



Bridge Design Details 10.1 February 2025

Girder Reinforcement

The GIRDER REINFORCEMENT sheet is intended to delineate the main girder reinforcement including deck and soffit slab main reinforcement and bar cut-offs.

Plan

1. Orient the same as the GIRDER LAYOUT sheet and include North Arrow.
2. Usually, the same scale as the GIRDER LAYOUT sheet but not less than 1" = 10'.
3. Place TOP REINFORCEMENT at the top of the sheet and BOTTOM REINFORCEMENT below.
4. If all reinforcement will not fit on a sheet, detail all top reinforcement on ONE sheet and all bottom reinforcement on another sheet. Each sheet should cover the limits of a GIRDER LAYOUT "frame".
5. The GIRDER REINFORCEMENT sheets should follow the corresponding GIRDER LAYOUT sheet, with the bottom reinforcement preceding the top reinforcement.
6. Typically, only one exterior and interior bay needs to be shown.
7. Reference bar cut-offs from centerline of span (Bottom Reinforcement) or centerline of bent (Top Reinforcement). Identify centerline of Hinge Span.
8. Draw main continuous bars as heavy solid lines, and spliced bars as lighter weight solid lines.
9. Show outside edge of box and centerlines of girders.
10. For T-Beams show girder outlines and take a SECTION through the girder at the maximum number of bars.
11. Indicate hooks at the ends of continuous reinforcement where applicable.
 - a. For bottom reinforcement, at abutments and long cantilever side of a hinge.
 - b. For top reinforcement, usually at the short cantilever side of hinge.
12. Show bundle symbol on bars to be bundled together.

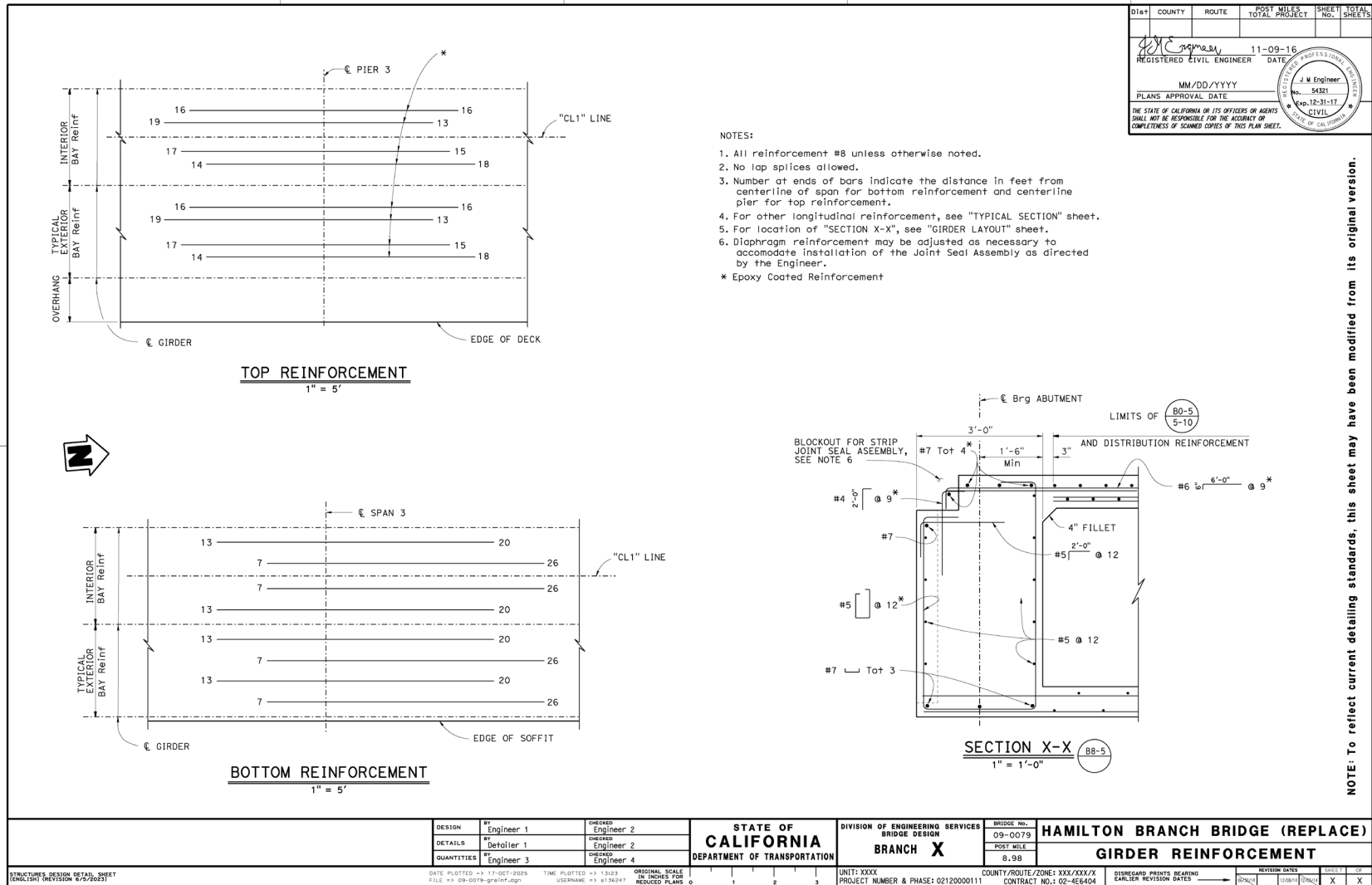


Standard Notes (use as required)

1. All reinforcement #__ unless otherwise noted.
2. Number at ends of bars indicates the distance in feet from centerline span or reference line for bottom reinforcement and centerline bent for top reinforcement.
3. No splices allowed in main girder reinforcement as designated in “No Splice Zones”.
4. Splices in continuous reinforcement shall be service level splices.
5. For reinforcement not shown, see “TYPICAL SECTION” sheet.



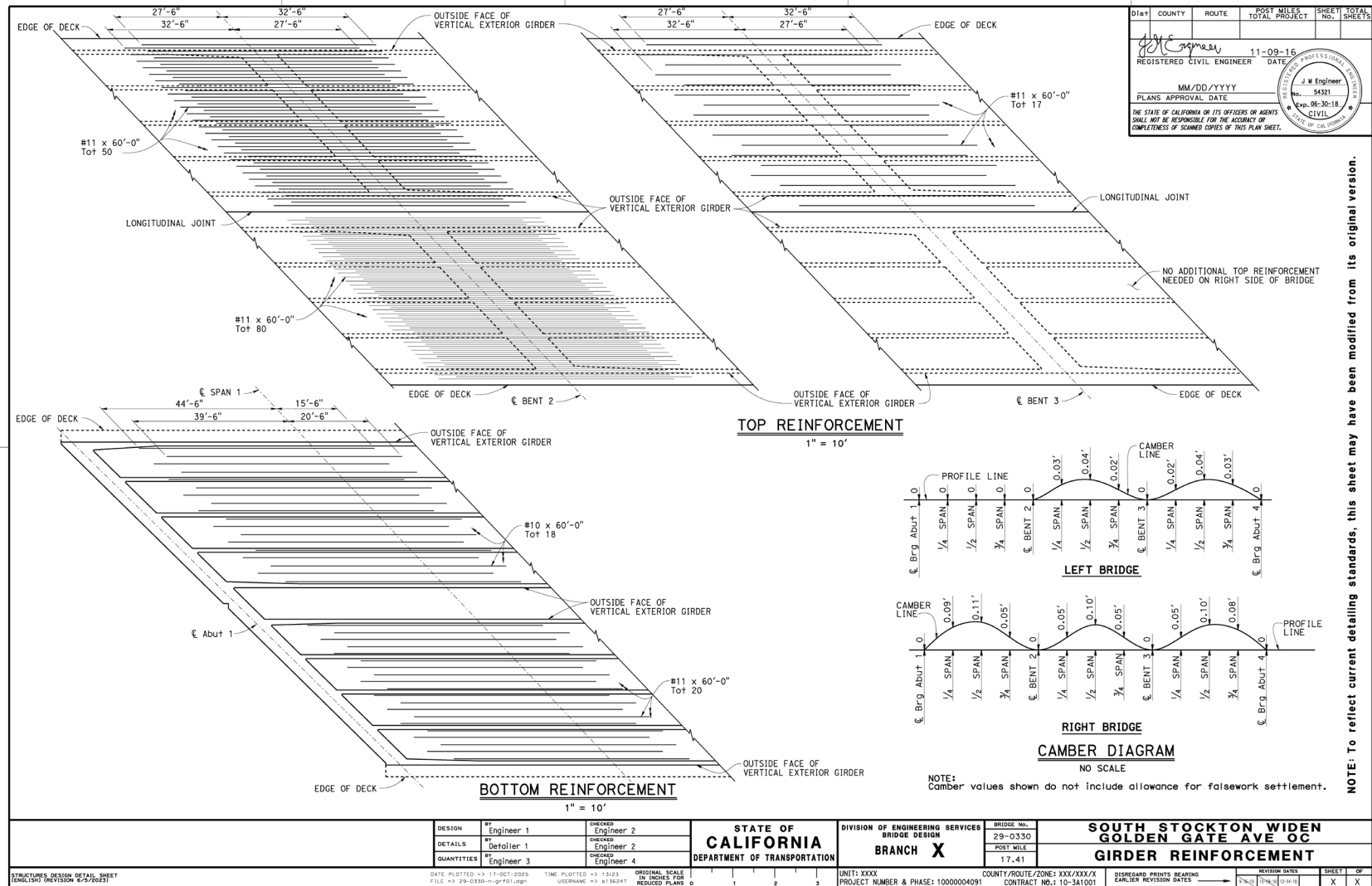
Figure 10A.A.1 Girder Reinforcement Detailing Example 1



DESIGN	BY Engineer 1	CHECKED Engineer 2	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES BRIDGE DESIGN BRANCH X	BRIDGE NO.	HAMILTON BRANCH BRIDGE (REPLACE) GIRDER REINFORCEMENT	
DETAILS	BY Detailer 1	CHECKED Engineer 2			09-0079		
QUANTITIES	BY Engineer 3	CHECKED Engineer 4			POST MILE 8.98		
DATE PLOTTED -> 17-OCT-2025			TIME PLOTTED -> 1:52:3	ORIGINAL SCALE 3/4" INCHES PER 1' REDUCED PLANS 0	UNIT: XXXX	COUNTY/ROUTE/ZONE: XXX/XXX/X	
FILE -> 09-0079-girder.rvt			USER: >> 4176247		PROJECT NUMBER & PHASE: 0212000111	CONTRACT NO.: 02-463404	
DISREGARD PRINTS BEARING EARLIER REVISION DATES						REVISION DATES	SHEET 01 OF 01
						Revised	Issued
							X X



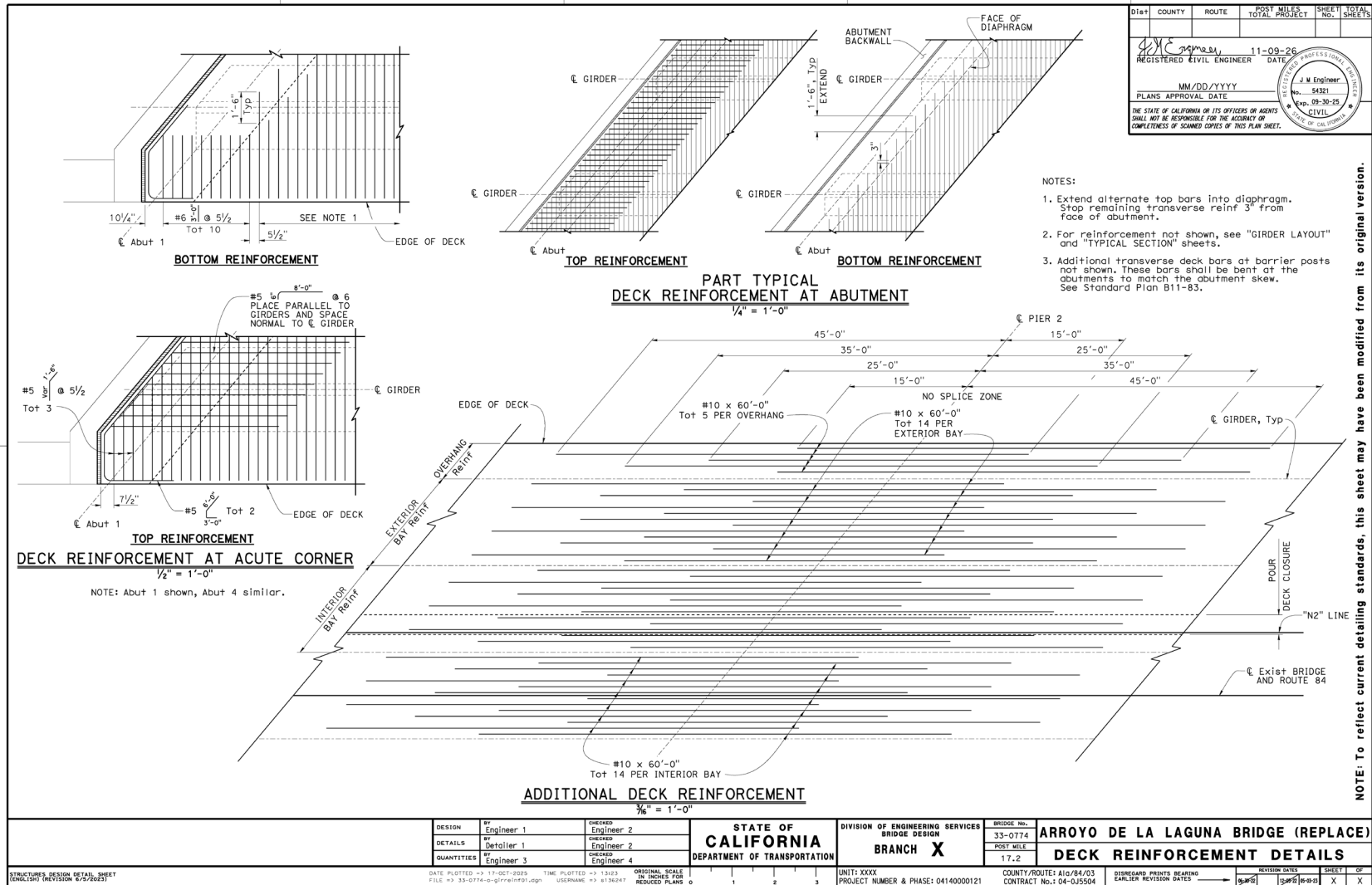
Figure 10A.A.2 Girder Reinforcement Detailing Example 2



NOTE: To reflect current detailing standards, this sheet may have been modified from its original version.



Figure 10A.A.3 Girder Reinforcement Detailing Example 3





Bridge Design Details 10.2 February 2025

Top and Bottom Slab Reinforcement

For a box girder type of bridge, Designers will develop a moment diagram with the number, size and length of main reinforcement. From this diagram, a girder reinforcement layout can be generated in PLAN view for the top and bottom slabs. For box girders the top slab is known as deck and bottom slab is known as soffit.

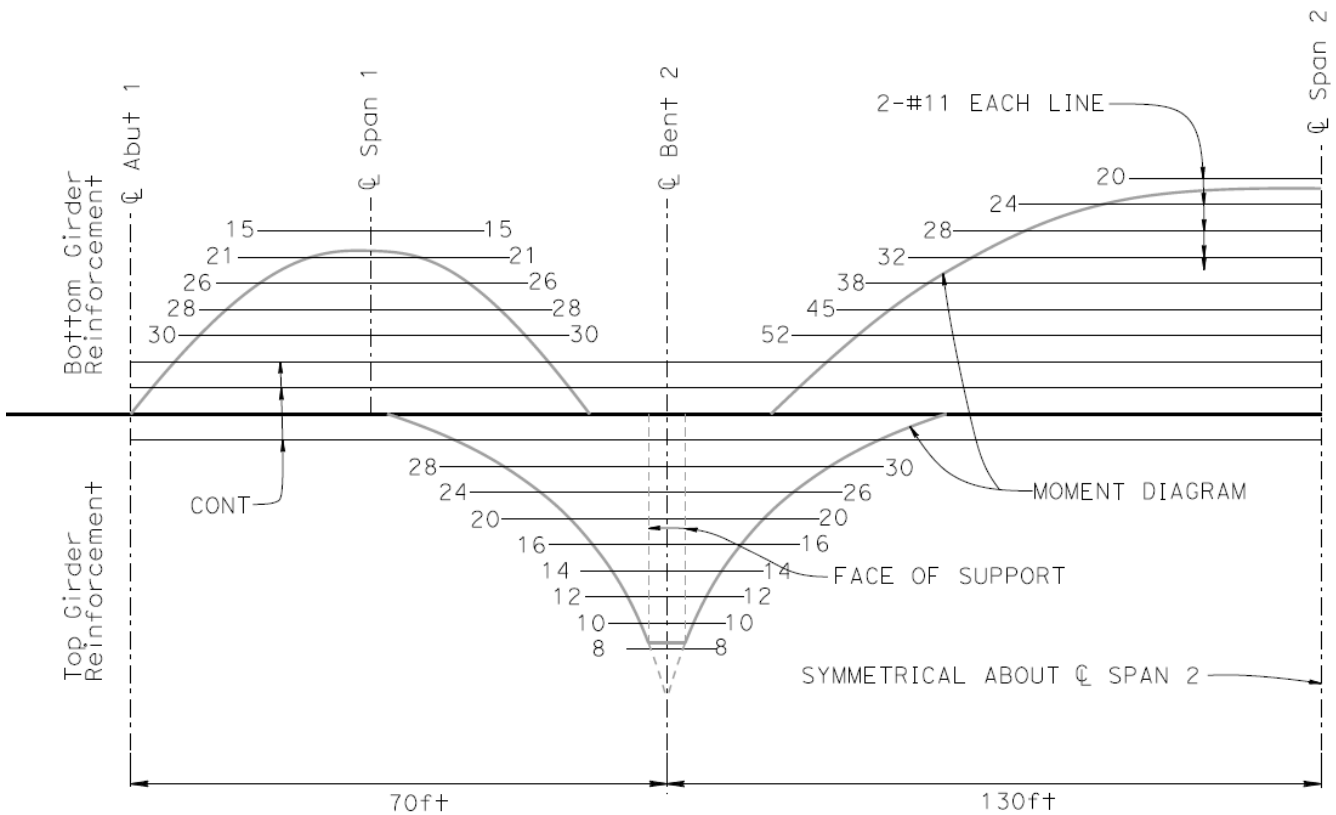


Figure 10.2.1 Bar Cut-off design example

The main reinforcement (cut-off bars) should be placed so as to stagger the ends instead of laying them out progressively shorter. Figure 10.2.1 above represents required reinforcement per bay between girder centerlines.

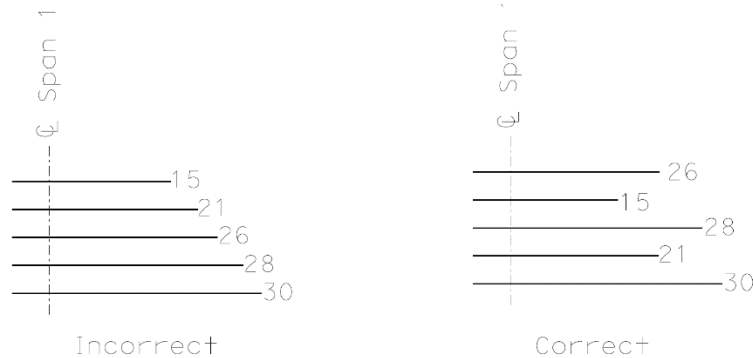


Figure 10.2.2 Example of end stagger

Reinforcement layout should be repeated about the centerline of bay with longer bars nearer to the centerline of girders. Attempt to use as few bar lengths as possible to simplify shop detailing, cutting, handling and placing. This can be achieved by adding a couple of feet to some of the bar cut-off values from the moment diagram. Bar lengths should be kept to 60 feet maximum for shipping purposes.

Using Figure 10.2.1 above for top slab reinforcement values, the following are possible pairs and overall lengths:

	28	24	20	16	14	12	10	8
+	8	10	12	14	16	20	26	30
	<u>36</u>	<u>34</u>	<u>32</u>	<u>30</u>	<u>30</u>	<u>32</u>	<u>36</u>	<u>38</u>

This layout results in 5 unique bar lengths. In Figure 10.2.3 below an example layout is shown with these bar lengths staggered. Note that continuous bars should be placed in the stirrup hooks near the girder centerline.

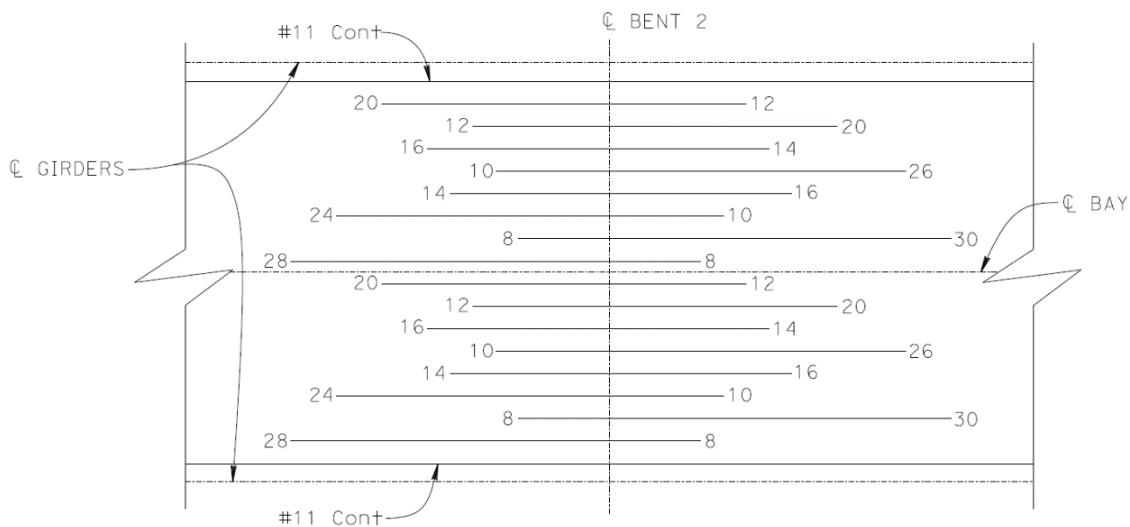


Figure 10.2.3 Top Slab Reinforcement Layout Example



Refer to Bridge Design Details: Part Typical Section Figure 8.5.1 on how to represent “cut-off” bars (also known as additional reinforcement) in the TYPICAL SECTION view. Place two continuous bars in the web of the girder at the top of the stirrup; continuous bars should also be placed at the edge of the deck slab adjacent to the barrier dowels. Longitudinal bar spacing shall not exceed 18 inches and be shown at approximately equal spacing. Additional #4 bars lapped with main reinforcement shall be added as necessary.

Bottom slab reinforcement layout is handled similarly to the top slab. Start by pairing the cut-off lengths for each span (since symmetrical about centerline of span, only unique pairs are needed):

Span 1	
30 28 26	Span 2
+ 15 21 26	+ 52 45 38 32
45 49 52	20 24 28 32
	72 69 64 64

Spans 1 and 2 each have 3 unique bar lengths needed. Notice that the Span 2 bar lengths exceed 60 feet. These bars may need to have service level splices/couplers if shipping these lengths is prohibitive. Do not show splice locations on the plans. Locations should be considered during the design, and staggering should be achievable.

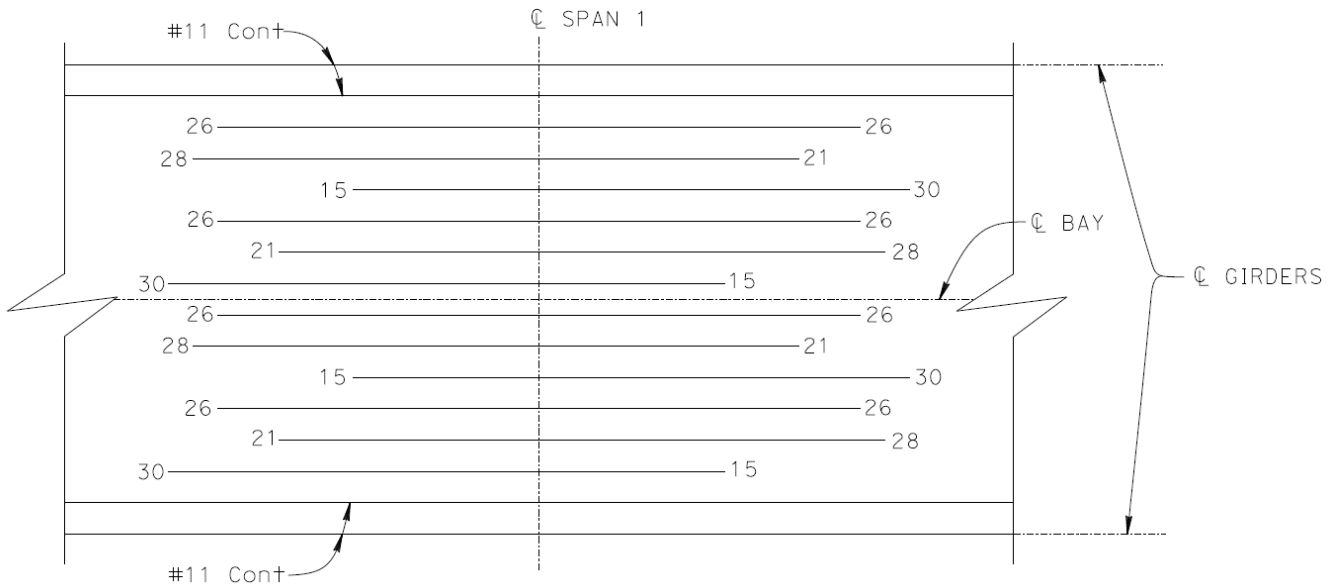


Figure 10.2.4 Bottom Slab Reinforcement Layout Example Span 1



Bridge Design Details 10.3 March 2026

T-Beam Girder Reinforcement

T-Beam main reinforcement is detailed very similarly to box girder main reinforcement. Both top and bottom main reinforcement bar cut-offs shall be shown. An example of bottom bar detailing is shown in Figure 10.3.1 below. Use a SECTION to show bar placement in the vertical direction, especially where there are bar bundles.

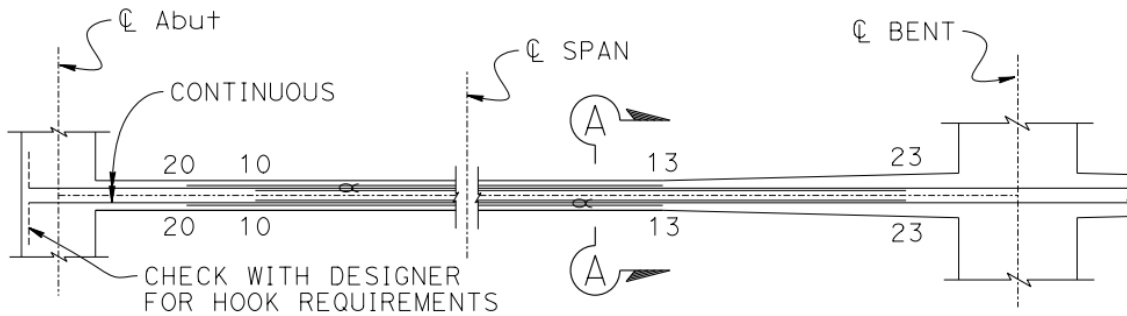
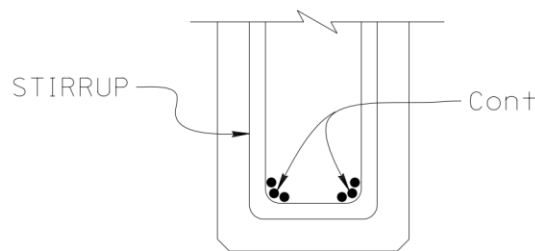


Figure 10.3.1 T-Beam Girder Reinforcement Example



SECTION A-A
 $1\frac{1}{2}'' = 1'-0''$

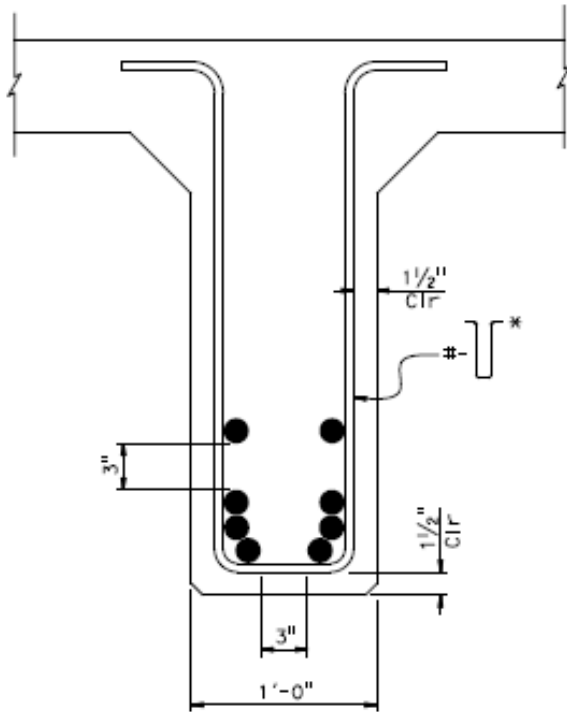
Figure 10.3.2 Typical Girder Section



Below are example sections showing vertical layout of main girder reinforcement with required spacing between bundles. The tables below show distances, "X", to the center of gravity of the group of bars from the bottom of the girder for various quantities of steel, assuming #11 rebar.

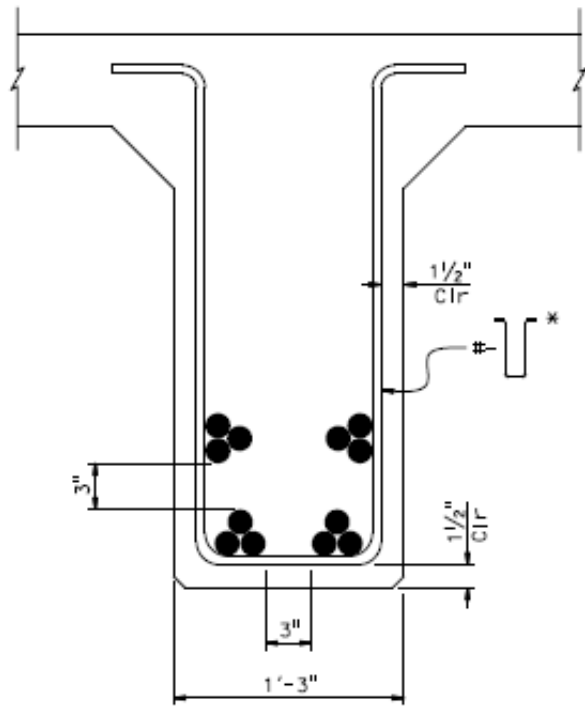
For example, the drawing on the left shows a total of 8 - #11 bars and 1.5" Clr. The center of gravity of the total group is 6.0" from the bottom of the girder.

*Refer to GIRDER LAYOUT sheet for spacing



No. OF BARS	X
4	2.9"
6	3.4"
8	4.7"
10	5.6"
12	6.4"

Figure 10.3.3 12-inch wide T-Beam



No. OF BARS	X
2	2.9"
4	3.6"
6	4.4"
8	6.0"

Figure 10.3.4 15-inch wide T-Beam