INDIANA DEPARTMENT OF TRANSPORTATION

Driving Indiana's Economic Growth

Design Memorandum No. 22-21

October 7, 2022

TO: **All Design, Operations, and District Personnel, and Consultants**

FROM: ***/s/Stephanie J. Wagner***
Stephanie J. Wagner
Director of Bridge Engineering

SUBJECT: **Deck Pour Sequence for Prestressed Beam Superstructures**

REVISES: ***Indiana Design Manual*** **(IDM) Chapter 404-2.06(02), Figure 404-2F**

EFFECTIVE: **Stage 3 submittals on or after November 1st, 2022**

IDM Chapter 404, Bridge Deck, has been revised to provide the Department's expectation for when a continuous deck pour should be allowed for a prestressed beam superstructure. The Designer should evaluate the feasibility of a continuous deck pour during the design process using the criteria provided in 404-2.06(02). If it's determined that the required pour rate is less than 80 CYS/HR a note similar to that shown on Figure 404-2F should be included on the plans indicating the minimum required pour rate, which will be based on the Designer's calculations for the span containing the largest volume of concrete.

The Contractor will submit a Deck Pour Sequence to the Engineer of Record in accordance with the LPA & State Shop Drawing & Falsework Review Procedure. If the Contractor proposes a continuous deck pour in their pour sequence submittal, the Designer should verify that the proposed pour rate meets or exceeds the minimum required pour rate that was shown on the plans.

For questions related to this design memo, please contact the Bridge Engineering Division at Bridgedesignoffice@indot.in.gov

Revisions

404-2.06(02) Construction Joint [Rev. Oct. 2022]

A construction joint creates planes of weakness that frequently cause maintenance problems. The use of deck construction joints is discouraged and their number should be minimized. The contractor, however, has the option of requesting additional joints if the number or locations shown on the plans are too restrictive.

1. Longitudinal Construction Joint.

   a. Usage. Construction joints need not be used on a deck having a constant cross section where the pour width is less than 65 ft. This applies if the constant cross section is rotated along the length of the deck, and the angular breaks within the cross section remain constant. Where the angular breaks within the cross section are variable, as in the runout length of a superelevation transition, a construction joint should be provided. Longitudinal construction joints will also be required on a deck with phased construction.

   b. Location. The following applies.

      (1) Where a construction joint is required, it should preferably be placed along the edge of a traffic lane. A joint which is close to a curb may be placed up to 1 ft outside the traffic lane.

      (2) A joint should not be located over a beam flange, unless phased construction dictates otherwise.

      (3) The joint locations should limit the maximum pour width to 50 to 55 ft.

   c. Transverse Reinforcing Steel. The lengths of transverse reinforcing bars should be selected so bar laps do not appear within a longitudinal construction joint.

2. Transverse Construction Joint.

   a. Steel Beam or Girder Structure. Concrete may be placed continuously on a deck requiring less than 260 yd^3 of concrete. A bridge deck that is poured integrally with the end bents may usually be placed with one pour.

For a longer structure that exceeds the pour-volume limitation of 260 yd^3, an alternative may be considered in which the deck length is subdivided into segments near the points of final dead load contraflexure, with segments in positive flexure placed first and those in negative flexure last.

b. Prestressed-Concrete Structure. A prestressed-concrete beam bridge made continuous for live load only should be treated such that transverse construction joints located 2.5 ft on each side of the pier centerline should be shown on the plans. The short deck segment and diaphragm over the support provide continuity for live load in the superstructure after the previously-poured center regions of the deck have been poured as simple-span loads. This pour sequence will prevent tensile loading of the diaphragm and deck concrete in the negative moment regions while the concrete is beginning to set, which will eliminate the risk of flexural cracking during the deck pour.

A continuous deck pour should be allowed at the Contractor's option and noted on the plans if the following criteria is met:

(1) The span containing the largest volume of concrete, including the pier diaphragm at the beginning of the span, can be placed within 3 ½ hours, and

(2) the pour rate is less than 80 cubic yards for per hour.

Notes similar to those shown in Figure 404-2F should be shown on the plans to indicate the calculated minimum required pour rate, if less than 80 cubic yards per hour. If the calculated required pour rate is 80 cubic yards per hour or higher, the optional continuous pour note should not be included on the plans.

If the Contractor requests a continuous pour in their pour sequence submittal, the Designer should verify that the Contractor's proposed pour rate meets or exceeds the calculated minimum required pour rate shown on the design plans and meets the criteria for a continuous deck pour outlined above. Contractor requested continuous pours using pour rates above 80 cubic yards per hour will require approval by INDOT Construction in addition to the approval of the Designer.

The advantages of a continuous deck pour include shorter construction duration, elimination of transverse construction joints, and lower construction costs.

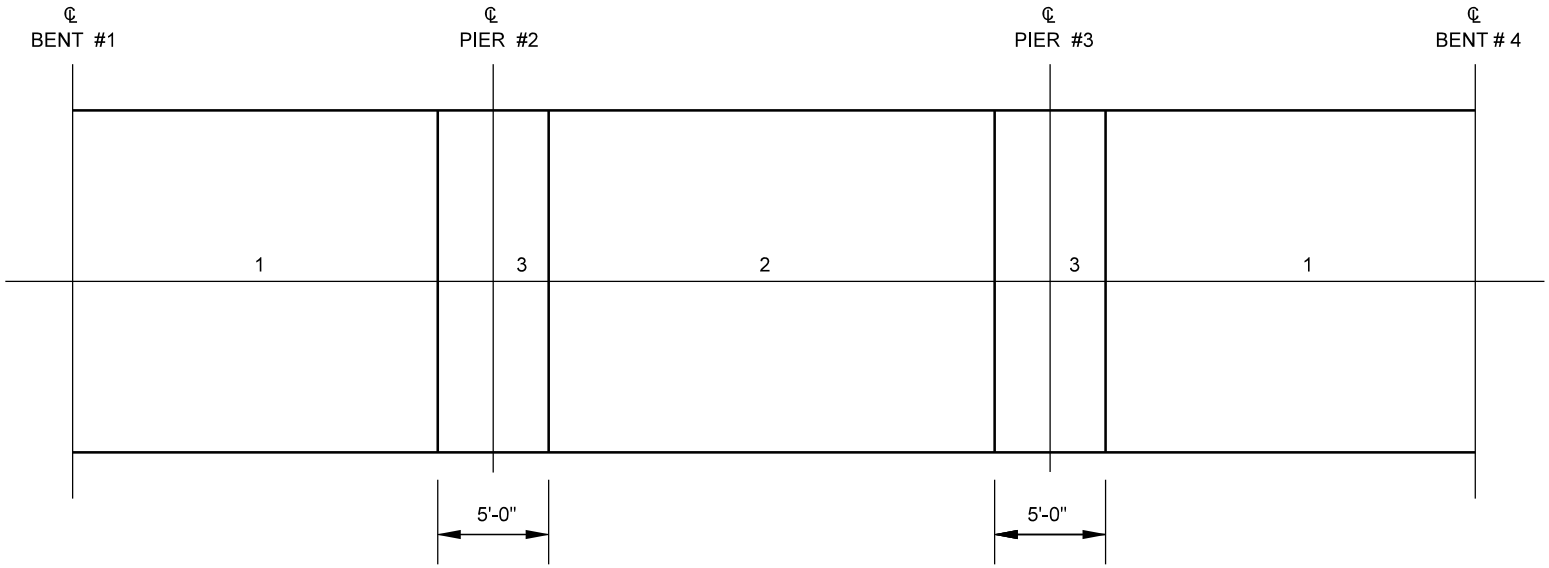
c. Location. Where used, transverse joints should be placed parallel to the transverse reinforcing steel.

3. Diaphragms. For a prestressed-concrete beam bridge with a cast-in-place deck, the *LRFD Specifications* requires diaphragms at the bearing points. These diaphragms should be poured at the same time as the deck.

4. Steel Structure. A steel superstructure with short end spans relative to the adjacent interior span can be subject to uplift at the end bent during the deck pour. This can occur where the far end span is 60% or less of the adjacent interior span. Where this occurs, and if objectionable, a required transverse construction joint should be placed in the far end span and a terminal portion of the end span poured first to counterbalance the uplift. The deck may then be poured from the opposite end forward in the usual manner. The effects of the deck pouring sequence should be investigated, including its effect on camber, screed elevations, and stresses.

5. End Bents. The simply-supported end of a short end span can experience uplift under live load. A counterweight may be poured near the end of the span to counterbalance the uplift, or positive hold-down devices may be installed. The details of counterweights or tie-downs should be shown on the plans. Integral end bent concrete should be considered as a counterweight.

6. Pour Diagrams. Figure 404-2F illustrates the pour diagrams for a continuous, prestressed-concrete beam structure. The plans should include note(s) similar to that shown on Figure 404-2F, revised as necessary. Figure 404-2G illustrates the pour diagrams for a continuous steel beam or girder structure.



The following note, revised as necessary, should be shown on the plans for a continuous prestressed concrete I-beam, bulb-T, or box beam structure in which the composite slab over the interior supports is designed for the live load:

POUR NUMBERS INDICATE SEQUENCE OF POURS, POURS OVER INTERIOR SUPPORTS SHALL BE MADE LAST TO REDUCE THE EFFECT OF THE SLAB DEAD LOAD IN THE NEGATIVE MOMENT AREA. POUR #3 WILL INCLUDE THE DIAPHRAGM AT THE SUPPORT AND SHALL BE HELD TO A 5'-0" LENGTH. INTERIOR DIAPHRAGMS WILL BE POURED BEFORE SLAB IS POURED. ALL POUR SEQUENCES AND PROCEDURES SHALL BE SUBMITTED IN ACCORDANCE WITH SECTION 704.04 OF THE STANDARD SPECIFICATIONS.

If a continuous pour is allowable in accordance with the criteria provided in 404-2.06(02), the following note should also be included on the plans:

AS AN ALTERNATE, THE CONTRACTOR MAY ELECT TO POUR THE DECK AND DIAPHRAGMS AS ONE CONTINOUS POUR FROM ONE END TO THE OTHER. THIS WILL BE ALLOWED PROVIDED THE FOLLOWING CRITERIA IS MET:

- THE MINIMUM REQUIRED POUR RATE SHALL BE ___ CYS/HR.
- EACH SPAN (DECK + PRIOR PIER DIAPHRAGM) SHALL BE COMPLETED WITHIN 3 1/2 HRS FROM THE TIME THE CONCRETE WITHIN THAT SPAN IS DISCHARGED.

TYPICAL POUR DIAGRAM
(Continous Prestressed Concrete Beams)

Figure 404-2F