UTILIZING "BRIDGE DESIGN" FOR SHORED CONSTRUCTION AND ACCELERATED BRIDGE CONSTRUCTION IN NEW YORK STATE

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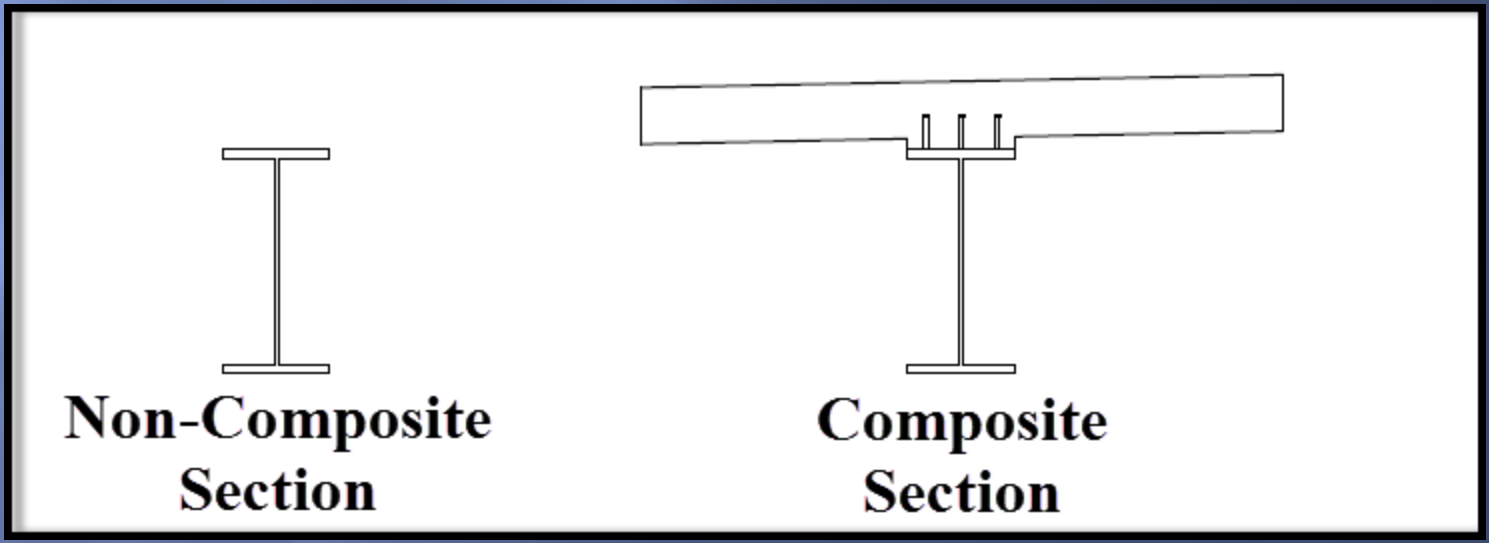
Main Office Structures

Agenda

- What is Shored Construction?
- Designing with BrD for Shored Construction
- Case Studies
  - I81 over Preble Road
  - I190 over Buffalo Avenue

What is Shored Construction?



Areas of Concern with Shored Construction

-Ability to Replace the Deck in the Future

-Required Camber for Shored Construction (Cast the barrier as shored or unshored?)

-"Previous" Lack of Software for Shored Construction

Utilizing BrD for Shored Construction

BrD Version 6.5 and Previous Versions

- The Girder and Deck loads are hard coded into the program as a DC1/Non-Composite Loads

- To "fake" the program into having the girder as a DC2 load, you need to unload the girder weight as a DC1/Non-composite and then reload it as a DC2/Composite load

- Sounds simple enough, but becomes a bookkeeping problem.

Utilizing BrD for Shored Construction

BrD Version 6.5 and Previous Versions

For un-shored construction design, the load cases are as follows:

Load Case Name	Description	Stage	Type	Time* (Days)
DC1	DC acting on non-composite section	Non-composite (Stage 1)	D,DC	
DC2	DC acting on long-term composite section	Composite (long term) (Stage 2)	D,DC	
DW	DW acting on long-term composite section	Composite (long term) (Stage 2)	D,DW	
SIP Forms	Weight due to stay-in-place forms	Non-composite (Stage 1)	D,DC	
DIAPH	DC acting on noncomposite	Non-composite (Stage 1)	D,DC	

Utilizing BrD for Shored Construction

BrD Version 6.5 and Previous Versions

For shored construction design, the load cases are as follows:

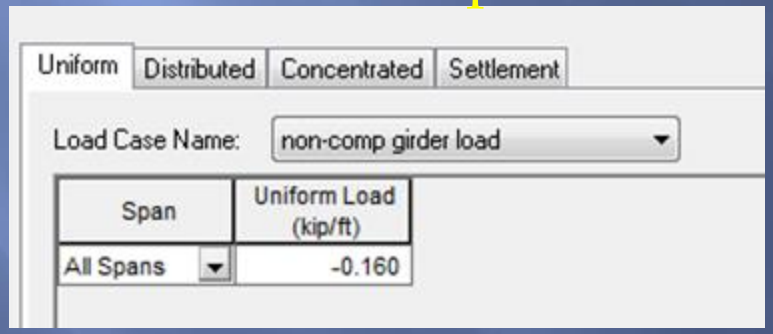
Load Case Name	Description	Stage	Type	Time* (Days)
Single Slope Barrier	Fascia Barrier, Single Slope	Composite (long term) (Stage 2)	D,DC	
Barrier load on fascia units	Barrier load differential on fascia unit girders	Composite (long term) (Stage 2)	D,DC	
non-comp girder load	non-comp girder load	Non-composite (Stage 1)	D,DC	
non-comp slab load	non-comp slab load	Non-composite (Stage 1)	D,DC	
non-comp diaphragm loads	non-comp diaphragm loads	Non-composite (Stage 1)	D,DC	
non-comp haunch load	non-comp haunch load	Non-composite (Stage 1)	D,DC	
comp diaphragm loads	comp diaphragm loads	Composite (long term) (Stage 2)	D,DC	
DC1	DC acting on non-composite section	Non-composite (Stage 1)	D,DC	
DC2	DC acting on long-term composite section	Composite (long term) (Stage 2)	D,DC	
Int barrier load differentials	Barrier load differentials, interior unit girders	Composite (long term) (Stage 2)	D,DC	
Comp deck slab loads	Comp deck slab loads	Composite (long term) (Stage 2)	D,DC	
comp haunch loads	comp haunch loads	Composite (long term) (Stage 2)	D,DC	
comp girder load	girder self weight comp	Composite (long term) (Stage 2)	D,DC	
fws	future wearing surface	Composite (long term) (Stage 2)	D,DW	

Utilizing BrD for Shored Construction

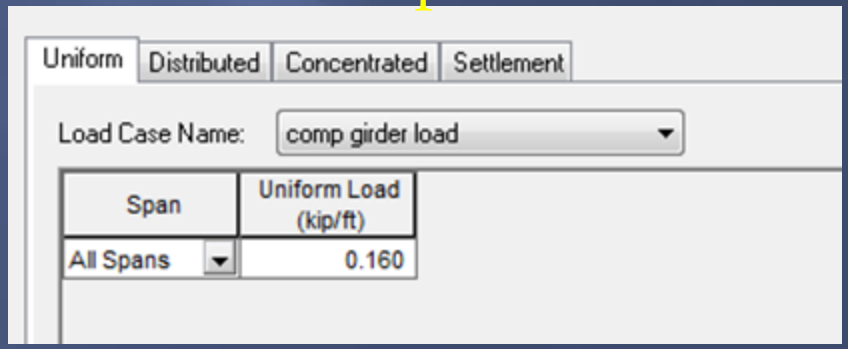
BrD Version 6.5 and Previous Versions

Girder and Deck loads need to be

Unloaded
as non-composite



Reloaded
as composite



Utilizing BrD for Shored Construction

BrD Version 6.6

- The Girder and Deck loads can be defined as either Composite or Non-Composite Loads

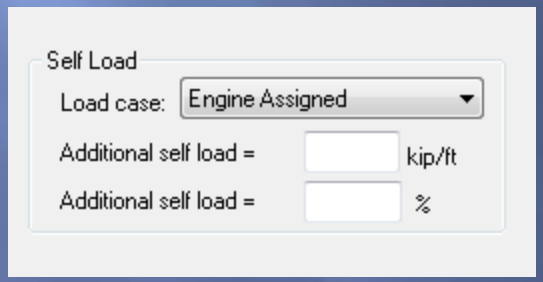
- "Faking" the program is no longer necessary

- Bookkeeping returns to normal

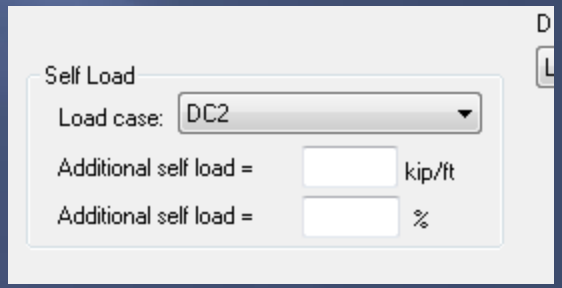
Utilizing BrD for Shored Construction

BrD Version 6.6 – Under Member Alternative

For un-shored construction design, the default is "Engine Assigned"



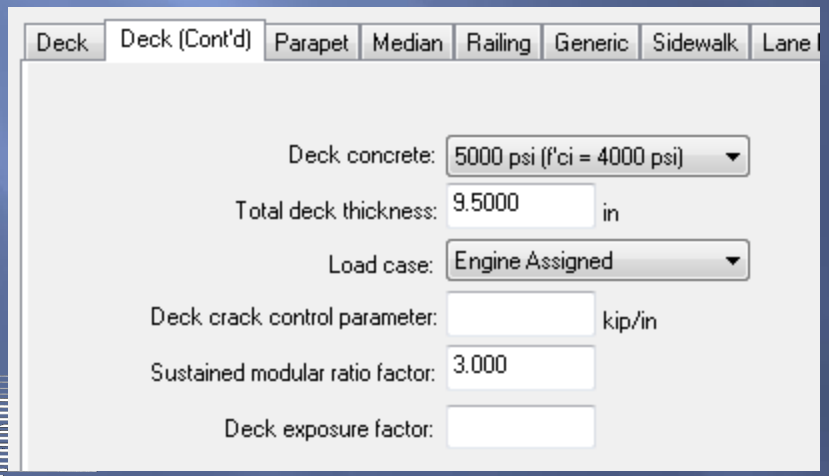
For shored construction design, The user can set the self load to DC2



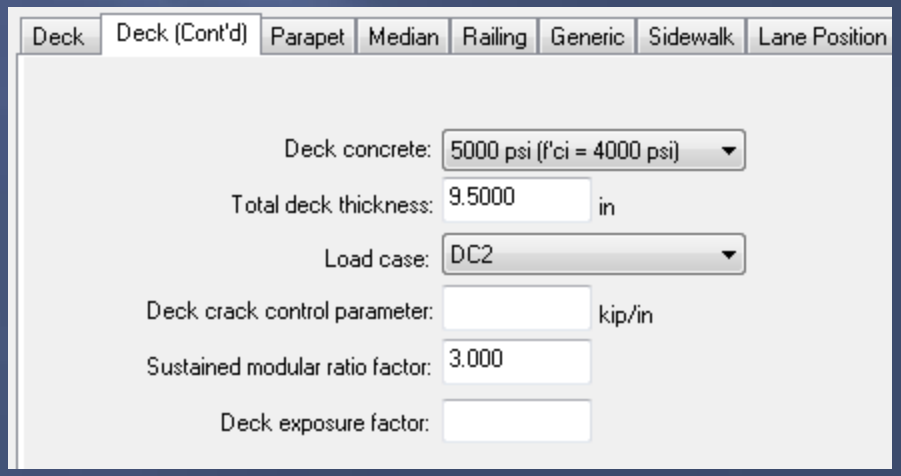
Utilizing BrD for Shored Construction

BrD Version 6.6 – Under Typical Section

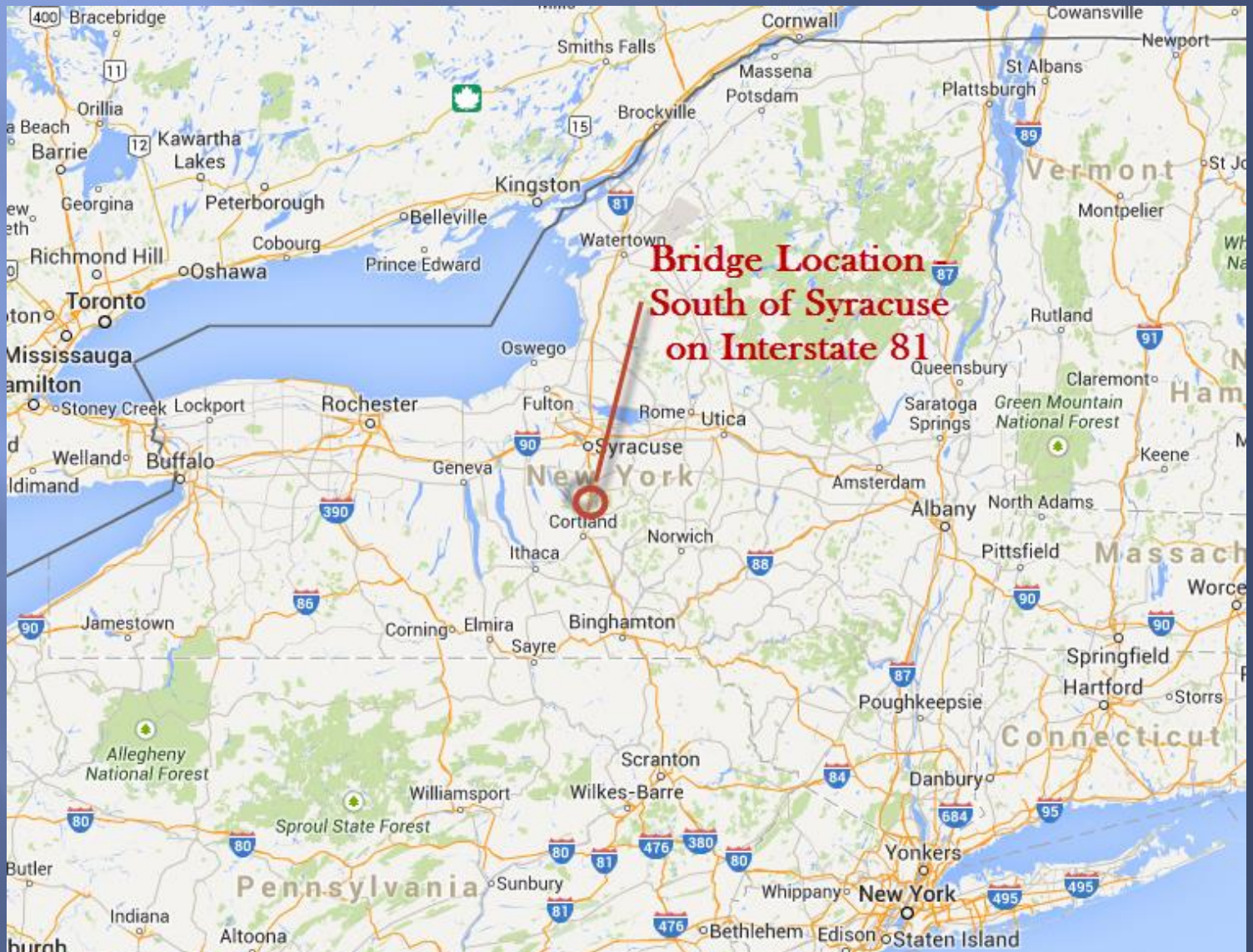
For un-shored construction design, the default is "Engine Assigned"



For shored construction design, the user can set the deck load to DC2



Case Study: I81 over Preble Road



Existing Bridge Information

- Two Bridges – I81 NB and I81 SB
- Built in 1966 (46 year old in 2012)
- Three Simple Spans: 39′ – 46′ – 39′
- Bridge Width – 35′-4″

Project Overview

April 27th, 2012 – NB Bridge was hit by Tractor Trailer with Over Height Backhoe

April 28th, 2012 – Support Columns Installed

Repair is deemed temporary –
Bridge needs to be replaced.

New Bridge Information

- NB Bridge utilized a crossover for MPT – 10 day closure
- SB Bridge utilized staged construction – 14 day closure
- Span Length – 75’
- Bridge Width – 43’

Designer: NYSDOT - Office of Structures

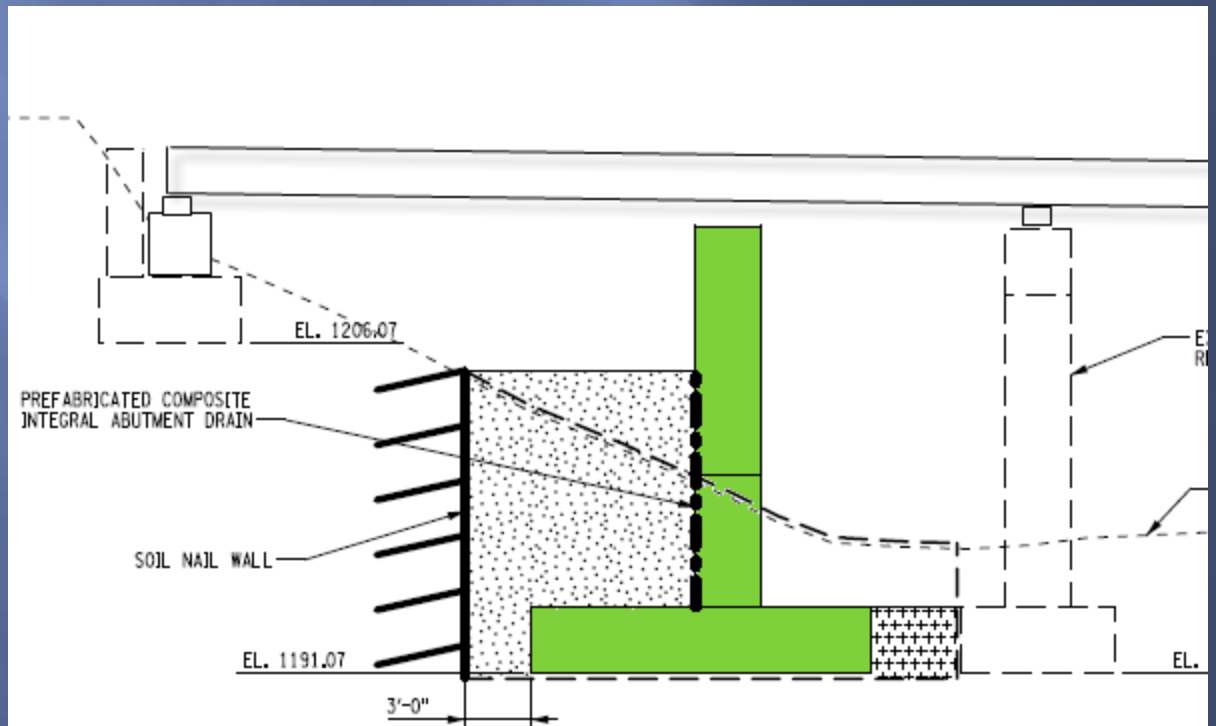
Contractor: Slate Hill Constructors, Warners, NY

Fabricator: Fort Miller of Schuylerville, NY

Project Cost $7.775 M (Two Bridges)

Vertical Staging

- Construct Abutments Underneath Existing Bridge (Bridge is still open to traffic.)
- Soil Nail Wall is Utilized for Excavation Support
- Allows for a Short Closure Window on the Interstate

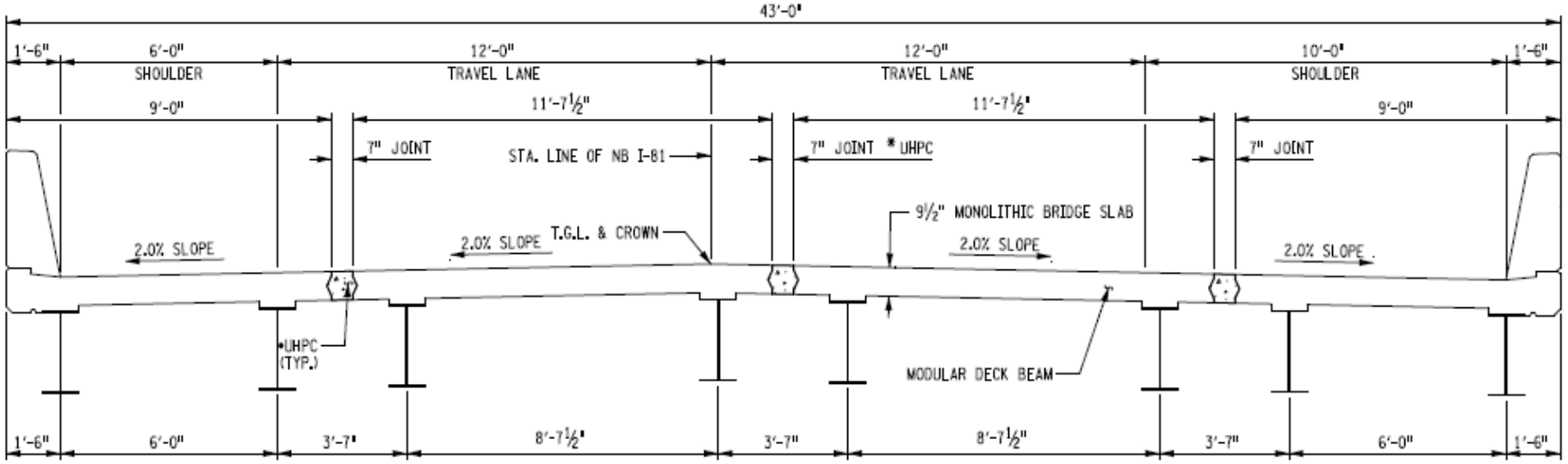


Soil Nail Wall

Footing Pour

Vertical Stage Complete

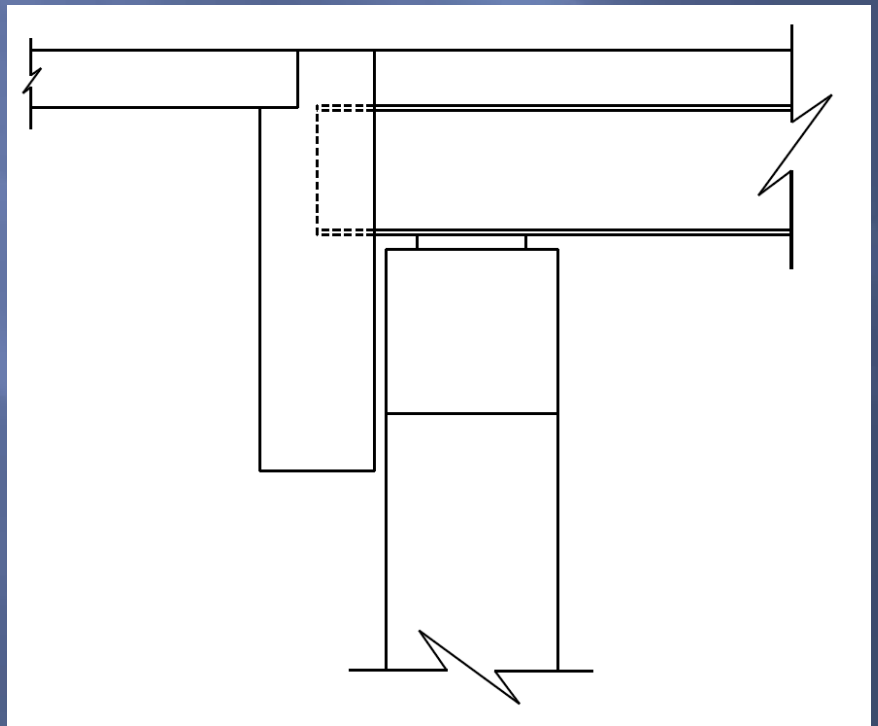
Modular Deck Beams



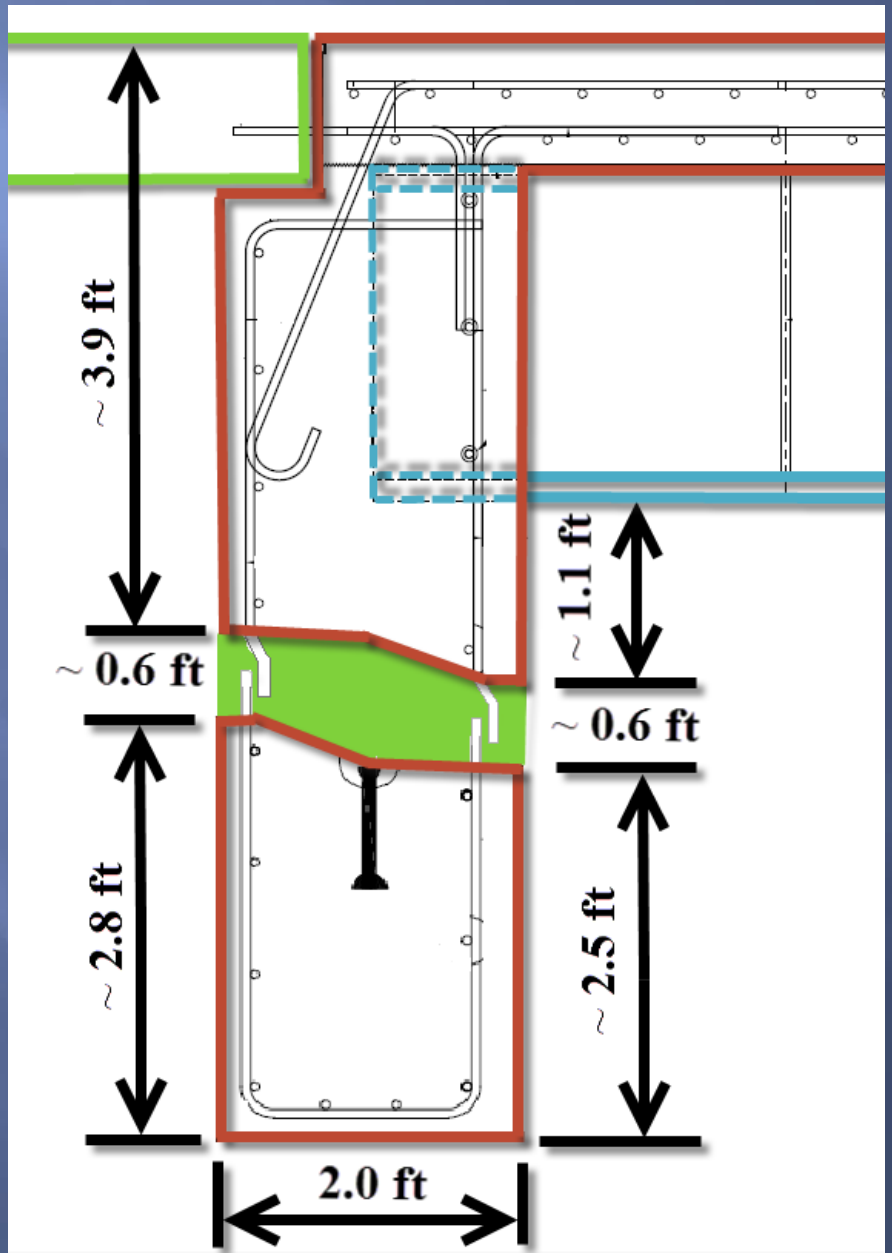
PROPOSED BRIDGE SECTION

Precast Semi-Integral Abutments

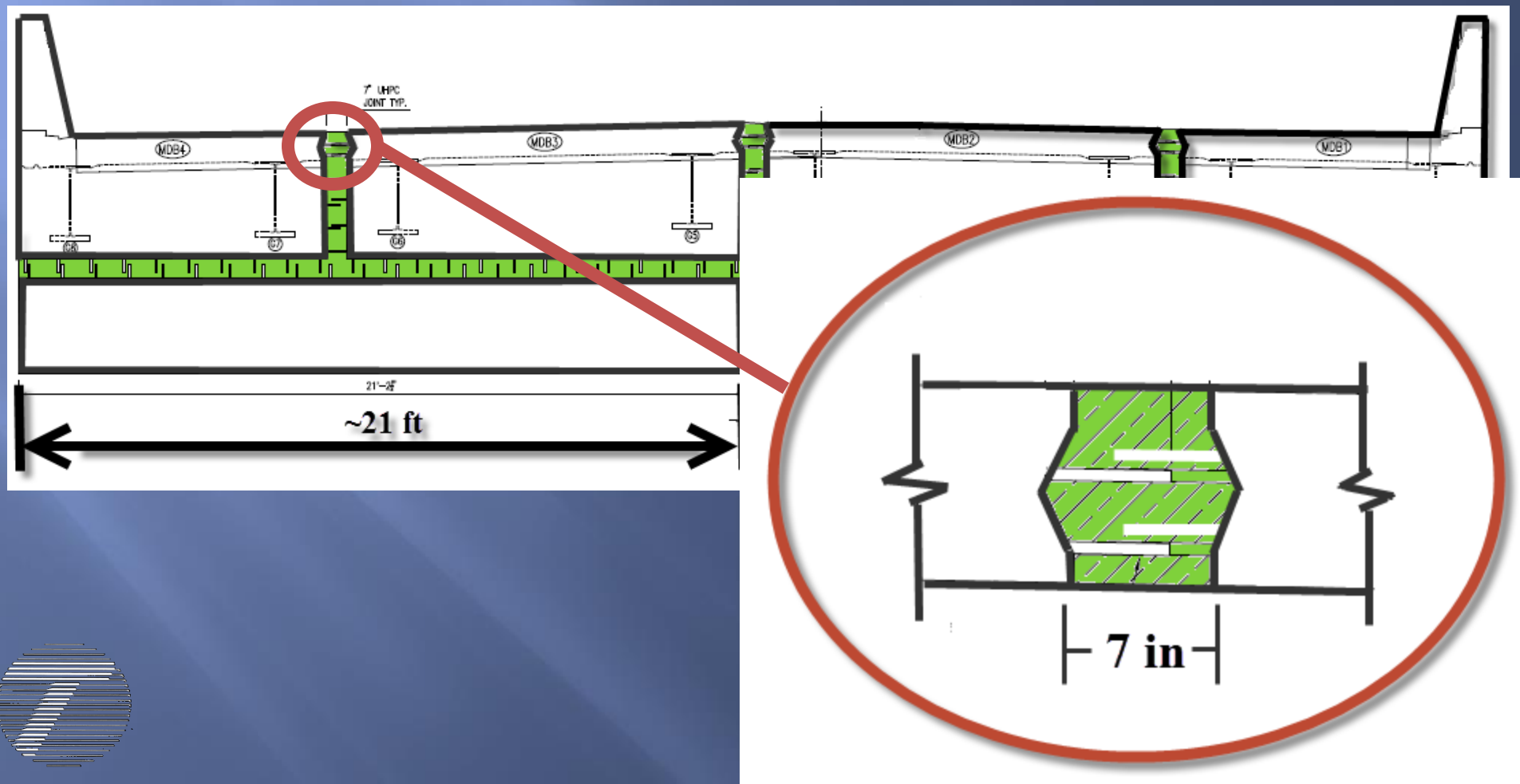
- Eliminates Joints at Abutments
- Reduces Construction Time with Precast Backwall
- Easier Shipping and Handling with use of Horizontal UHPC Joints in the Precast Backwall



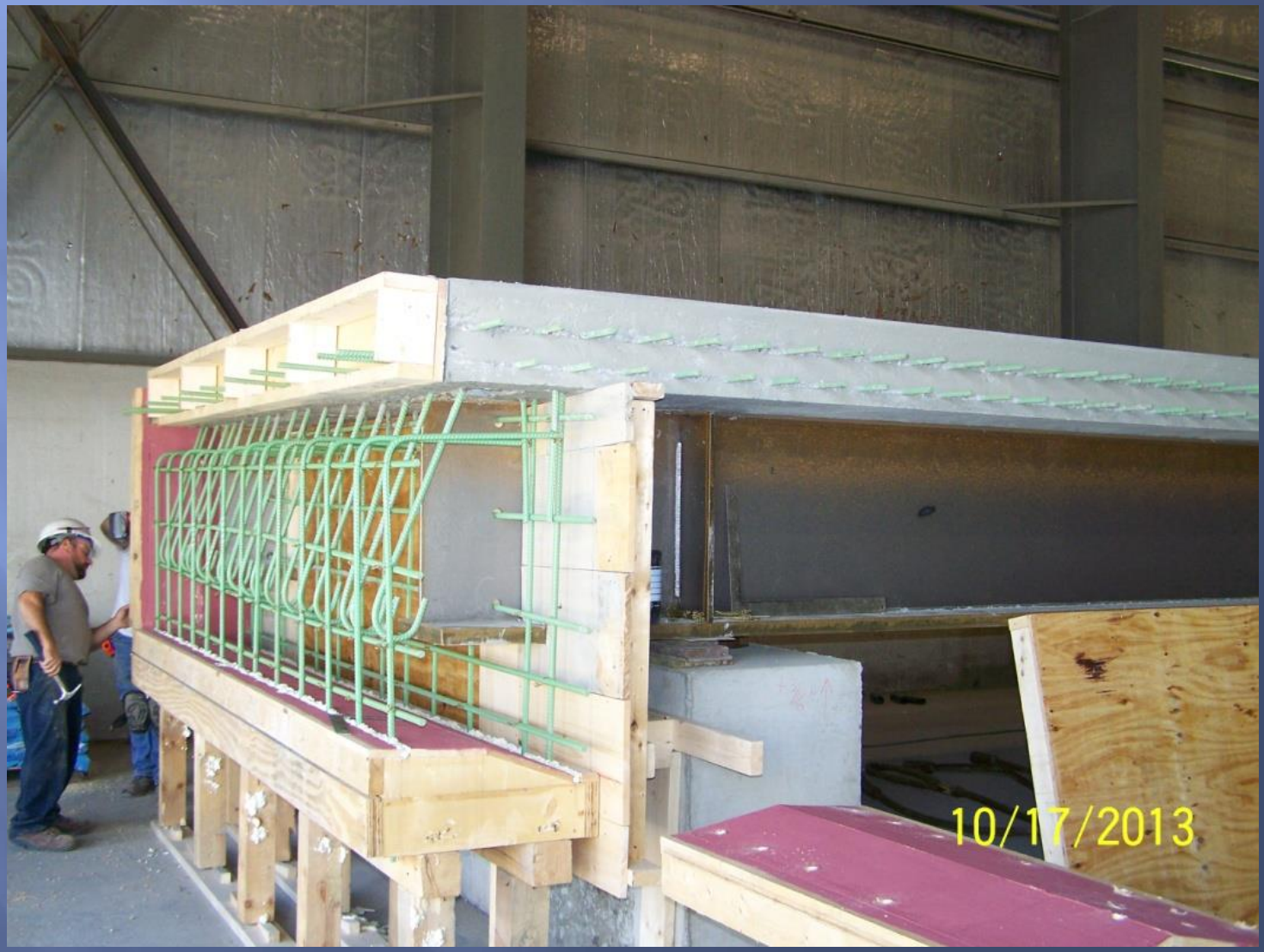
Semi-Integral Abutment – As Fabricated



Semi-Integral Abutment – As Fabricated



Fabrication



Fabrication

Fabrication

Superstructure Construction

Construction

Construction

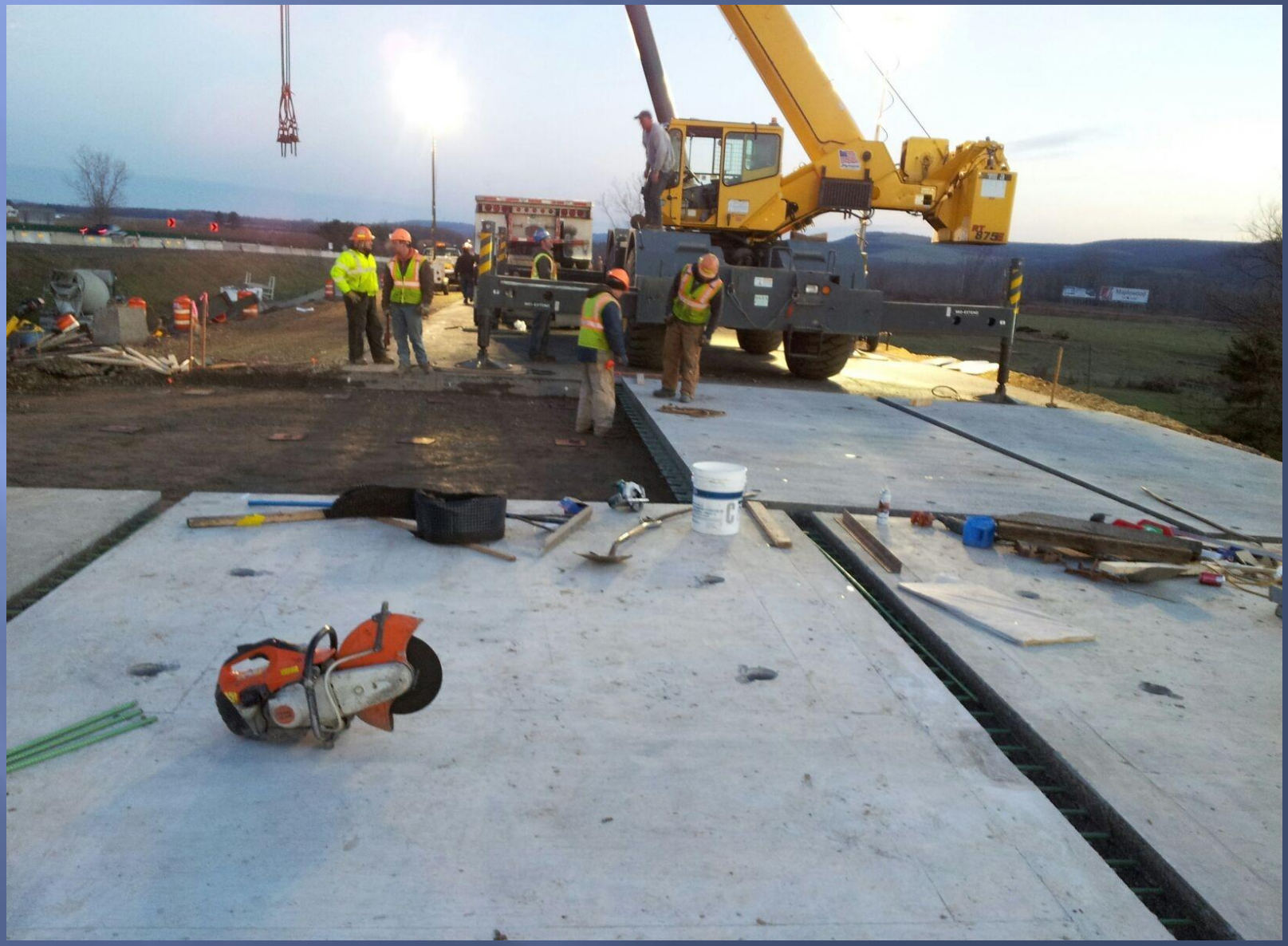
Construction

Construction

Construction

Construction

Construction



Construction

Construction

Construction

Construction

Construction

Construction

Finished Bridge

Case Study: I190 over Buffalo Ave.

I-190 over Buffalo Ave – Niagara Falls, NY

- Vertical Staging Utilized
- Semi-Integral Abutment Utilized to Accelerate Construction Schedule
- **3 Day Closure (midnight Thursday to midnight on Sunday)**
- Accelerated Concrete used for Closure Pours instead of UHPC
- Modular Deck Beam Constructed in a Yard one mile from Bridge Location Instead of Fabrication Plant.

I 190 over Buffalo Ave

I 190 over Buffalo Ave

Fabrication at Yard 1 Mile from Bridge

Video

THANK YOU
QUESTIONS?

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