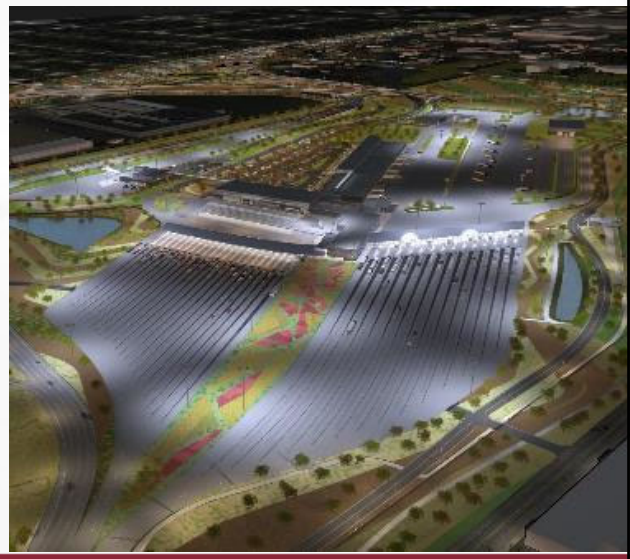
PONT INTERNATIONAL
GORDIE HOWE
INTERNATIONAL BRIDGE

Michigan Bridge Conference 2023

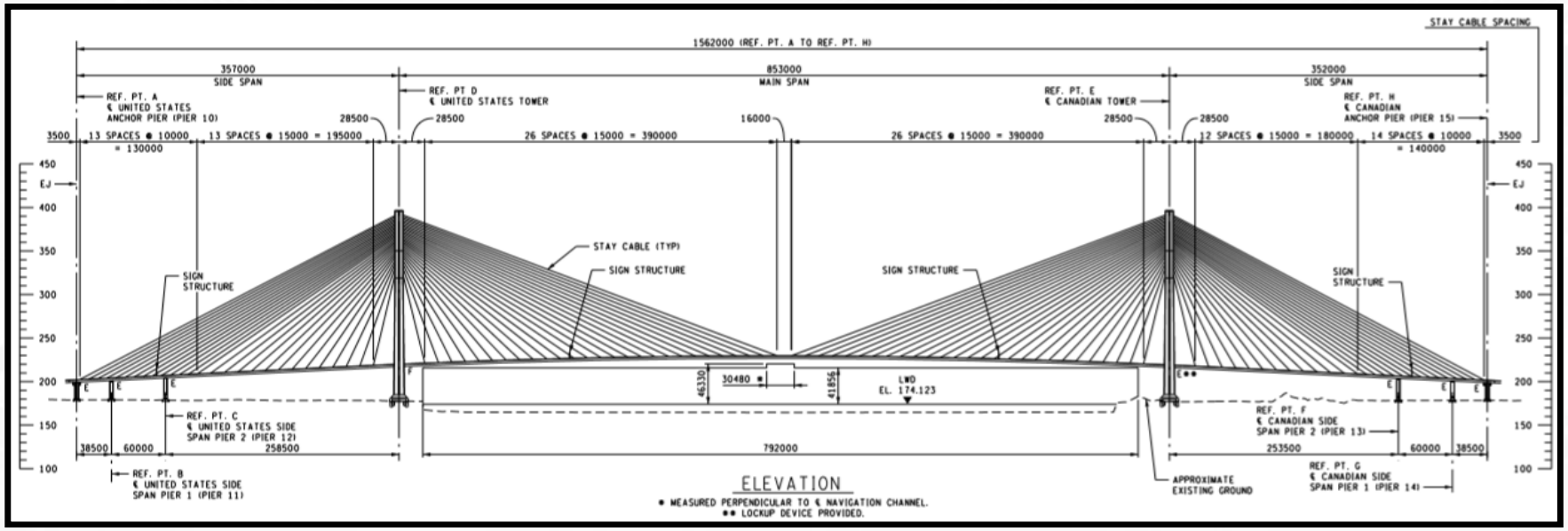
March 14, 2023

ORGANIZATIONAL STRUCTURE

PROJECT COMPONENTS

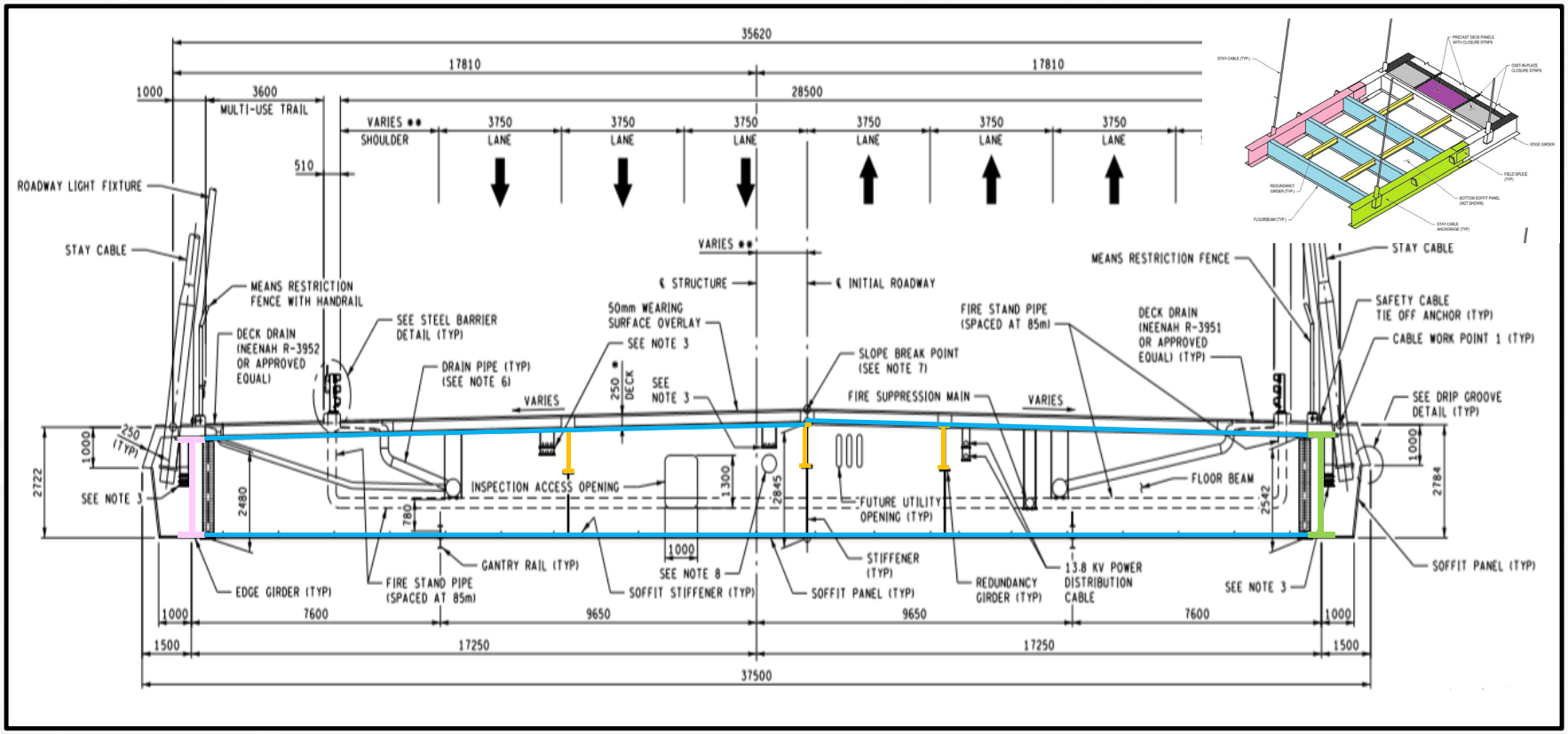


BRIDGE SUPERSTRUCTURE



- Tower Height from ground-level = 722ft
- Navigational channel envelope 2,600 ft x 137 ft
- Maximum navigation clearance 100ft x 152ft width

BRIDGE SUPERSTRUCTURE: DECK



STEEL COMPOSITE TYPICAL SECTION @ STAY CABLES – INITIAL CONFIGURATION N

BRIDGE SUBSTRUCTURE: DRILLED SHAFTS

Construction of the tower foundations for the main bridge are complete on both the Canadian and US bridge sites.

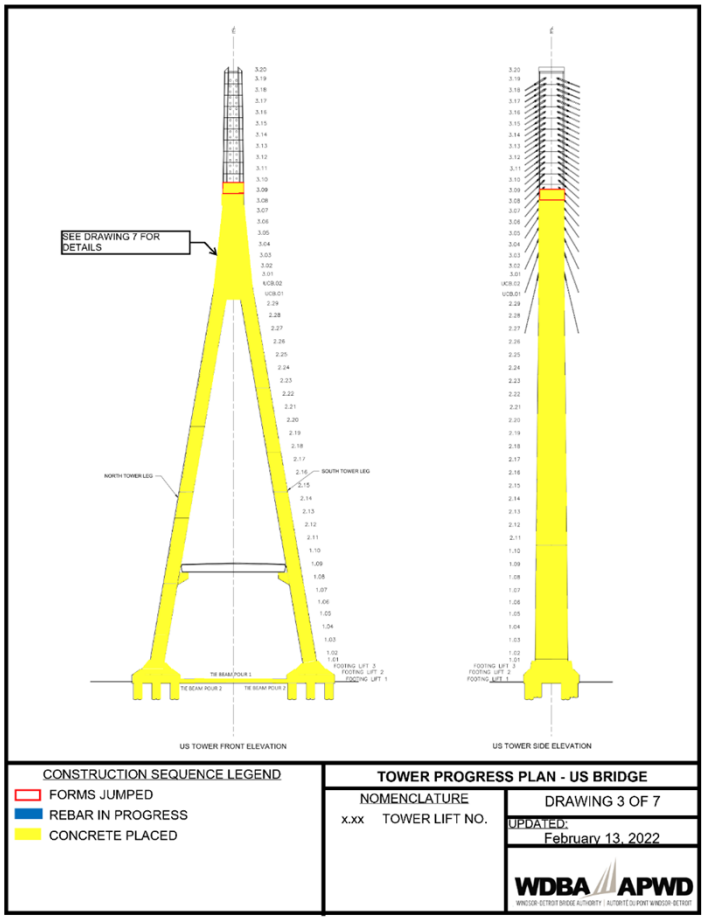
- The foundations for each tower are composed of a total of 18, 100 ft deep drilled shafts; 12 for the main tower footing and 6 for the back span.
- Drilled shafts were drilled to bedrock (limestone)
- Once concrete in each shaft was cured, specialty testing was undertaken.
- Installation of the Post Tensioning System in the main tower was completed in summer 2021.

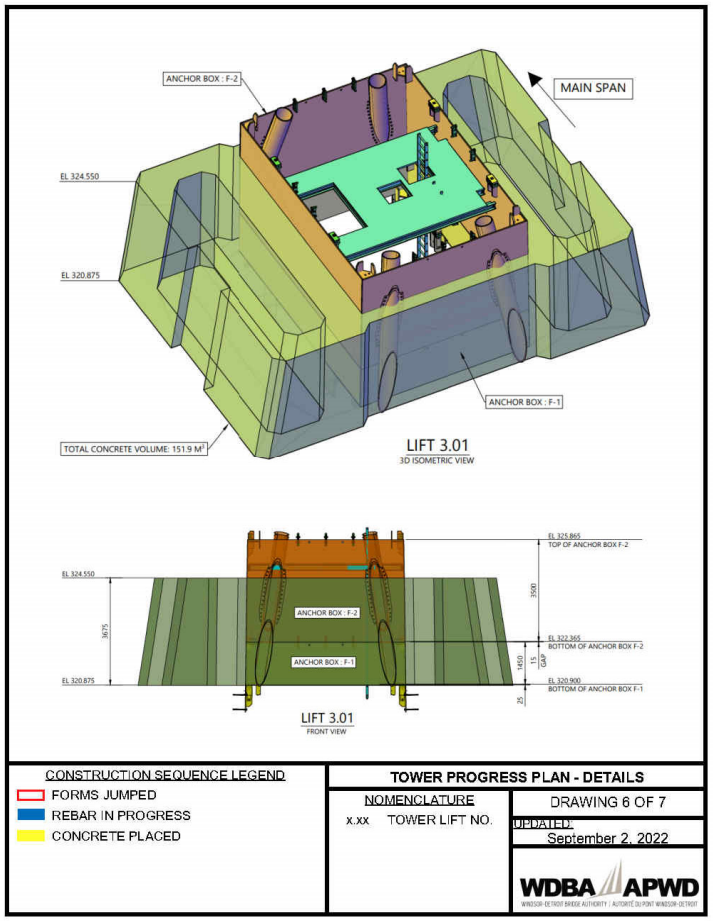
BRIDGE SUBSTRUCTURE: FOOTING

US Tower Footing with Tie beam
(2021-04-27)

Canadian Tower Footing with Tie beam
(2021-02-12)

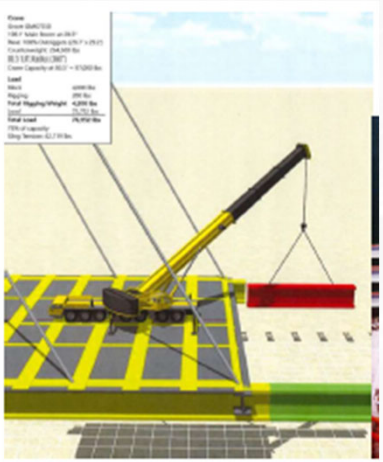
SUPERSTRUCTURE DETAILS: TOWERS

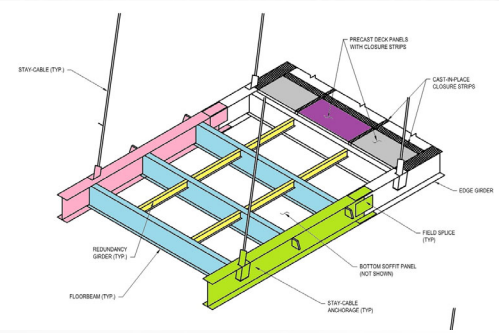




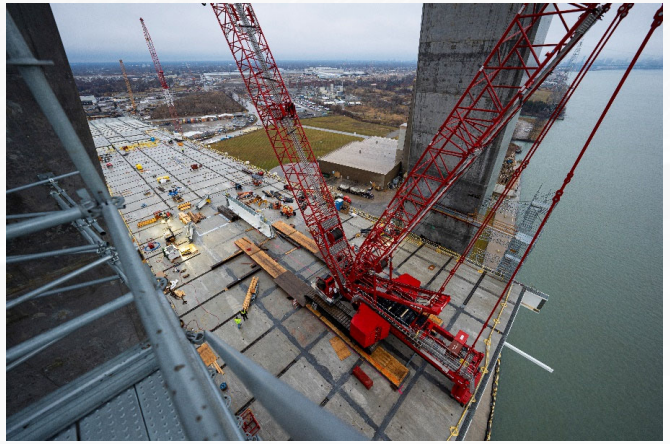
OVERALL BRIDGE CONSTRUCTION APPROACH

- Erecting from land
- Unbalanced cantilever system; stick build
- Build back span using temporary towers while main concrete towers are being constructed
- Main span will be constructed with the pieces transported from the back span/bridge approach





OVERALL BRIDGE CONSTRUCTION APPROACH



DUAL DESIGN

- **Dual Design** means harmonizing between the requirements of the two countries which the bridge connects: Canada and the US.
- **Design phase**: The Engineer of Record (EoR) produces two complete sets of calculations (CDN track and US track), and one single set of design plans meeting the most stringent requirements between the CDN track and the US track.

CDN track	USA track
Canadian design standards, e.g. : • CSA S6-14 and commentary • MTO standards • NRCC • Canadian Foundation Engineering Manual Common design standards, e.g. : • PTI M50.3, M55.1, DC45.1 • FHWA Geotech. Eng. Circ. No.10 (drilled shafts) • Fib bulleting 34 & CEB-FIP Model Code 1990	US design standards, e.g. : • AASHTO LRFD 8th ed. • other AASHTO standards • MDOT standards • FHWA standards Common design standards, e.g. : • PTI M50.3, M55.1, DC45.1 • FHWA Geotech. Eng. Circ. No.10 (drilled shafts) • Fib bulleting 34 & CEB-FIP Model Code 1990

SPECIAL DESIGN CRITERIA FOR STEEL

- Stainless steel reinforcement will be used in the specified locations for concrete bridge elements
- Structural steel is limited to ASTM A709/A709M, Grade 36(250), ASTM Grade 50(345)
- All structural steel, including weathering steel, will be coated
- Reinforcing steel will conform to CSA G30.18-09 grade 400W or 500W
- Reinforcing bar materials is selected from the following:
  - stainless steel
  - glass-fiber-reinforced polymer
  - low carbon/chromium corrosion resistant reinforcing steel (ASTM A1035 Type CS)
  - galvanized carbon steel
  - uncoated carbon steel.

REDUNDANCY

Owner Requirements:

All steel tension members and connections are designed with redundancy. Tension members include any bridge element that has a region in tension under any limit state.

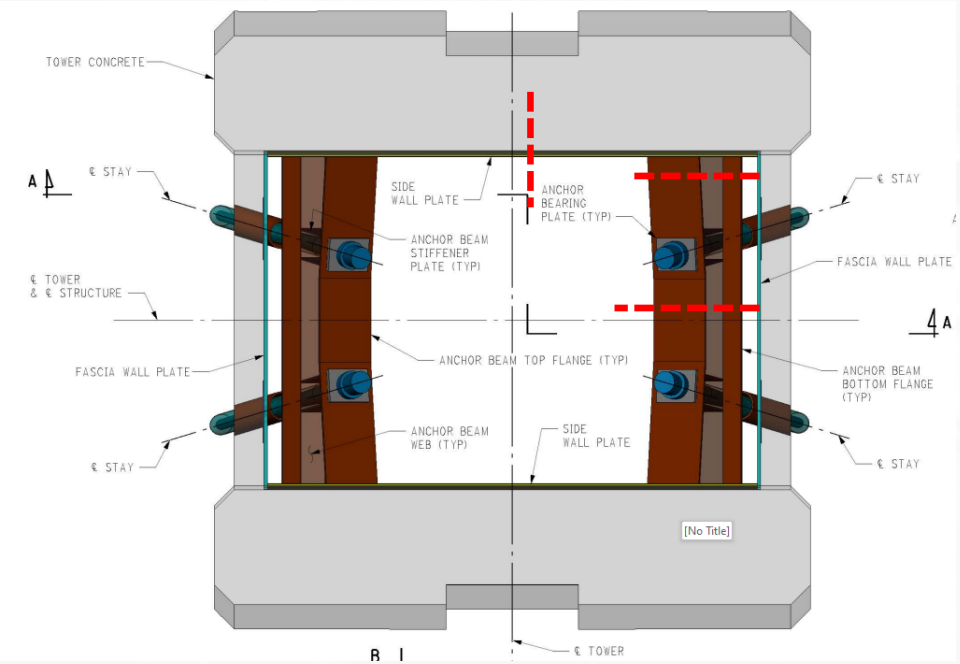
Two ways to achieve redundancy :

- Load path redundancy: alternative and sufficient load path exists after the member fails.
- Structural redundancy: alternative and sufficient load path through 3-dimensional mechanisms.
- Internal redundancy: alternative and sufficient load path, within the member itself, exists after a portion of the member fails and failure cannot propagate to the rest of the member.

Redundancy report: loading cases, locations of fractures, degree of dynamic effects, modelling, etc.

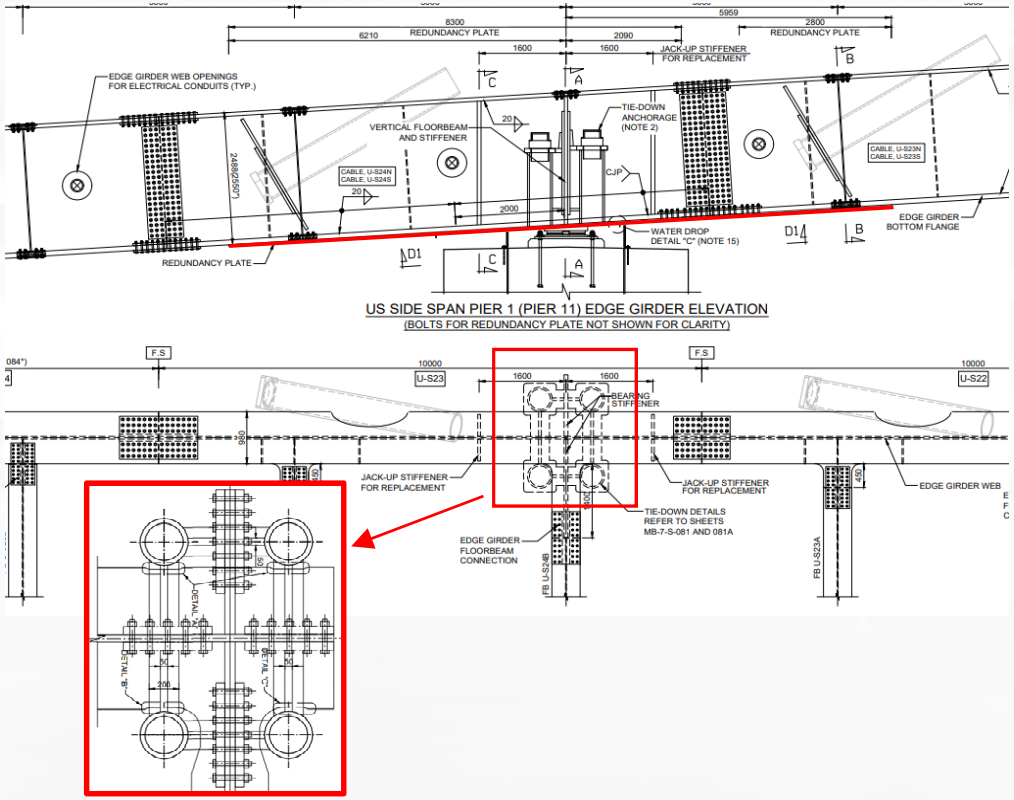
REDUNDANCY

Tower anchor boxes:



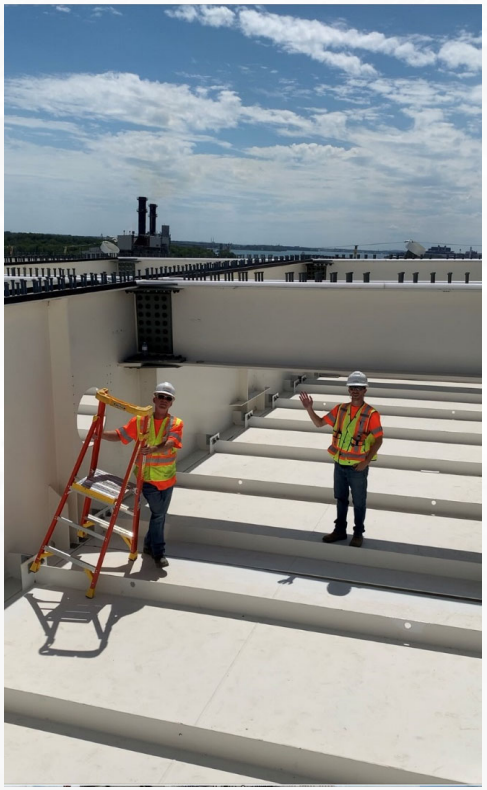
REDUNDANCY

Edge girders, cable anchorages and tie-down connections:



REDUNDANCY

Floor beams and redundancy girders:



DURABILITY & COATINGS

The project is required to have a **service life of 125 years.**

Why 125 years, and not 75 or 100?

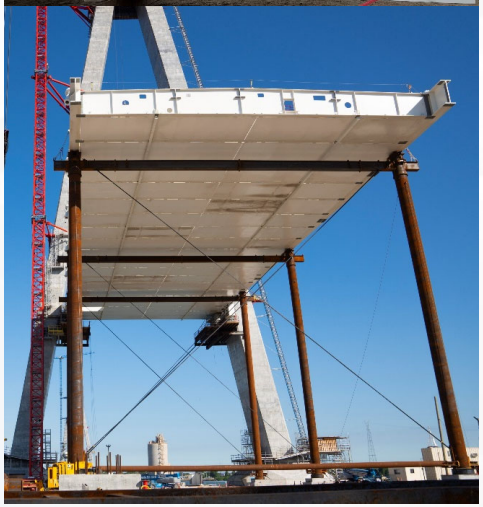
- 125 years: highest service life in comparable procurements (NBSL, ORB, Goethals).
- Cost impact evaluation: major cost impact unlikely regardless of 75, 100 or 125 years.

- Structural steel above grade: MDOT/MTO requires coated steel, e.g., prescriptive baseline ensures high durability.
- Structural steel below grade: Durability dependent added coating or extra sacrificial thickness, e.g., 75 years to 125 years = approx. +3mm sacrificial thickness = minor cost impact.

Contractually-authorized and/or routine maintenance activities are allowed to reach a service life of 125 years, but **no major repairs**.

Structural steel is non-replaceable in 125 years, but **coatings are replaceable with a service life requirement of 40 years** before a full remove and recoat.

DURABILITY & COATINGS



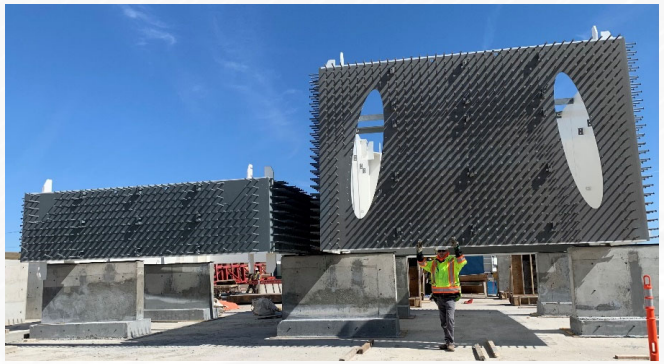
Owner's minimum coating requirements to reach 40 years:

a) Embedded in concrete: zinc primer

b) Exposed to de-icing: metallized with seal coat or HDG with two coats

c) Exterior surfaces: 3 coat paint system of OZ-E-U or metallized with seal coat or HDG with aesthetic top coats

d) Interior surfaces: 2 coat paint system or metallized with seal coat or HDG



DURABILITY & COATINGS

Coating performance requirements are defined by BNA's durability experts:

- Exposure conditions :
  - ISO C2 – Low: steel protected by soffit and anchor box
  - ISO C3 – Medium: all other steel
  - ISO C5 – Very High Industrial: steel exposed to chloride salts and/or Zug Island emissions

To achieve 40yr, coating applied at 80% max NEPCOAT thick range

Table 3 - Carbon Steel and Galvanizing Paint Dry Film Thickness
(for galvanizing spot prime as needed and apply intermediate and finish only)

Mfg	Products	NEPCOAT DFT Range (microns/mils)	Connections
Carboline	1-Carbozinc® 859	76-254 µm 3-10 mils[1, 2]	Max 152 µm Max 6 mils[3]
	2-Carboguard® 893	76-152 µm 3-6 mils[1, 2]	NA
	3-Carbothane 133VOC	76-127 µm 3-5 mils[1]	NA
Sherwin Williams	1-Zinc Clad®4100 Organic	76-127 µm 3-5 mils[1, 2]	Max 127 µm Max 5 mils[3]
	2-Macropoxy® 646 FC	76-254 µm 3-10 mils[1, 2]	NA
	3- Acrolon™ 218 HS Acrylic Polyurethane	76-152 µm 3-6 mils[1]	NA


CONSTRUCTION PROGRESS

CONSTRUCTION PROGRESS

Tower footings and tie-beam Canada

Tower footings:

- July 1, 2020: First footing concrete placement.
- December 2020: Footings complete, totaling ~10,000 yd^3 for both towers
- July 2021: 1000 days since start of construction. Tie-beams complete.

CONSTRUCTION PROGRESS

Tower legs and structural steel:

- January 2021: Climbing formwork installation began
- February 2023: The Canadian tower is approximately 561 feet and US tower is 577 feet (final height: 721 feet)

US towers February 23, 2023

Canadian towers February 23, 2023

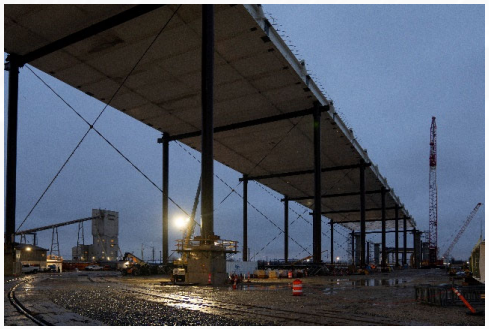
CONSTRUCTION PROGRESS

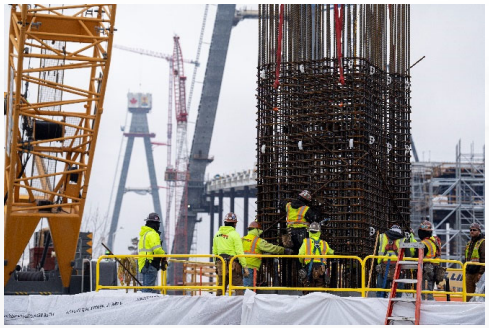
- **Structural steel – deck** : Installation began March 2022

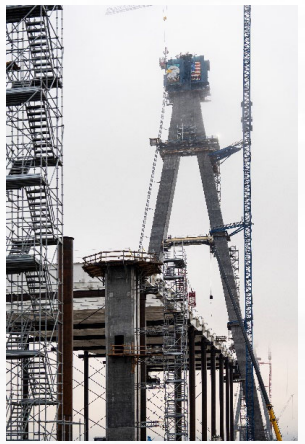
Backspan deck February 23, 2023, US

Structural steel:

- Progress on back span deck

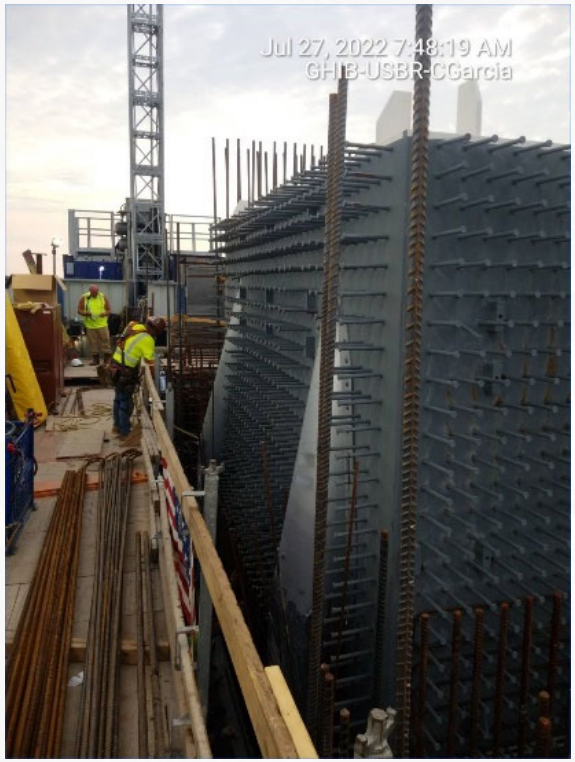




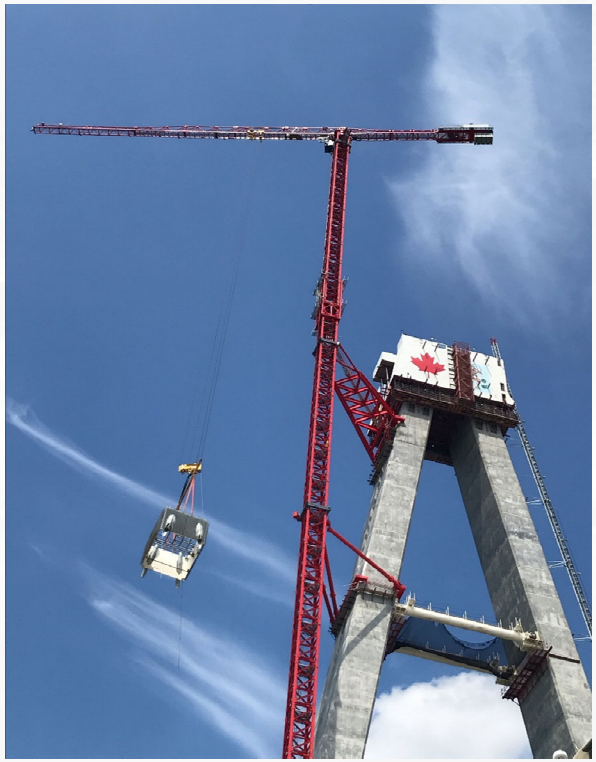


CONSTRUCTION PROGRESS

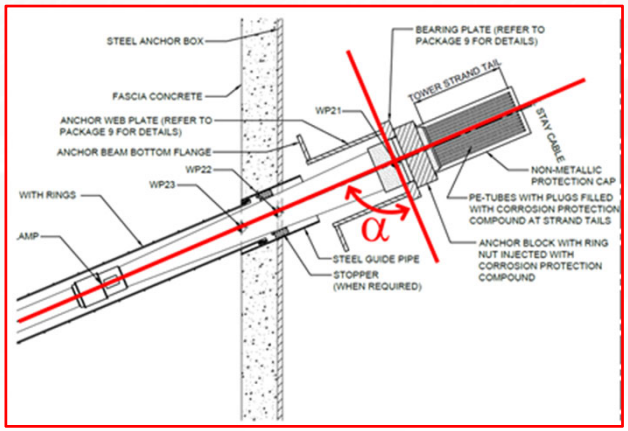
Structural steel and tower anchor boxes: Installation began July 2022



First anchor box installation July 2022 US



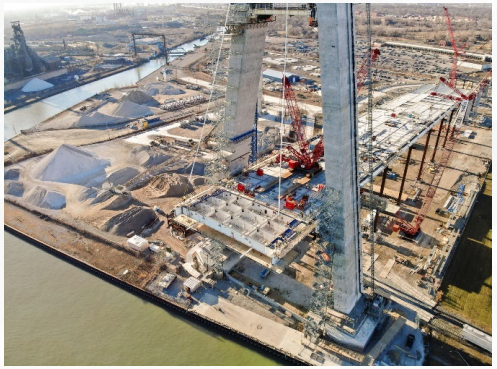
First anchor box installation August 2022 Canada

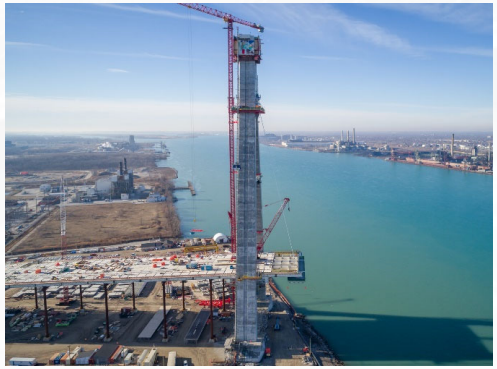


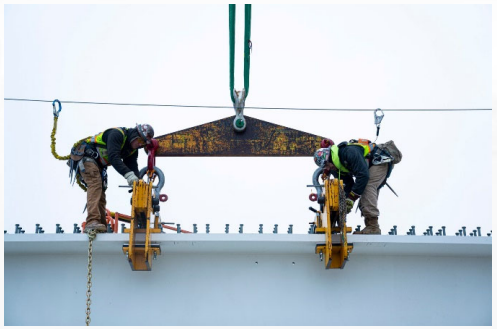
Milestones to come:

- Tower head completion to 721 ft above ground
- Installation of the deck for main span
- Approach foundations and substructures to complete

BRIDGE CONSTRUCTION OVER THE DETROIT RIVER

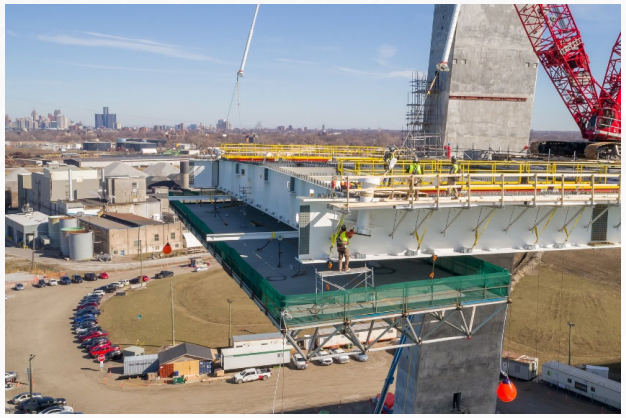


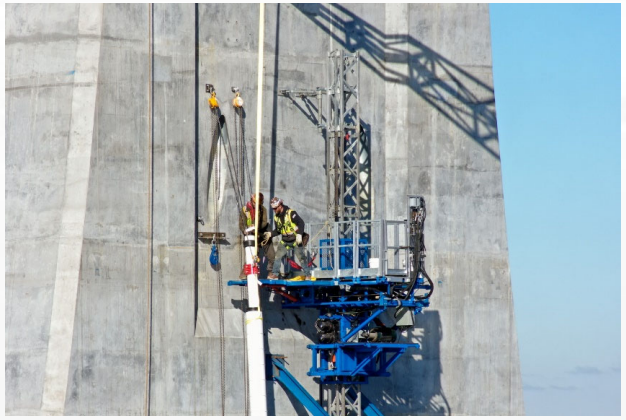




CABLE STAY INSTALLATIONS





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