51-1.03D(4) Construction Joints

Concrete Technology Manual
Additional information regarding girder stem to deck joints can be found in the Concrete Technology Manual, Chapter 5 Concrete Construction.

Stem to Deck Construction Joint
In 2010, the Structure Maintenance and Investigations (SM&I) group discovered horizontal shear failure between the stem to deck interface in both T-Beam and Box Girder cast-in-place reinforced concrete structures. The shear failure in some cases progressed enough to warrant bridge replacement.

The Division of Engineering Services (DES) Reinforced Concrete Committee evaluated this issue with the objective of increasing horizontal shear capacity at the girder stem to deck interface. In addition to other changes in design practice and procedures, it was concluded that horizontal shear capacity across the stem to deck interface increases significantly when the construction joint is intentionally roughened to minimum amplitude of ¼". To help assure that proper attention is given to the critical construction joint between the girder stem and the deck, the specifications have been amended.

Figures 1 through 3 depict acceptable roughened surfaces. A hand-held garden rake was used to obtain the roughened surface in these examples.

Figure 1: Example of Acceptable Roughened Surface.
During the roughening operation, care should be exercised to avoid the following:

- Excessive dislodging of coarse aggregates when using the roughening tool.
- Floating/troweling of the top surface of the stem forcing coarse aggregate into the paste and making the surface too smooth.
- Excessive vibration causing the cement paste to rise and cover coarse aggregates.

In addition to the above, it is also extremely important that the surface of the construction joint be abrasively cleaned per the specifications\(^1\), prior to placement of deck concrete. All laitance, curing compound, and loosened particles of concrete must be removed.

A rough clean construction joint can go a long way in assuring the structural integrity throughout the life of the bridge.

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\(^1\) 2010 SS, Section 51-1.03D(4), *Construction Joints*
For projects that are using *Standard Specifications* dated earlier than 2010, your attention is directed to the Division of Construction’s Construction Procedure Directive (CPD) 10-8, *Stem to Deck Construction Joint*² for more details on how to incorporate the modified joint detail into their projects.

If a change order is required, it will be implemented at no additional cost. It has been determined that the desired roughness can be obtained with insignificant additional effort. Furthermore, removal of the requirement to expose the aggregate by blasting strengthens the *no additional cost* determination.

**51-1.03E(2) Placing Mortar**

*Filling Bolt Holes*

Mortar used for filling bolt holes may include additives that reduce shrinkage and cracking of the patch and to provide a better bond between the patch and the existing concrete. Mortar additives (shrinkage reducers, water reducers, bonding agents, etc.) are acceptable provided they meet the following requirements:

1. The additive must not have polyvinyl acetate as the active ingredient.
2. The additive must be acrylic based.

For questions on whether a particular additive is acceptable contact your regional Structural Materials Representative (SMR)³.

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51-6 Mass Concrete

51-6.01 General

_Concrete Technology Manual_
Refer to the Concrete Technology Manual, Chapter 7, Caltrans Advancements/High Performance Concrete, for additional information.

51-6.01C Submittals

_Contractor Requested Construction Joint_
Mass concrete is typically identified in the contract by the minimum dimension of an element exceeding 7 feet. Contractors may attempt to have the mass concrete provisions waived by proposing a construction joint at a dimension less than 7 feet. Creating a construction joint below the mass concrete dimension does not ensure that the peak curing temperature or temperature differential is adequately controlled. Such proposals must be evaluated in the context of a complete _Thermal Control Plan_ (TCP). The placement of construction joints is not at the Contractors’ discretion and their introduction requires Structure Design and Structure Construction approval. The Structure Representative must verify that the Contractor adequately addresses all issues related to the TCP.

51-6.01D(2) Temperature Monitoring

_Temperature Monitoring - Not Optional_
Caltrans’ ongoing evaluation of the mass concrete specifications, including the current minimum dimension, is dependent upon the data collected from the mass concrete temperature monitoring requirements. Temperature monitoring requirements are not to be waived.