

TO: All Bridge Design Office Staff  
FROM: Bijan Khaleghi  
DATE: August 7, 2013  
SUBJECT: Intermediate Diaphragms for Prestressed Concrete Girder Bridges

This design memorandum describes WSDOT policies for use of intermediate diaphragms for prestressed concrete pretensioned girders, and post-tensioned concrete spliced girders including WF series girders, deck bulb tee girders and tub girders.

Intermediate Diaphragms shall be provided for all prestressed concrete girder bridges as follows:

- Precast pretensioned concrete girders including WF series girders, and deck bulb tee girders, and tub girders: Intermediate diaphragms shall be provided according to WSDOT BDM Table 5.6.2-1.
- Post-tensioned concrete spliced girders including WF series, deck bulb tee girders and tub spliced girders: Intermediate diaphragms shall be provided according to WSDOT BDM Table 5.6.2-1. The centerline of the intermediate diaphragms shall not be closer than 3'-0" to the centerline of the cast-in-place concrete (CIP) closures.

Intermediate diaphragms shall be provided for both inside and between the prestressed concrete tub girders. The diaphragm inside the tub may be cast in the field or at the fabrication plant while the diaphragms between the tubs shall be cast in the field.

Inserts may be used to accommodate the construction of the intermediate diaphragms for connections between the diaphragm and the web of precast girders. Designer shall investigate the adequacy of:

1. The insert and the connection to develop the tensile capacity of diaphragm reinforcement.
2. Interface shear capacity of the diaphragm-to-web connections for construction and deck placement loads.

The bottom of the intermediate diaphragms inside the tub shall be at least 3 inches above the bottom of the web. Drain holes shall be provided at the low point of the tub girders at the centerline of the bottom flange.

The final configuration of the closures shall be coordinated with the State Bridge and Structures Architect on all highly visible bridges, such as bridges over vehicular or pedestrian traffic. Self-consolidating concrete (SCC) may be used for CIP closures.

**Background:**

Connection details for the intermediate diaphragm for tubs are important. Open holes should be provided for interior webs so through reinforcement can be placed. For the portion of diaphragm between the tub girders, the concrete face and shear keys on the sloped web faces may not be effective in resisting interface shear, and all diaphragm and construction loads on the diaphragm before the deck placement will be resisted by inserts.

WSDOT BDM requires a minimum of 2 ½ inches of concrete cover for CIP post-tensioned superstructures. This requirement is now extended to CIP closures of prestressed concrete spliced girders to ensure the proper flow and vibration of concrete through reinforcement and ducts. Removing the side forms at the CIP closures allows inspectors to ensure the soundness of concrete prior to post-tensioning and grouting. This additional cover on the exterior face of spliced girders may not be compatible with the architectural guidelines for some projects. The final configuration of closures shall be coordinated with the State Bridge and Structures Architect on all highly visible bridges, such as bridges over vehicular or pedestrian traffic. Self-consolidating concrete (SCC) may be used for CIP closures.

If you have any questions regarding these issues, please contact Bijan Khaleghi at 360-705-7181 ([khalegb@wsdot.wa.gov](mailto:khalegb@wsdot.wa.gov)).

cc: Mark Gaines, Bridge Construction - 47354

Craig Boone, Bridge and Structures – 47340

## **BDM Revisions**

### **2.7 WSDOT Standard Highway Bridge**

#### **2.7.1- C.**

Delete third paragraph pertaining to intermediate diaphragms

### **5.6.2 Design Criteria**

The last item in Table 5.6.2-1 is revised to read as follows:

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- Post-tensioned concrete spliced girders including WF series, deck bulb tee girders and tub spliced girders: Intermediate diaphragms shall be provided according to WSDOT BDM Table 5.6.2-1. The centerline of the intermediate diaphragms shall not be closer than 3'-0" to the centerline of the cast-in-place concrete (CIP) closures.

Intermediate diaphragms shall be provided for both inside and between the prestressed concrete tub girders. The diaphragm inside the tub may be cast in the field or at the fabrication plant while the diaphragms between the tubs shall be cast in the field.

Inserts may be used to accommodate the construction of the intermediate diaphragms for connections between the diaphragm and the web of precast girders. Designer shall investigate the adequacy of:

3. The insert and the connection to develop the tensile capacity of diaphragm reinforcement.
4. Interface shear capacity of the diaphragm-to-web connections for construction and deck placement loads.

Connection details for the intermediate diaphragm for tubs are important. Open holes should be provided for interior webs so through reinforcement can be placed. For the portion of diaphragm between the tub girders, the concrete face and shear keys on the sloped web faces may not be effective in resisting interface shear, and all diaphragm and construction loads on the diaphragm before the deck placement will be resisted by inserts.

The bottom of the intermediate diaphragms inside the tub shall be at least 3 inches above the bottom of the web. Drain holes shall be provided at the low point of the tub girders at the centerline of the bottom flange.

WSDOT BDM requires a minimum of 2 ½ inches of concrete cover for CIP post-tensioned superstructures. This requirement is now extended to CIP closures of prestressed concrete spliced girders to ensure the proper flow and vibration of concrete through reinforcement and ducts. Removing the side forms at the CIP closures allows inspectors to ensure the soundness of concrete prior to post-tensioning and grouting. This additional cover on the exterior face of spliced girders may not be compatible with the architectural guidelines for some projects. The final configuration of closures shall be coordinated with the State Bridge and Structures Architect on all highly visible bridges, such as bridges over vehicular or pedestrian traffic. Self-consolidating concrete (SCC) may be used for CIP closures.