

## **Bridge Design Details 9.1 January 2023**

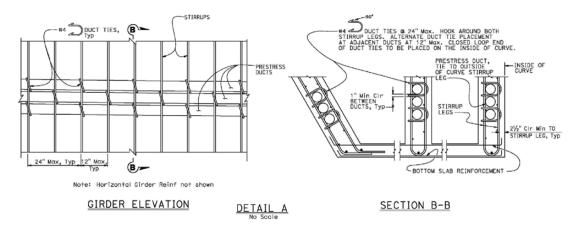
The GIRDER LAYOUT sheet provides specific details for the girder layout, camber diagram and end diaphragm section. For more details regarding girders and end diaphragms, see *Bridge Design Details*: 14 Prestressed Post-Tensioned Concrete.

#### Plan

- 1. Orient the PLAN view the same as the GENERAL PLAN. Combine the GIRDER LAYOUT and TYPICAL SECTION sheets when possible.
- 2. Preferred scale ½" = 1'-0"; on larger structures 1" = 20' may be used to show line diagram type GIRDER LAYOUT sheets. For widenings it may be necessary to use larger ½" = 1'-0" scale to show additional details.
- 3. Show North Arrow. If several GIRDER LAYOUT sheets are used, such as in long curved structure, show North Arrow on all layouts.
- 4. Do not show stations and layout information given on GENERAL PLAN or FOUNDATION PLAN.
- 5. Dimension girder spacing along centerline of support from station line to centerline of exterior girders, but do not show intermediate girder spacing unless it differs from the TYPICAL SECTION.
- 6. Show centerlines of girders. Designate girders with lettered callouts (A, B, C, etc.).
- 7. Show the bearing layout of the girders, do not repeat alignment layout information shown elsewhere. Lengths of precast girders are tabulated on precast girder standard detail sheets.
- 8. Show girders with solid lines (main view is of concrete section including girders, bent caps, end diaphragms, and hinges prior to deck placement). If edge of deck is shown use dashed line.
- 9. Show portion of transverse deck reinforcement on skewed bridges, see *Bridge Design Details*: 8.8 Typical Transverse Reinforcement. Not required for skews less than 20 degrees. Label epoxy-coated reinforcement.
- 10. Detail deck corners on skewed bridge abutments or hinges, see *Bridge Design Details*: 8.9 Skewed Deck Corner Reinforcement. Label epoxy-coated reinforcement.
- 11. Show intermediate diaphragms parallel to transverse deck reinforcement in concrete box girders. Intermediate diaphragms in concrete box girders are uncommon and locations should be specified by Designer, if required. For precast girders intermediate diaphragms should be normal, skewed, or staggered depending on girder length and skew.



- 12. Dimension locations of the field splices of precast or steel girders.
- 13. Dimension locations and spacing of lateral bracings, cross frames, and diaphragms along the layout line or centerline of structure.
- 14. Show locations of bearing stiffeners and spacing of intermediate stiffeners along the centerline of steel girders. Also show thickness and widths of bearing and intermediate stiffeners.
- 15. Show concrete box girder flare lengths and stem thickness at both ends of flares.
  - i. Sloped exterior girders must be flared to 18" web thickness at the end diaphragms over a minimum of 16-foot length. Designate girder width symbol ( ) in inches.
- 16. Place "DETAIL A" for curved box girders on TYPICAL SECTION sheet. "DETAIL A" can also be placed on GIRDER LAYOUT sheet if there is not enough room on TYPICAL SECTION. For "DETAIL A", see *Bridge Design Memo* 5.27.



- 17. Show soffit slab flare locations.
- 18. Show vertical fillets (not required for skews less than 20 degrees).
- 19. Show utility opening and future utility locations and call out type per *Standard Plan*: B7-10 Utility Openings Box Girder or *Standard Plan*: B6-10 Utility Openings T-Beam.
- 20. Show location of soffit and deck access openings, see *Standard Plan*: B14-5 Water Supply Line (Details) (Pipe Sizes Less Than 4"). A minimum of one opening per span should be placed for bays that contain utilities for future access. Dimension from centerline of support.
- 21. Show deck drain locations and drainpipes. Additional DECK DRAINAGE sheet may be used to provide additional drainage details.
- 22. Show concrete box vents and call out *Standard Plan*: B7-1 Box Girder Details (Detail V-1). Soffit vents should be placed per notes on standard details.
- 23. Do not show prestressing ducts or duct vents.
- 9.1.2 GIRDER LAYOUT



#### **Longitudinal Section**

- 1. Draw LONGITUDINAL SECTION not to scale. Typically place as a projection from the PLAN view. Exaggerate vertically to show details more clearly.
- 2. Show stirrup spacing. Combine callouts on similar girders to save space.
  - i. Provide stirrups at no more than 12-inch spacing for a minimum of 8 feet at supports and anchor ends.
- Show soffit flare thickness and lengths. Show non-typical soffit and deck thickness along the bridge LONGITUDINAL SECTION (e.g., soffit thickness near in-span hinge seat).
- 4. Show cable path for prestressed bridges. Note control dimensions to center of gravity of prestressing force at centerline of supports and locate inflection points of cable path. Dimension high points, low points, points of inflection and cable ends from bottom of soffit. The cable path should be labeled as parabolic between points shown.
- 5. Add standard cell for PRESTRESSING NOTES.
  - i. Give type of strands (e.g., 270 ksi low relaxation strands).
  - ii. Specify P<sub>jack</sub> (kips) and the number of girders for which it applies.
  - iii. Include all assumptions for prestress losses (assumed K and  $\mu$  as well as assumed long term loss stress).
  - iv. Include the final force ratio allowed between any two girders.
  - v. Clearly identify the physical location of the point of no movement along the cable path in the LONGITUDINAL SECTION view. Indicate the force coefficient at the point of no movement \( \mathbb{\mathbb{\textit{Z}}} \) in decimal form (rounded to nearest 0.001). Add symbol description to LEGEND.
  - vi. Specify either one end or two end stressing. If one end stressing, specify which end is to be the stressing end.
  - vii. Give concrete strength (ksi) at 28 days f'c and at time of stressing f'ci.



## **Camber Diagram**

- 1. Draw proportionally correct, but not to scale.
- Add note: "Does not include allowance for falsework settlement".
- 3. Use one diagram for all girders except unusual conditions.
- 4. Avoid negative camber values especially in conjunction with flat bridge profiles
- 5. Camber units shown in feet and to the nearest 0.01'.
  - i. Camber values for precast girders are tabulated on precast girder standard detail sheets.
  - ii. Camber values for steel girders should be detailed on GIRDER DETAIL sheets.

#### **End Diaphragm Section**

- 1. Use scale  $\frac{1}{2}$ " = 1'-0" minimum.
- END DIAPHRAGM section should be taken from PLAN view on the GIRDER LAYOUT sheet. SECTION may be shown on TYPICAL SECTION sheet if space is limited.
- 3. Show width of diaphragm.
- 4. Show approximate prestress blockout location. For prestressing Grillage, reference *Standard Plan B8-5*. For reinforcement, see *Bridge Design Memo 5.26*
- 5. Label all reinforcement. Show limits of transverse deck reinforcement.
- Show sealed joint (MR ≤ 2") or joint seal blockout (MR > 2").
- 7. Only show lines that intersect the section cut plane (do not show lines and reinforcement that are beyond the section cut plane).
- 8. In some cases, multiple SECTIONS may be required. If multiple SECTIONS are required, then consider adding END DIAPHRAGM DETAILS sheet.



NOTE: To reflect current detailing standards, this sheet may have been modified from its original version. MINITION BRANCH BRIDGE (REPLACE) % (in) 0.15 (1/rad) 0.0002 (1/f+) 8500 = 20 The final force ratio (larger divided by smaller) between any two girders shall not exceed exceed the ratio of: 10 to 9 & Brg Abut 4 One end stressing shall be performed from the long-span end only.  $f'c = \frac{4000}{500} \text{ psi @ 28 days}$   $f'ci = \frac{3500}{500} \text{ psi @ time of stressing}$ GIRDER LAYOUT PRESTRESSING NOTES Contractor shall submit elongation calculations based on initial stress at: M = 0.835 times jacking stress. Friction wobble coefficient, K 0.413 270 KSI Low Relaxation Strand: Point of no movement for prestress shortening Assumed long term losses Total Number of Girders Friction curvature For "CAMBER DIAGRAM" and "SECTION X-X", see "GIRDER REINFORCEMENT" sheet. Anchor Set Width of girder stem in inches Concrete: designation SOFFIT ACCESS B14-5 FUTURE UTILITY OPENING U-4 POINT OF INFLECTION DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN
DESIGN BRANCH X \* EF 0 **(4)** @ 9 0.112 0.113 · @ PIER 3-CALIFORNIA
DEPARTMENT OF TRANSPORTATION 20'-0" Typ 8 12 J € Brg Abut 4 φ 12 12 ONGITUDINAL SECTION € FUTURE UTILITY OPENING @ 15 Max B7-1 V-1 PLAN 87-1 88-5 12 [2] 12 [18] E 18 √"½1-,t 16'-0" SOFFIT Typ FLARE C PIER 2 12 0.112 E 12 8 18 16'-0" Typ GIRDER FLARE GIRDER 1 C PIER 2 18 18 -C PIER -EOD 18 12 [2] 12 0.11 CABLE PATH IS A PARABOLIC CURVE BETWEEN POINTS SHOWN EOD 18 <u>=</u> FUTURE UTILITY OPENING U-7 30,-0" 12 12 -€ Brg Abut 1 φ 12 2 12 H-E Brg Abut 1 0.3L1 18 18 STRUCTURES DESIGN DETAIL SHEET [ENGLISH) (REVISION 12/13/2019) ⋖ Ó \$ (,9∓),,9−,2 B7-10 U-4 N "CL1" LINE "CL1" LINE ÷

Figure 9A.A.1 Girder Layout Detailing Example 1



Evaluate revision battes to the party band 16 27 (kips) = 0,0002 (17f+) Concrete: f'c =  $\frac{4000}{3500}$  psi & 28 days f'ci =  $\frac{3500}{3500}$  psi & time of stressing DRY CREEK BRIDGE (REPLACE) <u>(P</u> The final force ratio (larger divided by smaller) between any two girders shall not exceed exceed the ratio of: 10 to NOTES: 1. For "CAMBER DIAGRAM" and "SECTION see "GIRDER REINFORCEMENT" sheet. (A) Girder designation

12 Width of girder stem in incha

8 Point of no movement for 2. Girder Flare length 16'-0" unless otherwise noted. Transverse soffit reinforcement shown, see "TYPICAL SECTION" shee for additional details. Point of no movement for prestress shortening RECISTERED CIVIL ENCINEER DATE GIRDER LAYOUT Confractor shall submit elongation calculations brees or initial stress & = 0.896 times jacking stress. Two end stressing shall be performed PRESTRESSING NOTES
270 KSJ Low Relaxation Strand:
Pjack Friction wobble coefficient, K Assumed long term losses Total Number of Girders LEGEND: Anchor Set © Brg Abut 4 9 12 R 30'-0" SIRDER (A) FLARE - C PIER 3 Θ 2009 2006 3004 4006 2009 018 2009 2006 2009 2006 4004 Ø 12 0,4% B14-5 C SOFFIT ACCESS OPENING, Typ DESIGN BRANCH X 4004\* 3004 4006 2009 9 Q -.CG OF PRESTRESS CABLE PATH IS A PARABOLIC CURVE BETWEEN POINTS SHOWN †-} + 2000 + œ) — 18 (B7-1) Typ 4036 STATE OF
CALIFORNIA
DEPARTMENT OF TRANSPORTATION 18 18 <u>`</u>[2], 0.1120 C PIER 3 18 75@4\* 63@4 20@9 @15 30@9 30@6 45@4 4504 3086 3089 618 3089 3086 4504 4504\_3006\_ 3009\_018\_2009\_6304\_ 7504\*\_ 30'-0" GIRDER (A) FLARE 12 LONGITUDINAL SECTION
NO SCALE 18 SEE NOTE 2, [2] 30 80-5 30 12 30'-0" GIRDER (F) FLARE E PTER 2-OUTSIDE FACE OF EXTERIOR GIRDER 12 0.5L2 PLAN (87-1) CUTSIDE FACE OF EXTERIOR SIRDER-= 0-11-0 C PIER 2 GIRDERS (BCO)E 2006\_2 2009 \_ 018 \_ 2009\_ 4006 \_ 3004 GIRDER (F) 2006\_ 2009 \_ 4006\_ 3004\_4004\_ 2009 4006 3004 EDGE OF POINT OF INFLECTION, Typ = ----30'-0" © SOFFIT B14-5 ACCESS OPENING #6 OR / Typ--STIRRUP SPACING GIRDER & 4004 2006 2009 € Brg Abu+ d£⊥ ,,11 GIRDER (F) FLARE 0.4L1 전 SEE "DETAIL A" ON "CIRDER REINFORCEMENT" SHEET & Brg Abut 1 ..e-,2 "YB20" LINE FUTURE UTILITY OPENING, Typ CHUCTURES, DESIGN DETAIL SHEET

Figure 9A.A.2 Girder Layout Detailing Example 2



GIRDER LAYOUT No. 1 0.15 (1/rad) = 0.0002 (1/f+) 9,000 (kips) i. SCOTTY CREEK BRIDGE POSTERED CIVIL ENGINEER DATE f'c = 5000 psi @ 28 days f'ci = 3500 psi @ time of stressing PRESTRESSING NOTES Contractor shall submit elongation calculations based on initial stress at: Friction curvature coefficient,  $\mu$  = The final force ratio (larger divided by smaller) between any two girders shall not exceed the ratio of: B = 0.741 times jacking stress. Iwo end stressing shall be performed Friction wobble coefficient, K 270 KSI Low Relaxation Strand: Assumed long term losses Total Number of Girders Anchor Set No. 2" SHEET Concrete: SHEET DESIGN OF ENGINEERING SERVICES
STRUCTURE DESIGN
DESIGN BRANCH 1. Girder flare leng†h is measured along ⊈ of each girder 2. FOR "SOFFIT GRATE OPENING DETAILS", see "WATER SUPPLY LINE DETAILS" sheet. PIER 4 3004 3006 3009 018 Max 3009 3006 3004 3006 3006 3009 018 Max 3009 3006 3004 @ PIER 4 STATE OF

CALIFORNIA
DEPARTMENT OF TRANSPORTATION FACE OF EXTERIOR GIRDER -INFLECTION POINT, Typ LONGITUDINAL SECTION NO SCALE 0.5L3 16'-0"SOFFIT Typ FLARE 0.113 NOTES: EDGE OF BECK € PIER 3 € PIER 3 PLAN 1" = 20' Girder stem width in inches 80-5 5-11 Point of no movement prestress shortening Girder designation FACE OF EXTERIOR GIRDER EDGE OF DECK 18 ⊠ \* 🔇 PIER 2 C PIER 2-OPENING, #6 J OR \ \* STIRRUPS SPACING 24@9 STRUCTURES DESIGN DETAIL SHEET [ENGLISH) (REVISION 3/17/2017) @ Brg Abut 1 SO.-O. SO.-O.

Figure 9A.A.3 Girder Layout Detailing Example 3



1. Girder flare length is measured along © of each girder 2. For "SOFFIT GRATE OPENING DETAILS", see "WATER SUPPL" LINE DETAILS" sheet. SCOTTY CREEK BRIDGE GIRDER LAYOUT No. 2 Girder stem width in inches Point of no movement prestress shortening 18 ⊠ \* ⊴ Figure 9A.A.4 Girder Layout Detailing Example 4 DIVISION OF ENGINEERING SERVICES
STRUCTURE DESIGN
DESIGN BRANCH ) (a) (a) (b) (c) (c) € Brg Abut 8 STATE OF
CALIFORNIA
PPARTMENT OF TRANSPORTATION FACE OF EXTERIOR ( SOFFIT GRATE, SEE NOTE 2 PIER 7 3009 3006 3004 3006 3009 018 Max 3009 3006 3004 FACE OF EXTERIOR GIRDER LONGITUDINAL SECTION NO SCALE B0-5 5-11 B7-1 PLAN 1" = 20' 0.5% C PIER 6 C PIER 6 EDGE OF DECK CABLE PATH IS A PARABOLIC CURVE BETWEEN POINTS SHOWN @ PIER 5 STRUCTURES DESIGN DETAIL SHEET (ENGLISH) (REVISION 12/13/2019)

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



#11 × 60'-0" TOTAL 10 PER BAY\* SCOTTY CREEK BRIDGE 2. For "BLOCKOUT DETAILS" and "a" dimension, see "JOINT SEAL - ABUTMENT DETAILS (MOVEMENT RATING GREATER THAN 4")" sheet. REGISTERED CIVIL ENGINEER DATE GIRDER DETAILS

OOI DISSECUE PHINTS SCARING

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AND CONTRACT SCARING 1. Reinforcing bars may be adjusted as necessary to accompate installation of the joint seal assembly blockout as directed by the Engineer 32'-0" ADDITIONAL TOP REINFORCEMENT Figure 9A.A.5 Girder Layout Detailing Example 5 0.03 NA92 № DESIGN BRANCH X ENGINEERING SERVICES BRIDGE NO. 20-0303 DESIGN BRANCH X FOOT MILE A 0.02 NA92 s√l © PIER € PIER 7 ,b0°C NA92 № ,90°0 NA92 s∤ 28,-0, ,<del>></del>0°0 NA92 N CALIFORNIA
SPARTMENT OF TRANSPORTATION € PIER 6 ,201 ,90.0 NA92 s√l ,20.0 NA92 N CAMBER DIAGRAM EDGE OF DECK ,90.0 NA92 ,80.0 NA92 s/l € GIRDER, Typ ,90.0 NA92 N T OF TRANSVERSE DECK AND DISTRIBUTION BARS NOTE: Does € PIER 4 EXTEND SOFFIT UPPER LONGITUDINAL Reinf 1'-0" INTO DIAPHRAGM 80-5 5-10 OR 80-5 5-11 #5 % 6'-0" @ 6\* #8 BUNDLED TOTAL 6 EXTEND TO EDGE DECK\* 0.03 NA92 1/5 #8 \_\_\_ TOTAL ,<sub>b0.0</sub> NA92 5/I #6 7 8 12 #5 TOTAL 5 € PIER 3 € Brg Abut ,90.0 NA92 1/5 ,60°0 NA92 5√ #5 TOTAL 6\* END DIAPHRAGM ,<u>10.0</u> NA92 N 2,-0... CAMBER LINE-NA92 № 1'-6" Abut 1 2'-0" Abut 8 NA92 s√l #6 0 12\* #5 % @ 9%, 1'-2" Abut 1 STRUCTURES DESIGN DETAIL SHEET (ENGLISH) (REVISION 12/13/2019) BLOCKOUT, SEE NOTE, 2 PROFILE LINE

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



GIRDER LAYOUT No. 1 MATCH LINE SEE
"GIRDER LAYOUT
NO. 2" SHEET FLOODWAY VIADUCT ..9∓ 4,-10. 18 - C BENT 9 0 B14-5 © SOFFIT 12'-0" ACCESS OPENINGS, "Z-, l 0.113 E BENT 4 NOTES:

1. For location of WSP, see "DRAINAGE DETAIL No. 1" sheet.

2. Access openings ploced for future access to hinge for repolar or replacement. LEGEND:

⑥ circler designation
⑥ circler stem width in inches
☒ Point of no movement for prestress shortening - SPAN B7-10 FUTURE U-7 OPENING, Typ DESIGN BRANCH 0.513 -C BENT 3 -- C BENT 3 40 @ 6 0.112 0.113 STATE OF

CALIFORNIA

EPARTMENT OF TRANSPORTATION LONGITUDINAL SECTION
NO SCALE 80-5 5-11 EDGE OF DECK--C SPAN EDGE OF DECK  $f'c = \frac{5000}{400}$  psi @ 28 days  $f'ci = \frac{4000}{400}$  psi @ time of stressing Contractor shall submit elongation calculations based on initial stress at: Two end stressing shall be performed. 155'-6" 0.5L2 EDGE OF SOFFIT-EDGE OF SOFFIT-40 @ 6 0.1L 0.1L2 SOFFIT 16'-0" FLARE Typ 8 @ 12 € BENT 2 PRESTRESSING NOTES .z-, i € BENT 2 0.837 (in) 0.15 (1/rad) 0.0002 (1/f+) (B7-1) Typ (ksi) CABLE PATH IS PARABOLIC BETWEEN POINTS SHOWN B14-5 & SOFFIT ACCESS OPENING, Typ The final force ratio (larger divided by smaller) between any two girders shall not exceed exceed the ratio of: 10 to 9 Friction wobble coefficient, K Friction curvature coefficien Assumed long term losses 270 KSI Low Relaxation Stra Total Number of Girders 18 \$ 12 12 #5 STIRRUPS, Typ 18 @ 12 18 € Brg Abut 1-..9∓ @ Brg Abut 1-STRUCTURES DESIGN DETAIL SHEET [ENGLISH) (REVISION 12/13/2019) FUTURE B7-10 UTILITY U-4 OPENING,

Figure 9A.A.6 Girder Layout Detailing Example 6



Figure 9A.A.7 Girder Layout Detailing Example 7

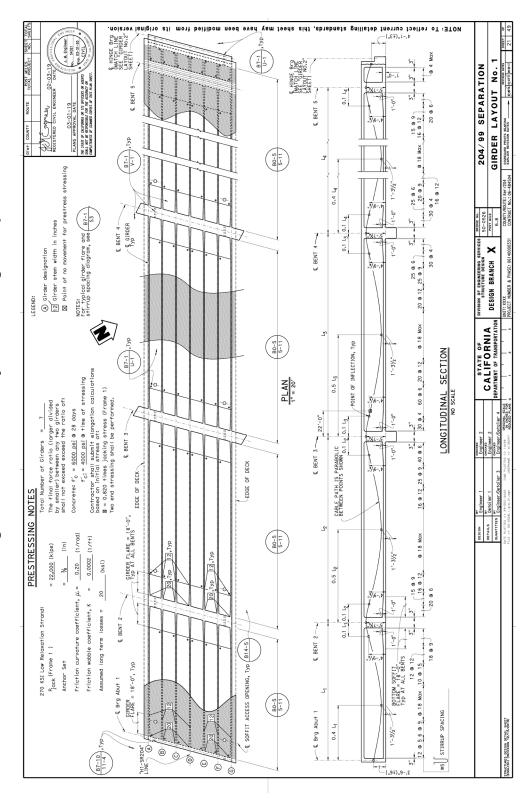
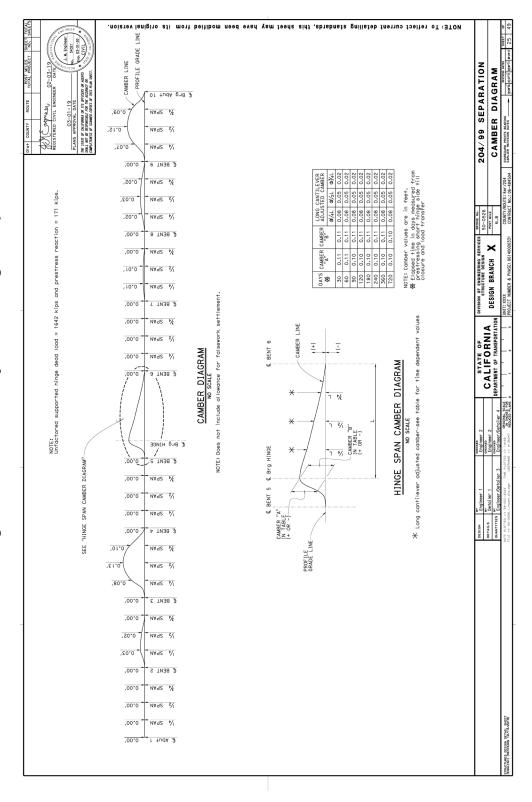




Figure 9A.A.8 Girder Layout Detailing Example 8





PFEIFFER CANYON BRIDGE NOTE:
1. For "SECTION A-A" and "SECTION B-B", see "GIRDER DETAILS NO. 2" sheet. GIRDER LAYOUT LEGEND:

A Girder designation 1 Figure 9A.A.9 Girder Layout Detailing Example 9 STEEL GIRDER MATCH LINE, SEE BELOW € Brg Abut 2 DESIGN OF ENGINEERING SERVICES
STRUCTURE DESIGN
DESIGN BRANCH INTERMEDIATE CROSS FRAME 25'-0" STATE OF

CALIFORNIA
DEPARTMENT OF TRANSPORTATION INTERMEDIATE CROSS FRAME SPACING 5 @ 26'-0" = 130'-0" RIGHT EDGE OF DECK -LEFT EDGE OF DECK-C CATWALK N 60°46'43" W, Typ INTERMEDIATE CROSS FRAME SPACING 5 @ 26'-0" = 130'-0" PLAN 1/8" = 1'-0" N 60°46'43" W, Typ-C CATWALK LEFT EDGE OF DECK-RIGHT EDGE OF DECK -FUTURE B6-10 UTILITY D-13 CONCRETE END DIAPHRAGM INTERMEDIATE CROSS FRAME C Brg Abut 1 E SPAN "0-'S1 qvT MATCH LINE, SEE ABOVE STRUCTURES DESIGN DETAIL SHEET [ENGLISH) (REVISION 12/13/2019)

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



Figure 9A.A.10 Girder Layout Detailing Example 10

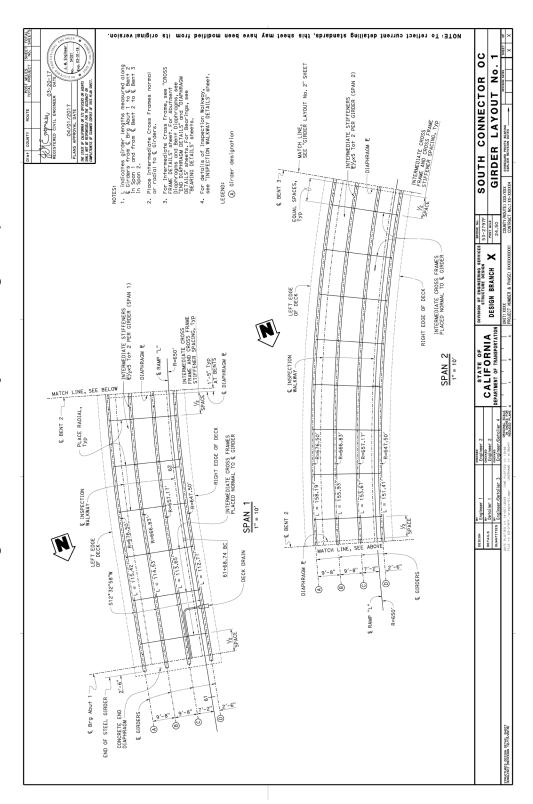
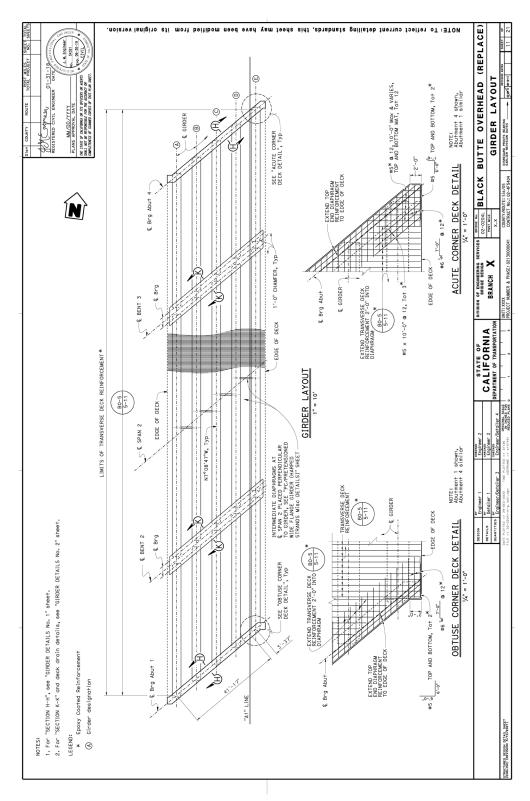




Figure 9A.A.11 Girder Layout Detailing Example 11





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

STREED PRICE BEARD

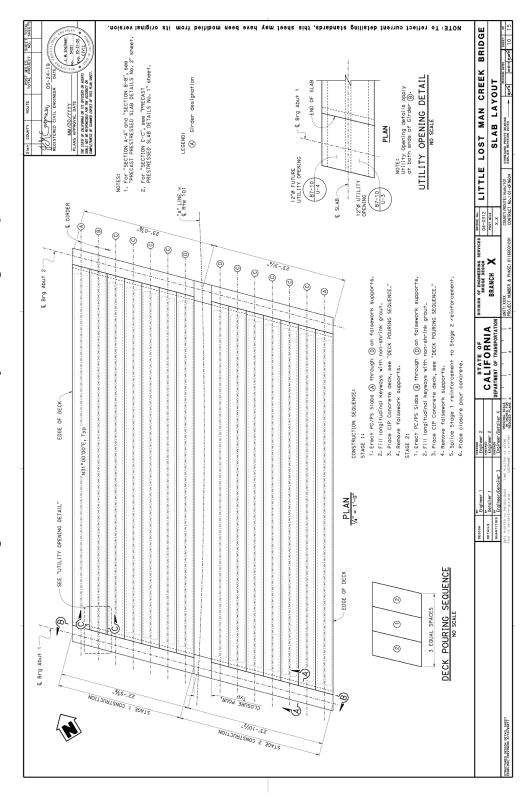
DEBLIES REVISION DATES

- SANTI REVENUE PRICE OF THE PARTY OF INSIDE FACE OF BACKWALL PIPELINE AVE OC (REPLACE) MM/DD/YYYY
PLANS APPROVAL DATE
THE STATE OF CALFORMA OF 175 OFFICES OR
SMALL NOT BE SEPARABLE OF THIS PAIR
COMPLETENESS OF SOMMED COPIES OF THIS PAIR DETAIL A %" = 1'-0" 8 C Abut 3 Brg (g) 11/2"% HOLE (INTERIOR GIRDER) FACE OF BENT CAP AT GIRDER LOCATION LEGEND:
(A) Girder segment designation DETAIL B %" = 1'-0" EOD DIVISION OF ENGINEERING SE BRIDGE DESIGN BRANCH 11/2"¢ HOLE (INTERIOR GIRDER) Typ (B6-10) T CALIFORNIA
DEPARTMENT OF TRANSPORTATION GIRDER LAYOUT OBTUSE CORNER DECK DETAIL C GIRDER 80-5 5-11 € Brg Abut 5-#6 C SPAN 1-ACUTE CORNER DECK DETAIL C GIRDER EOD € Brg Abut EXTEND TRANSVERSE DECK Reinf 1'-6" INTO DIAPHRAGM, TYP (Be-10) Typ STRUCTURES DESIGN DETAIL SHEET (ENSLISH) (REVISION 3/10/2021) STAGE 1 9 B6-10 U-14 GIRDER (1)

Figure 9A.A.12 Girder Layout Detailing Example 12



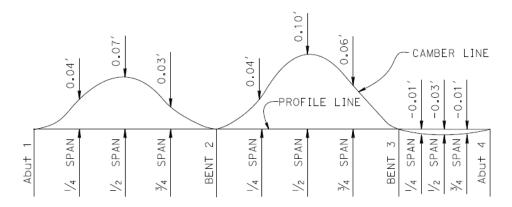
Figure 9A.A.13 Girder Layout Detailing Example 13





# Bridge Design Details 9.2 January 2023 Camber Diagrams for Cast-In-Place Concrete Girders

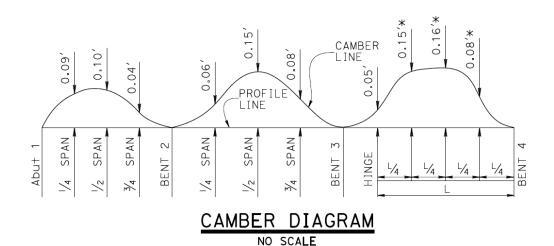
For steel girder camber diagram details, see Bridge Design Details: 11 Steel Girders.



# CAMBER DIAGRAM NO SCALE

Note: Does not include allowance for falsework settlement.

Figure 9.2.1 Three-Span Camber Diagram



Note: Does not include allowance for falsework settlement. \* - Long cantilever adjusted camber (time dependent)

Figure 9.2.2 Three-Span with Hinge Camber Diagram



## **Bridge Design Details 9.3 January 2023**

#### **Center of Gravity of Prestressing Force Diagram**

On multiple span continuous prestressed bridges, utilizing two-end stressing may be more economical. Use similar center of gravity (CG) diagram for both one and two-end stressing and dimension the location of the theoretical point of no movement in all cases. For additional details, see *Bridge Design Details*, 14.2 Longitudinal Section. Provide directions in the plans regarding stressing sequence assumed for design, using a note similar to the following: "NOTE: Two end stressing shall be performed." Or "NOTE: One end stressing shall be performed from Abutment X side."

Actual dimensions should be shown for single span bridges or bridges with equal length spans.

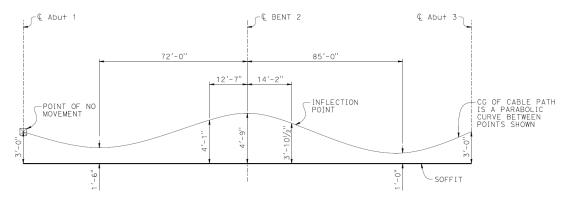


Figure 9.3.1 Equal Span Bridge Path of CG of Prestressing Force

On bridges with variable span lengths or bridges with a radius, the span dimensions should be indicated as below. Girders on radius will have different lengths.

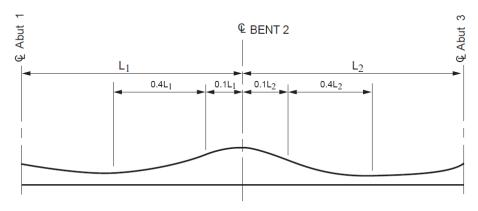


Figure 9.3.2 Variable Span Bridge Path of CG of Prestressing Force



## **Bridge Design Details 9.4 January 2023**

#### **Deck Joints Cast-in-Place Concrete Girder**

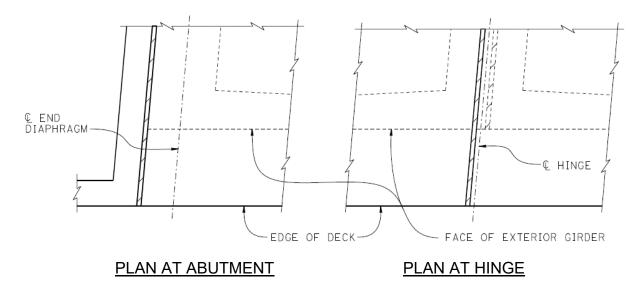


Figure 9.4.1 Deck Joints at Vertical or Sloping Exterior Girders (Skew 0° to 20°)

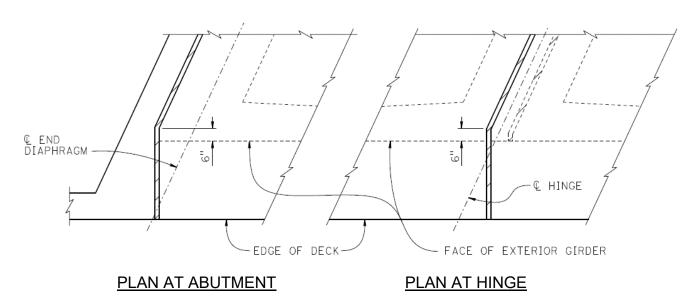


Figure 9.4.2 Deck Joints at Vertical Exterior Girders (Over 20° Skew)



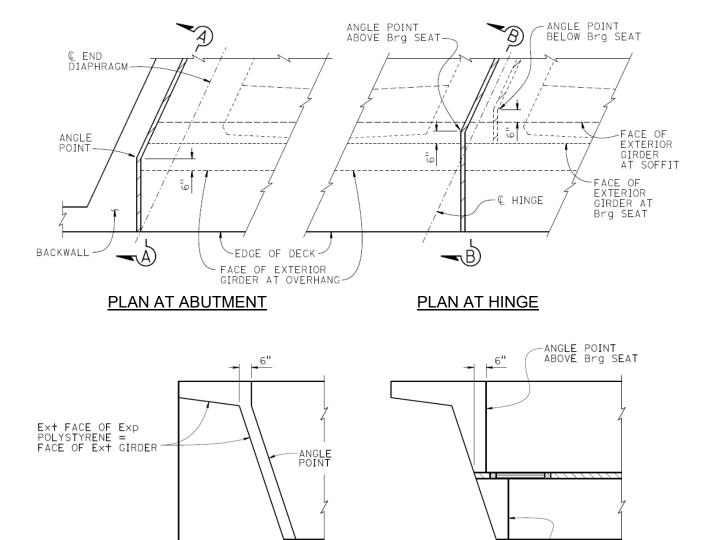


Figure 9.4.3 Deck Joints at Sloping Exterior Girders (Over 20° Skew)

\_6"

**SECTION B-B** 

ANGLE POINT BELOW Brg SEAT

6"

**SECTION A-A** 



## **Bridge Design Details 9.5 January 2023**

#### **Deck Joints Precast Concrete or Steel Girders**

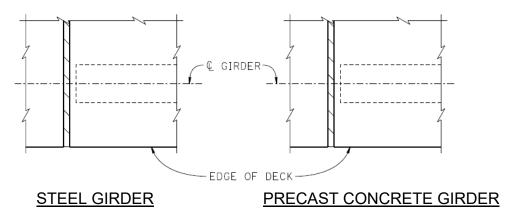


Figure 9.5.1 Deck Joints at Girders (No Skew)

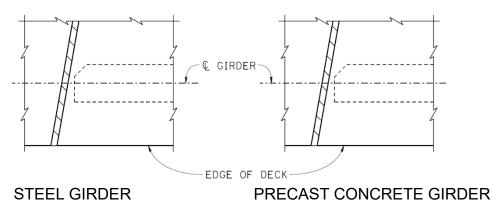


Figure 9.5.2 Deck Joints at Girders (Skew 0° to 20°)

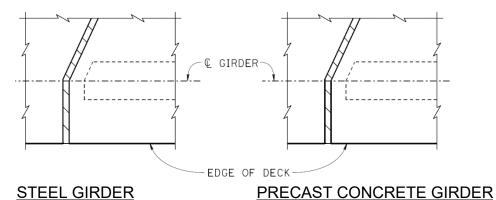
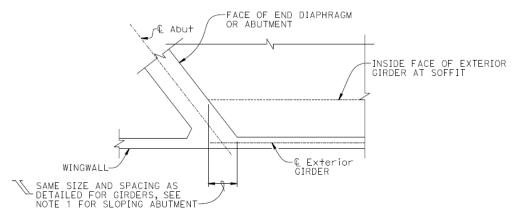


Figure 9.5.3 Deck Joints at Girders (Over 20° Skew)



## **Bridge Design Details 9.6 January 2023**

## **Stirrup Reinforcement at Abutments**



PART PLAN ACUTE ABUTMENT CORNER

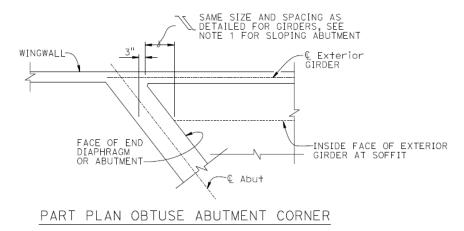


Figure 9.6.1 Stirrup Reinforcement at Abutments (Sloping Exterior Girder)

#### Notes:

- Additional stirrups or equivalent reinforcement may be required for sloping abutment face.
- 2. Considerations should be given to potential conflicts when accommodating prestressing flares and assemblies.
- 3. The details above should be shown in addition to the details on *Standard Plan*: B6-1 T-Beam Details and *Standard Plan*: B7-1 Box Girder Details.



## **Bridge Design Details 9.7 January 2023**

### Soffit Reinforcement (Skews > 20°)

At the junction of the bottom slab and end diaphragm of seat-type abutments, for skews greater than 20°, rebar clearance problems may be encountered. The slab thickness may not be adequate to accommodate the "stacking" of longitudinal and transverse slab bars, diaphragm stirrups, and diaphragm bottom bars.

Use in conjunction with *Bridge Design Details*: 8.8 Typical Transverse Reinforcement and *Bridge Design Details*: 14.5 Level Abutment Seat.

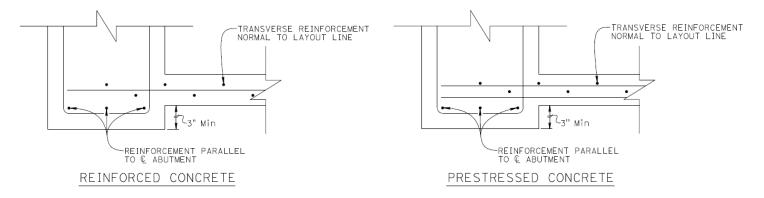
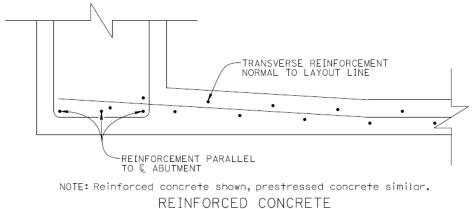


Figure 9.7.1 Drop Diaphragm Alternative



REINFORCED CONCRETE

Figure 9.7.2 Flared Soffit Alternative



## Bridge Design Details 9.8 January 2023

#### **Concrete Strength and Type Limits**

The plans and/or specifications must clearly define the pay limits for all concrete. The *Standard Specifications* state that all concrete not otherwise designated by strength on the plans will be paid for as STRUCTURAL CONCRETE, BRIDGE; likewise, the limits for all high strength concrete must be shown on the plans. These limits can be shown by the use of a CONCRETE STRENGTH AND TYPE LIMITS diagram, or by providing the information directly on the detail drawings of the various elements.

All bents or piers are not required to be shown if they have the same type and strength of concrete. Precast girder limits should be shown on the diagram but reference the detail sheets for strengths and other details. Approach slab concrete limits should not be shown.

To avoid confusion, avoid using cross hatching whenever possible. If necessary, cross hatching may be used to describe seal course or concrete pile concrete limits. Do not show the specific days to which strength should be obtained (e.g., f'c at 28 days).

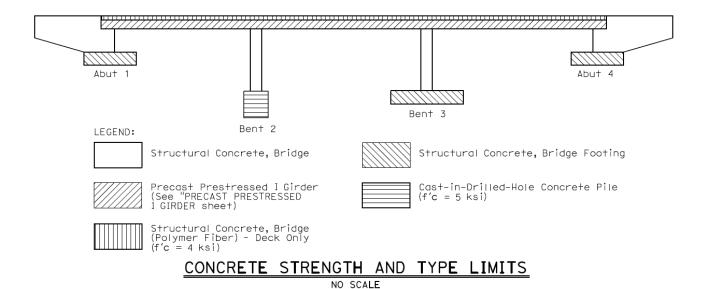


Figure 9.8.1 Concrete Strength and Type Limits Diagram
Precast Prestressed Girder Bridge



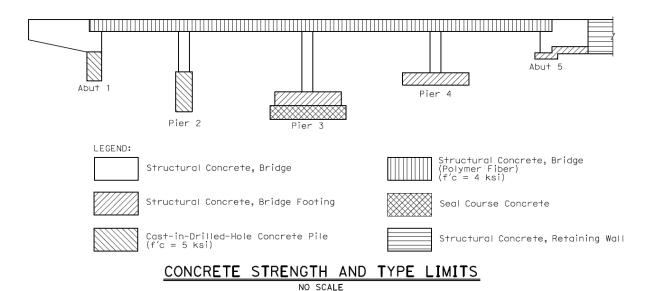


Figure 9.8.2 Concrete Strength and Type Limits Diagram Reinforced Concrete Slab Bridge

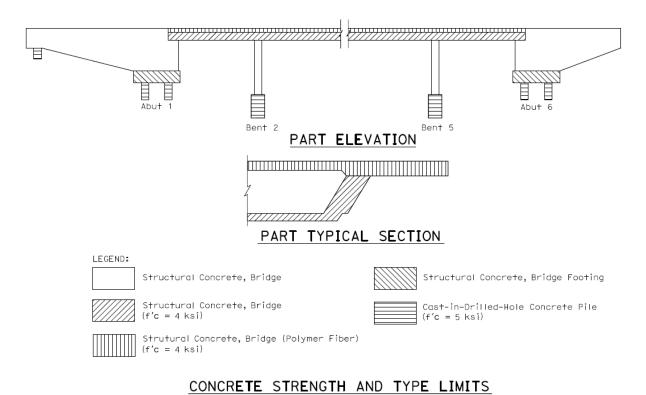


Figure 9.8.3 Concrete Strength and Type Limits Diagram Cast-in-Place Prestressed Box Girder Bridge