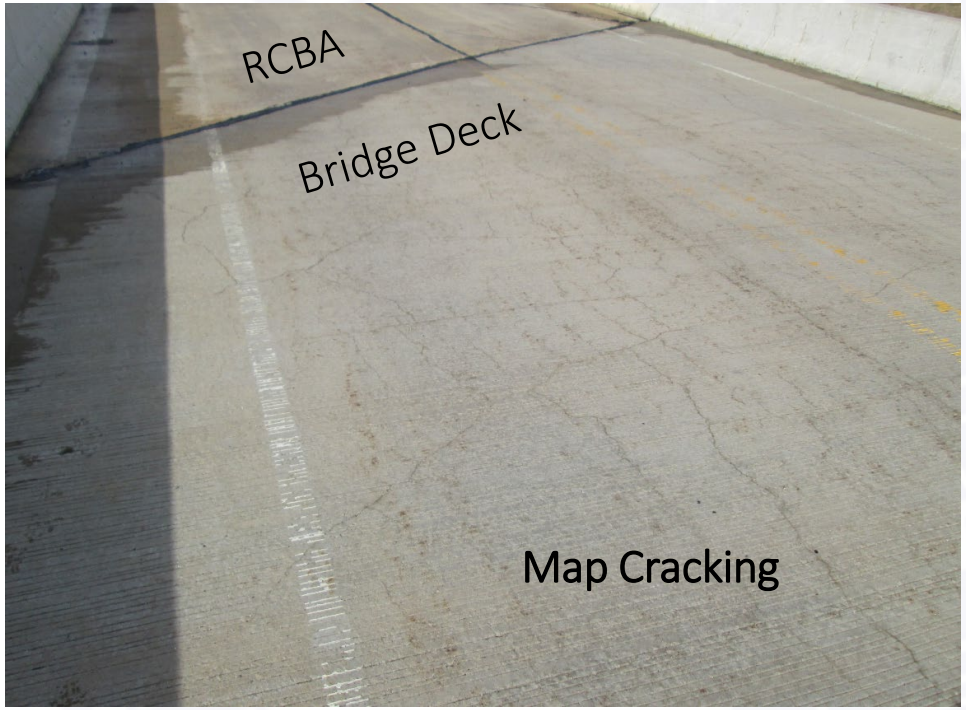
Deck Pour Sequences

INDOT Bridge Design Conference 2023

Donald (DJ) Shaw
Central Office Bridge Engineering

Noted Problems



Kenilworth Rd./ US31
Prestressed Concrete Beams
Two Simple Spans (during pour)
Built 2009, Photo Taken 2017

US31/ Kern Rd.
Steel Plate Girders
Three Continuous Spans
Built 2012, Photo Taken 2017

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Continuous vs. Sequenced

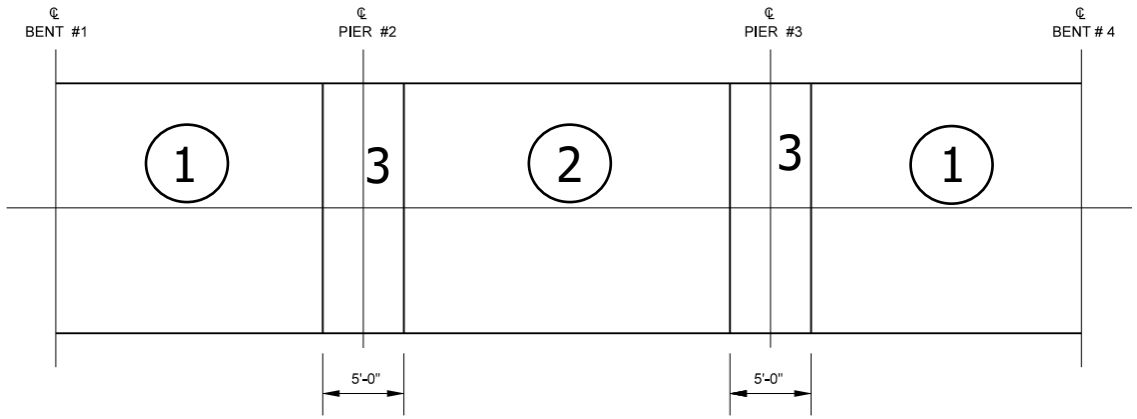
1. Structurally - SAME
    1. Single span bridge
    2. Continuous RC slab bridge

2. Structurally – DIFFERENT
    1. Simple spans, made continuous
        Prestressed beam bridge
    2. Continuous
        Steel beam/plate girder

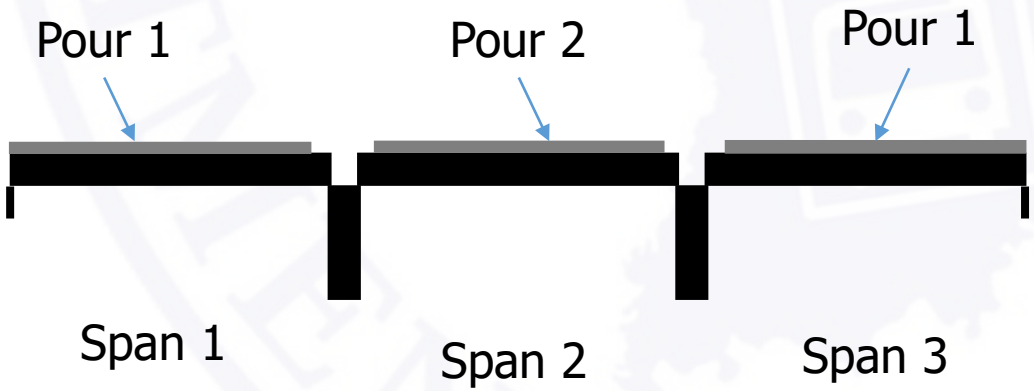
Sequenced Bridge Deck Pour

Simple Spans, Made Continuous

(Prestressed Concrete Beam Bridges)

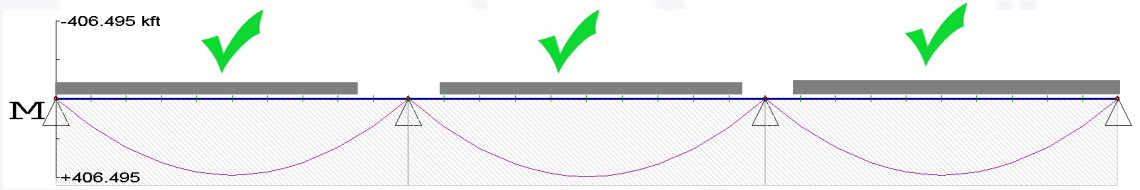


Typical Pour Diagram
IDM Fig. 404-2F

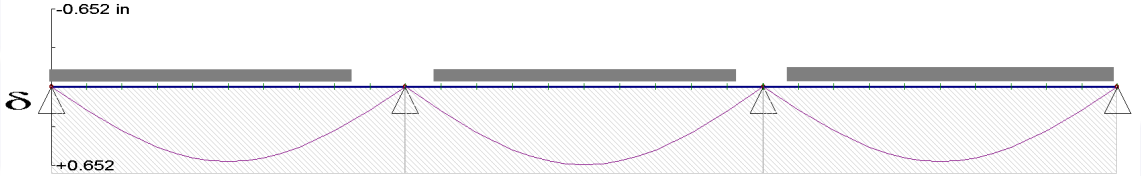


During Pour (1 & 2)

MOMENT



DEFLECTION



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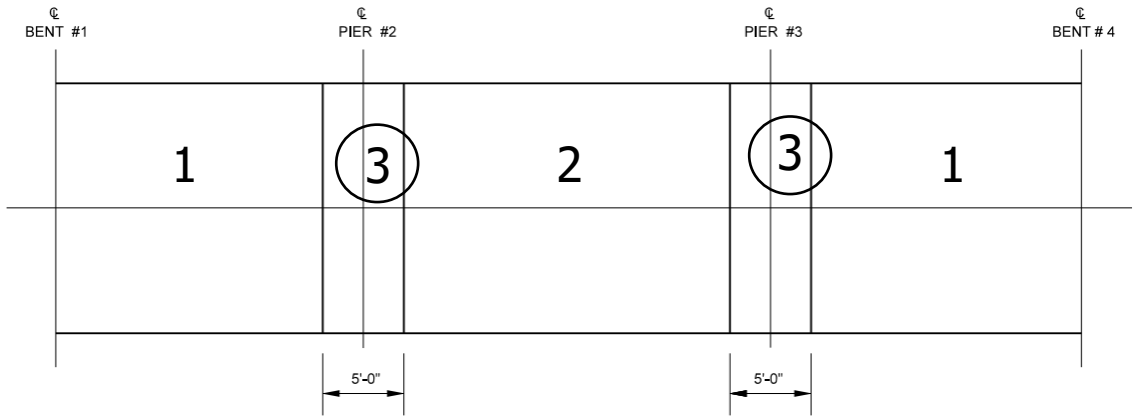
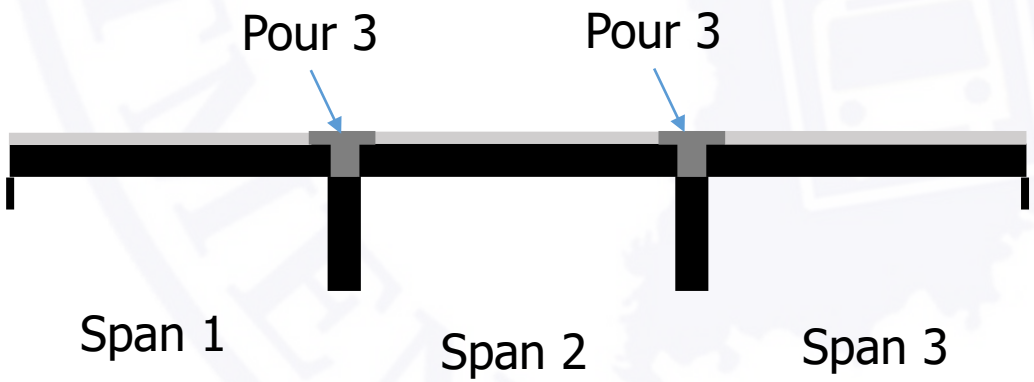
Sequenced Bridge Deck Pour

Simple Spans, Made Continuous

(Prestressed Concrete Beam Bridges)

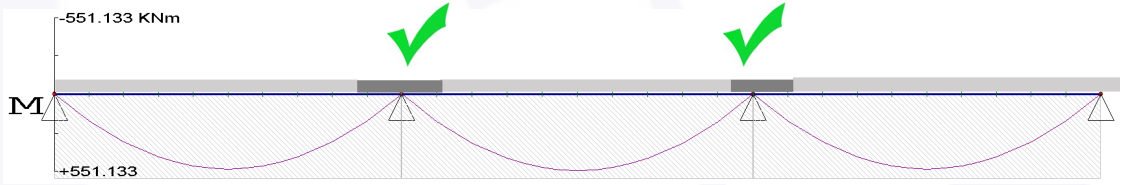


Typical Pour Diagram
IDM Fig. 404-2F

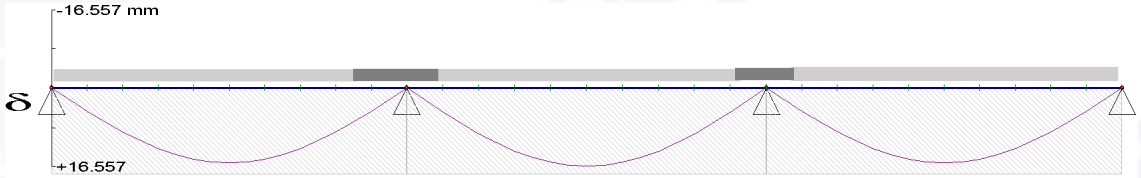


During Pour (3)

MOMENT



DEFLECTION



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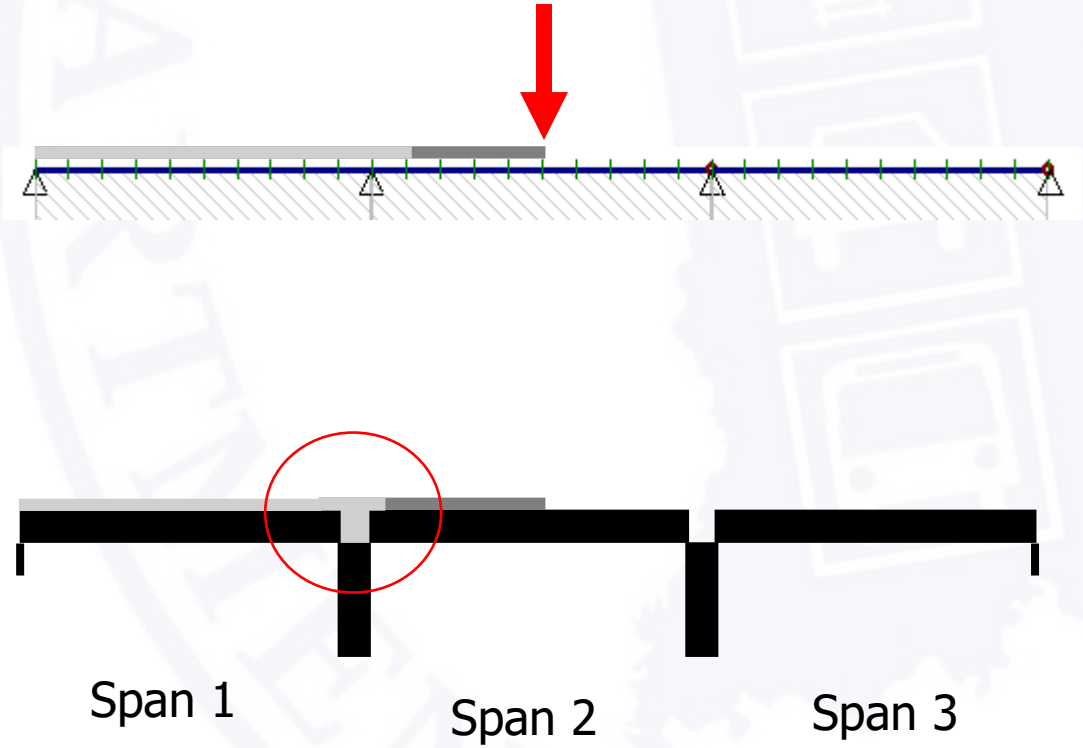
Continuous Bridge Deck Pour

Simple Spans, Made Continuous

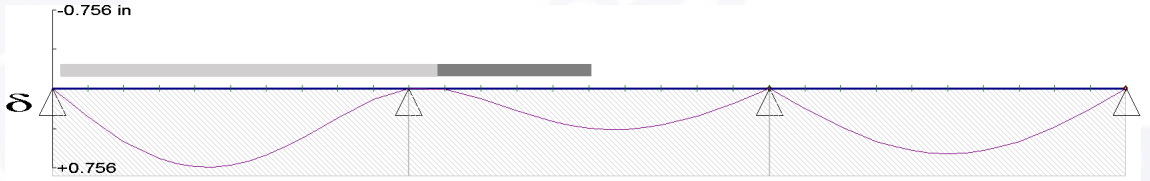
(Prestressed Concrete Beam Bridges)



During Pour (50% Span 2)

MOMENT

DEFLECTION



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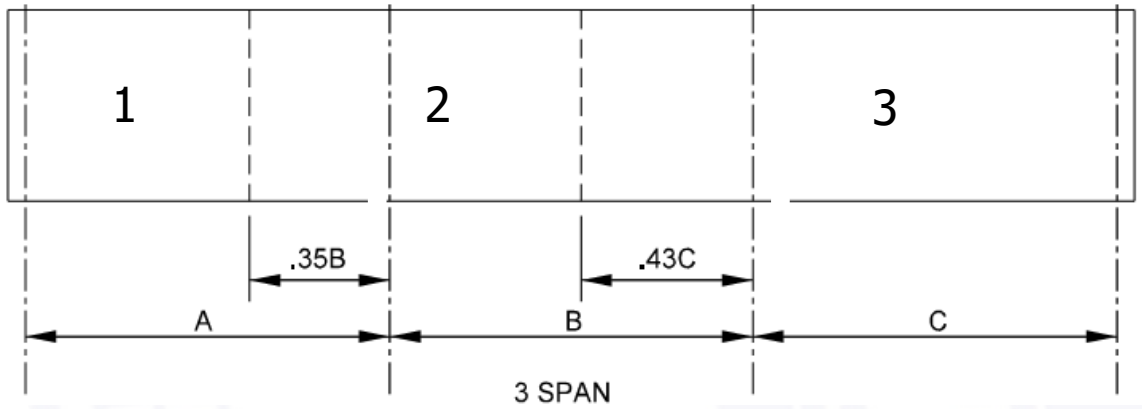
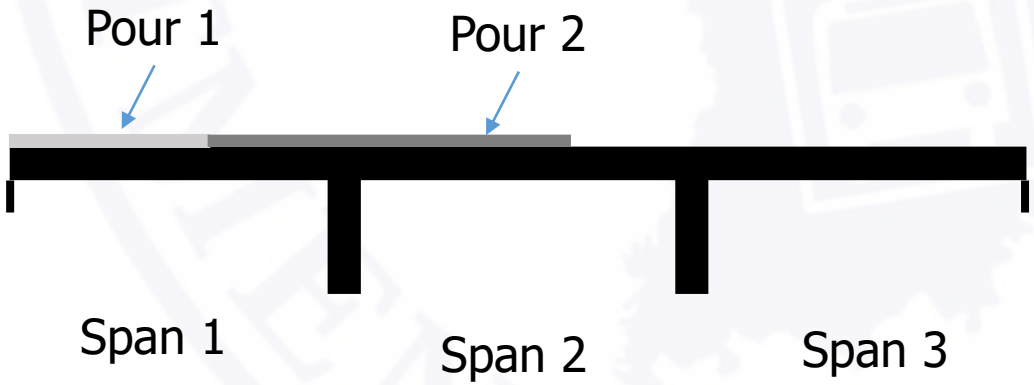
Sequenced Bridge Deck Pour

Continuous Spans

(Steel Beam or Plate Girder Bridges)

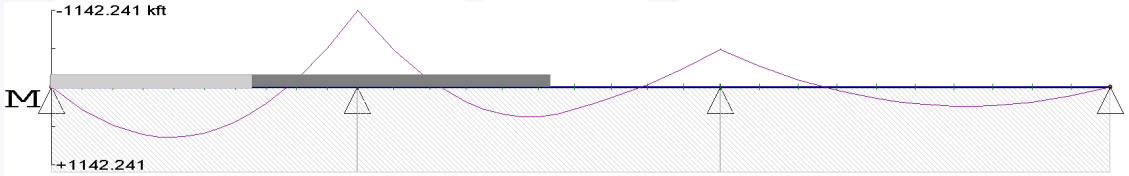


Typical Pour Diagram
IDM Fig. 404-2G



During Pour (2)

MOMENT



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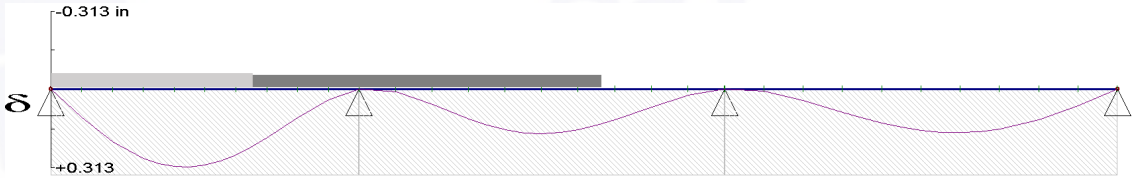

Concrete in compression
OR
Allowed to cure to carry
tension through reinforcing

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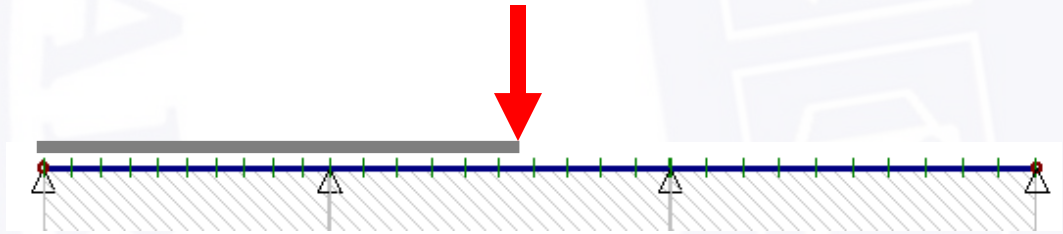
Continuous Bridge Deck Pour

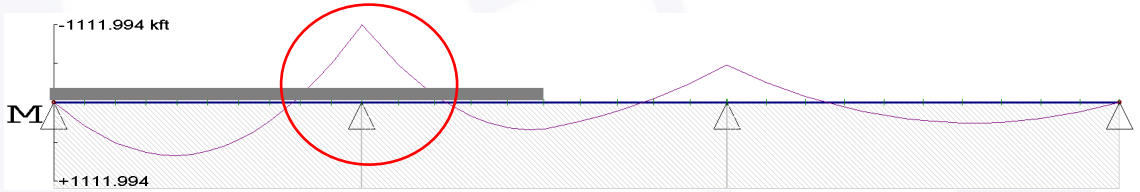
Continuous Spans

(Steel Beam or Plate Girder Bridges)



During Pour (50% Span 2)

MOMENT



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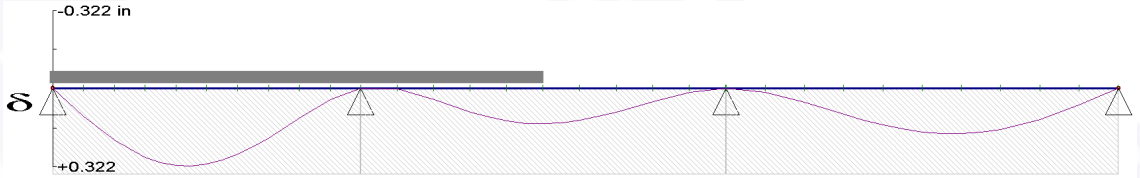

concrete deck could be in TENSION

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BDA 404-01

1. Create uniformity in the industry between EORs
2. Inform contractors, reduce surprises, reduce cost
3. EOR's are responsible for review

INDOT | BRIDGE DESIGN AIDS

BDA 404-01 | DECEMBER 7, 2022

CONTINUOUS DECK POUR FOR PRESTRESSED BEAM SUPERSTRUCTURES

Reference: IDM 404-2.06(02) Transverse Construction Joint

The Engineer of Record, EOR, is responsible for review and approval of Contractor submitted deck pour sequences, per the LPA & State Shop Drawing & Falsework Review Procedure. For prestressed beam superstructures, if the Contractor's proposed sequence combines individual pours from th[illegible] EOR should us[illegible] the INDOT Continuous Bridge Deck Pour Sequence Review Spreadsheet to evaluate the p[illegible] should be used as the EOR's primary basis for approving or rejecting a pour sequence post-letting and setting a minimum pour rate for a continuous pour pre-letting, if deemed possible by the spreadsheet.

https://www.in.gov/dot/div/contracts/standards/bridges/BDA.htm

i. Foundation Seals and Deck Pour Sequences

Requests for use of foundation seals not shown in the plans are to be submitted to the Department's Geotechnical Services Division at geotech@indot.in.gov for review and approval. The submittal must include the contract number, Contractor's name and indicate the location and dimensions of the seal. The Office will distribute approved requests.

Planned deck pour sequences are to be submitted by the Contractor to the PEMS. The PEMS should send the deck pour sequence directly to the EOR for review and approval and copy the Office of Bridge Design at BridgeDesignOffice@indot.IN.gov.

The EOR will distribute approved requests.

https://www.in.gov/dot/div/contracts/standards/GIFE/SECTION%2029.pdf

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BDA 404-01 Spreadsheet

Purpose: Determine if a continuous bridge deck pour is possible under a set of criteria that aims to minimize the likelihood of excessive early deck cracking

Acceptance Criteria: Time to pour each span < 3.5 hr. concrete set time

DISCLAIMER: This spreadsheet is a tool provided to EOR & it does not relieve the EOR of their responsibility

BDA 404-01 Spreadsheet

Purpose: Determine if a continuous bridge deck pour is possible under a set of criteria that aims to minimize the likelihood of excessive early deck cracking

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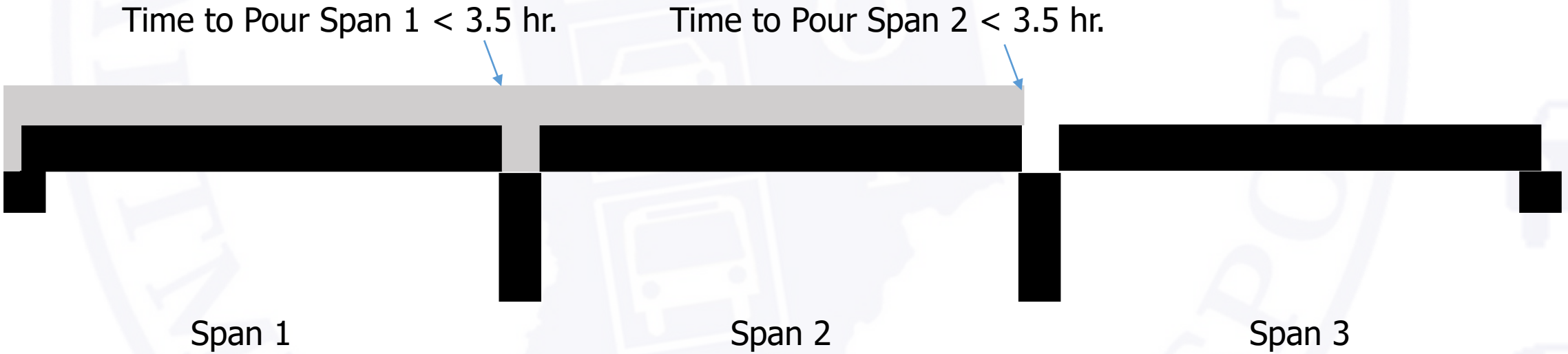

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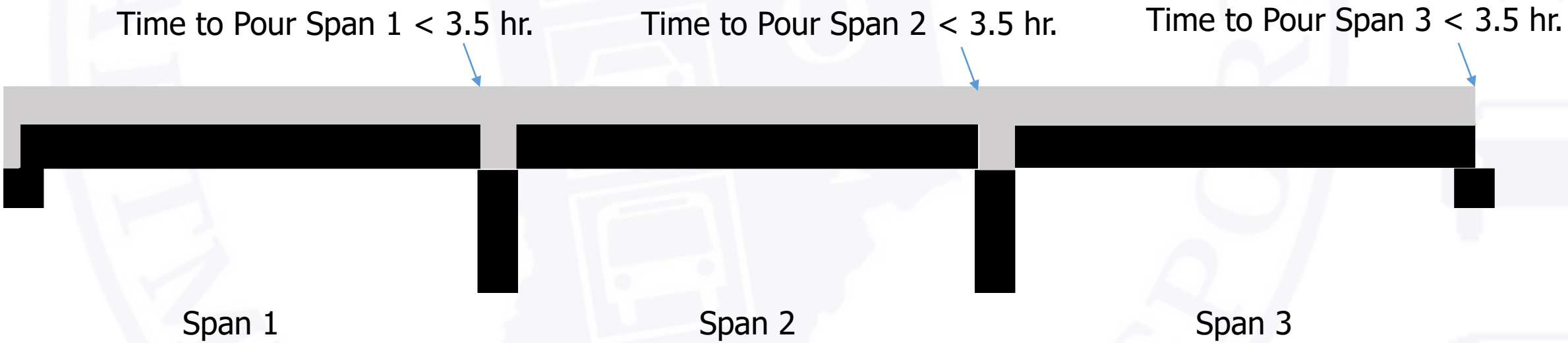

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BDA 404-01 Spreadsheet

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BDA 404-01 Spreadsheet

PRIOR TO LETTING

STAGE 3 SUBMITTAL

1. Assume pour rate = 80 CYS/Hr.
2. If time to pour each span < 3.5 hr.
3. Then determine the minimum pour rate needed to pour each span < 3.5 hr.
4. And include the note below on the deck pour sequence plan sheet at STG3 submittal (still show the sequenced bridge deck pour)

"As an alternate, the Contractor may elect to pour the deck and diaphragms as one continuous pour from one end to the other. This will be allowed provided the following criteria is met:

- *The minimum required pour rate shall be "X" cys/hr.*
- *Each span (deck + prior pier diaphragm) shall be completed within 3 1/2 hrs measured from the time the concrete within that span is discharged."*

Where “X”= minimum pour rate to pour each span < 3.5 hr.

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BDA 404-01 Spreadsheet

PRIOR TO LETTING (STG3 SUBMITTAL)

STAGE 3 SUBMITTAL

1. Assume pour rate = 80 CYS/Hr.
2. If time to pour each span > 3.5 hr.
3. Then include the note below on the deck pour sequence plan sheet at STG3 submittal (still show the sequenced bridge deck pour)

"Preliminary calculations have shown a continuous bridge deck pour sequence will require a pour rate more than 80 cubic yards per hour and is not likely feasible. "

> Planned deck pour sequences are to be submitted by the Contractor to the PEMS. The PEMS should send the deck pour sequence directly to the EOR for review and approval and copy the Office of Bridge Design at BridgeDesignOffice@indot.IN.gov.
>
> The EOR will distribute approved requests.

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BDA 404-01 Spreadsheet

POST LETTING

POST LETTING

1. If Contractor submits a different pour sequence
2. Use Contractor's planned deck pour sequence
   - If time to pour each span < 3.5 hr. → recommend approval
   - If time to pour each span > 3.5 hr. → recommend reject

> Planned deck pour sequences are to be submitted by the Contractor to the PEMS. The PEMS should send the deck pour sequence directly to the EOR for review and approval and copy the Office of Bridge Design at BridgeDesignOffice@indot.IN.gov.
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BDA 404-01 Spreadsheet

CLOSING REMARKS

- BDA only for prestressed concrete girder superstructure bridge deck pours
- First tab contains important notes and assumptions

[PLEASE READ BEFORE USING]

- Spreadsheet is locked and password protected. The password is provided on the first tab
- All calculations are provided on the 3rd tab – can be printed for rechecking

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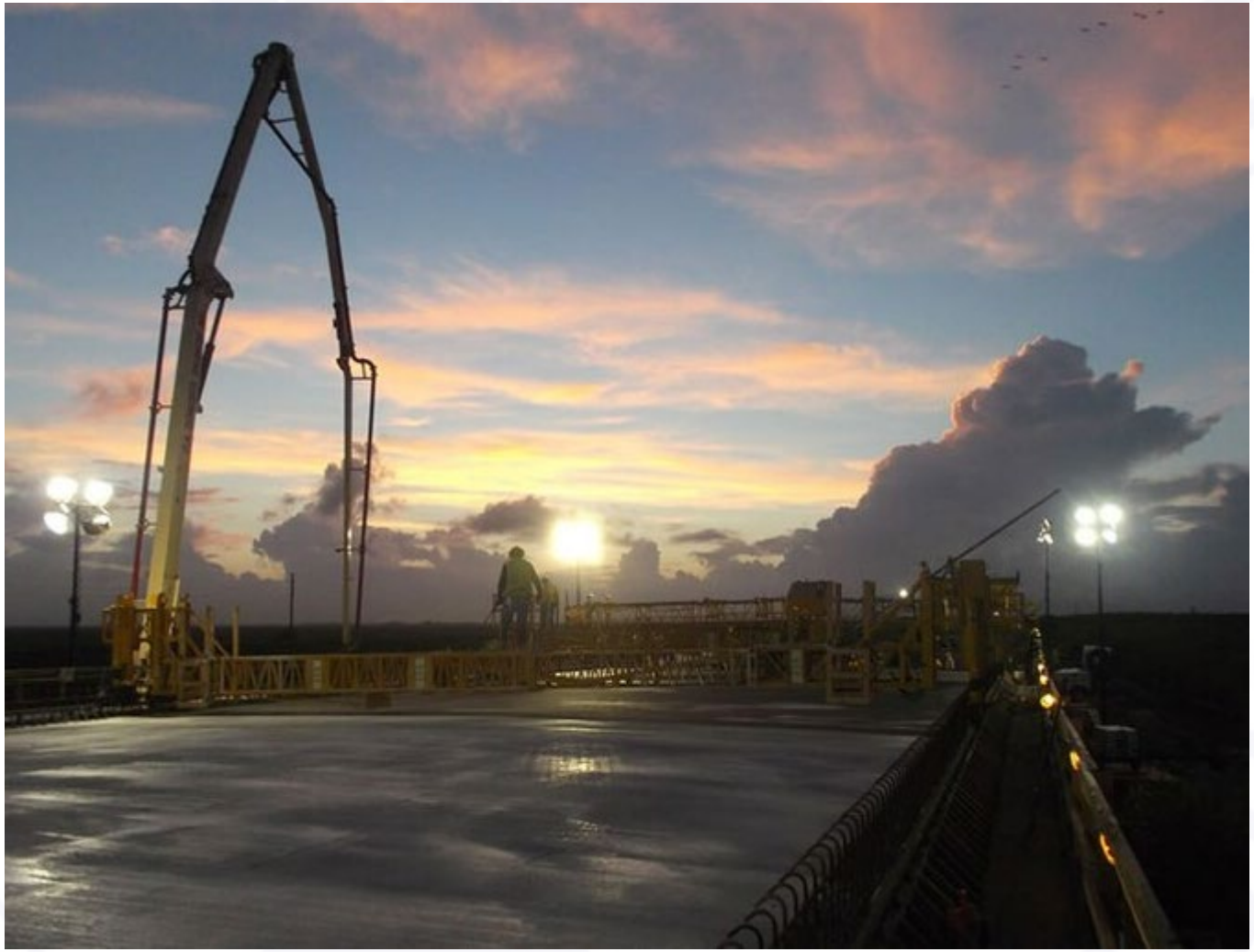
Questions



If questions come up after this presentation, please email BridgeDesignOffice@indot.in.gov