

ACCELERATED DECK REPLACEMENT FOR THE MACDONALD BRIDGE

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WSDOT ABC Workshop

Tumwater, WA

2015 April 01



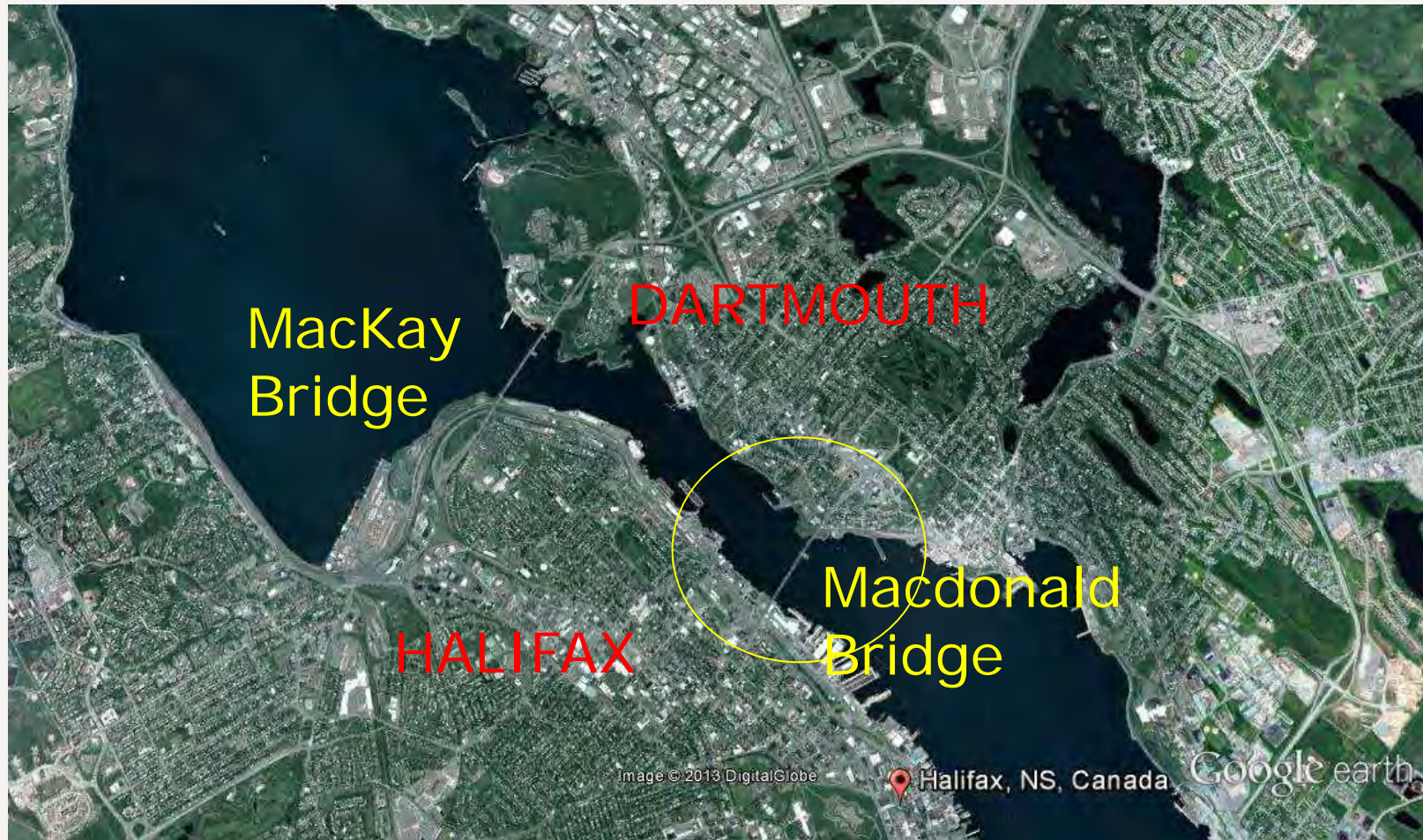
Project Location



Bridge Location



Bridge Location



Original Bridge



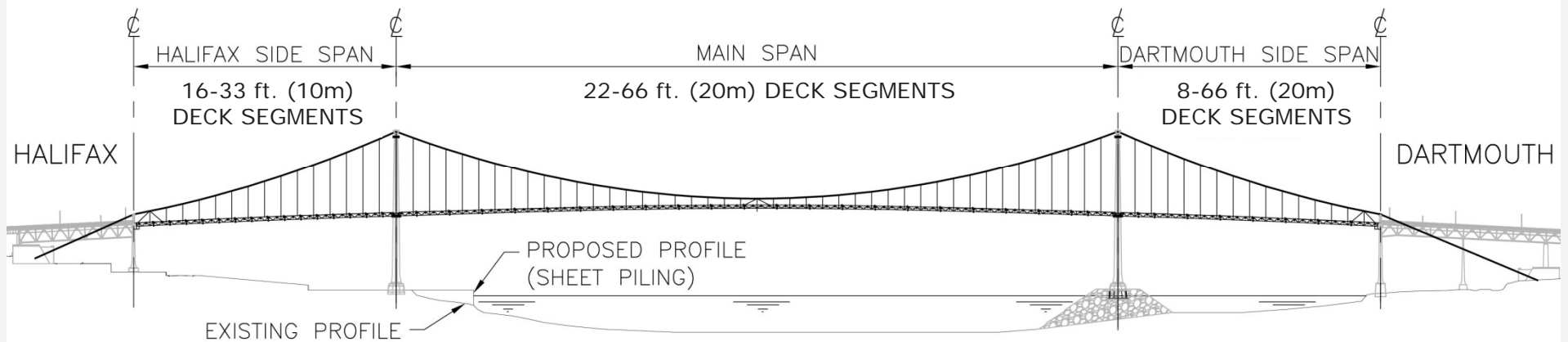
- › Designed by P. L. Pratley
- › Built by Dominion Bridge Company Ltd. in 1955.
- › Suspension bridge: Main span 1,446 ft., L=2,498 ft.
- › Operated by Halifax Harbour Bridges

Roadway Deck



- › Deck OK for strength but high maintenance.
- › Suspended structure replacement - Entirely new suspended structure including hangers in 2016.

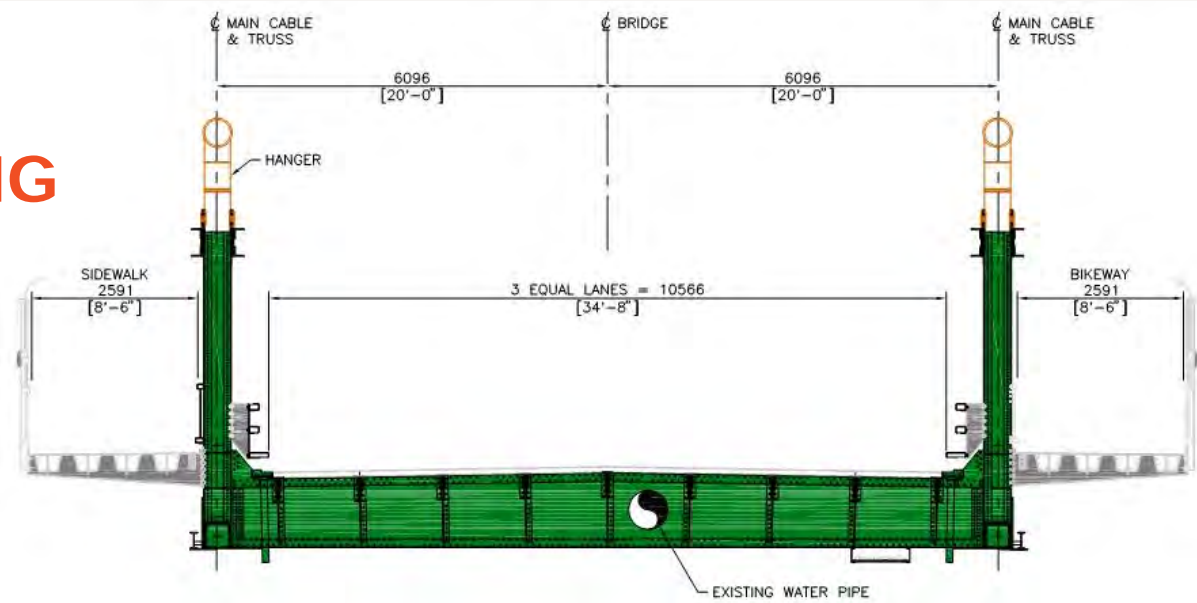
Scope



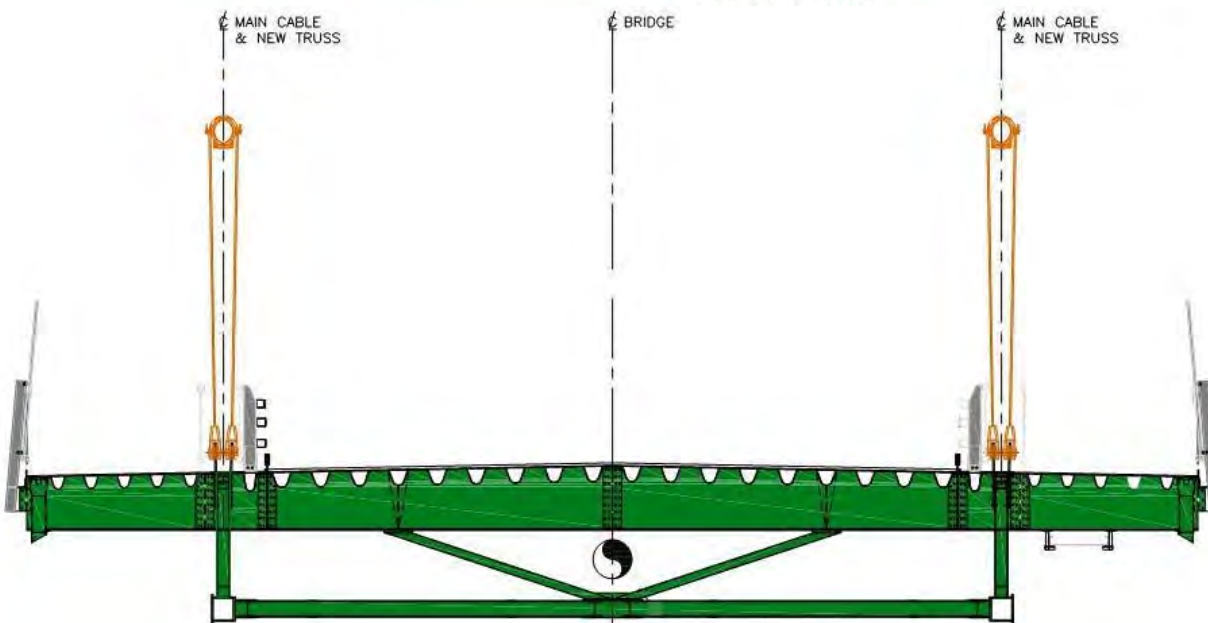
- > Replace suspended bridge superstructure including hangers
- > Strengthen towers and bents if necessary
- > Traffic to be kept running
- > Superstructure replacement allowed only during closures – night / weekend closures
- > Full segment replacement

Typical Deck Cross Sections

EXISTING



NEW



Fabrication



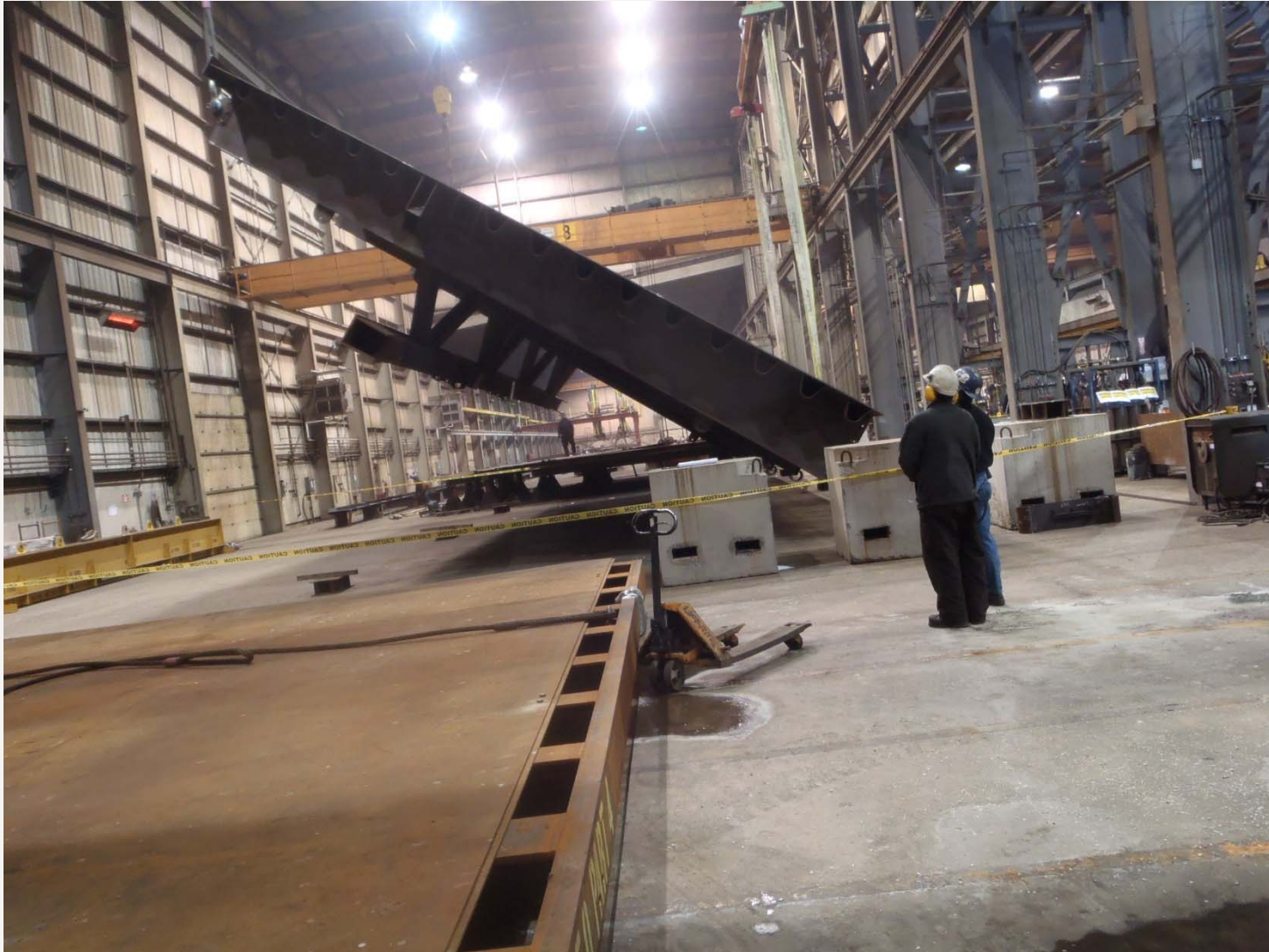
Fabrication



Fabrication



Fabrication

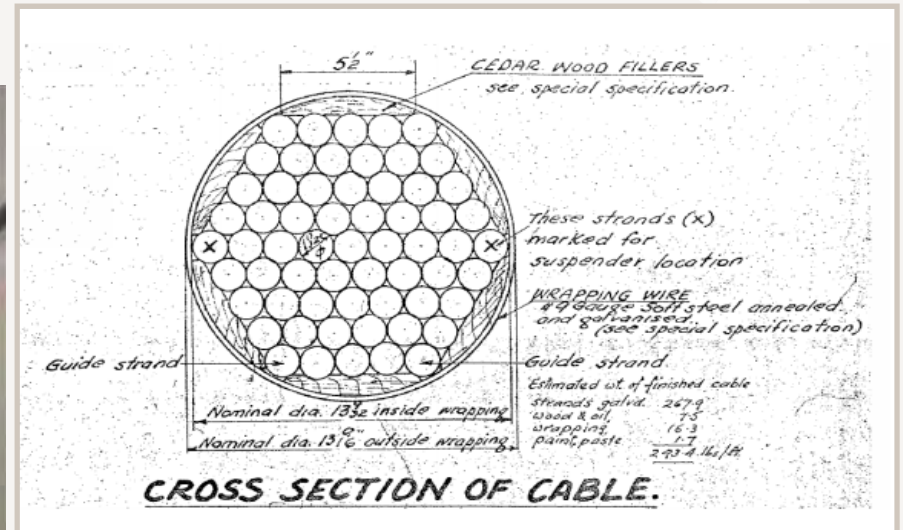


New Deck Segment



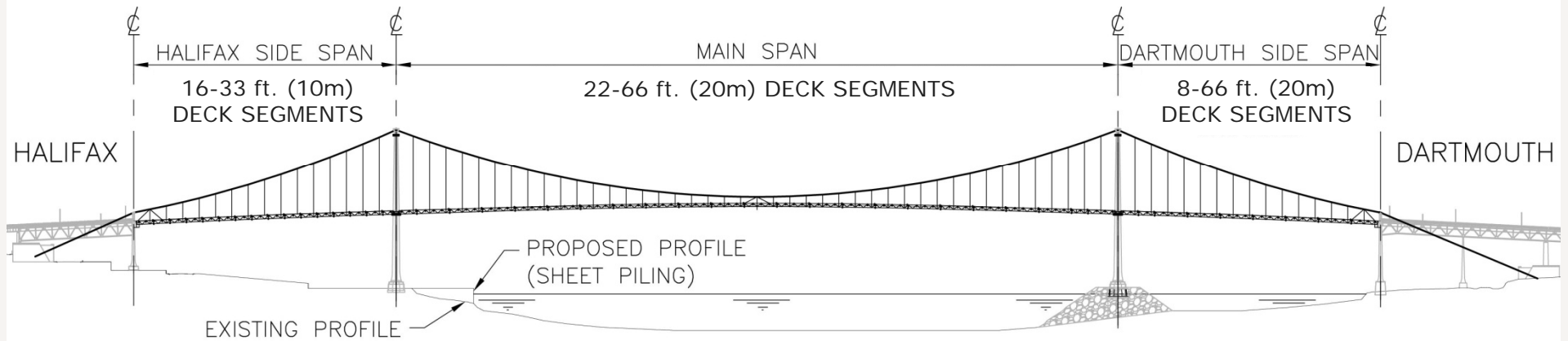
Photo from
Lion's Gate
Bridge Deck
Replacement

Existing Elements



- > Cables inspected in 2010
- > Main cables in good shape, with sufficient capacity
- > Tower and bents – very good

How?

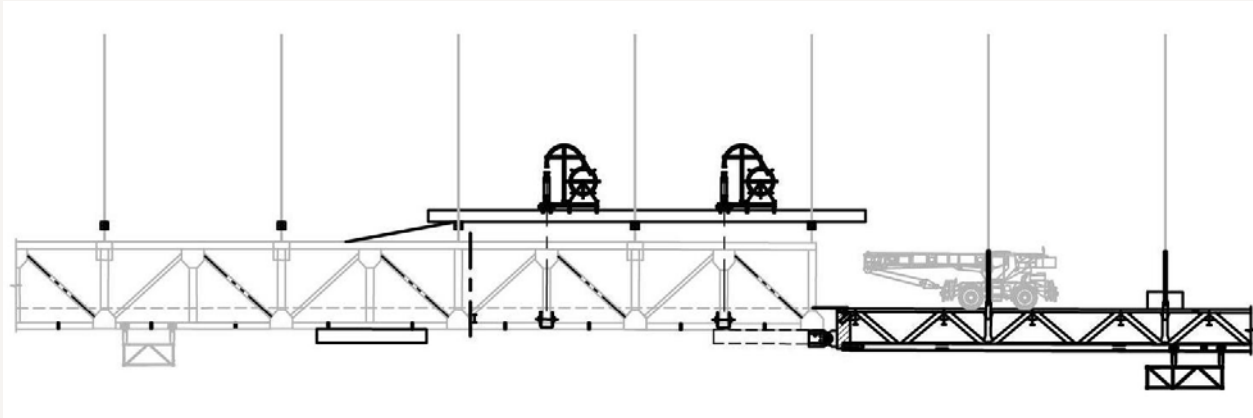


← Direction of Deck Replacement

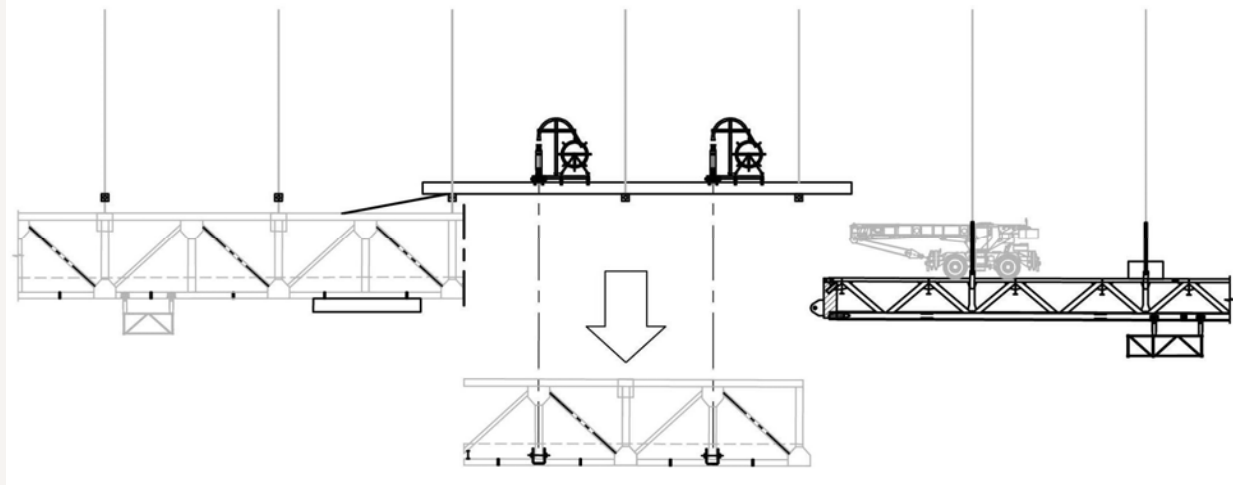
- > Traffic to be kept running
- > 10 ½ hour full closures at night
- > Approximately 7 full weekend closures
- > Single-lane closures at off-peak times

Typical segment replacement

1

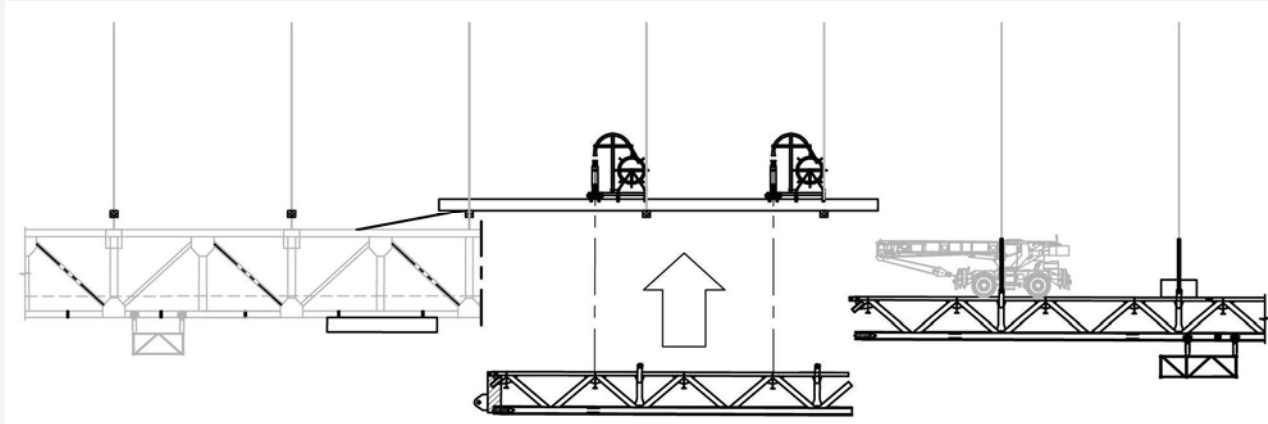


2

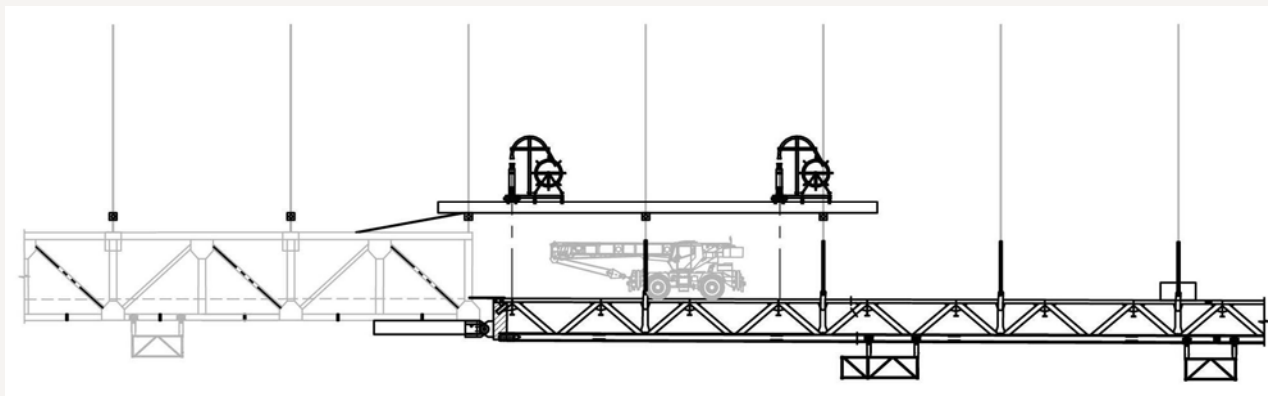


Typical segment replacement

3



4



Typical segment replacement

Photo from
Lion's Gate
Bridge Deck
Replacement



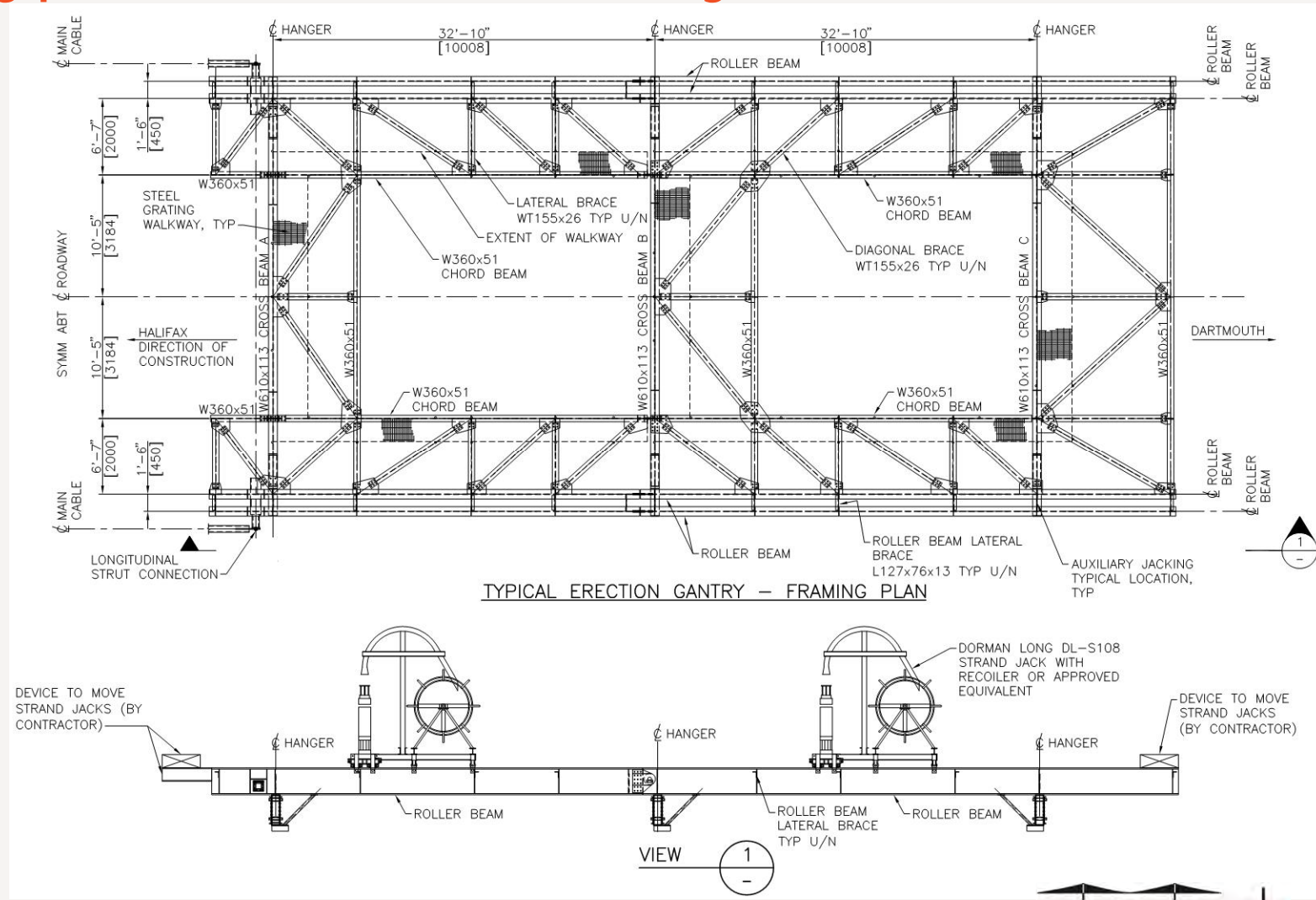
Typical segment replacement



Typical segment replacement



Typical Erection Gantry

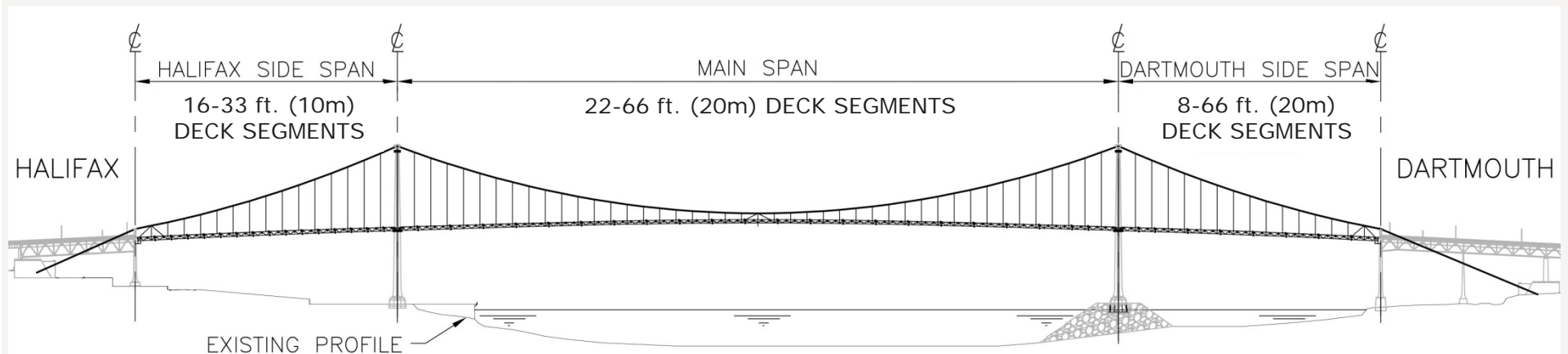


Typical Erection Gantry

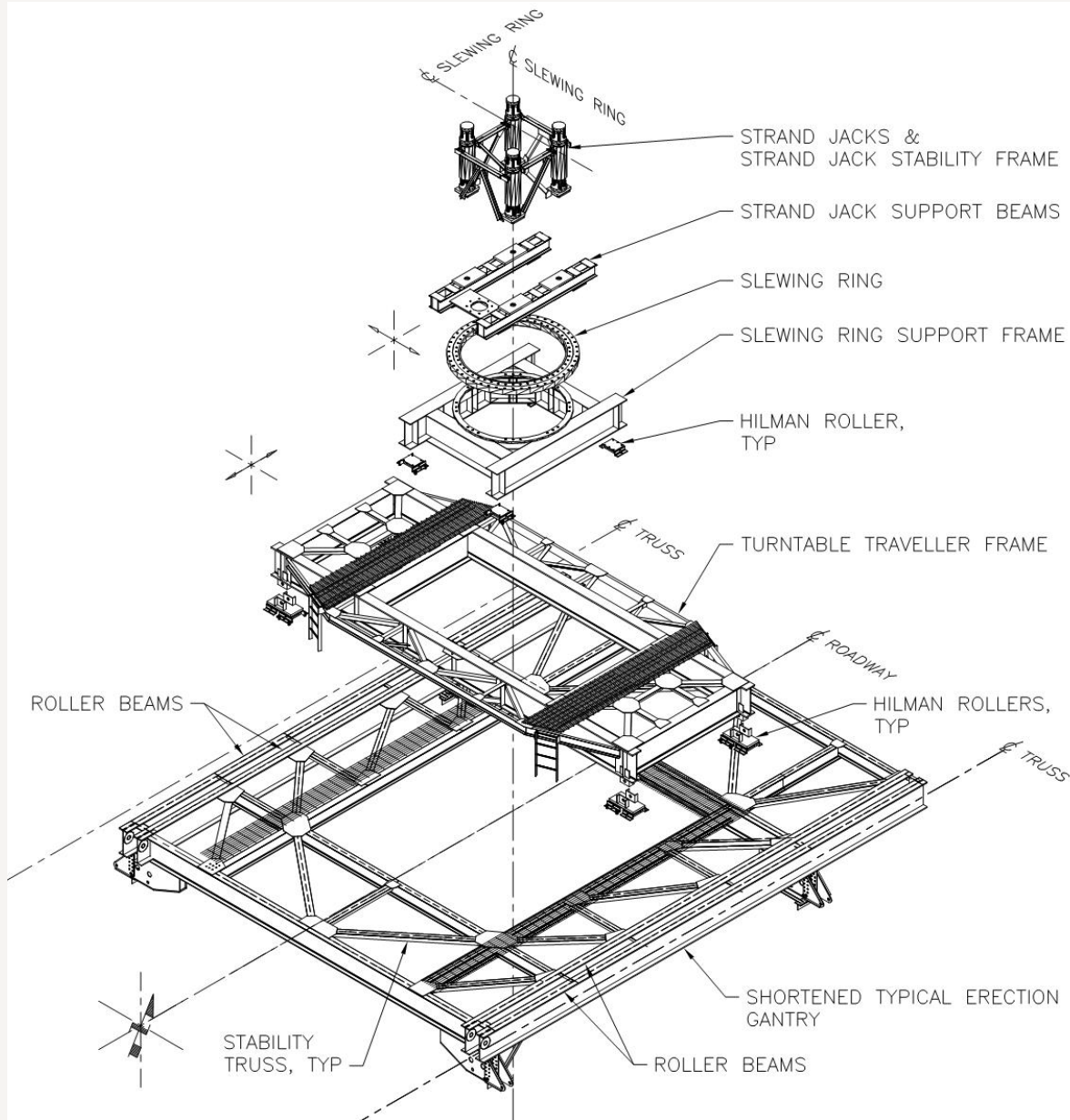


Segment replacement in Halifax side span

- > 16 deck segments to be in Halifax side span
- > Over DND property



Turntable Erection Gantry



Halifax Side Span Segment Replacement

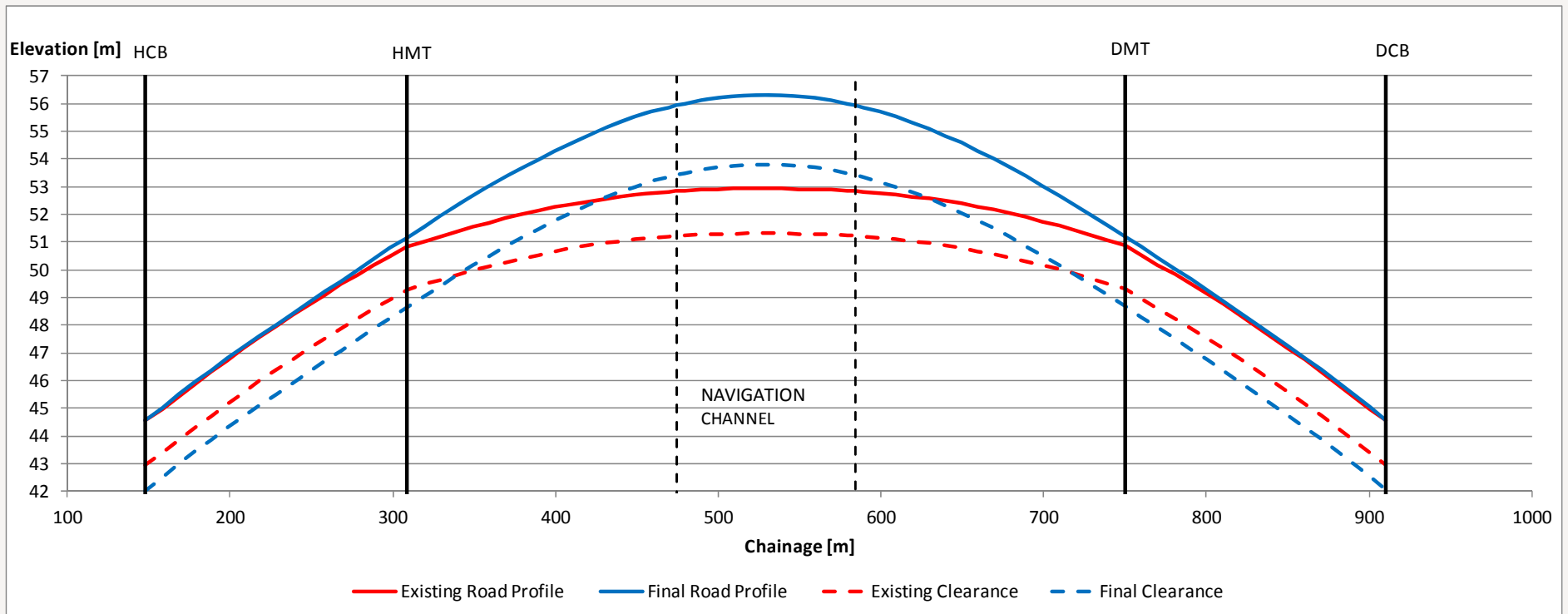


Halifax Side Span Segment Replacement



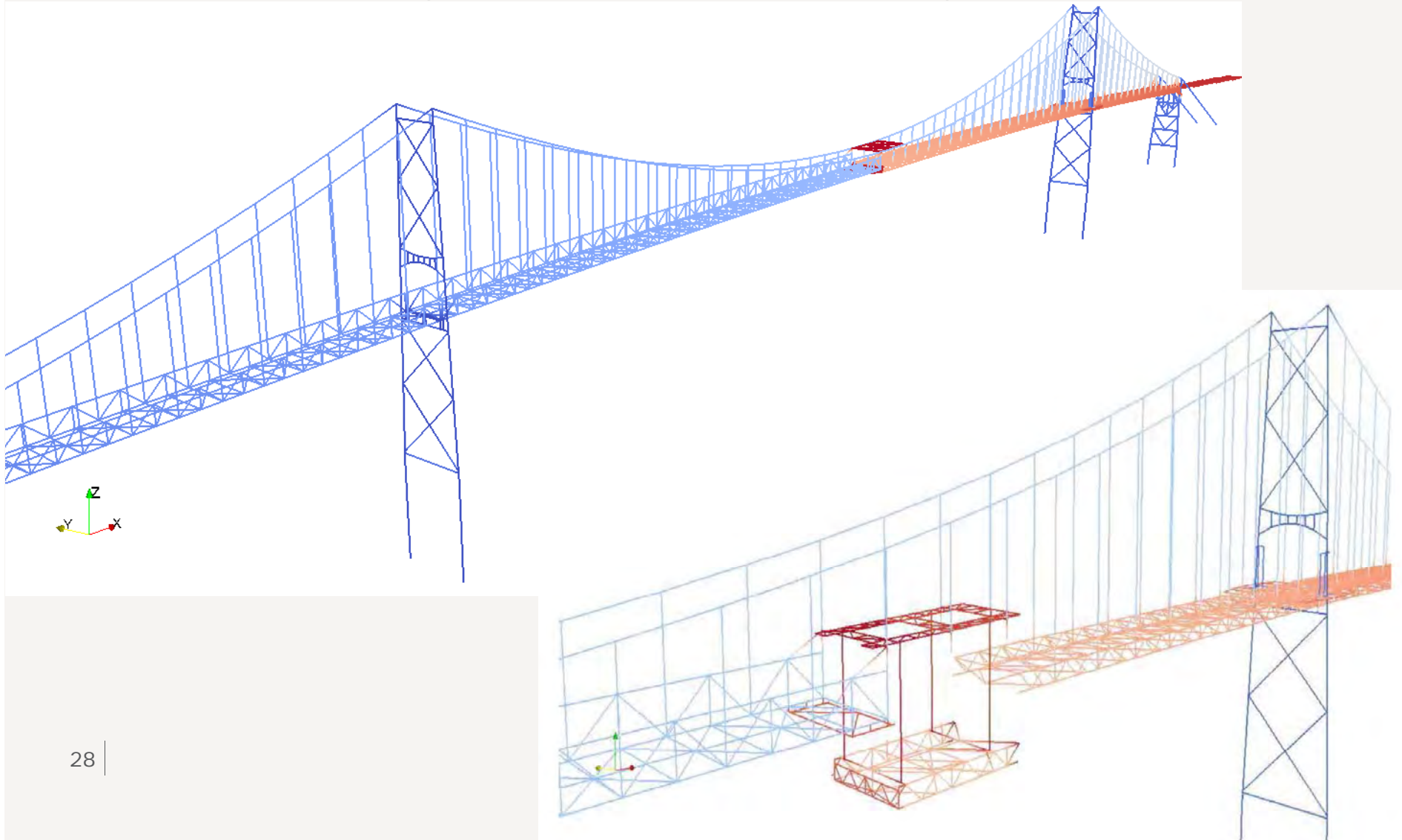
Increased Shipping Clearance

- › Bridge deck jacked up following deck replacement
- › Raising of deck 10 ft. at midspan; 1 ft. at towers
- › Increase in shipping clearance 7 ft.



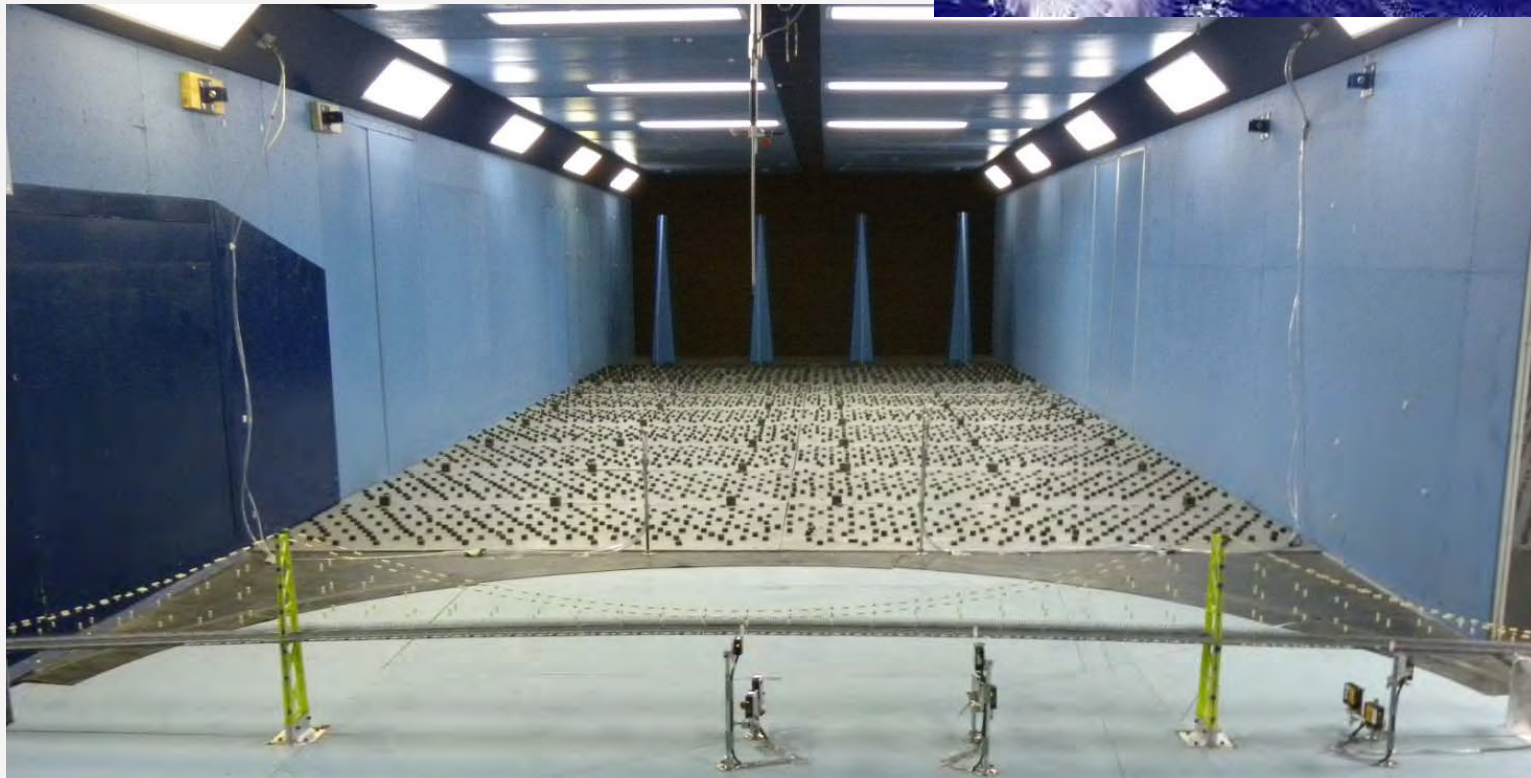
Erection Analysis

> Complex analysis; 700+ steps analyzed; iterative

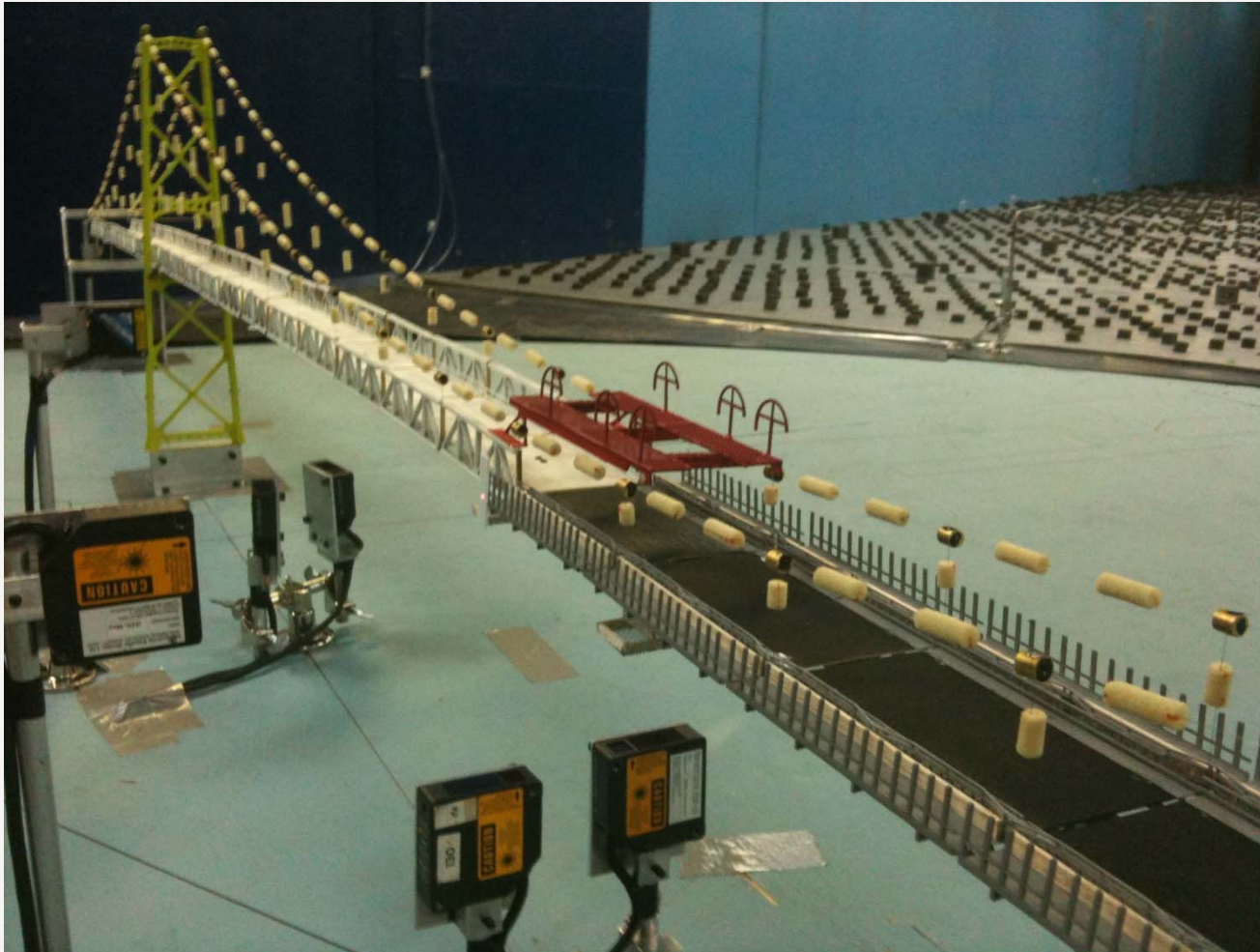


Wind Engineering

- › Halifax – hurricane zone
- › High wind speeds –> significant wind loads



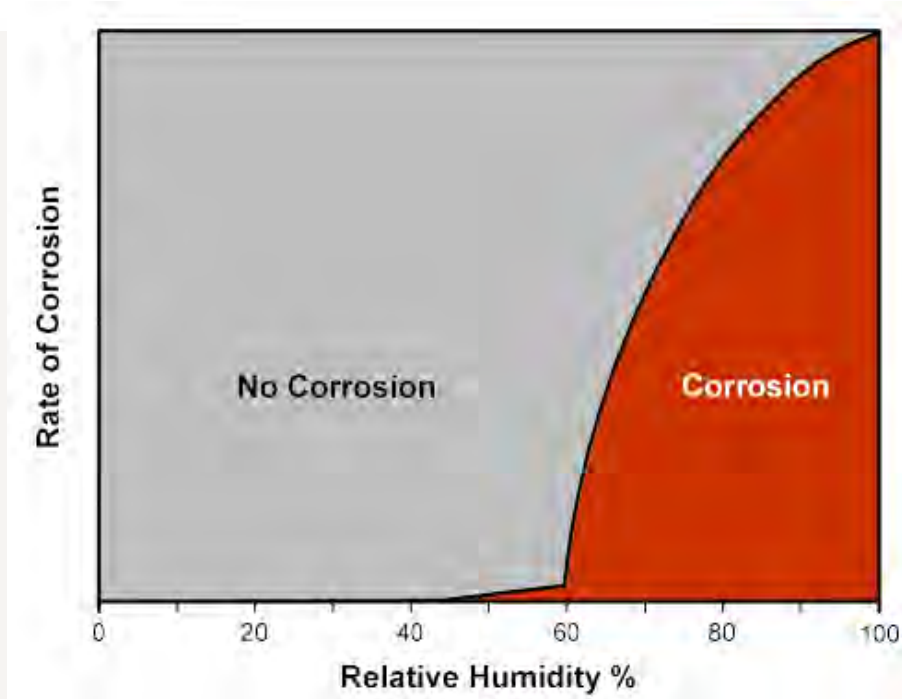
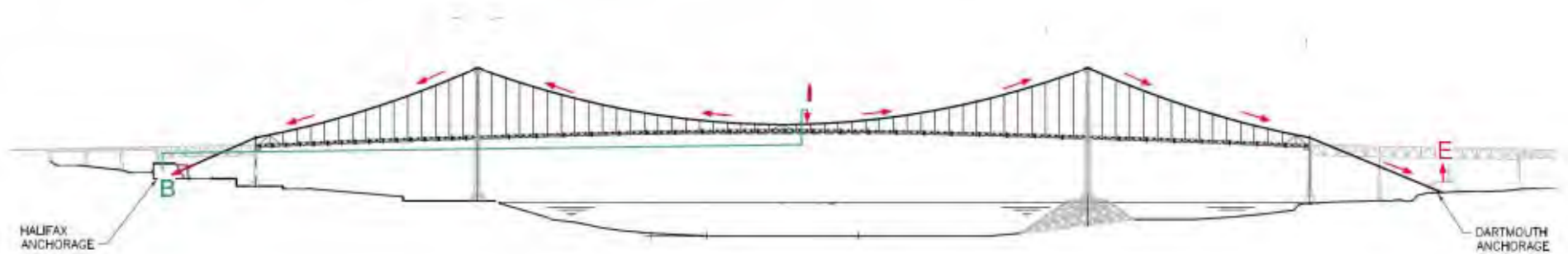
Wind Engineering – Aeroelastic Models



Wind Engineering – Aeroelastic Models



Main Cable Dehumidification



Main Cable Dehumidification



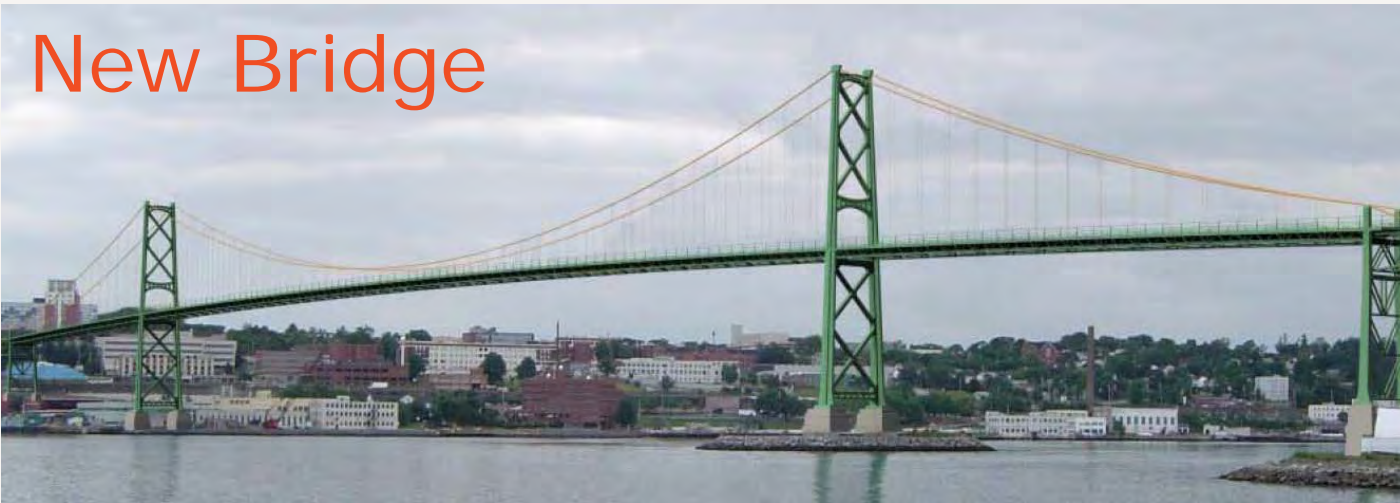
When?

- › RFP – December 2013
- › Proposals received (ABC, FI, AV JV) - April 2014
- › LNP, American Bridge Canada – June 2014
- › Contract award – October 2014
- › Erection start – expected August 2015
- › Substantial completion – Sept/Oct 2016

Existing Bridge



New Bridge



Questions ?