2 dowels,*
   *For NEBT 1600 and NEBT 1800, use 3 dowels equally spaced.*
2. *Dimension to be provided is equal to total thickness of bearing.*
3. *If the bearing exceeds 16" in diameter, set the 9" dimension to (Bearing Dia.)/2 + 1", and set the 10" dimension to (Bearing Dia.)/2 + 2".*
4. *The Designer shall ensure that at least 2" clear cover is maintained to the top of the deck at all locations.*
5. *Threaded inserts shall be used only on skewed bridges with a skew angle exceeding 10°. For all other bridges use 2" ø sleeves and #5 ⊏ bars as shown for typical interior bay.*

| | | |
|---|---|---|
| massDOT Massachusetts Department of Transportation Highway Division<br>LRFD BRIDGE MANUAL, PART II | DETAILS OVER PIER NOTES FOR NEBT BEAMS<br>PIER DETAILS | DATE OF ISSUE<br>JUNE 2013<br>DRAWING NUMBER<br>**6.5.10** |

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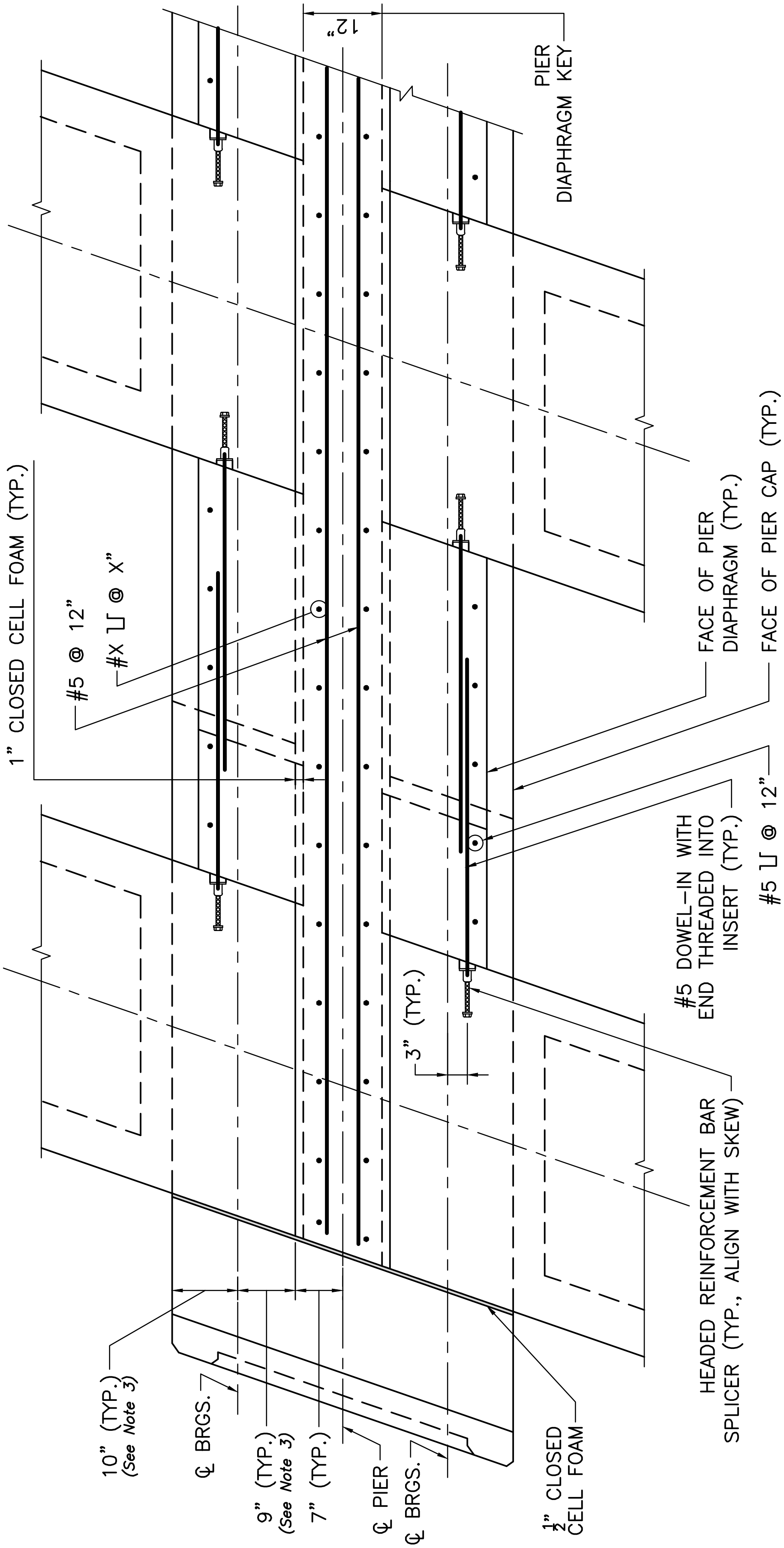
LRFD BRIDGE MANUAL, PART II

# DETAILS OVER PIER FOR BOX BEAMS

PIER DETAILS

DATE OF ISSUE
JUNE 2013

DRAWING NUMBER
**6.5.11**




*TYPICAL INTERIOR BAY*

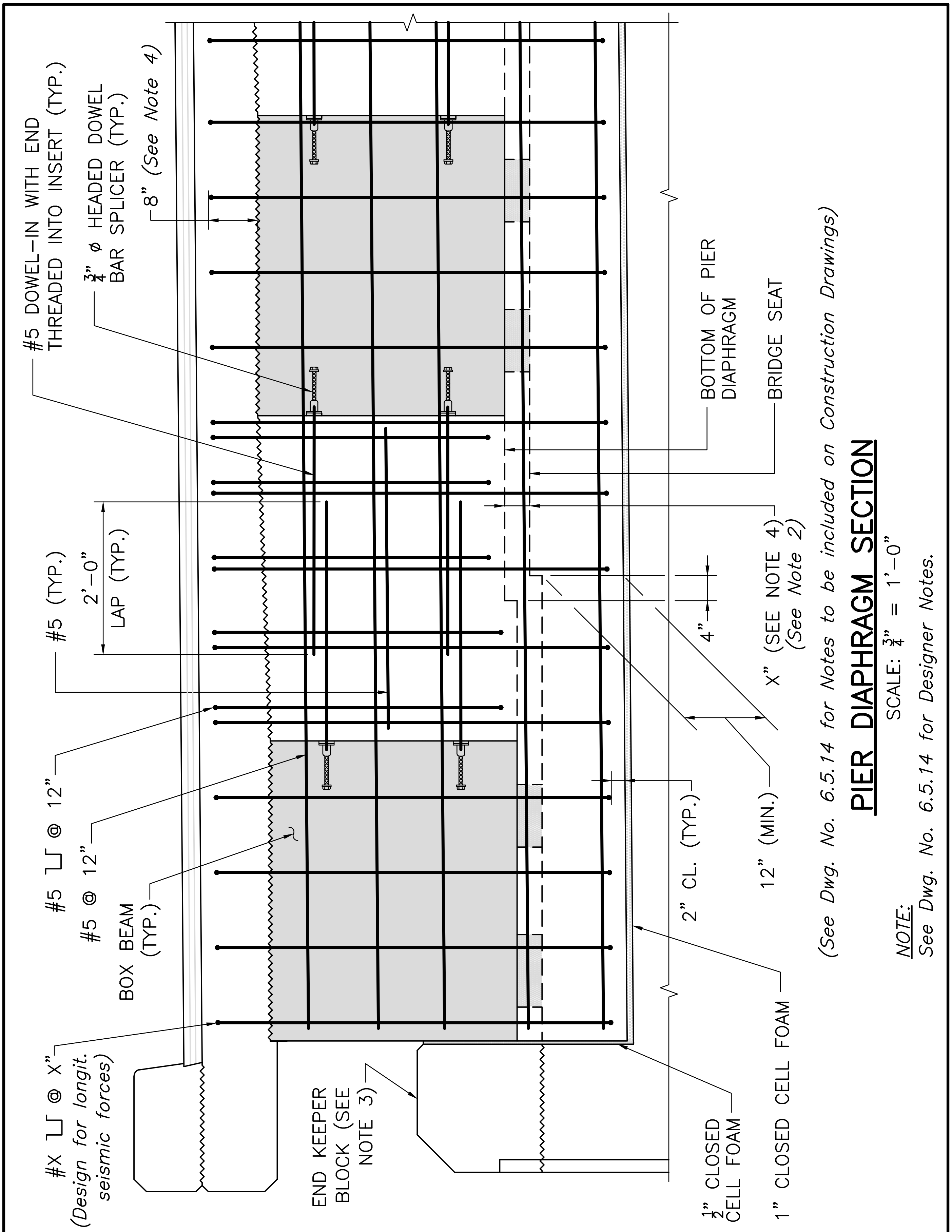
*AT END KEEPER BLOCK*

## PIER DIAPHRAGM PLAN

SCALE: ¾" = 1'–0"

NOTES:
*See Dwg. No. 6.5.14 for Designer Notes.*

| massDOT Massachusetts Department of Transportation Highway Division LRFD BRIDGE MANUAL, PART II | PIER DIAPHRAGM PLAN FOR BOX BEAMS PIER DETAILS | DATE OF ISSUE JUNE 2013 DRAWING NUMBER **6.5.12** |
|---|---|---|

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LRFD BRIDGE MANUAL, PART II

PIER DIAPHRAGM SECTION FOR BOX BEAMS

PIER DETAILS

DATE OF ISSUE
JUNE 2013

DRAWING NUMBER
**6.5.13**

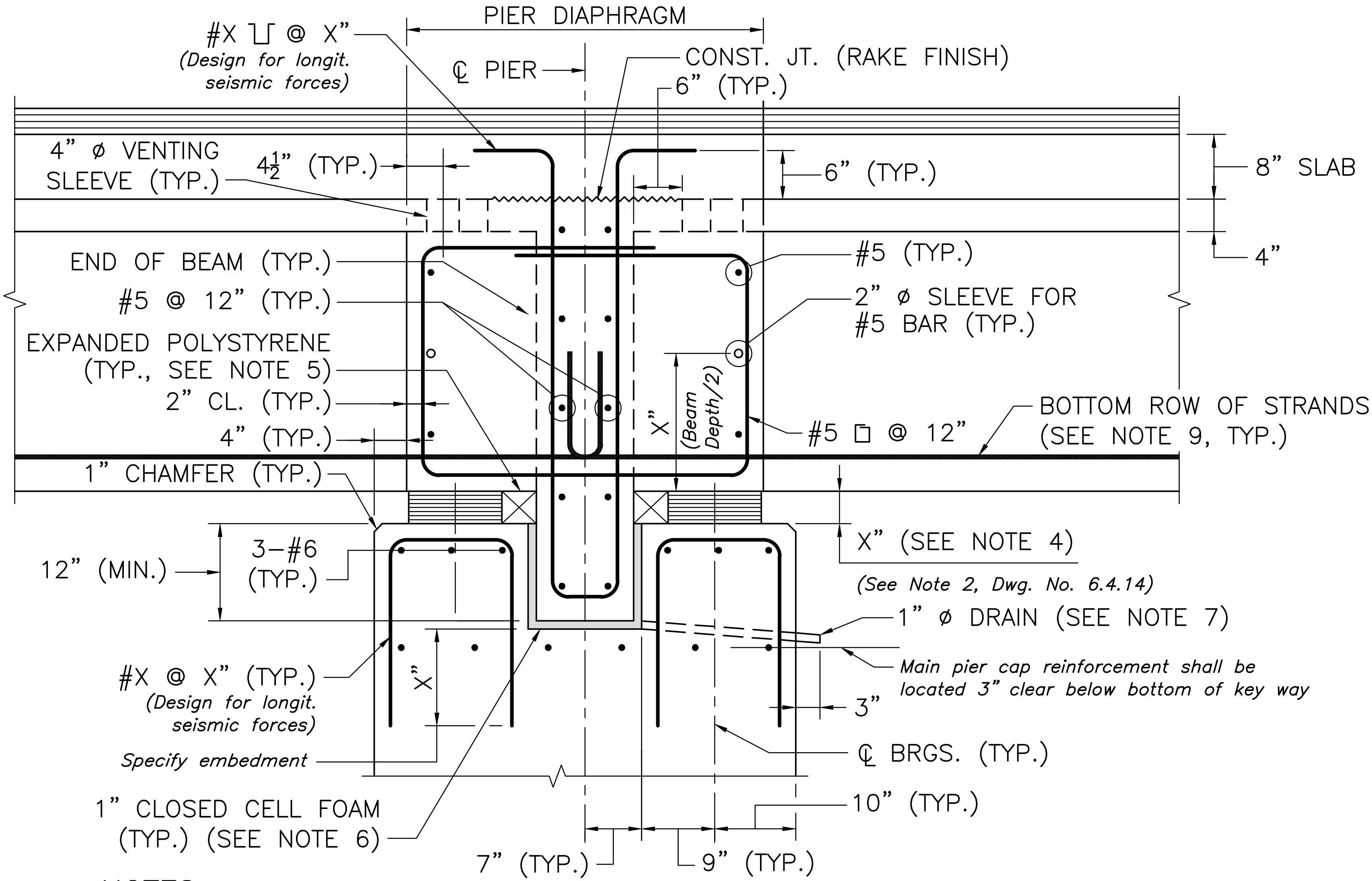
# DETAILS OVER PIER NOTES: *(Include these Notes with the details shown on Dwg. No.'s 6.5.11, 6.5.12, and 6.5.13)*

1. ALL REINFORCEMENT SHOWN IN THESE DETAILS SHALL BE COATED.
2. ALL PIER DIAPHRAGM CONCRETE SHALL BE 4000 PSI, $\frac{3}{4}$ IN, 585 HP CEMENT CONCRETE.
3. END KEEPER BLOCKS SHALL BE CAST AFTER THE BEAMS ARE ERECTED AND THE PIER DIAPHRAGM HAS BEEN CAST. ATTACH CLOSED CELL FOAM TO THE BEAMS AND DIAPHRAGM PRIOR TO PLACING END KEEPER BLOCK CONCRETE.
4. CONTRACTOR MAY USE EXPANDED POLYSTYRENE FILLER OR A REMOVABLE FORM TO FORM THE BOTTOM OF THE PIER DIAPHRAGM.
5. PLACE EXPANDED POLYSTYRENE FILLER UNDER THE BOTTOM FLANGE AT THE EDGE OF THE SHEAR KEY.
6. PRIOR TO PLACING PIER DIAPHRAGM CONCRETE, LINE ALL SURFACES OF THE SHEAR KEY WITH CLOSED CELL FOAM AS SHOWN. PIER DIAPHRAGM CONCRETE MAY NOT COME IN DIRECT CONTACT WITH THE PIER CAP CONCRETE MASONRY.
7. SLOPE SHEAR KEY DRAIN 5% MIN. TOWARDS FACE OF PIER CAP.
8. $\frac{3}{4}$" ø THREADED DOWEL BAR SPLICERS SHALL BE CAST–IN–PLACE BY THE FABRICATOR AND SHALL BE EMBEDDED AS REQUIRED TO PROVIDE A MINIMUM NOMINAL TENSILE RESISTANCE OF 17 KIPS AS SPECIFIED BY THE MANUFACTURER.

*<u>NOTES:</u> (These Notes are for details shown on Dwg. No.'s 6.5.11, 6.5.12, and 6.5.13)*

1. *Provide headed dowel bar splicers by beam designation as follows:*
   - *B–24 thru B–30 beams* — *1 headed reinforcement bar splicer mid beam;*
   - *B–33 thru B–48 beams* — *2 headed reinforcement bar splicers as shown.*

   *Provide #5 intermediate reinforcing bars by beam designation as follows:*
   - *B–24 thru B–30 beams* — *No intermediate bars;*
   - *B–33 thru B–48 beams* — *1 intermediate bar midway between splicers.*
2. *Dimension to be provided is equal to total thickness of bearing.*
3. *If the bearing exceeds 16" in diameter, set the 9" dimension to (Bearing Dia.)/2 + 1", and set the 10" dimension to (Bearing Dia.)/2 + 2".*
4. *The Designer shall ensure that at least 2" clear cover is maintained to the top of the deck at all locations.*




NOTES:

*(See Dwg. No. 6.5.10 for Notes 1 through 8 to be included on the Construction Drawings, and modify Note 7 as shown)*

7. PROVIDE VENTING SLEEVES IN THE TOP FLANGE OF THE NEXT F BEAMS AS SHOWN.

9. DECK SLAB REINFORCEMENT AND THE REMAINDER OF STRANDS IN BEAMS NOT SHOWN FOR CLARITY.

## DETAILS OVER PIER

SCALE: $\frac{3}{4}$" = 1'–0"

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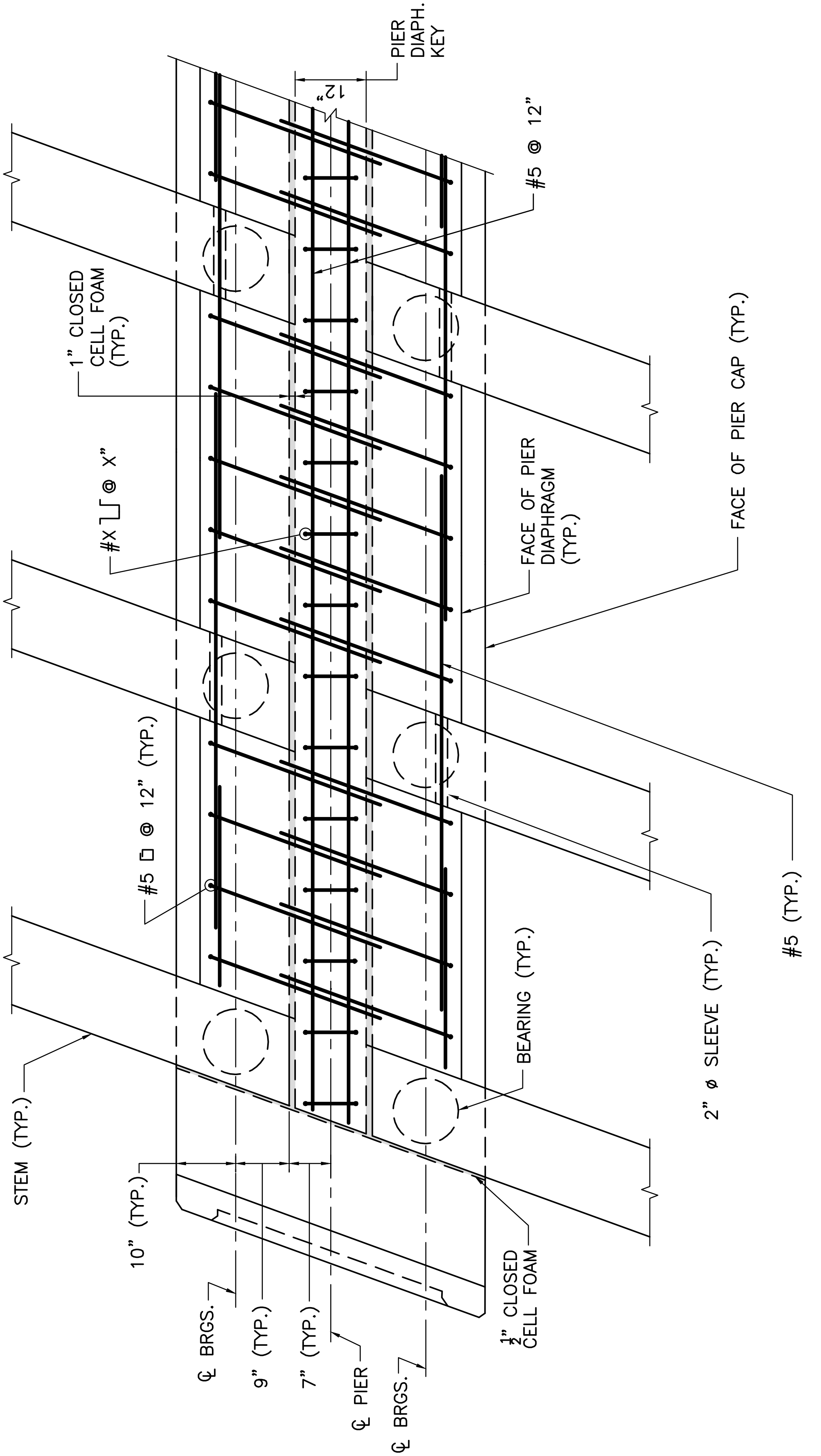
LRFD BRIDGE MANUAL, PART II

# DETAILS OVER PIER FOR NEXT F BEAMS

PIER DETAILS

DATE OF ISSUE
JUNE 2013

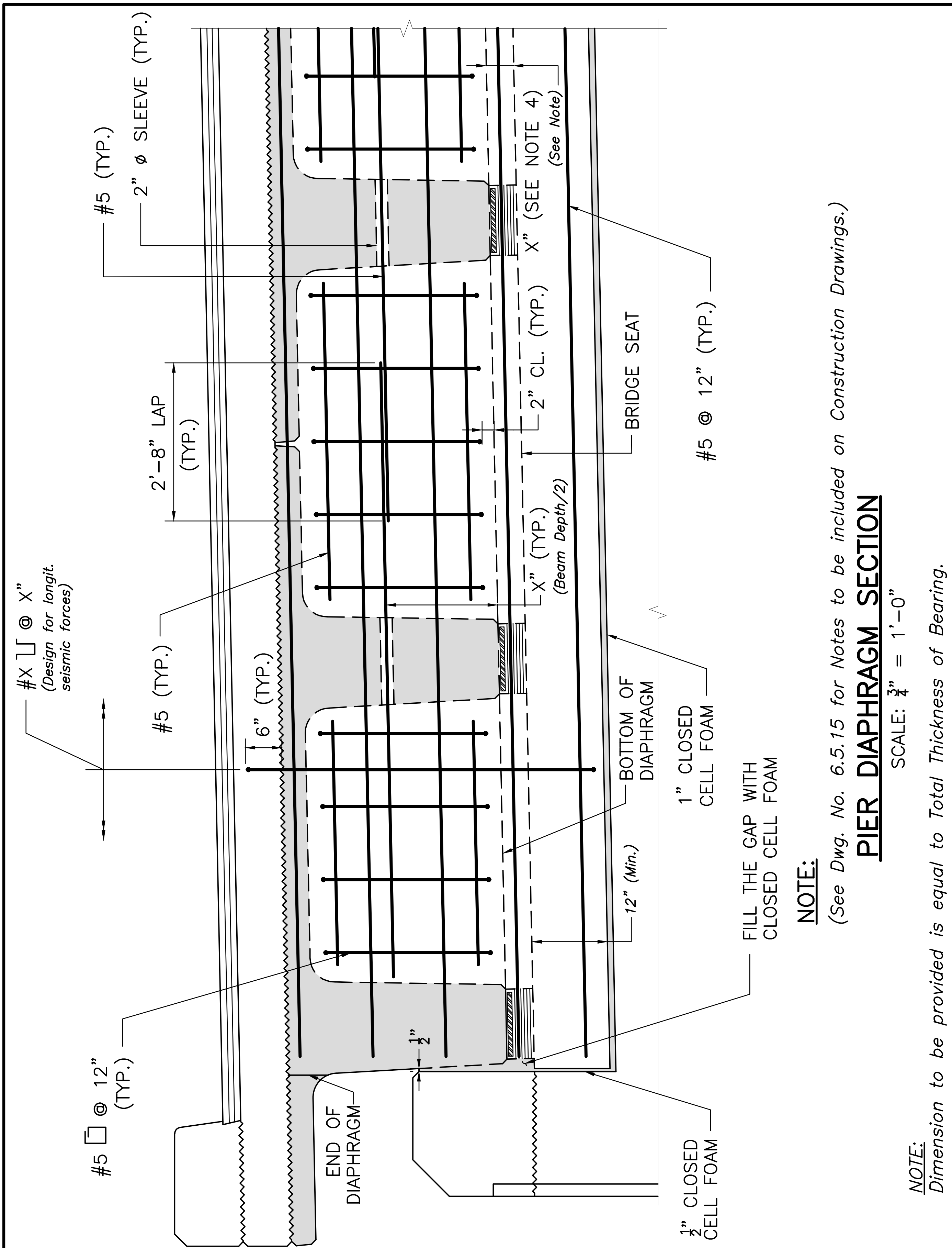
DRAWING NUMBER
**6.5.15**



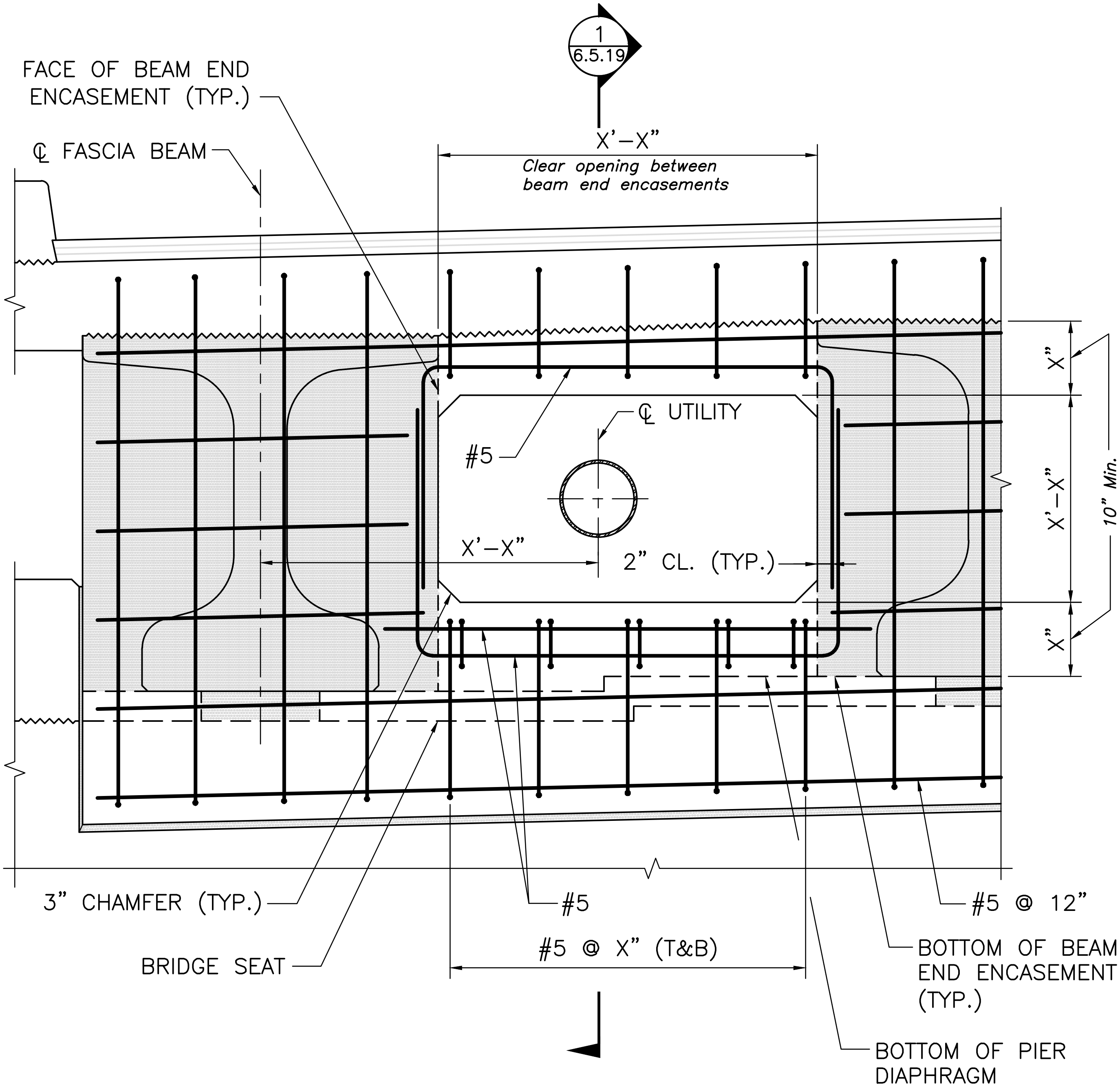

**HORIZONTAL SECTION THRU PIER DIAPHRAGM**

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

| massDOT Massachusetts Department of Transportation Highway Division<br>LRFD BRIDGE MANUAL, PART II | NEXT F BEAMS – HORIZ. SECTION THRU PIER DIAPHRAGM<br>PIER DETAILS | DATE OF ISSUE<br>JUNE 2013<br>DRAWING NUMBER<br>**6.5.16** |
|---|---|---|




| | | |
|---|---|---|
| massDOT Massachusetts Department of Transportation Highway Division<br>LRFD BRIDGE MANUAL, PART II | NEXT F BEAMS – VERTICAL SECTION THRU PIER DIAPHRAGM<br><br>PIER DETAILS | DATE OF ISSUE<br>JUNE 2013<br><br>DRAWING NUMBER<br>**6.5.17** |




NOTE:

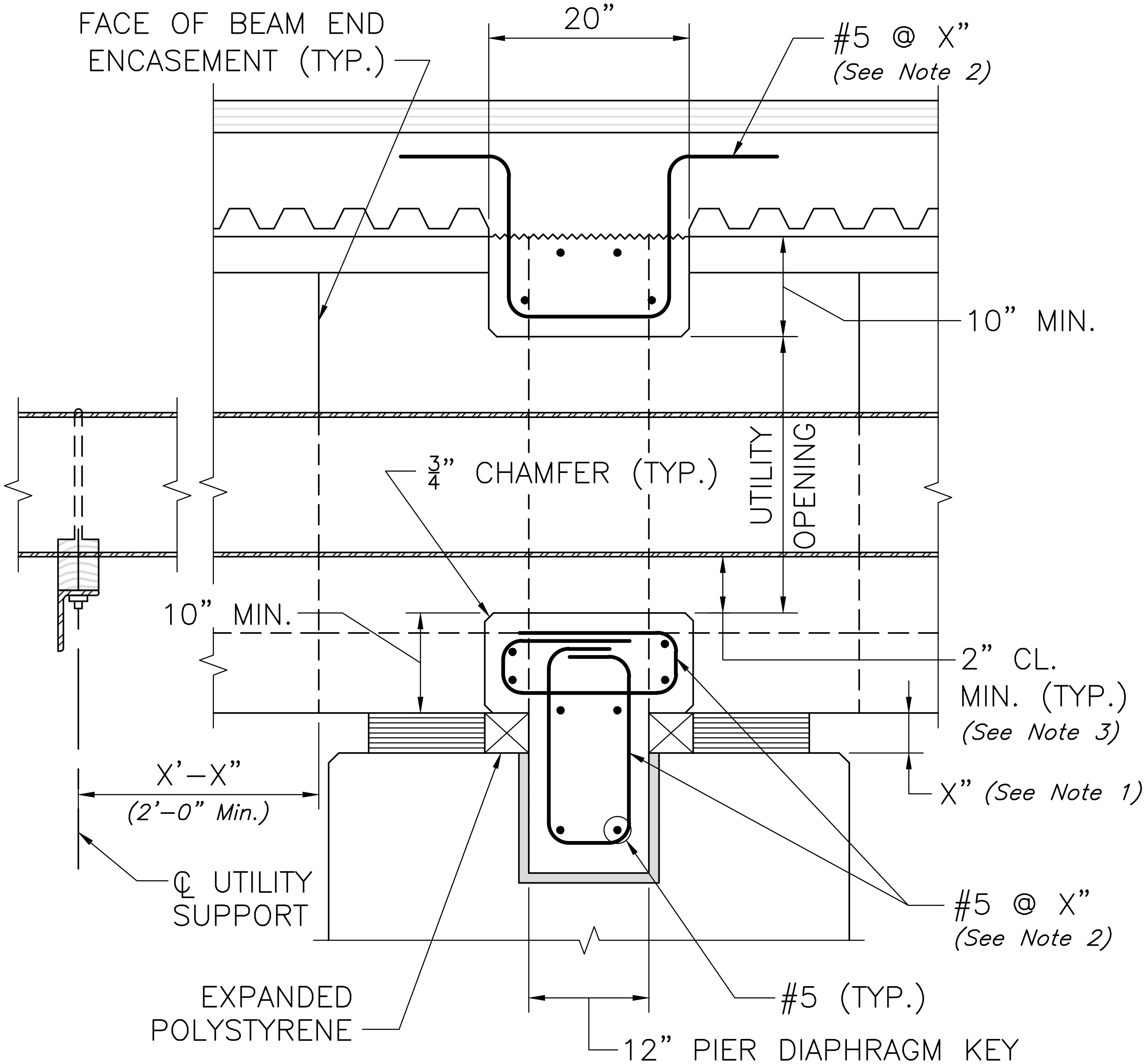
BEAM END ENCASEMENT REINFORCEMENT NOT SHOWN FOR CLARITY.

## UTILITY DETAIL AT PIER

SCALE: $\frac{3}{4}$" = 1'–0"

*NOTE:*
*The type of utility is conceptual and shall be modified to accommodate the actual type.*

| | | |
|---|---|---|
| massDOT Massachusetts Department of Transportation Highway Division<br>LRFD BRIDGE MANUAL, PART II | UTILITY BAY DETAILS FOR NEBT BEAMS<br>PIER DETAILS | DATE OF ISSUE<br>JUNE 2013<br>DRAWING NUMBER<br>6.5.18 |




NOTE:

BEAM END ENCASEMENT REINFORCEMENT AND PIER CAP REINFORCEMENT NOT SHOWN FOR CLARITY.

## SECTION 1

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

*NOTES:*

1. *Dimension to be provided is equal to Total Thickness of Bearing.*
2. *Use same spacing as for the typical pier diaphragm reinforcement.*
3. *The Designer shall verify that the clearances required by utilities are maintained.*
4. *The type of utility is conceptual and shall be modified to accommodate the actual type.*

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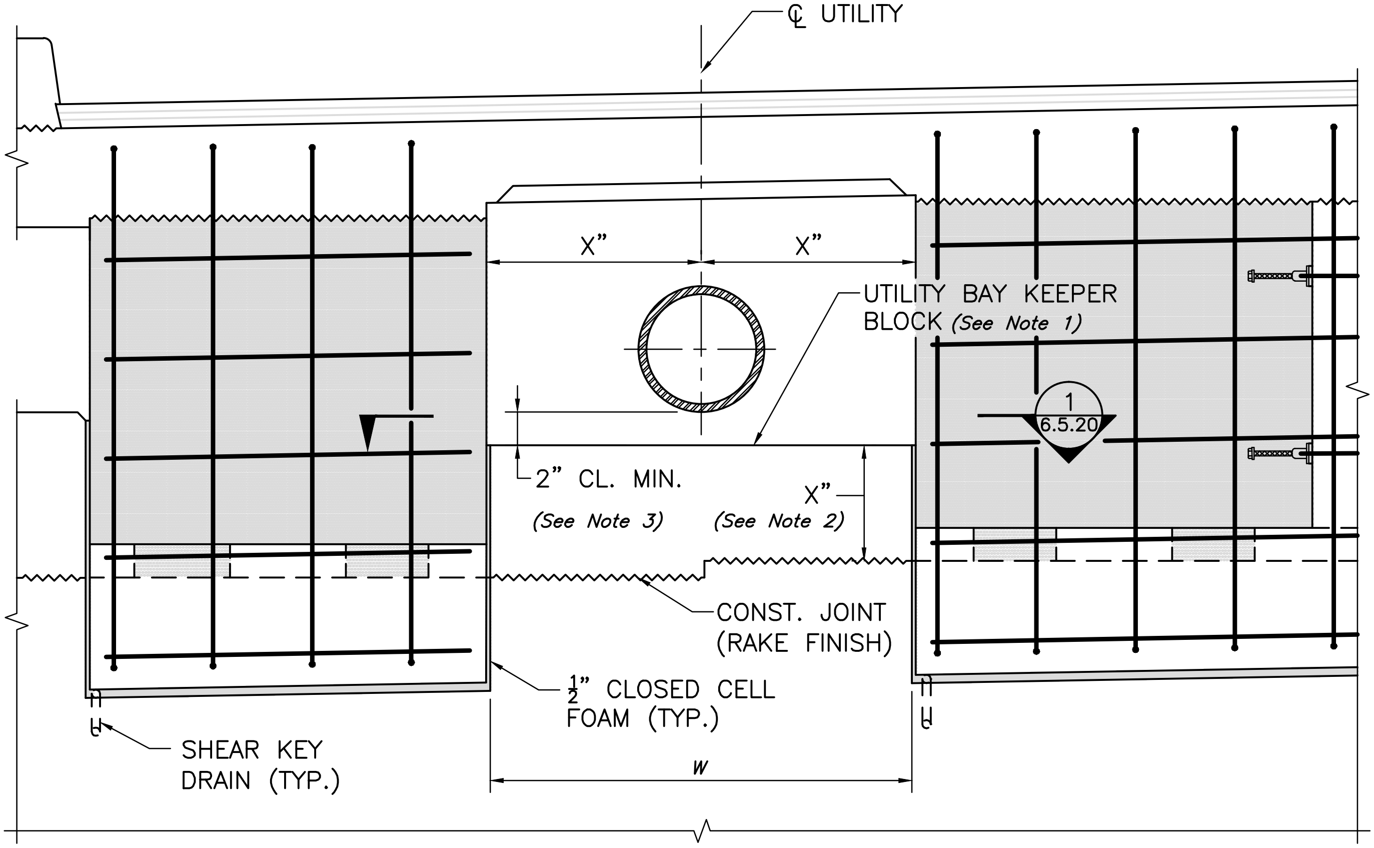
| massDOT Massachusetts Department of Transportation Highway Division<br>LRFD BRIDGE MANUAL, PART II | SECTION THRU UTILITY BAY FOR NEBT BEAMS<br>PIER DETAILS | DATE OF ISSUE<br>JUNE 2013<br>DRAWING NUMBER<br>**6.5.19** |




## UTILITY DETAIL AT PIER

SCALE: ¾" = 1'–0"

*NOTES:*

1. *Reinforcement for utility bay keeper block shall be the same as for the intermediate keeper blocks. Refer to Dwg. No. 6.5.5 and show all relevant details on the Construction Drawings.*
2. *Height of keeper block: h shall be less or equal to W/3, 10" Min.*
3. *The Designer shall verify that the clearances required by utilities are maintained.*
4. *The type of utility is conceptual and shall be modified to accommodate the actual type.*

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|---|---|---|
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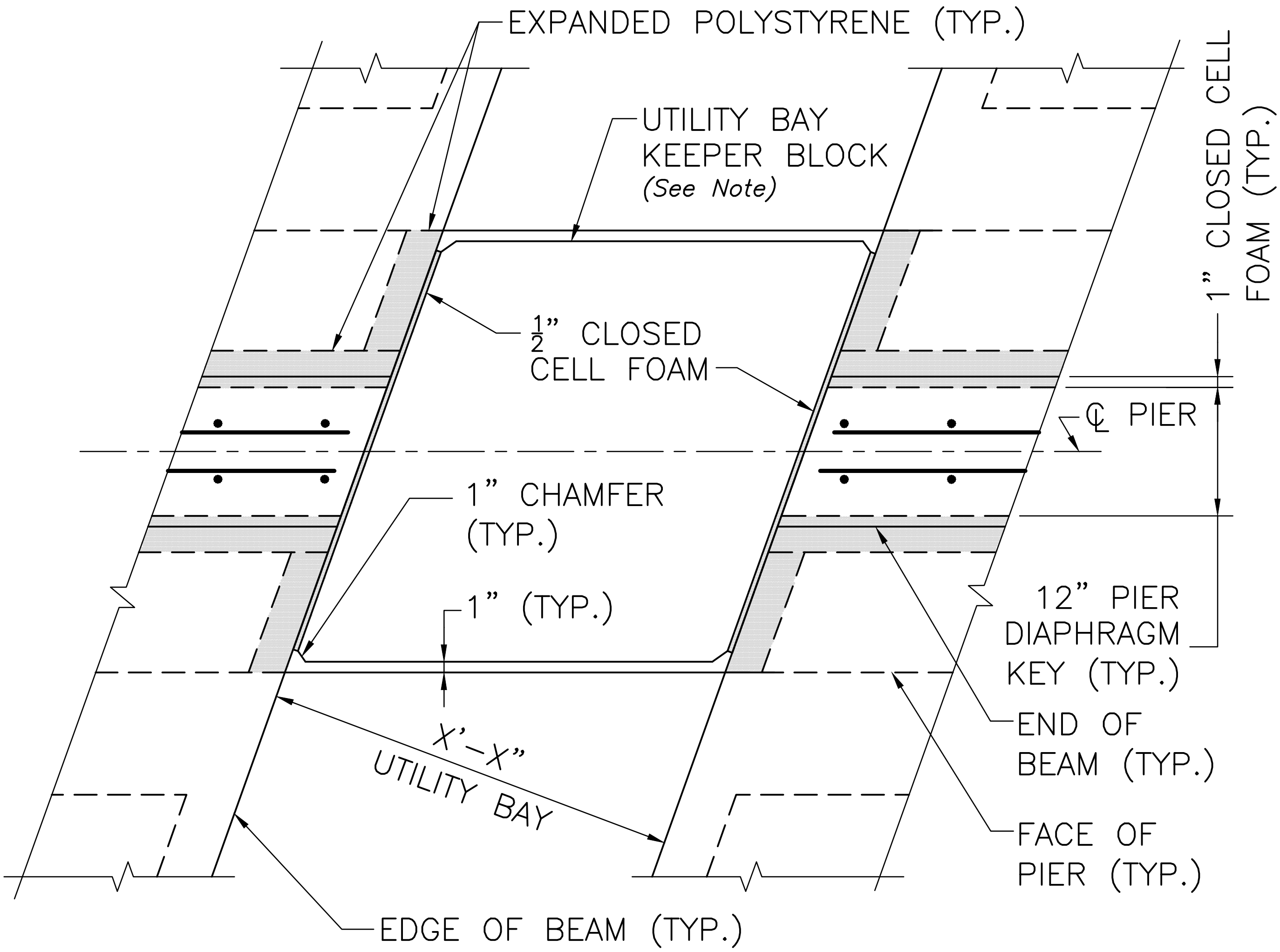


NOTE:

KEEPER BLOCK SHALL BE CAST AFTER BEAMS ARE ERECTED AND THE PIER DIAPHRAGM HAS BEEN CAST. ATTACH CLOSED CELL FOAM TO THE BEAMS AND DIAPHRAGM PRIOR TO PLACING KEEPER BLOCK CONCRETE.

## SECTION 1

SCALE: ¾" = 1'–0"

*NOTE:*

*Reinforcement for utility bay keeper block shall be the same as for the intermediate keeper blocks. For additional dimensions, details and Designer Notes, refer to Dwg. No. 6.5.5 and show all on the Construction Drawings.*

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