Bridge Design Details 8.1 January 2023

Typical Section

The TYPICAL SECTION sheet provides specific details for the bridge or retaining wall section. Do not clutter this sheet; instead, use additional sheets for special deck details, slab reinforcing layouts, precast girders or retaining wall details.

Typical Section

1. Place at top of sheet looking ahead on station. Note the orientation if non-standard. For skewed bridges, section should be draw perpendicular to the edge of deck or direction of travel.
2. The preferred scale is ¼" = 1'-0" for single structures. Use ⅛" = 1' – 0" for extremely wide structures or parallel (left/right) structures.
3. Show only concrete dimensions, including the top slab, bottom slab and overhang thickness, or primary geometric dimensions of steel, precast concrete or other types of bridges. Do not show any reinforcement.
4. Do not show lanes and shoulders shown on GENERAL PLAN.
5. Show the girder spacing, overhang and overall deck width measured from bridge layout line.
6. Show utilities and future utility openings. Identify utility type, size, owner and location from bridge layout line.
7. Show bridge rail type, width and locations; provide reference to the appropriate Standard Plan or other detail sheets.
8. Show drip grooves and provide reference to the appropriate *Standard Plan*.
9. Do not show any portion of the substructure or supports.
10. Show the location of the PROFILE GRADE and typical direction of the cross slope. Include arrow and “+” or “-“ direction showing slope away from the PROFILE GRADE. If the cross slope varies along the structure, show as “± (Cross Slope) & VARIES”. Provide SUPERELEVATION DIAGRAM on another sheet; typically, the DECK CONTOURS sheet is a good location.
11. Show the deck overlay and the limits of refinishing the bridge deck. Structure depth dimension should not include the thickness of the overlay.

12. Show limits and dimensions of Bridge Removal (Portion) as hatched. Include LEGEND of hatching.
13. Identify bridge rail to be salvaged on widenings. Do not hatch rail if rail is to be salvaged.
14. All of the details above and PART TYPICAL SECTION may be combined into one larger TYPICAL SECTION if there is room on the sheet. In that case, see PART TYPICAL SECTION details and minimum scale below.

Part Typical Section

1. Place below the TYPICAL SECTION.
2. Preferred scale is usually ½" = 1'- 0", but not less than ⅜" = 1'- 0".
3. For symmetrical cross sections, showing the overhang, one exterior and one interior bay is usually sufficient (add NOTE: Left side shown, right side similar). If the bay dimensions vary, or there are dissimilar overhangs, show additional details using break lines. On variable-width bays, only show reinforcement that is different than typical bays.
4. For precast girders, show the structure depth at centerline of support bearings to help calculate haunch thickness and camber. Provide the total number of precast girders.
5. Show deck reinforcing clearances that are different than 2" (e.g., freeze-thaw and marine environments). Do not show 2" clearances.
6. Show the deck top and bottom transverse reinforcement size and spacing. Reference applicable *Standard Plans*. Give the direction of placement of transverse reinforcement, see Bridge Design Details: 8.8 Typical Transverse Reinforcement.
7. Show all slab distribution bars and other reinforcement in deck, girders, and soffit. Reference applicable *Standard Plans* or other sheets such as GIRDER REINFORCEMENT for additional details.
8. Show barrier and sidewalk dowels, but do not indicate size or spacing. Reference *Standard Plan*, if appropriate.
9. Call out all epoxy-coated reinforcement.

Miscellaneous

1. Combine the GIRDER LAYOUT and TYPICAL SECTION sheets, when possible, see *Bridge Design Details*: 9.1 Girder Layout.
2. If any other sections or details are shown on this sheet (such as end diaphragm or curb details), they should be drawn at the same or compatible scale as the PART TYPICAL SECTION; minimum ⅜" = 1'-0" and maximum 1" = 1'-0".
3. For widening projects, show Temporary Barrier System with attachment details, existing reinforcement details, width of closure pour and approximate concrete removal limits. Widths of widening shall be shown using "±"; whereas the total final width of the structure shall be shown without "±".
4. If a future widening is anticipated, refer to guidance for additional bottom transverse reinforcing in overhang.

Retaining Wall Typical Section

1. Orientate TYPICAL SECTION looking ahead on station. Identify all sections by letter if section or type of retaining wall varies.
2. Preferred scale usually ½" = 1'- 0", but not less than ⅜" = 1'- 0" if reinforcement is shown.
3. Show retaining wall layout line and location of PROFILE GRADE. Include dimensions required to calculate location, height and thickness of typical wall section.
4. Show typical location of original grade and finished grade, refer to ROADWAY PLANS when appropriate.
5. Show all drainage features such as geocomposite drains, weep holes, gutters and underdrains.
6. Show details and limits of payment for structural concrete facing and architectural concrete surface texture.
7. Show existing structures or other obstructions in relation to retaining wall including utilities. Note if to be removed.
8. For Modified Standard retaining walls, identify pile type, and footing modifications. Refer to specific Standard Plans or Standard XS-Sheet Details.
9. For Soldier Pile retaining walls, identify timber/concrete lagging, concrete anchors, concrete walers, ground anchors, drilled hole and pile type. Show the limits of payment for piles, concrete backfill, clean and paint surfaces. Include details from Standard XS-Sheet Details.

10. For Soil Nail and Ground Anchor retaining walls, identify construction sequence and details for ground anchors, initial shotcrete facing, and structural concrete facing. Include details for ground anchors from Standard XS-Sheet Details.
11. For Mechanically Stabilized Embankment (MSE) walls show leveling pad, base width and facing elements. Show soil reinforcement layers. Include details from Standard XS-Sheet Details.

Figure 8A.A.1 Typical Section Detailing Example 1

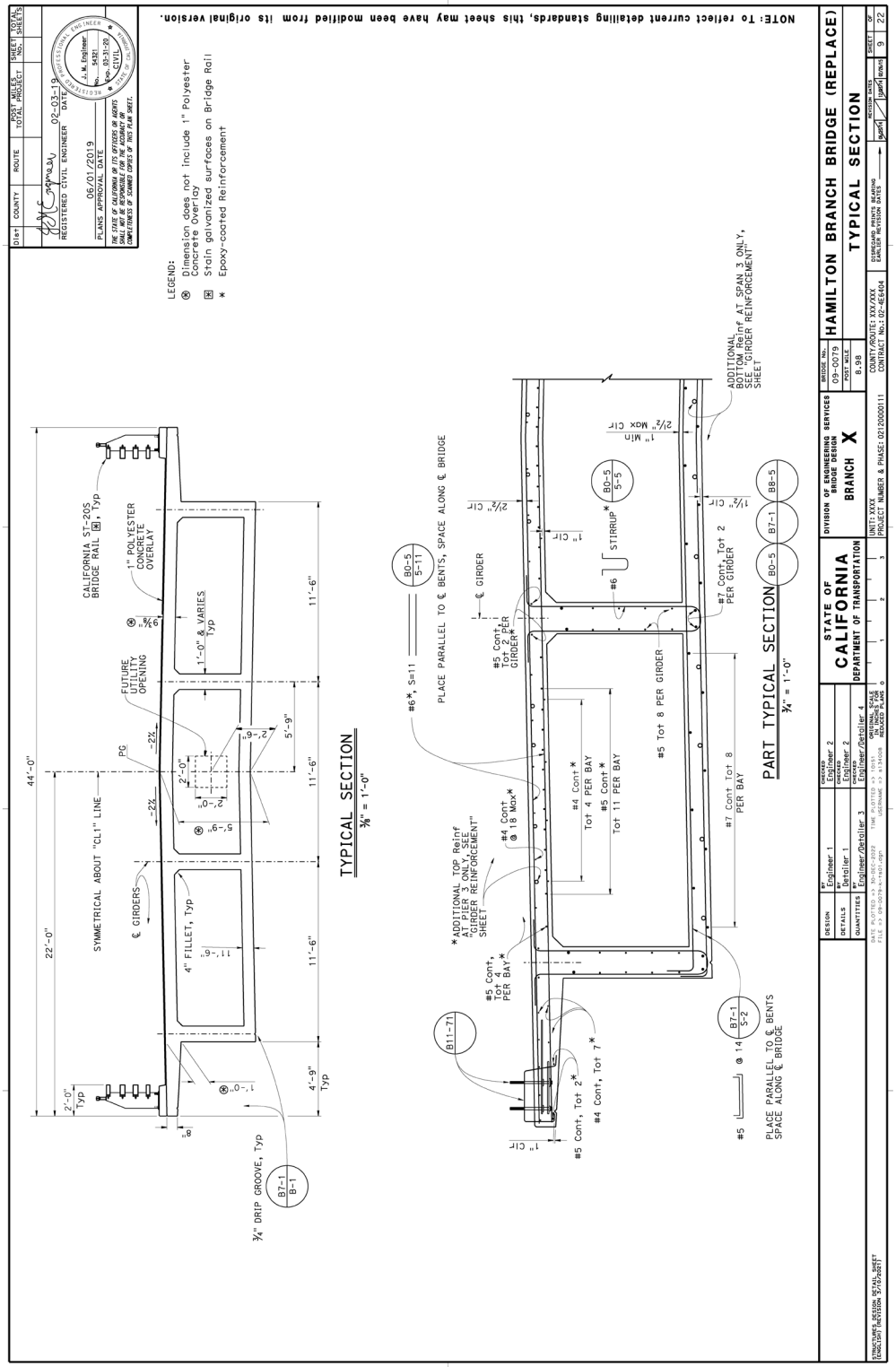


Figure 8A.A.2 Typical Section Detailing Example 2

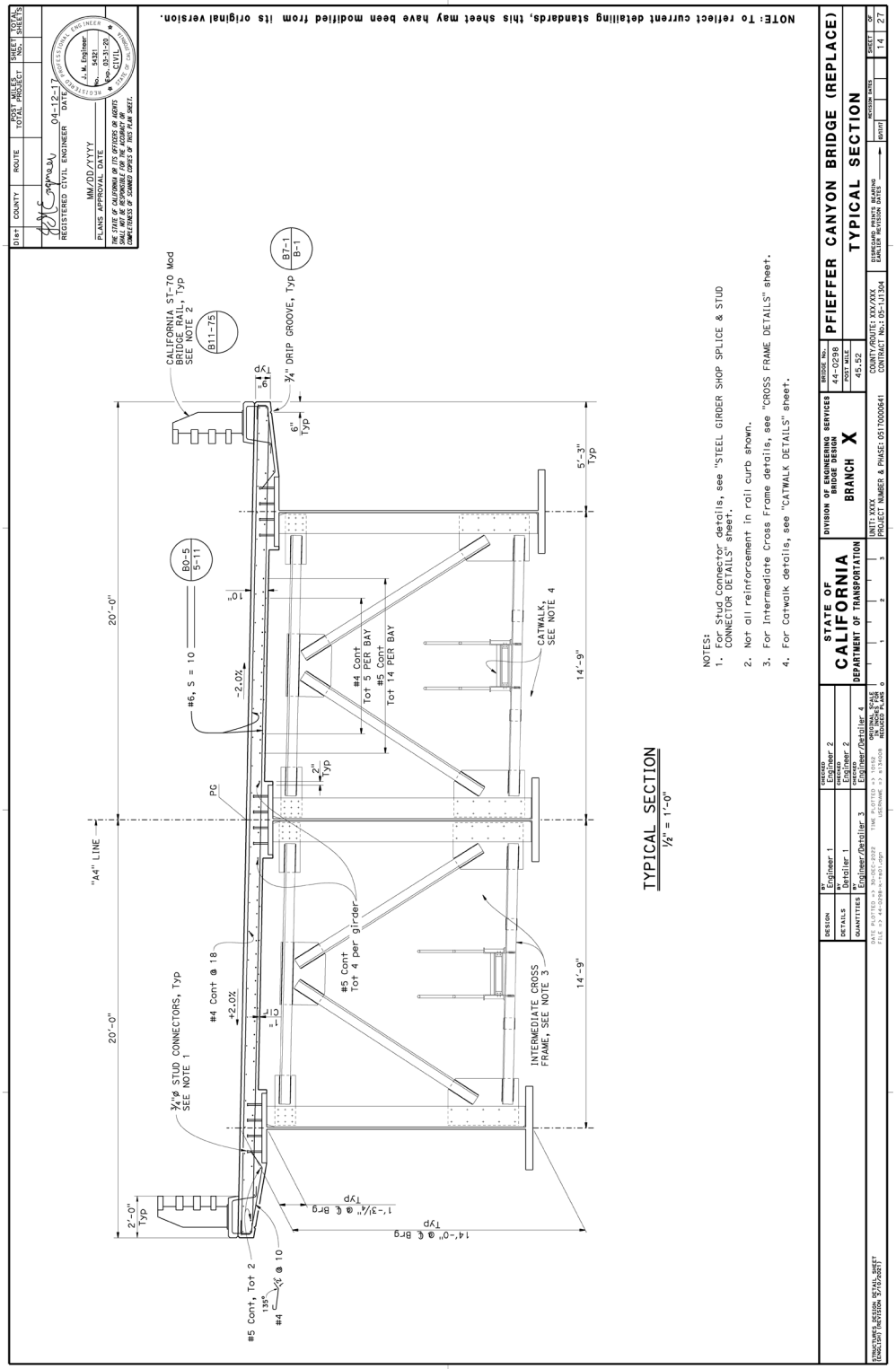


Figure 8A.A.3 Typical Section Detailing Example 3

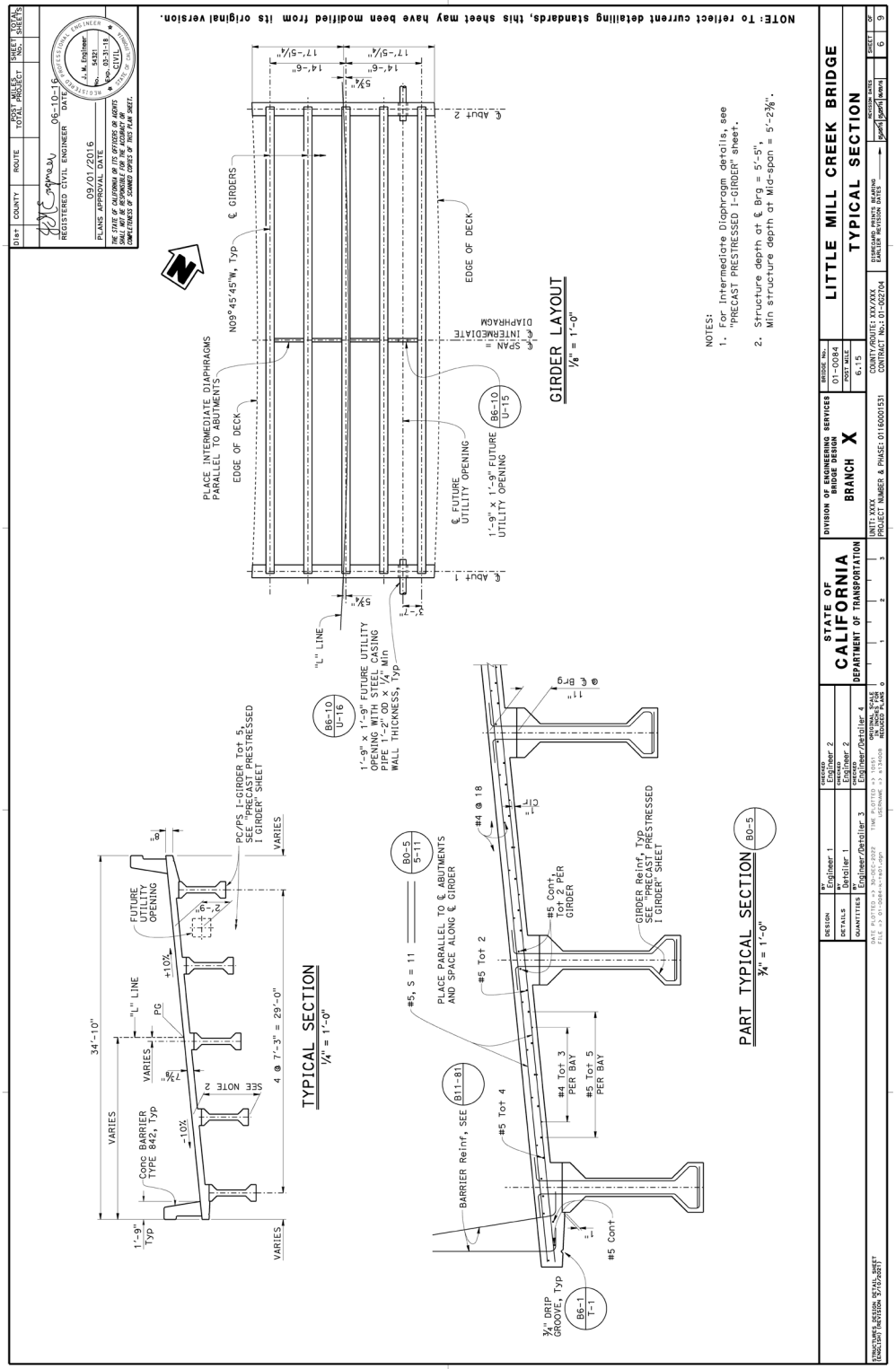


Figure 8A.A.4 Typical Section Detailing Example 4

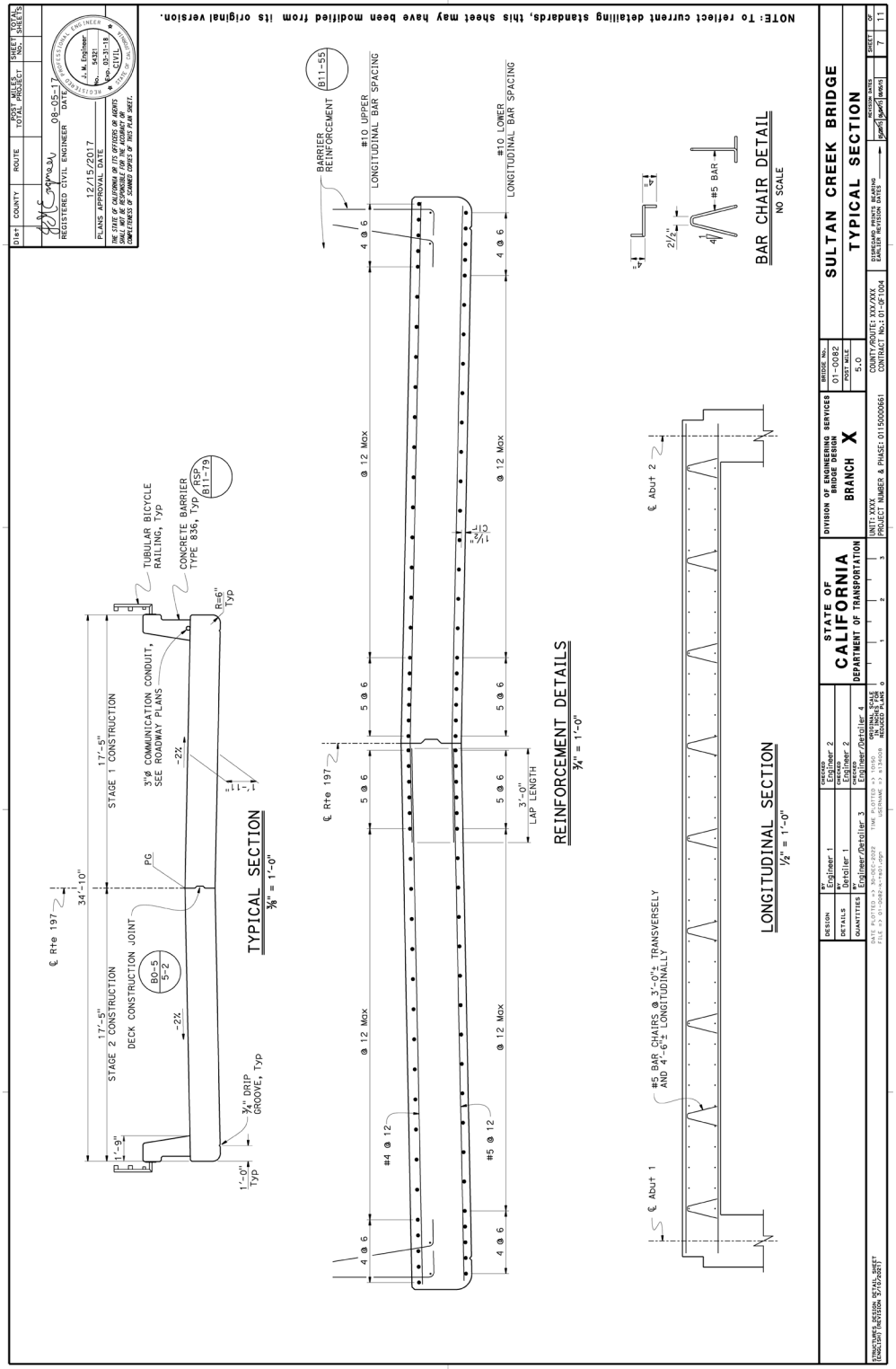


Figure 8A.A.5 Typical Section Detailing Example 5

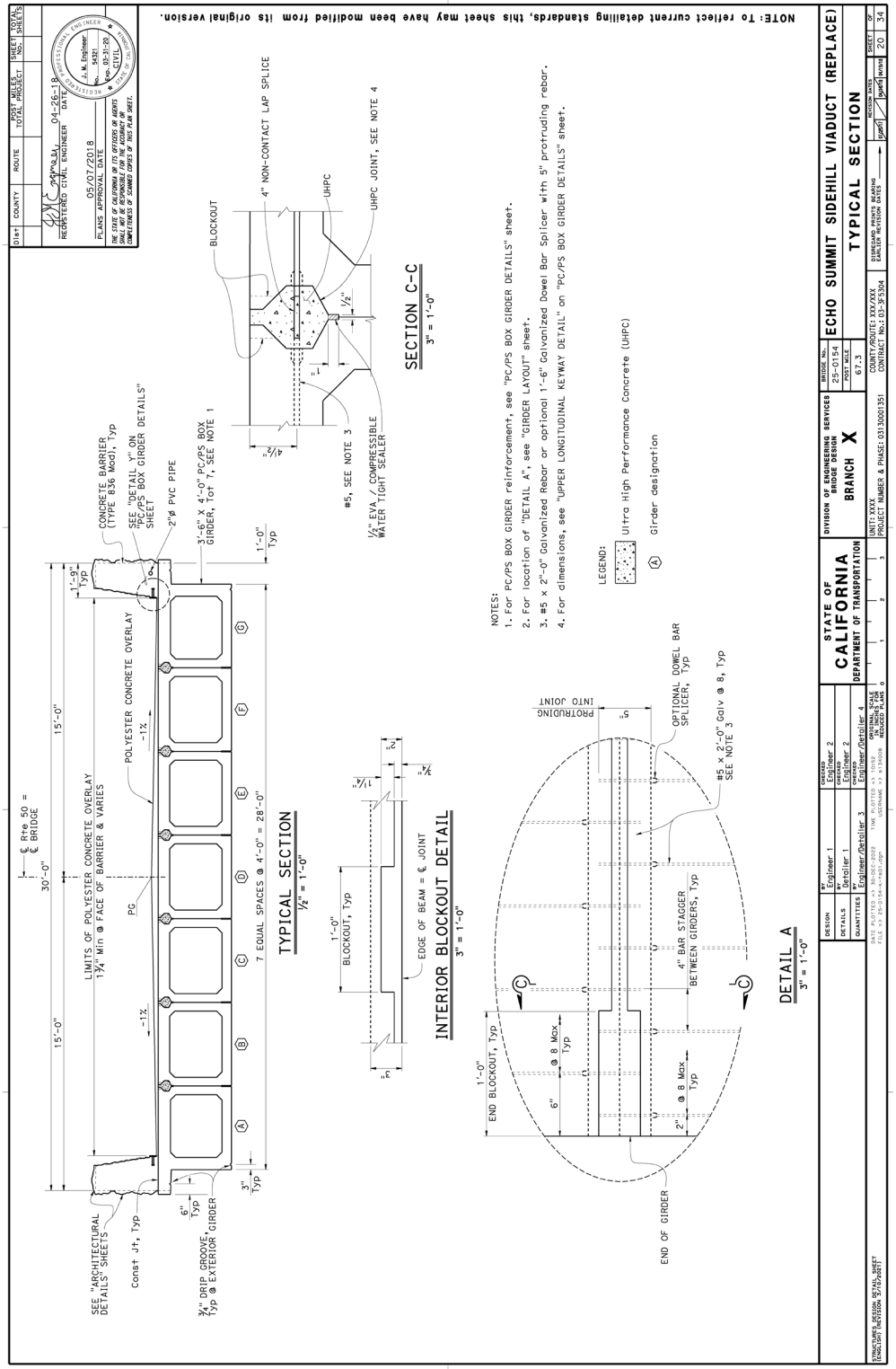
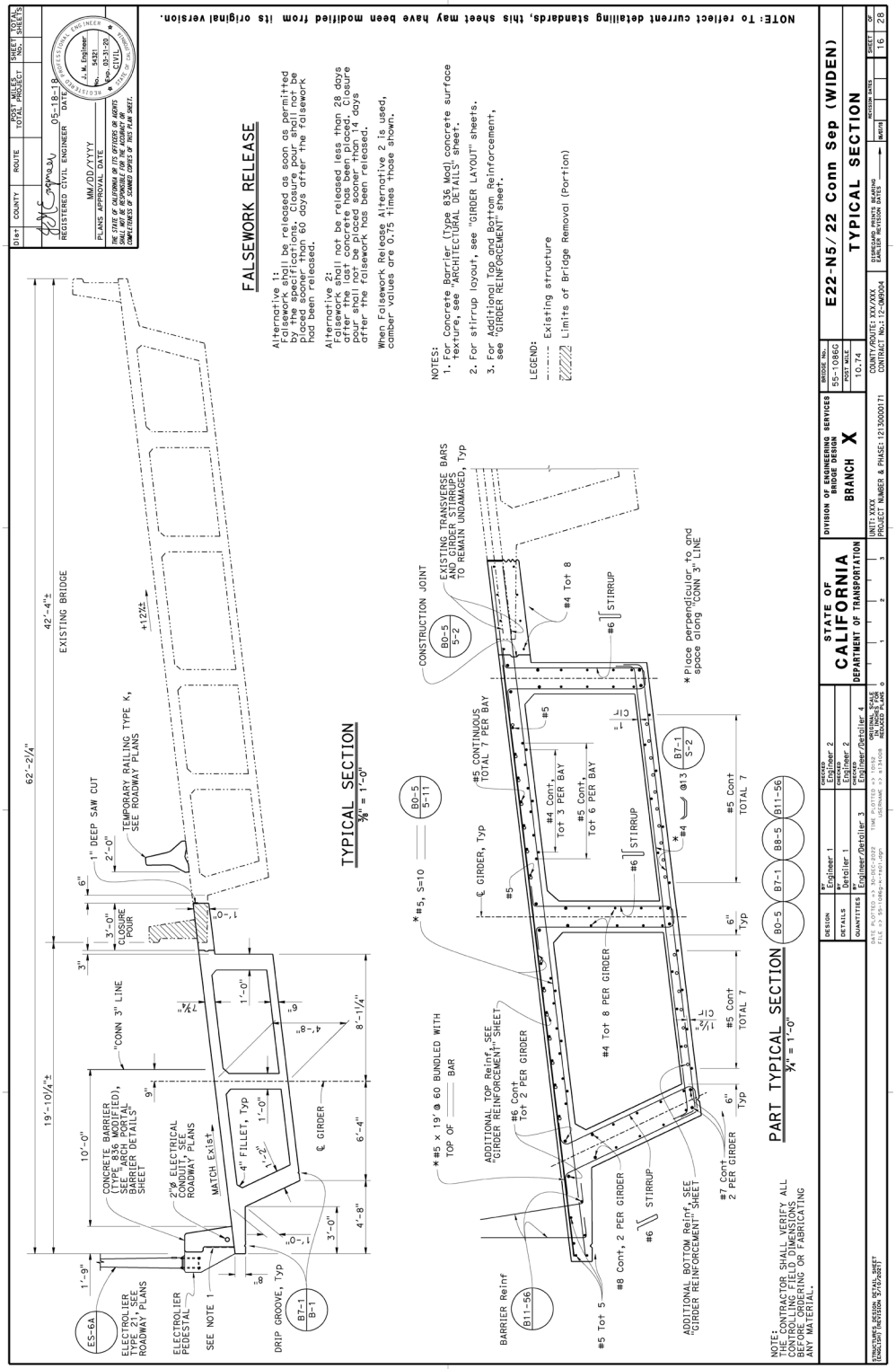
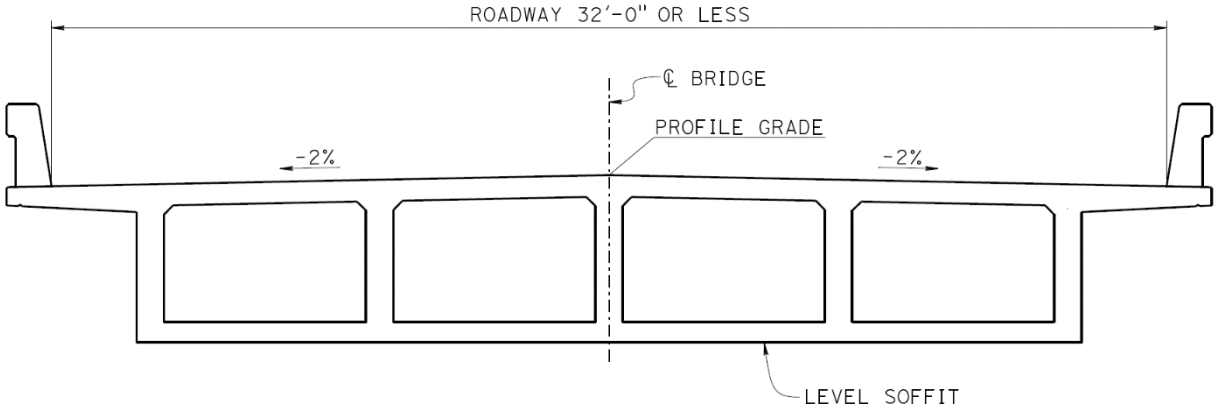


Figure 8A.A.6 Typical Section Detailing Example 6



Bridge Design Details 8.2 January 2023

Box Girder Soffits



NOTE: The soffit may be cast on a straight line between the outside bottom edges of the box girder as approved by Engineer. Deck slab thickness remains as shown. Stem and stirrup heights and soffit thickness will vary to meet finished grade and provided clearances shown.

Figure 8.2.1 Box Girder Level Soffit

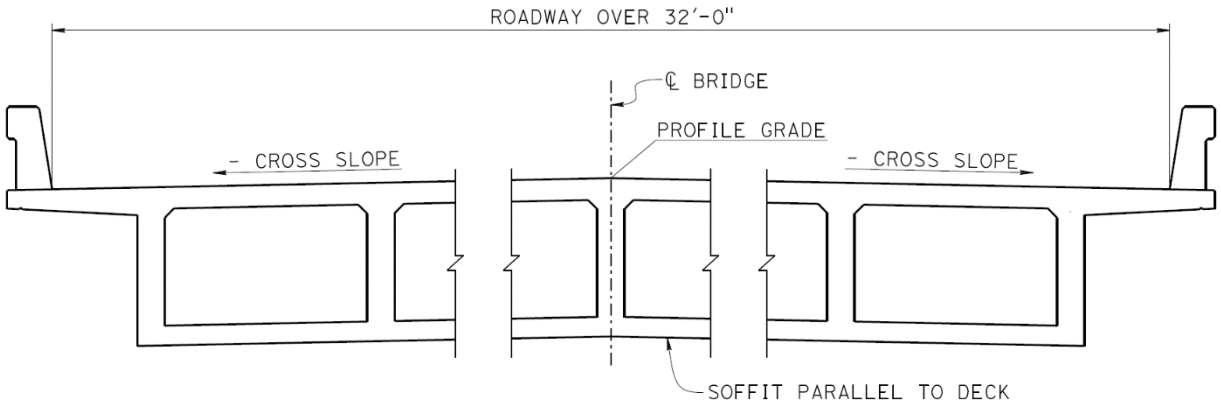


Figure 8.2.2 Box Girder Parallel Soffit

Notes:

1. Crowned box girder soffit may be level and thickness vary when the roadway is less than 32'-0" and deck cross slope is ≤ 2%.
2. Show the box girder as constant depth when the roadway is greater than 32'-0", in this case the soffit should be parallel to deck slope.
3. Minimum structure depth shown on the plans shall correspond to outside edge of exterior girder (soffit to deck). Minimum vertical clearance for a structure is measured from bottom edge of exterior girder to finish grade.

Bridge Design Details 8.3 January 2023

Sloped Exterior Girders

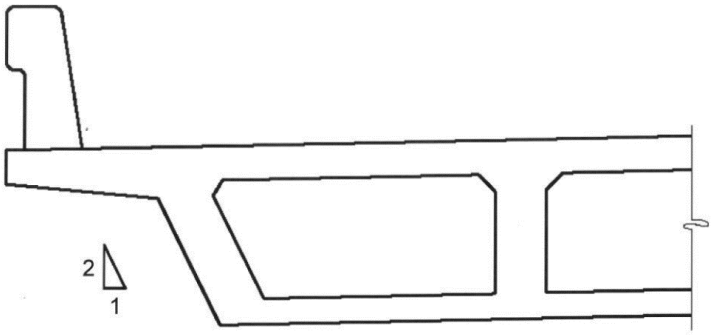


Figure 8.3.1 Sloped Exterior Girder

A standard 1:2 slope should be used for the exterior face of reinforced concrete or prestressed concrete box girders when the general configuration shown above is desired for architectural purposes. The 2:1 slope is relative to the slope of the deck surface to allow for superstructure falsework used for the girder stems to be reused for the deck construction (lost deck) whenever possible.

Typical sections on the plans should be dimensioned as shown below to obtain this slope. The slope will vary at superelevation transitions.

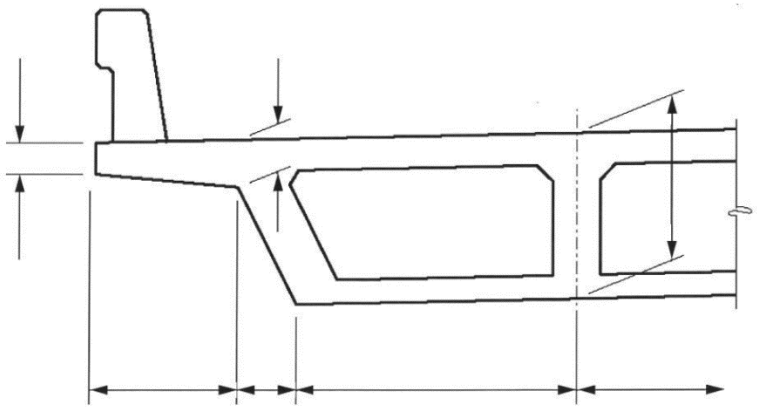
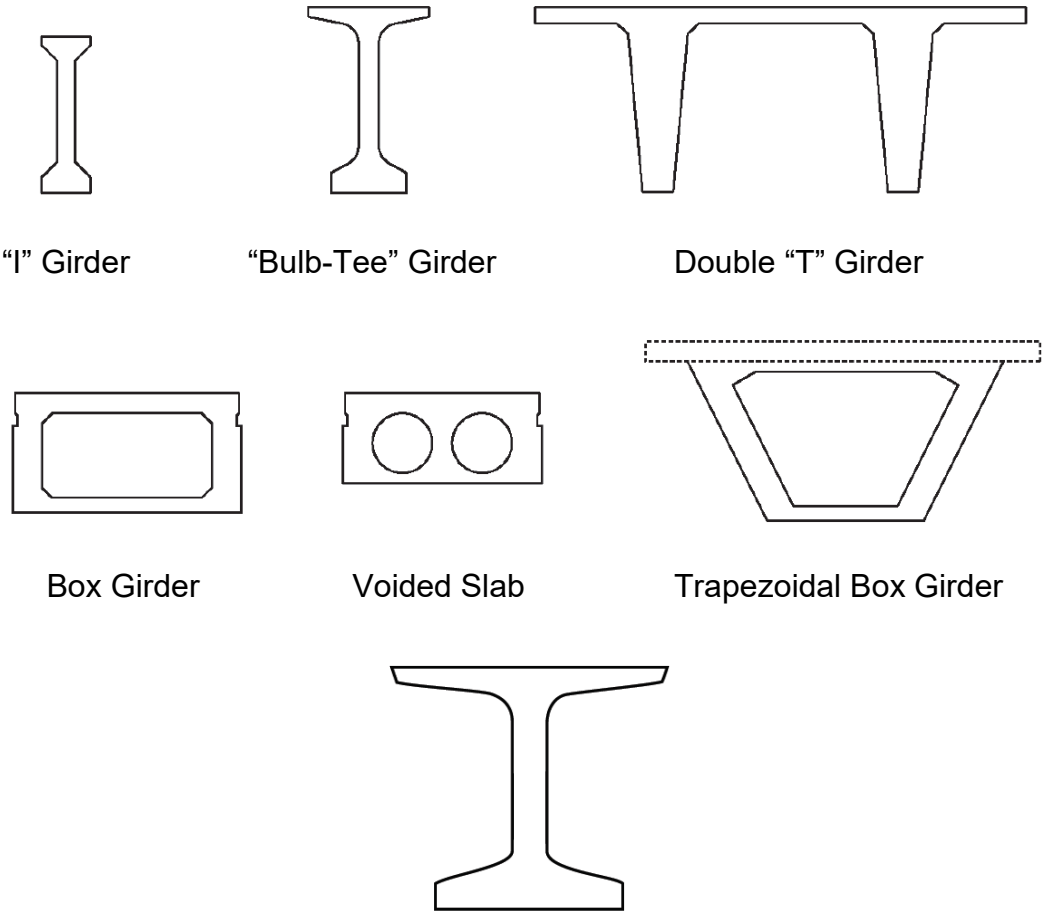


Figure 8.3.2 Sloped Exterior Girder Dimensions

Bridge Design Details 8.4 January 2023

Standard Precast Prestressed Girders

Not all standard precast prestressed girder types shown, for additional precast prestressed girder details, see *Standard Details (XS Sheets)*.



"I" Girder

"Bulb-Tee" Girder

Double "T" Girder

Box Girder

Voided Slab

Trapezoidal Box Girder

California "Wide-Flange" Girder

Figure 8.4.1 Standard Precast Girders

Bridge Design Details 8.5 January 2023

Part Typical Section

This example illustrates the use of Standard Plan detail symbols and the detailing necessary to coordinate a PART TYPICAL SECTION with “Standard Plans” for a concrete box girder. The designer will provide the design data to be used from deck design charts and guidance, shown elsewhere. Similar details will be provided for superstructures with precast and steel girders.

Additional transverse bars in the overhang/deck may be required depending on barrier.

The longitudinal bars on the outside face of the exterior sloping girders will be spaced at 9 inches maximum. This maximum spacing was chosen to aid the placement and vibration of concrete.

Reinforced concrete box girders with 12" wide girder stems require two continuous longitudinal bars at the bottom of each girder. Only one continuous bar is required when the girder stems are 8" wide.

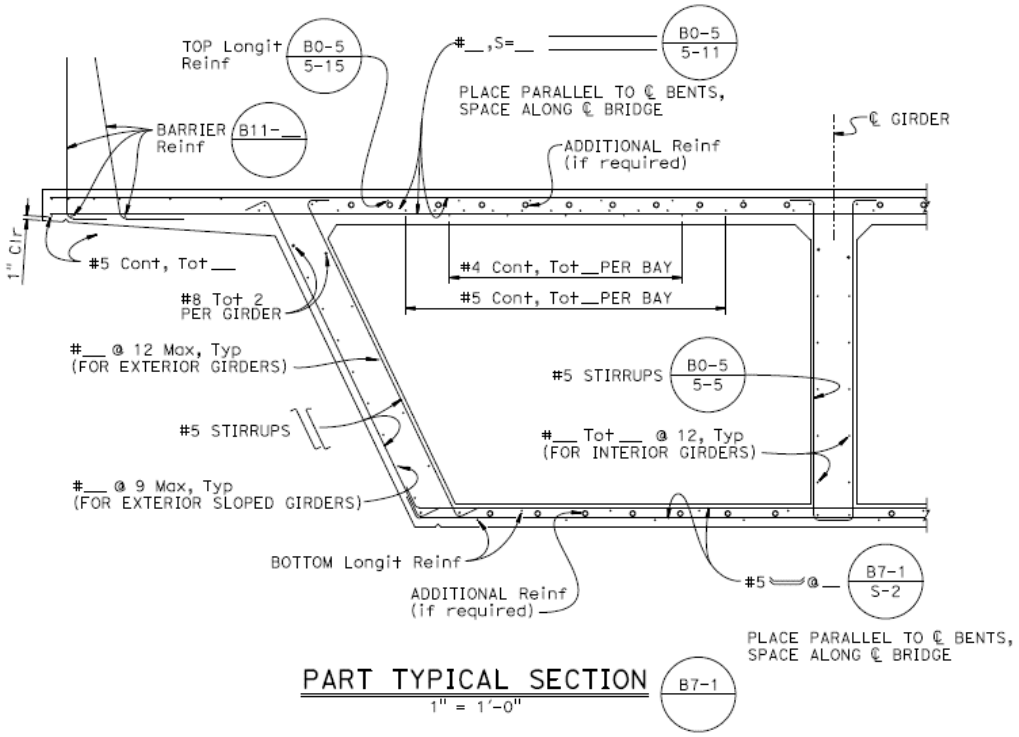


Figure 8.5.1 Part Typical Section Details

Bridge Design Details 8.6 January 2023

Variable Bay Transverse Reinforcement

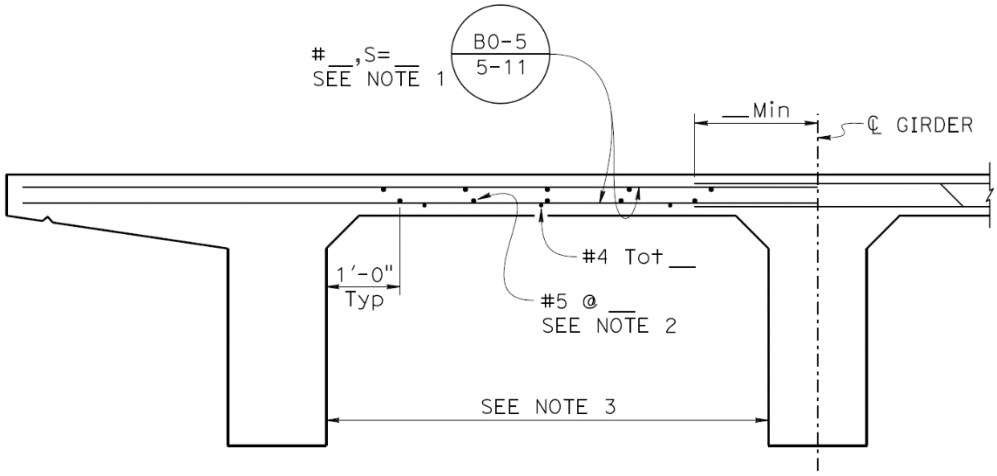


Figure 8.6.1 Transverse Reinforcement for Exterior Girders

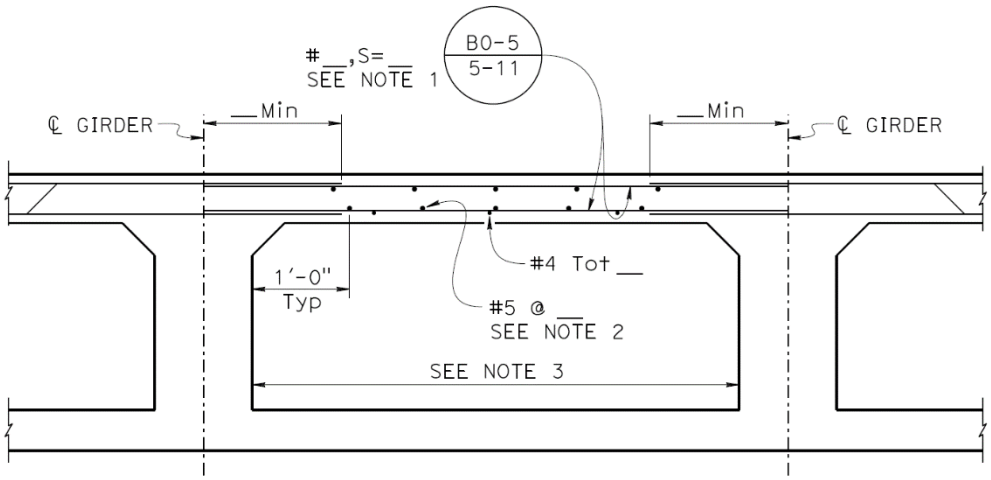


Figure 8.6.2 Transverse Reinforcement for Interior Girders

Notes:

1. Use the same size bar at ¾ the spacing of adjacent transverse reinforcement. Transverse bar spacing is consistent for both arrangements, see *Standard Plan* B0-5.
2. The designer determines the required distribution of reinforcement.
3. Deck slab and soffit may be thickened, or larger bars used if the variable bay is wider than the adjacent bay.

Bridge Design Details 8.7 January 2023

Minimum Reinforcement at Deck Overhangs

The following illustration together with related information shows the minimum amount of longitudinal reinforcing steel placed adjacent to barrier dowels and at the edges of decks. The detail applies to deck slabs for steel girders, T-Beams, box girders, prestressed girders, or other situations, but not slab bridges.

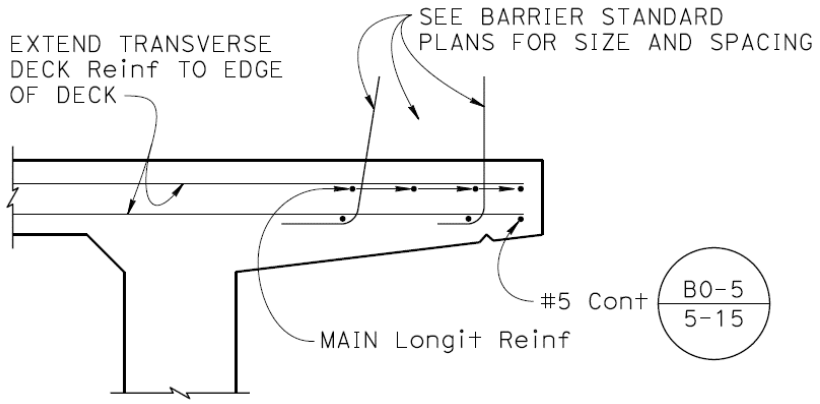


Figure 8.7.1 Barrier and Sidewalk Minimum Longitudinal Reinforcement

Notes:

1. The minimum reinforcement shown is necessary to anchor the barrier and sidewalk to the deck. Using the minimum reinforcement, deck cracking at the concrete barrier joints will be minimized.
2. Overhang reinforcement should be indicated on TYPICAL SECTION and DECK REINFORCEMENT sheets. The overhang reinforcement supports the barrier reinforcement and distributes traffic impact loads to the deck slab.

Bridge Design Details 8.8 January 2023

Typical Transverse Reinforcement

The following details describe the use of *Standard Plan*: B0-5 Bridge Details, 5-11 for deck transverse reinforcement of skewed structures. Similar details can be used for soffit reinforcement.

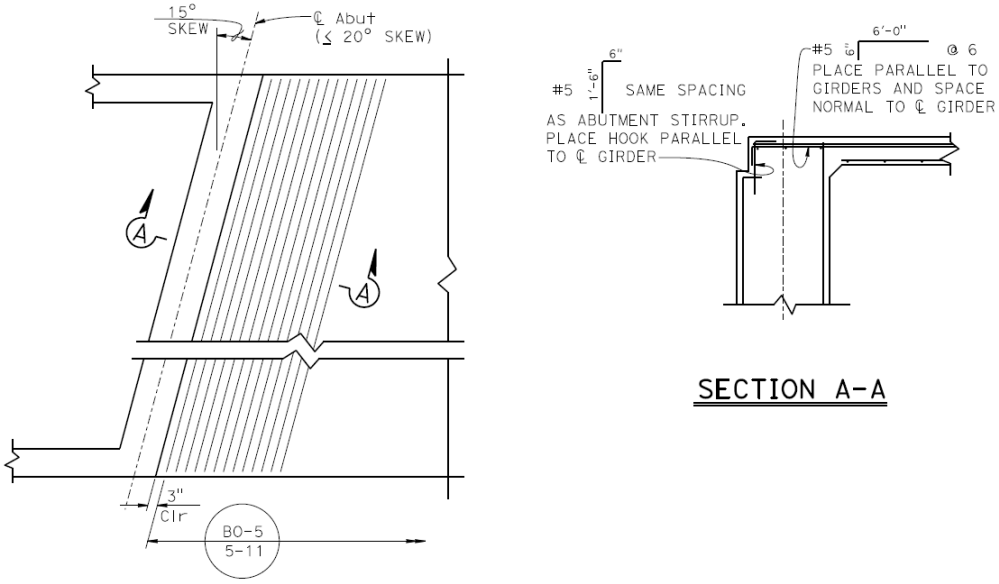


Figure 8.8.1 Transverse Deck Reinforcement Details at Abutment (≤ 20° Skew)

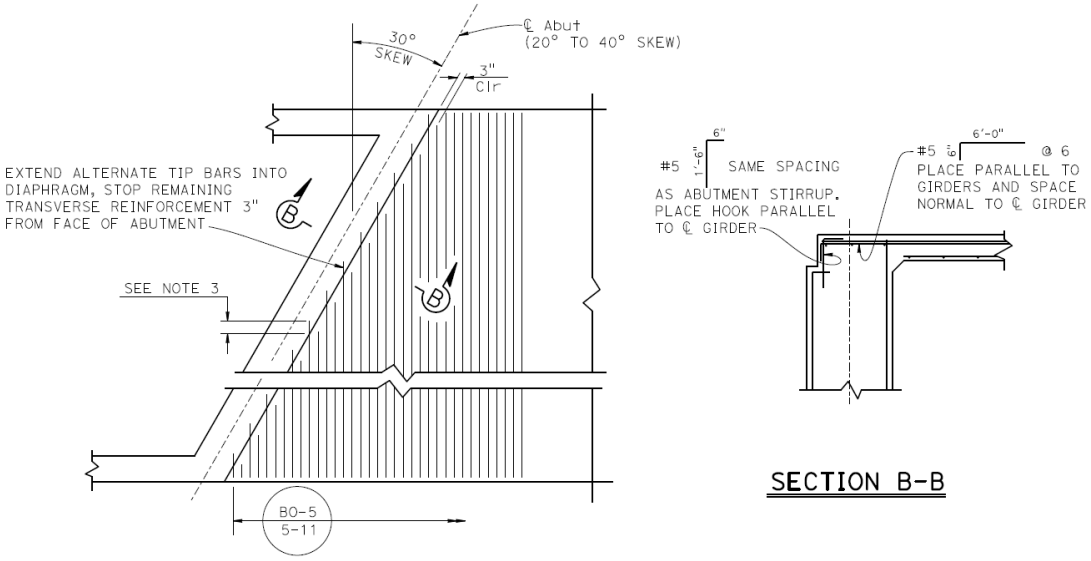


Figure 8.8.2 Transverse Deck Reinforcement Details at Abutment (20° to 40° Skew)

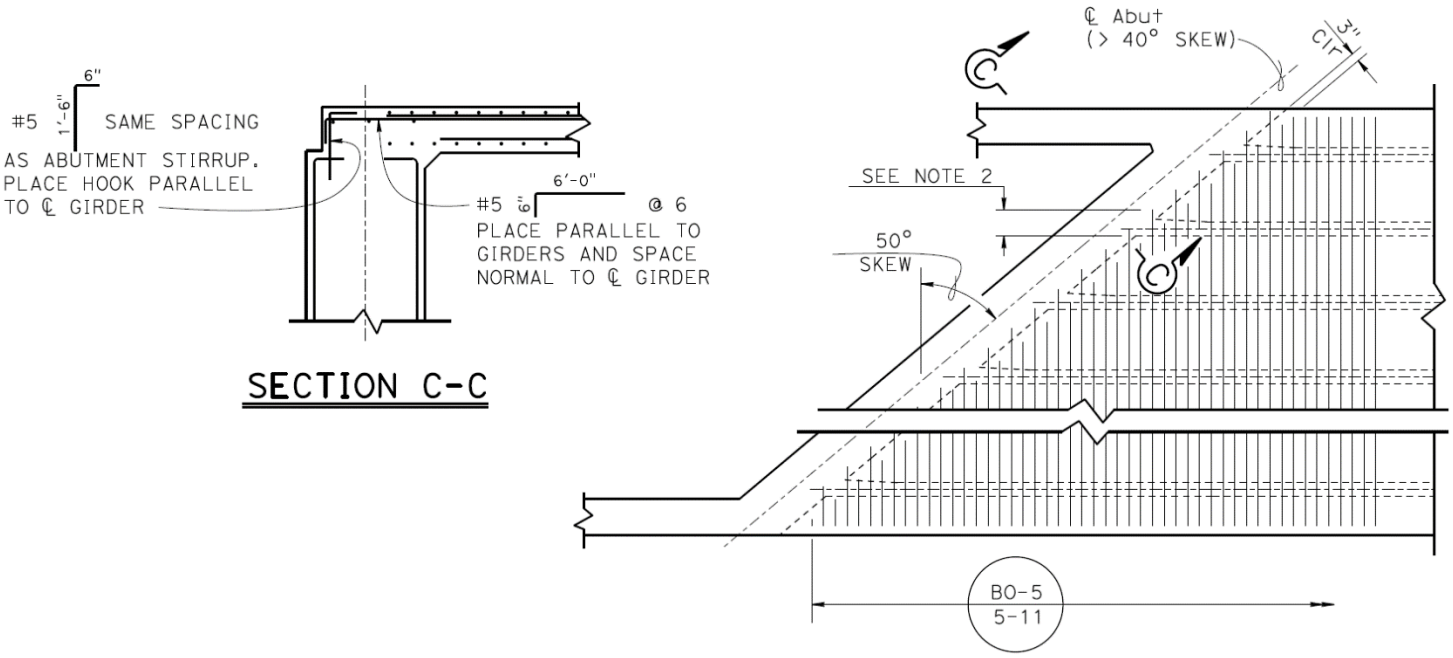


Figure 8.8.3 Transverse Deck Reinforcement Details at Abutment (> 40° Skew)

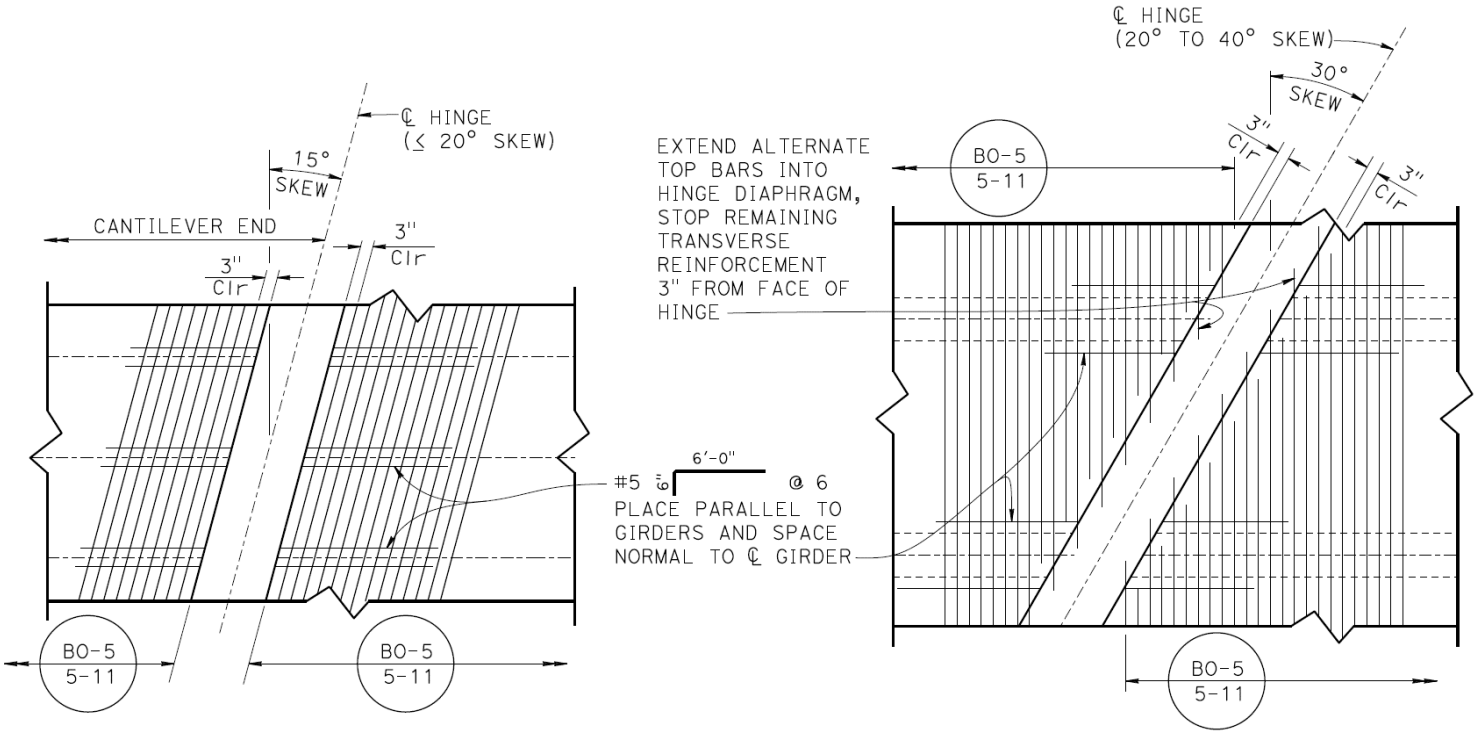


Figure 8.8.4 Transverse Deck Reinforcement Details at Hinge (≤ 40° Skew)

8.8.2 TYPICAL TRANSVERSE REINFORCEMENT

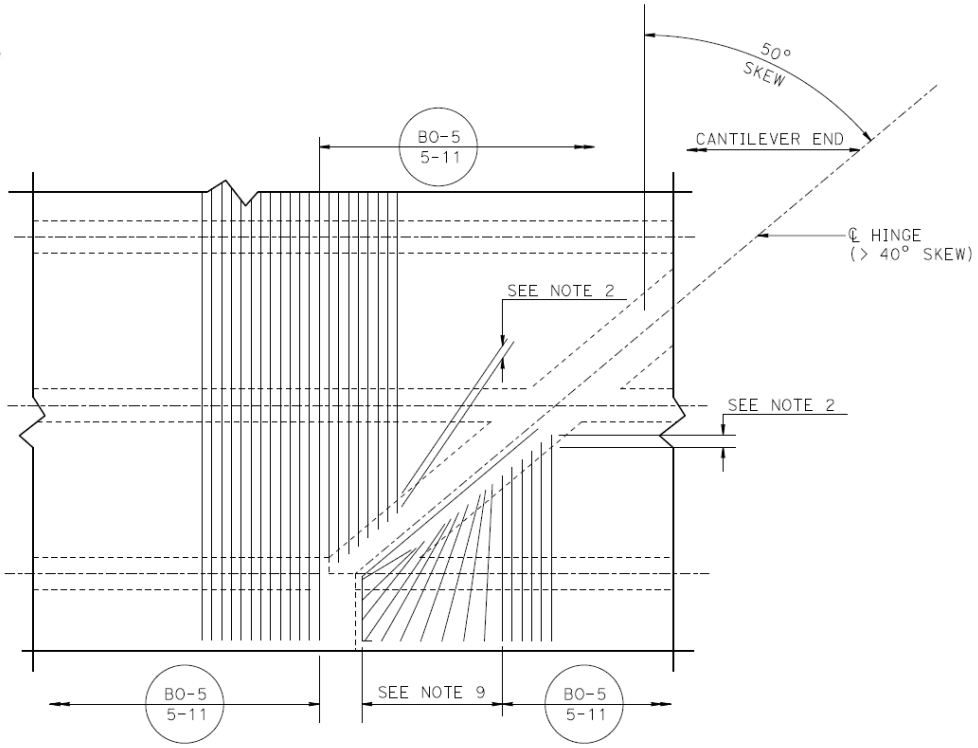


Figure 8.8.5 Transverse Deck Reinforcement Details at Hinge (> 40° Skew)

Notes:

1. May be used for lesser skews if savings appear warranted. This same detail may be used for handling reinforcement in tapered panels.
2. Show anchorage required; 1'-6" would be adequate for bars up to and including #7s.
3. Note on the plans that distribution bars stop 3" from bent caps, abutments and hinge diaphragms.
4. The location of the bend points in transverse reinforcement over the flared ends of the girders need not be changed from those shown at the ℄ of span, until #7 bars exceed 9 inches on one side. Changes should be made in 6-inch steps.
5. Soffit transverse reinforcement in box girders is treated similar to top slab reinforcement shown. For additional information and detailing examples, see *Bridge Design Details*: 9.1 Girder Layout.
6. Note on the plans how transverse reinforcement are spaced and placed (Example: Along ℄ Bridge, radial or normal to girders or layout lines, etc.)
7. Provide special size and spacing details for acute corners of deck overhang.
8. Consider additional longitudinal reinforcement in deck overhangs at acute corners.
9. Hinge reinforcement must be specifically detailed to pass below the transverse reinforcement shown for skews over 40 degrees.

Bridge Design Details 8.9 January 2023

Skewed Deck Corner Reinforcement

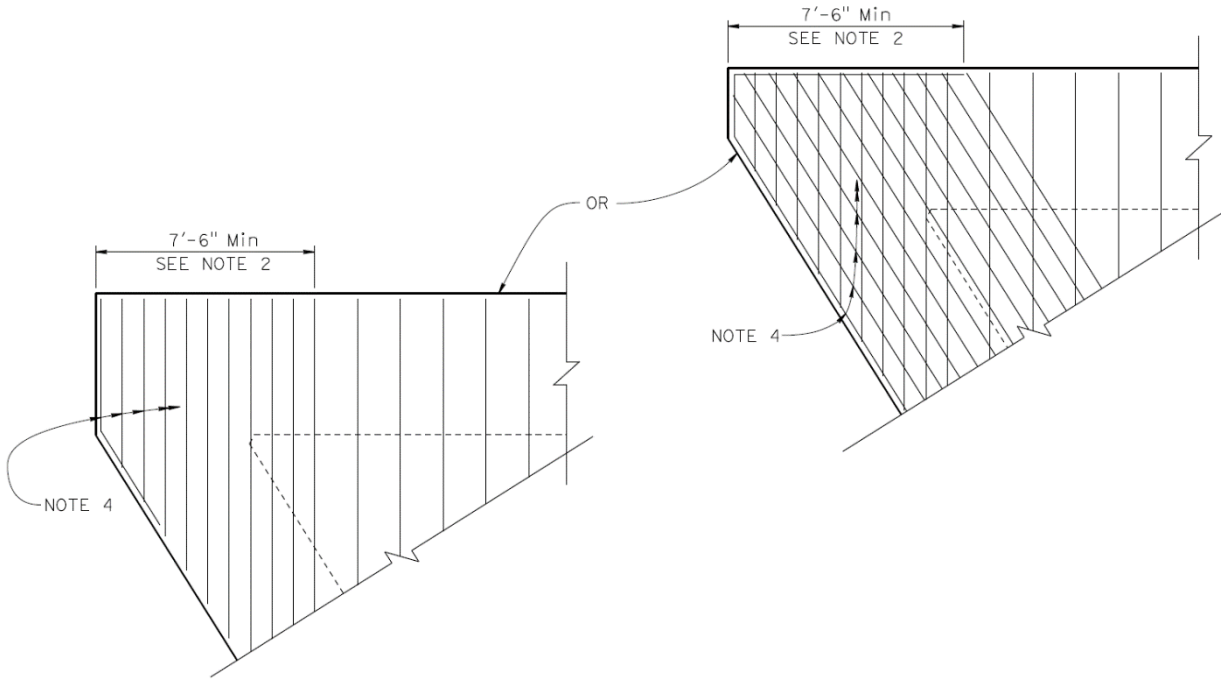


Figure 8.9.1 Skewed Deck Corner Reinforcement (Over 20° Skews)

Notes:

1. Consider squaring off the deck at the end of the girder or placing additional transverse reinforcement parallel to the abutment.
2. Special consideration should be given to detailing the deck reinforcement in skewed corners of bridge decks. Additional transverse reinforcement should be added at bridge joints to distribute barrier impact loads to concrete deck.
3. The Designer shall determine the amount and location of the reinforcement.
4. All reinforcement must be adequately anchored.

Bridge Design Details 8.10 January 2023

Median Slab with Concrete Barrier

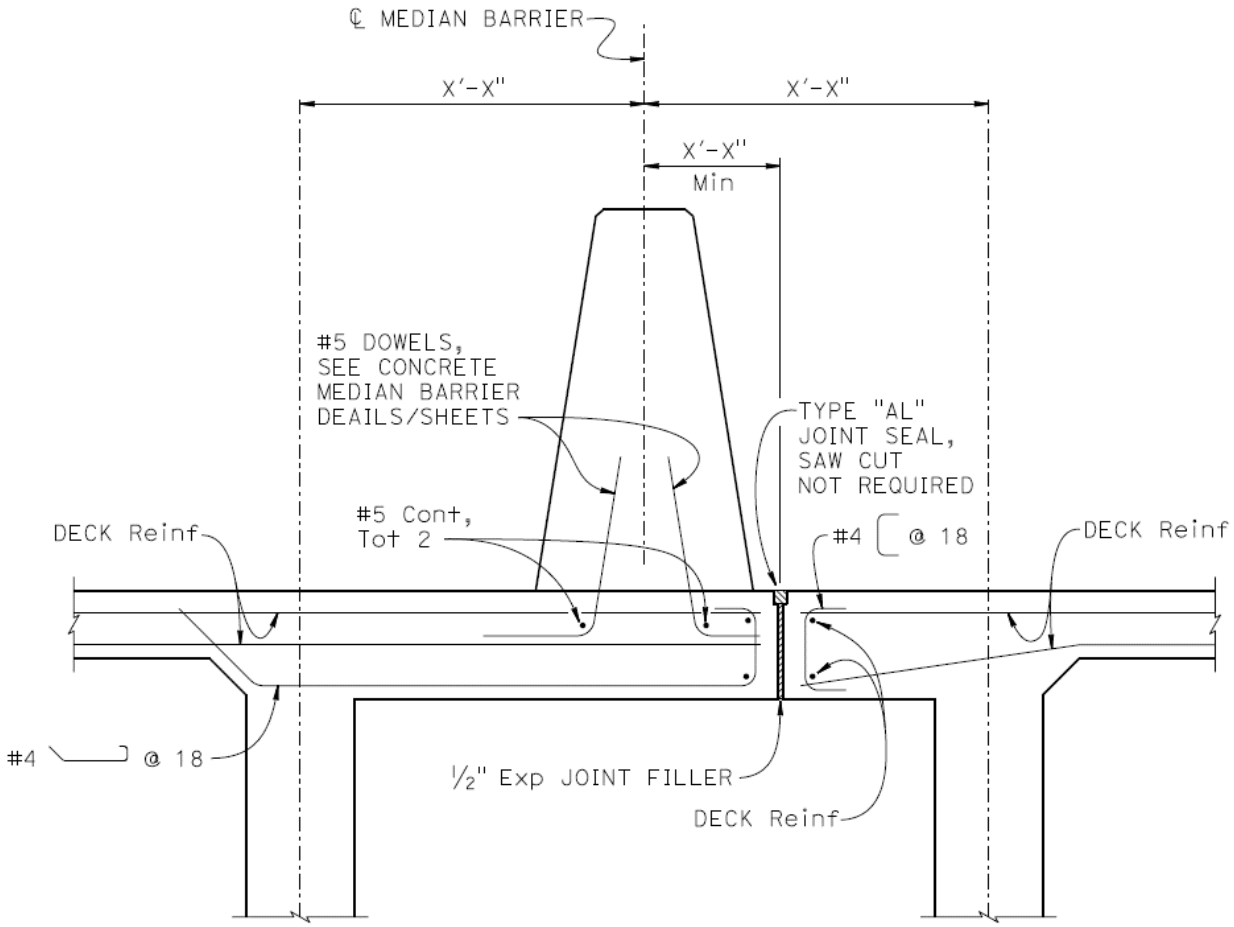


Figure 8.10.1 Median Slab with Concrete Barrier

Notes:

1. Joint to be located on low side of concrete barrier.
2. Median barrier should be centered between girders, if possible.

Bridge Design Details 8.11 January 2023

Median Alternatives

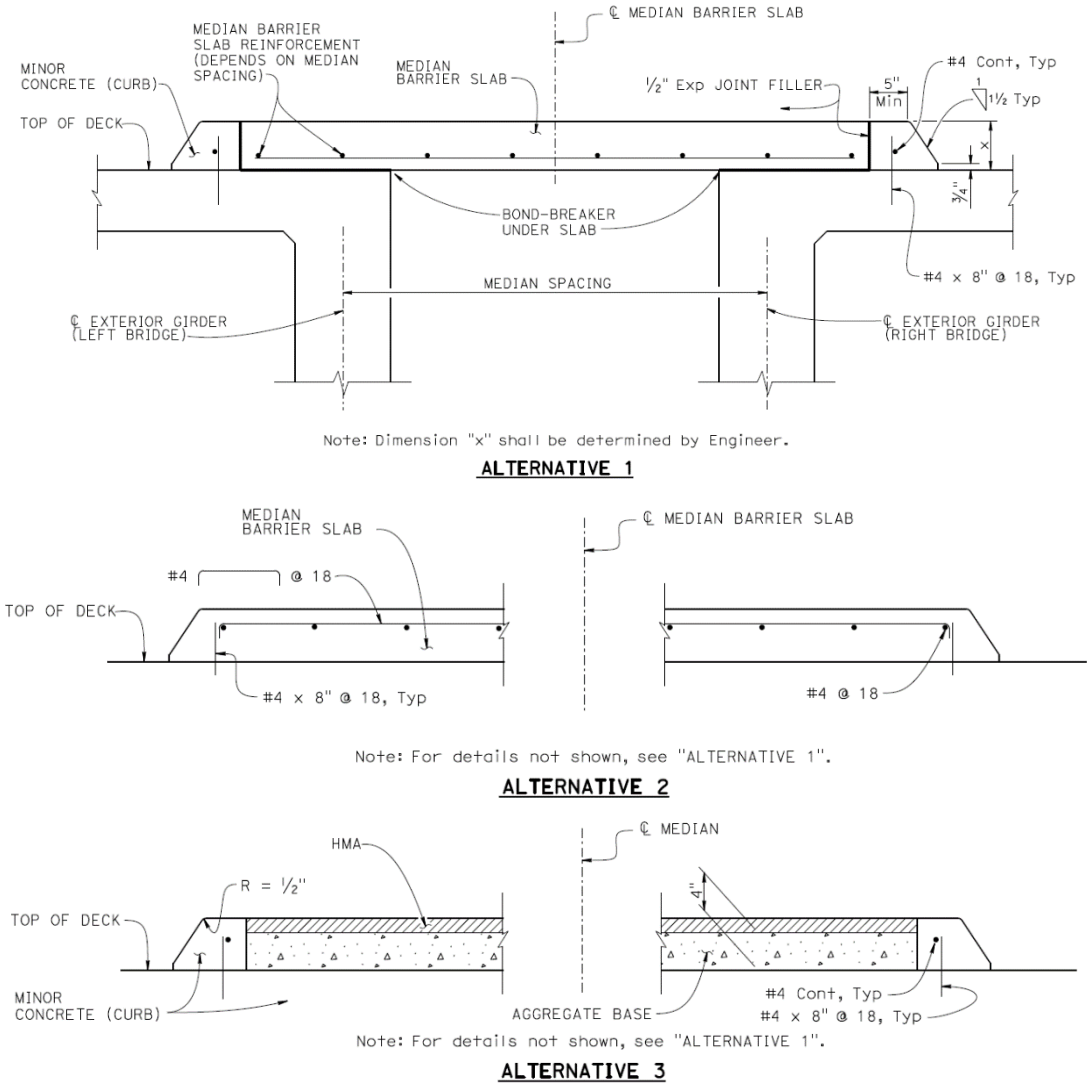


Figure 8.11.1 Median Alternatives

Notes:

1. Special consideration should be given to longitudinal and transverse joints in the deck before using Alternative 3, which is suitable primarily for medians with large areas.
2. Alternatives 2 and 3 are for medians supported completely by bridge deck.

Bridge Design Details 8.12 January 2023

Sidewalks

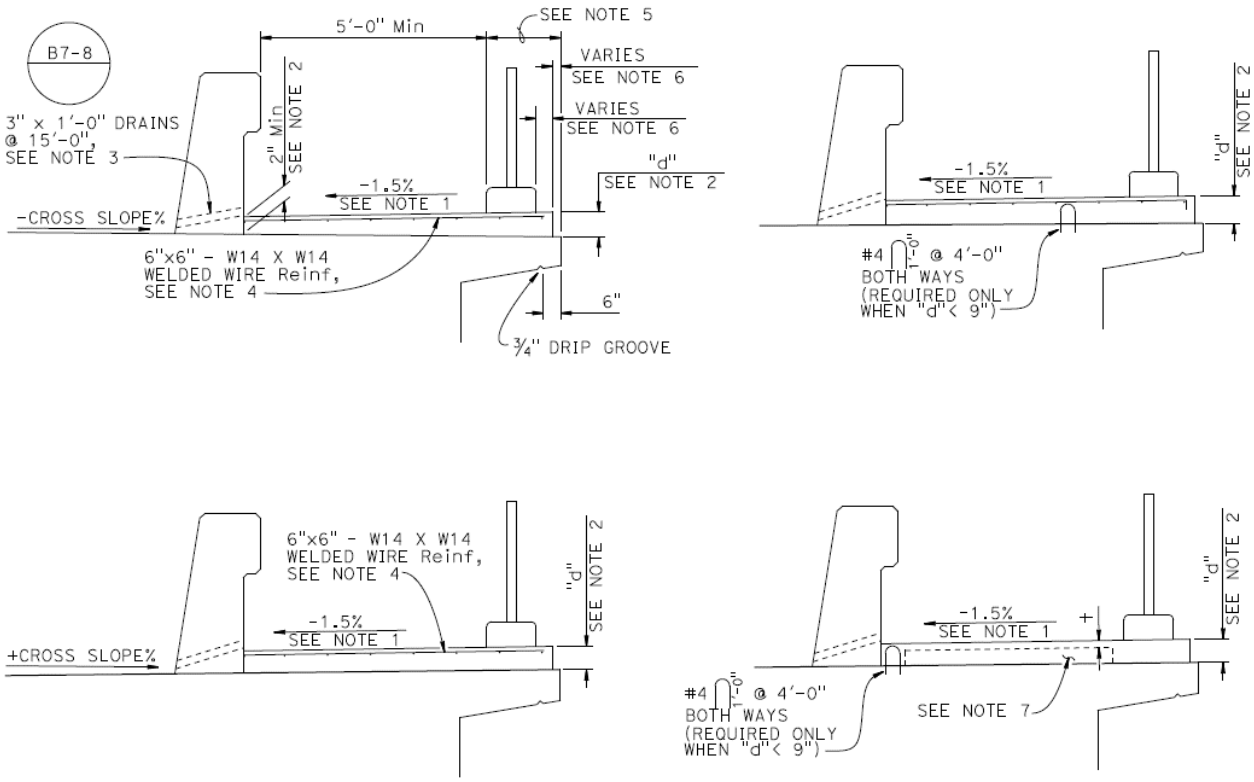


Figure 8.12.1 Sidewalk Details

Notes:

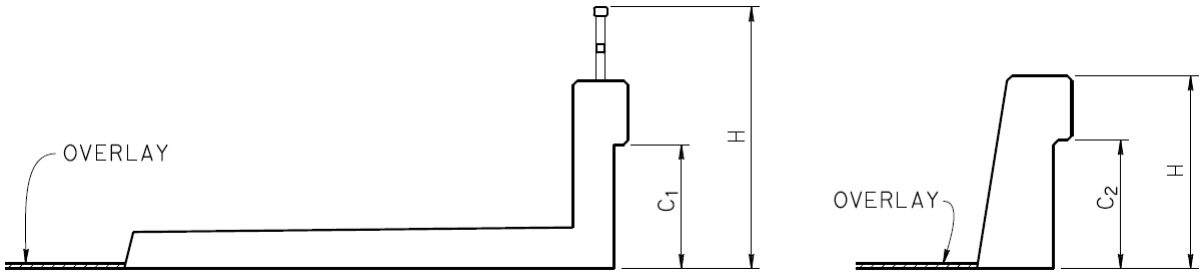
1. Per ADA law, the maximum slope of sidewalks after construction is ≤ 2%. This area will be hand finished and typically poured separate from deck concrete; therefore, 1.5% should be specified on plans to allow for construction tolerances.
2. Minimum thickness of sidewalk may be increased to prevent shoulder flow problems. Thickness of sidewalk will vary depending on bridge cross slope. The top of the concrete shall match the approach sidewalk.
3. Consider all drainage details associated with scuppers and other deck drains. The width of the drainage shall be contained within the limits of the roadway shoulder. The drainage will be carried off the structure based on the longitudinal roadway slope. Additional considerations should be made for superelevation transitions.

4. If specified by the Designer, #4 @ 18 in both directions may be used in lieu of welded wire reinforcement per ASTM A1064.
5. The Designer shall assess the potential safety hazard when the dimension between the pedestrian rail and the edge of deck is > 6” and allows pedestrians to stand on the edge of the bridge.
6. The Designer should match outside edge of pedestrian rail curb and sidewalk with edge of deck whenever possible, otherwise dimension should be shown in plans.
7. This void may be used to reduce the dead load. Designer shall determine minimum “t” required. Form the void with green or saturated lumber or other approved means of preventing swelling of the forms. If green or saturated forms are used, Designer should contact Structure Office Engineer to develop specifications for this work. Another option is to use circular voids using 4” conduits which are also a good option for carrying utilities across the structure with good future access.
8. Sidewalk joints should match size and spacing in the concrete barrier. The Designer should consider adding expansion control joints in the sidewalks at Bent locations to limit possible cracking.
9. Designers should consider safety issues created by vertical height from top of sidewalk to the top of traffic barrier for pedestrian and bicyclists. For minimums refer to Highway Design Manual and other guidance.
10. Details for all sections are similar, unless noted otherwise.

Bridge Design Details 8.13 January 2023

Barrier Railing Modification for Deck Overlays

When overlays are placed on bridges as part of the original construction, the standard plan heights of Concrete Barriers are adjusted as follows:



Type 732 SW Type 836 or 842

Figure 8.13.1 Bridge Railing Modification

Notes:

1. For Type 732SW, 75SW, 76SW, 85SW and other sidewalk barriers increase overall "H" by increasing vertical height "C_1". Minimum sidewalk thickness in standard details is measured from top of roadway surface (top of overlay).
2. For Types 836 and 842, increase overall "H" by increasing vertical height "C_2".
3. Show "C_1" or "C_2" on bridge plans when overlay surfacing is required on structure.
4. For standard curb barriers (e.g., ST-75, ST-76, ST-20S, ST-70, Type 85, Type 86H) curb height varies based on cross slope and overlay thickness.
5. Do not adjust barrier height for future overlay thickness.

Overall Thickness	Total Adjustment
Up to 1½"	Standard H + 1½"
1½" to 3"	Standard H + 3" *

*Height adjustment greater than 3" will require a revised design for barrier reinforcement.

Table 8.13.1 Railing Modification.

Bridge Design Details 8.14 January 2023

Polyester Concrete Expansion Dam

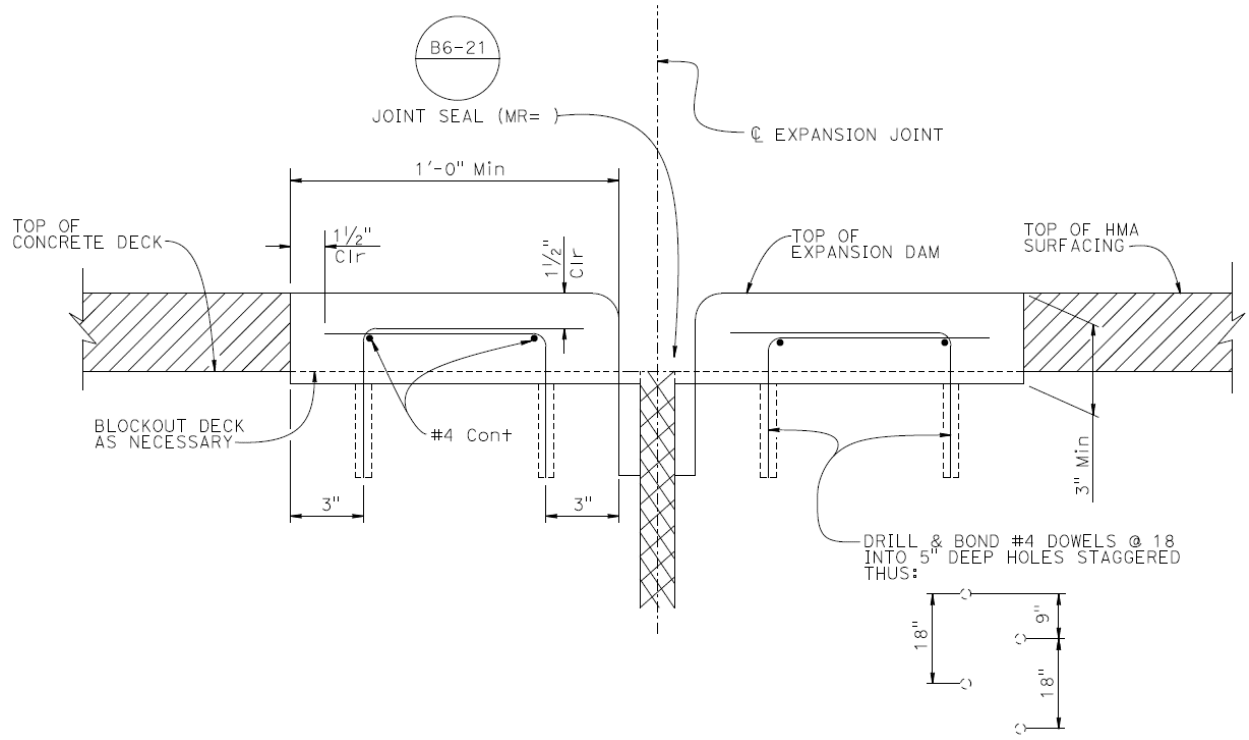


Figure 8.14.1 Polyester Concrete Expansion Dam

Notes:

1. To be used on bridges with sealed joint seals of MR ≤ 2” when Hot Mix Asphalt (HMA) surfacing is required. Sealed joints may be Type A or Type B as shown in *Standard Plan*.
2. Dam to be constructed after HMA has been placed continuous across blockout.
3. Depth to width of expansion dam is ±1:4.
4. Estimate expansion dam concrete by the cubic foot (quantity estimate includes expansion dam reinforcement and dowels). Joint seal and drill/bond holes are separate bridge items.

Bridge Design Details 8.15 January 2023

Retaining Walls

TYPICAL SECTION sheet is typically included in retaining wall plans to show information such as design heights, reinforcement, concrete surface texture, drainage and footing details. Depending on the type of retaining wall, various other details may be shown on this sheet. For further description on what is typically shown, see Bridge Design Details: 8.1 Typical Section. Do not clutter this sheet with additional details, instead create other sheets to show this information.

Refer to *Bridge Design Details* Attachment 8A.B.1 through Attachment 8A.B.8 for some examples of common retaining wall TYPICAL SECTION and DETAIL sheets.

- Modified Standard Retaining Wall (Type 1):
  Attachment 8A.B.1 and Attachment 8A.B.2
- Soldier Pile Retaining Wall:
  Attachment 8A.B.3, Attachment 8A.B.4, and Attachment 8A.B.5
- Soil Nail Wall:
  Attachment 8A.B.6 and Attachment 8A.B.7
- Ground Anchor Wall:
  Attachment 8A.B.8

Figure 8A.B.1 Modified Standard Retaining Wall (Type 1) Detailing Example 1

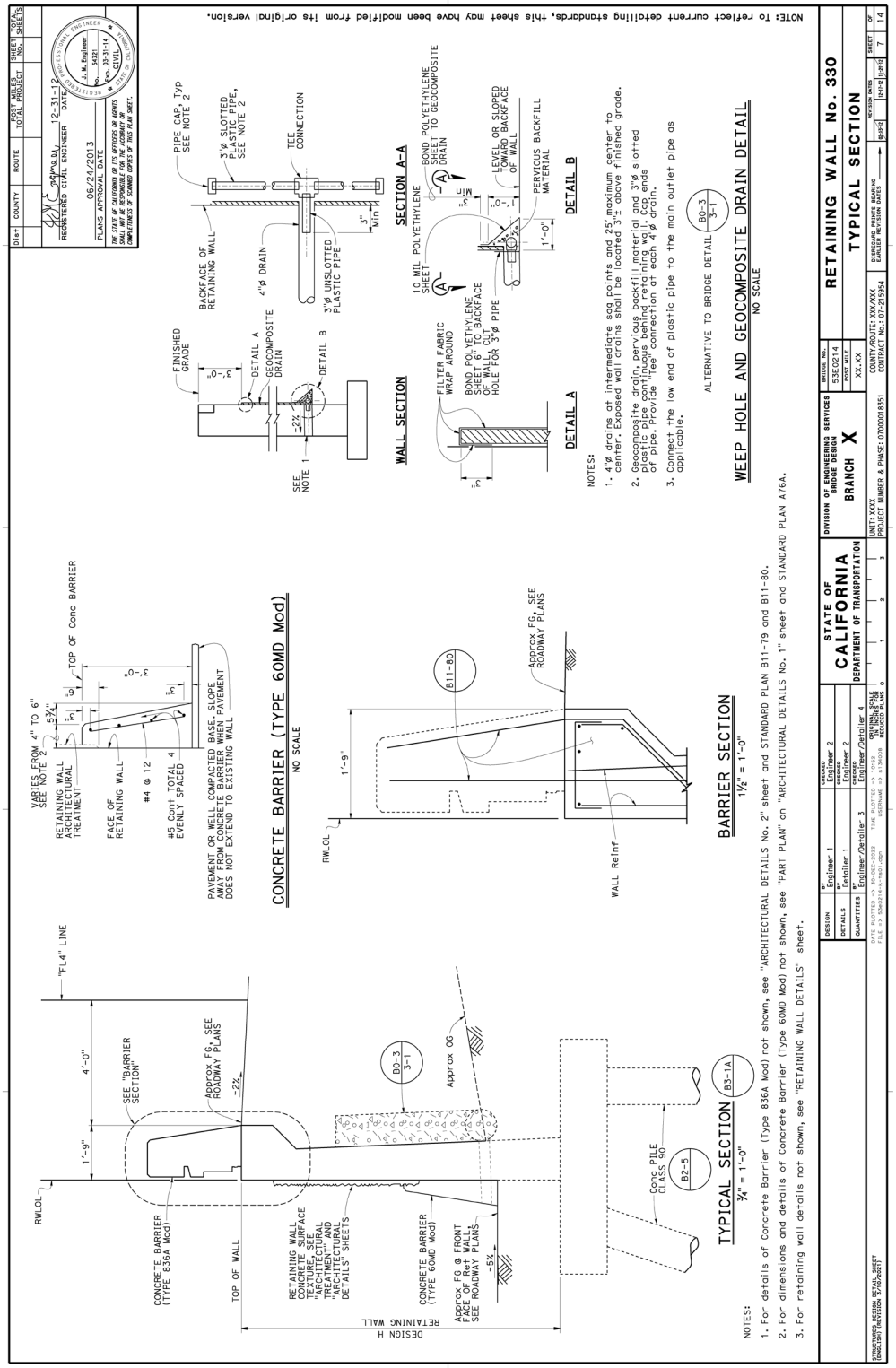


Figure 8A.B.2 Modified Standard Retaining Wall (Type 1) Detailing Example 2

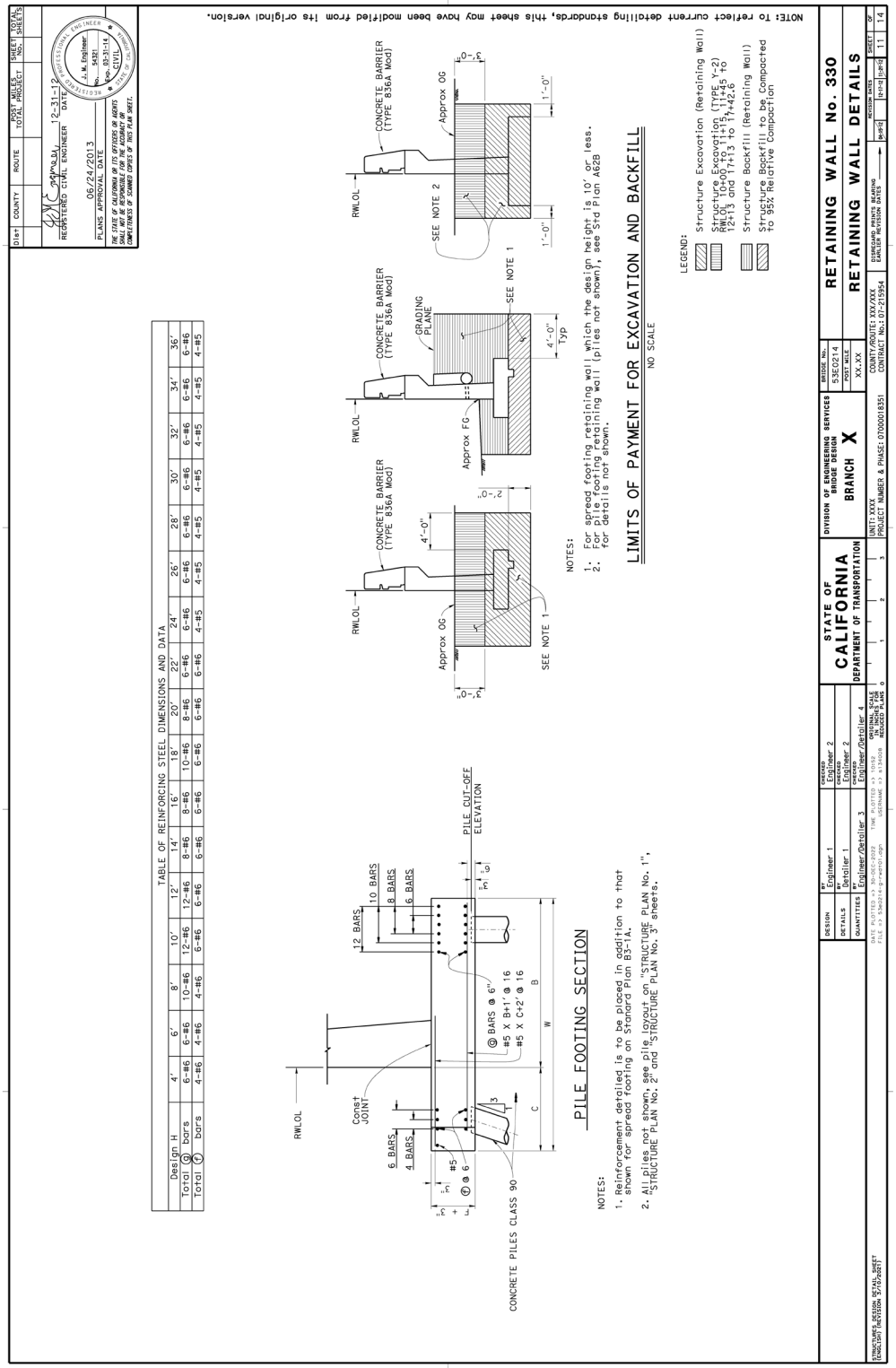


Figure 8A.B.3 Soldier Pile Retaining Wall Detailing Example 3

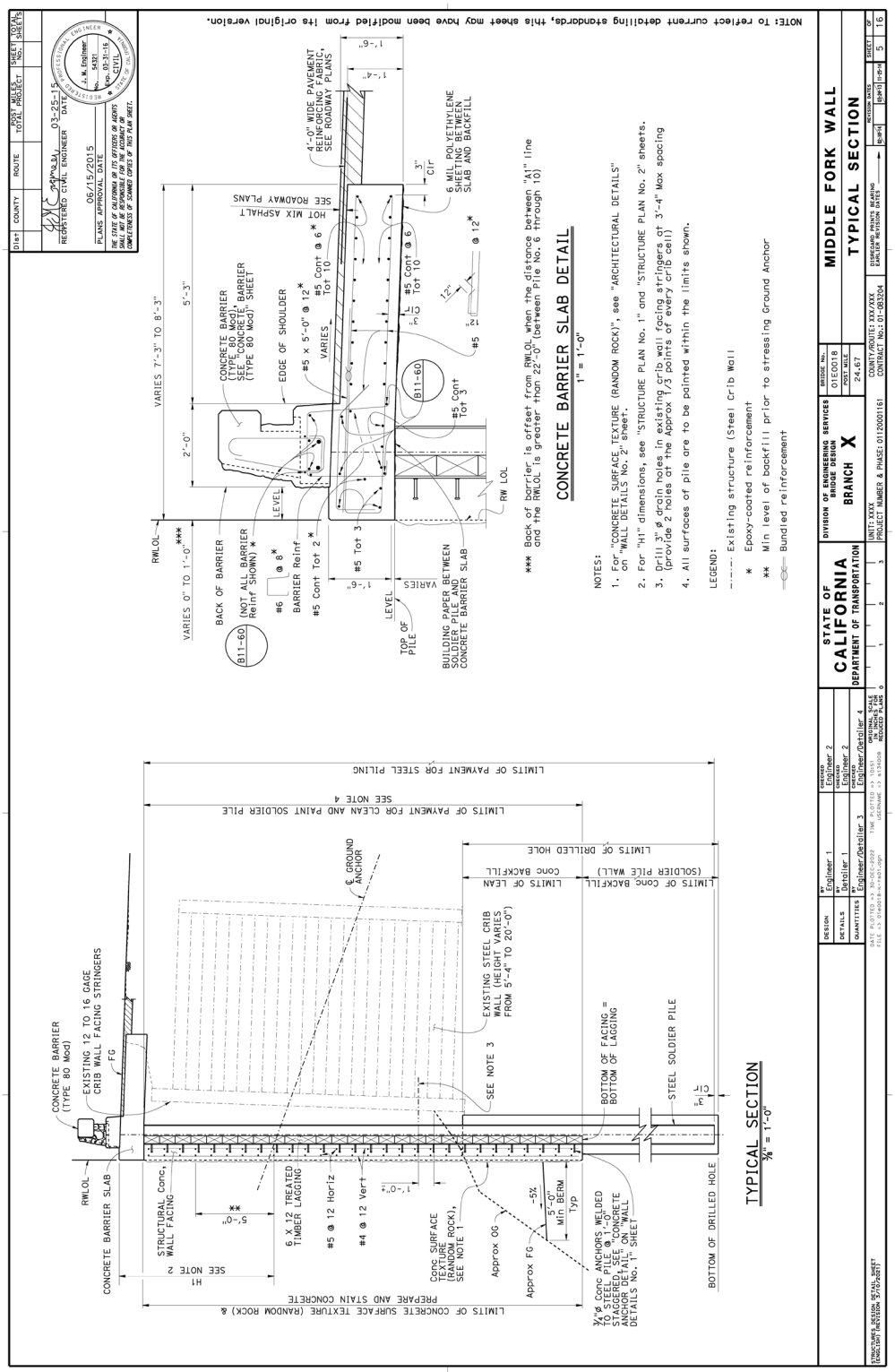


Figure 8A.B.4 Soldier Pile Retaining Wall Detailing Example 4

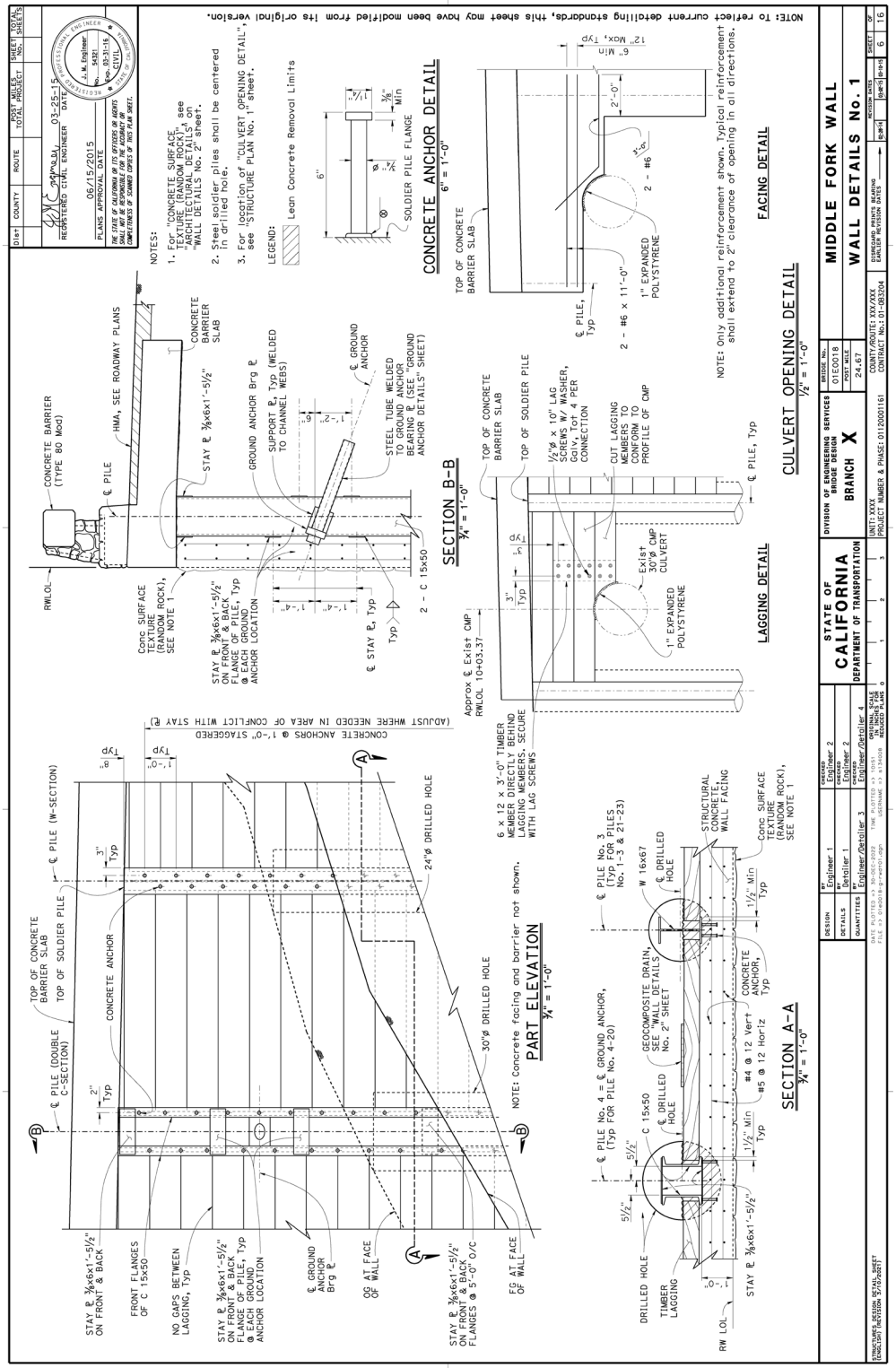


Figure 8A.B.5 Soldier Pile Retaining Wall Detailing Example 5

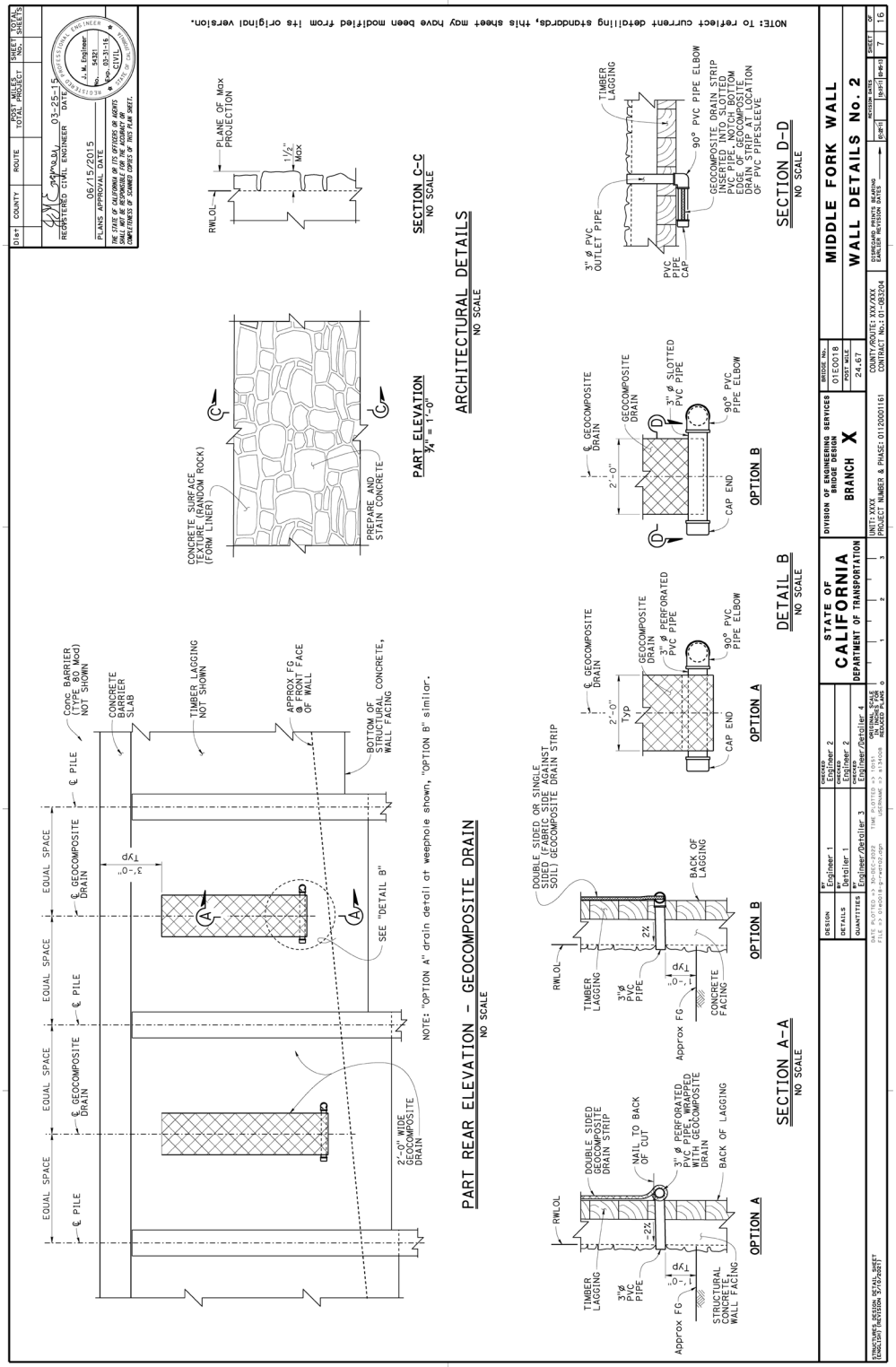


Figure 8A.B.6 Soil Nail Wall Detailing Example 6

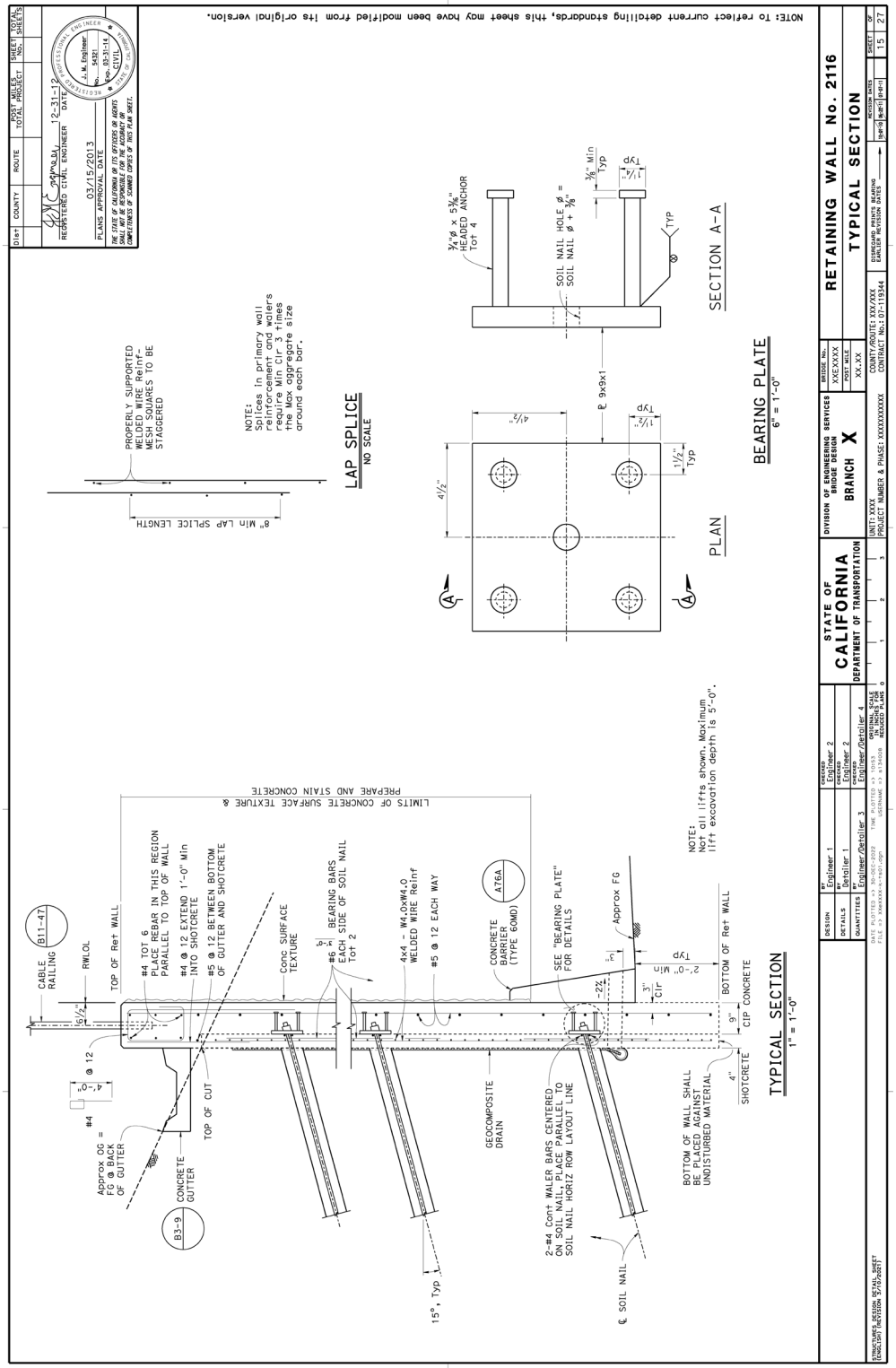


Figure 8A.B.7 Soil Nail Wall Detailing Example 7

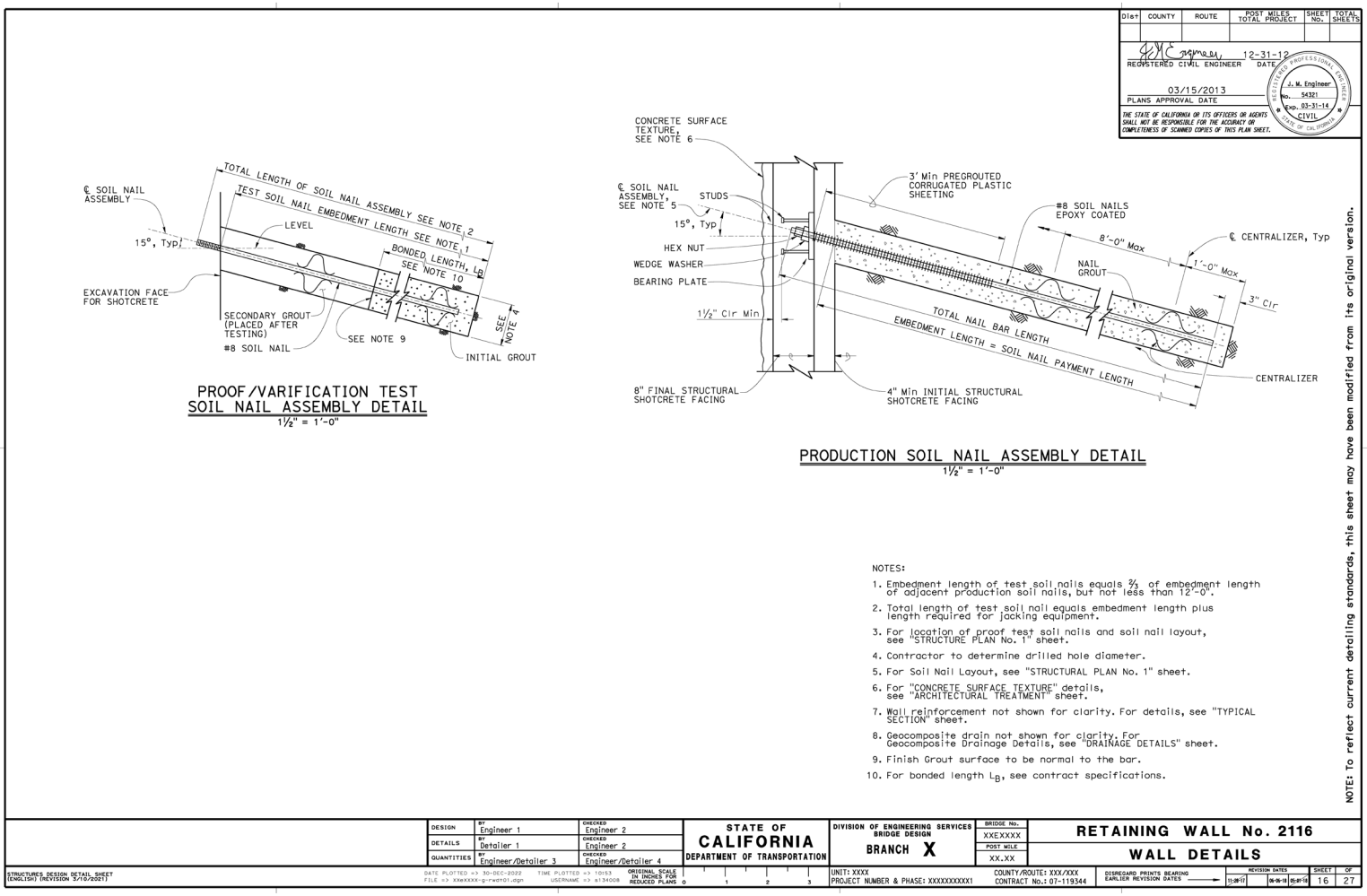


Figure 8A.B.8 Ground Anchor Wall Detailing Example 8