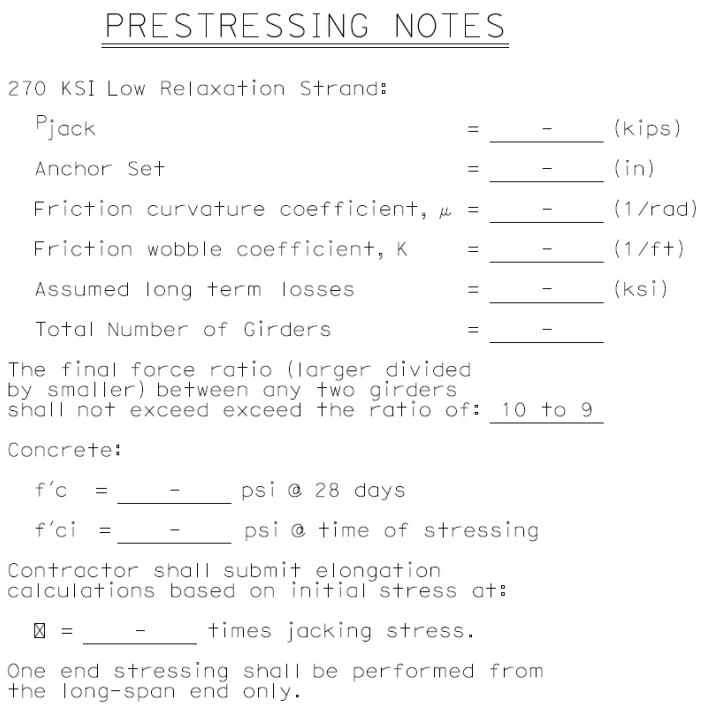
Bridge Design Details 14.1 January 2023

Prestressed Post-Tensioned Concrete

The details and guidelines in this chapter only cover the general detailing practices for Cast-in-place Prestressed (CIP/PS) bridges. Detailers must check with the Design Engineer for anchorage zone reinforcement details and any other details that may be needed.

Prestressing Notes

The following decal and notes are to be placed on the GIRDER LAYOUT sheets. One set of PRESTRESSING NOTES are required for each structural frame. For staged construction, there should be a separate set of PRESTRESSING NOTES for each stage. P_{jack} corresponds to the total number of girders listed. Specify either one end or two end stressing. If one end stressing, specify which end is to be the stressing end. Include all assumptions for prestress losses (assumed K and μ as well as average long term loss stress).


PRESTRESSING NOTES

270 KSI Low Relaxation Strand:

P_{jack} = ____-____ (kips)

Anchor Set = ____-____ (in)

Friction curvature coefficient, μ = ____-____ (1/rad)

Friction wobble coefficient, K = ____-____ (1/ft)

Assumed long term losses = ____-____ (ksi)

Total Number of Girders = ____-____

The final force ratio (larger divided by smaller) between any two girders shall not exceed exceed the ratio of: 10 to 9

Concrete:

f'c = ____-____ psi @ 28 days

f'ci = ____-____ psi @ time of stressing

Contractor shall submit elongation calculations based on initial stress at:

☒ = ____-____ times jacking stress.

One end stressing shall be performed from the long-span end only.

Figure 14.1.1 Prestressing Notes

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Longitudinal Section

The prestress cable path must be drawn parabolic and dimensioned at the frame ends, high points, low points, and points of inflection. The point of inflection is the point along the cable path in multiple span structures where a change in direction of curvature occurs. Vertical dimensions must be shown to the nearest 1/8". Draw the Longitudinal Section at NO SCALE and exaggerated in the vertical direction for clarity. If there are soffit flares, show them in this view and on the GIRDER LAYOUT detail but only dimension them in one location. Dimension the cable path ends with a 6-inch allowance upward or downward to accommodate splaying of tendons at the anchorage. Show the point of no movement in this view indicated by: ☒

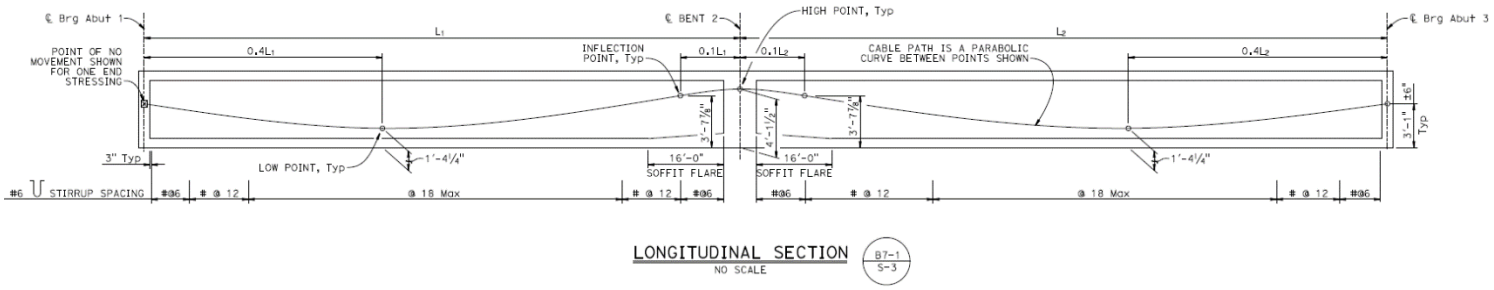

Figure 14.2.1 Longitudinal Section

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End Diaphragm – CIP/PS Box Girder

Show limits of deck and soffit slab reinforcement, see Bridge Design Memo 9.4.

Prestress blockout shape can be vertical or inclined and is determined by the Contractor, see Bridge Design Memo 5.26 for anchorage zone design. For other prestress anchorage blockout details, see Standard Plans B8-5. For recommended end diaphragm dimensions, refer to Bridge Design Memo 5.22.

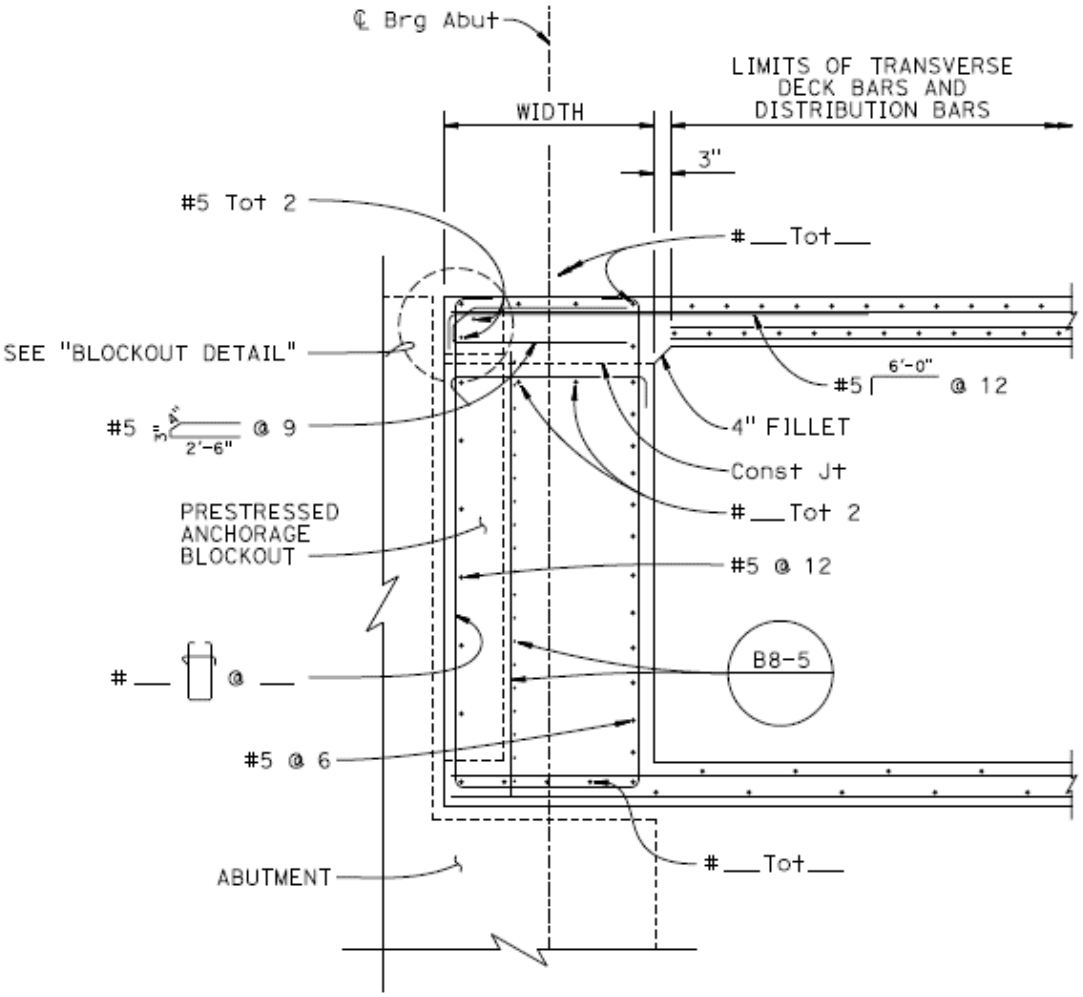

Figure 14.3.1 End Diaphragm Detail

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Hinge Diaphragm – CIP/PS Box Girder

Bars connecting to adjacent diaphragm are not shown for clarity. Show limits of deck and soffit slab reinforcement, see Bridge Design Memo 9.4.

Prestress blockout shape can be vertical or inclined and is determined by the Contractor, see Bridge Design Memo 5.26 for anchorage zone design. For other prestress anchorage blockout details, see Standard Plans B8-5. For recommended end diaphragm dimensions, refer to Bridge Design Memo 5.22.

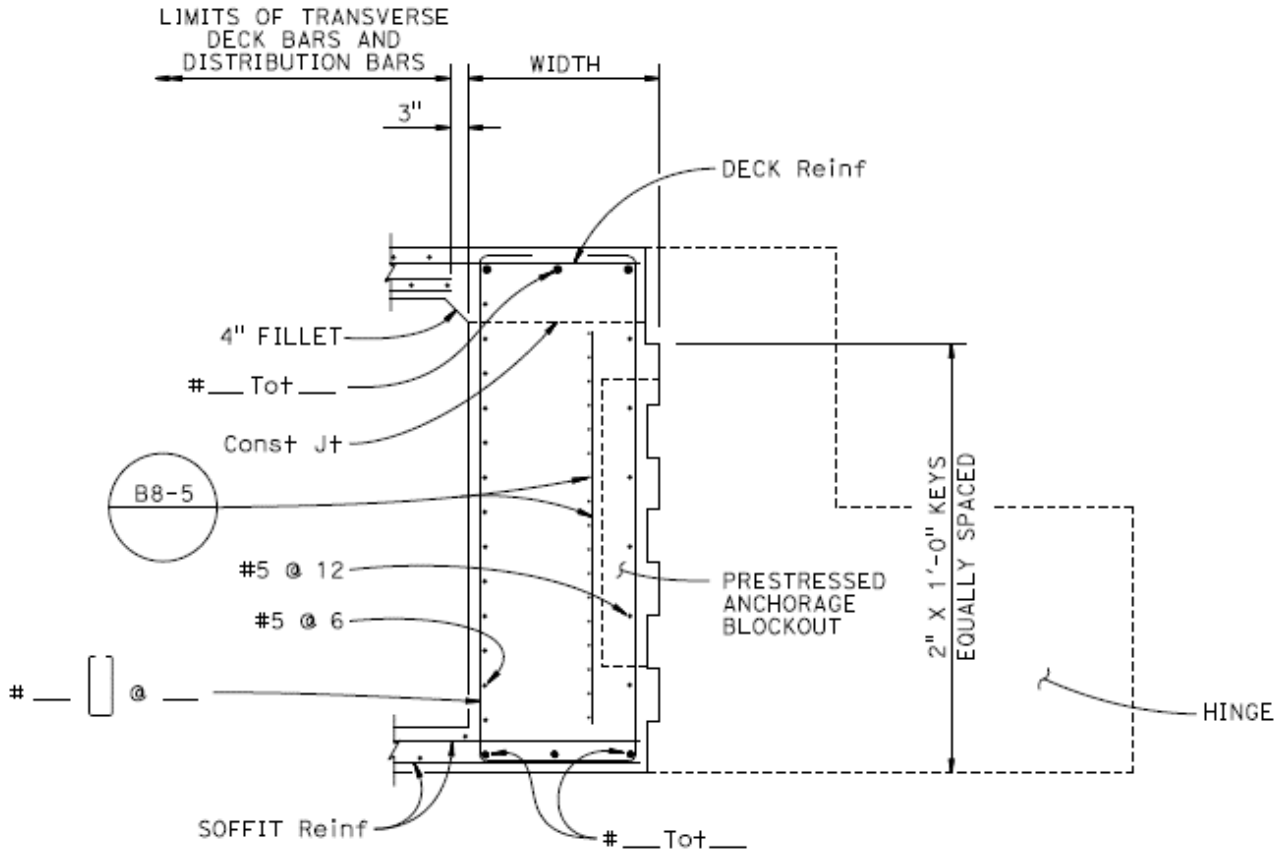

Figure 14.4.1 Hinge Diaphragm Detail

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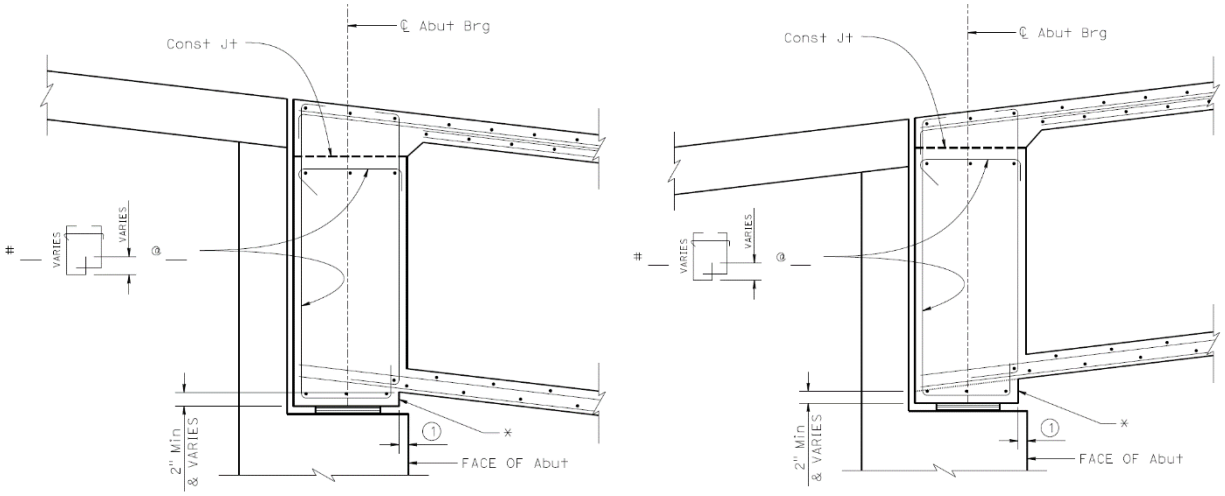
Level Abutment Seat

The End Diaphragm depth should be increased (also known as dropped diaphragm) for bridges with steep longitudinal slope (when longitudinal slope exceeds 3%). The portion of the End Diaphragm below the soffit should be inset behind the face of the abutment stem by an amount equal to the expected prestress shortening movement.

Additionally, a dropped diaphragm is used when there are high superelevations (cross slope exceeds 3%) or when there are high skews (greater than 20 degrees) to allow the bottom slab reinforcement to be extended into the end diaphragm and not conflict with the bottom end diaphragm reinforcement.

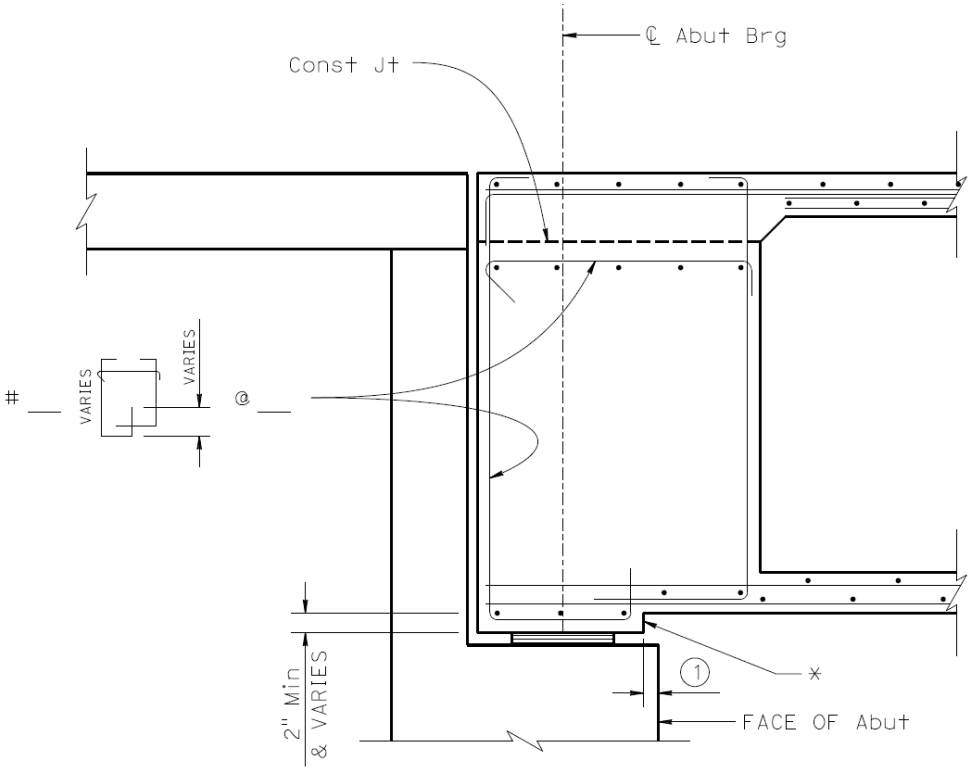


(Uphill Side) **(Downhill side)**

NOTE:
① Inset diaphragm ___" to allow for prestress shortening.

* Increase end diaphragm depth to allow for abutment seat to be level

Figure 14.5.1 Level Seat at End Diaphragm



NOTE:
(1) Inset diaphragm ___" to allow for prestress shortening.

* Increase end diaphragm depth to allow for abutment seat to be level

Figure 14.5.2 Level Seat at Wide End Diaphragm (Superelevation)

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Box Girder Cell Access for Inspection and Repair

Although rare, when tendons are exposed within the cells of post-tensioned concrete box girder bridges, access must be provided to those cells for removal of deck forms and future inspection of the tendons. Use standard specifications to detail what is required for removing forms to provide permanent access to cells. More common is providing access for installation and repair of utilities in cells without soffit or deck openings.

A minimum of two access openings per span and multiple openings in interior webs are required to provide access to all bays for future access of spans with exposed tendons and utilities. Openings in diaphragms and webs should follow details and sizes given in the *Standard Plans*. Temporary openings in the top or bottom slab shall be permitted for removal of deck forms. Location and maximum size of temporary openings shall be shown and indicated as optional for the Contractor. Temporary openings 4'-0" x 4'-0" will be permitted in the top or bottom slab, where indicated, at Contractor's option. Openings in the top slab (deck) are preferred for overcrossings, while openings in bottom slab (soffit) may be preferred for undercrossings. Final location of access openings is determined by the Engineer after considering structural effects, security and limiting future disruption to traffic.

If possible, form lumber should not have to be moved through more than two openings in diaphragms or webs. Permanent stay-in-place galvanized, corrugated steel forms are an acceptable alternative for Contractor. Using steel forms would allow Contractor to leave forms in cells; if lumber forms are used all material should be removed for future access.

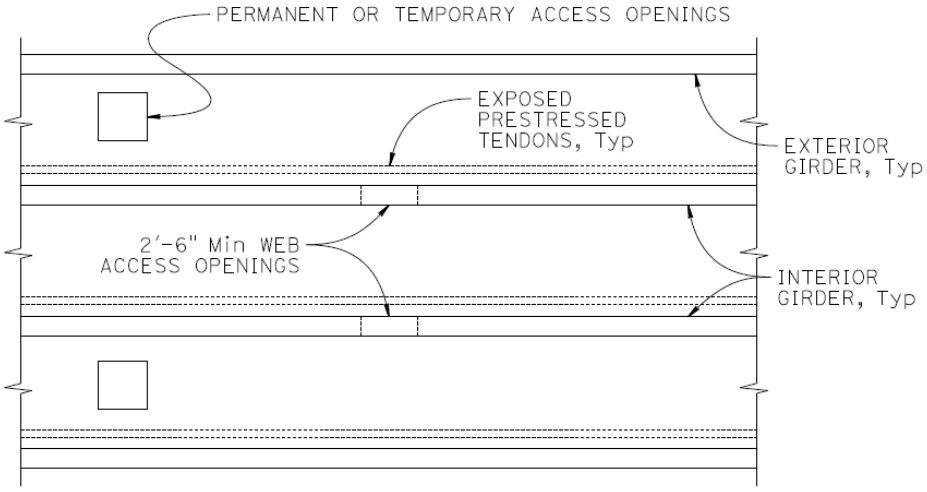

Figure 14.6.1 Girder Layout with Access to Tendons