



US181: New Harbor Bridge

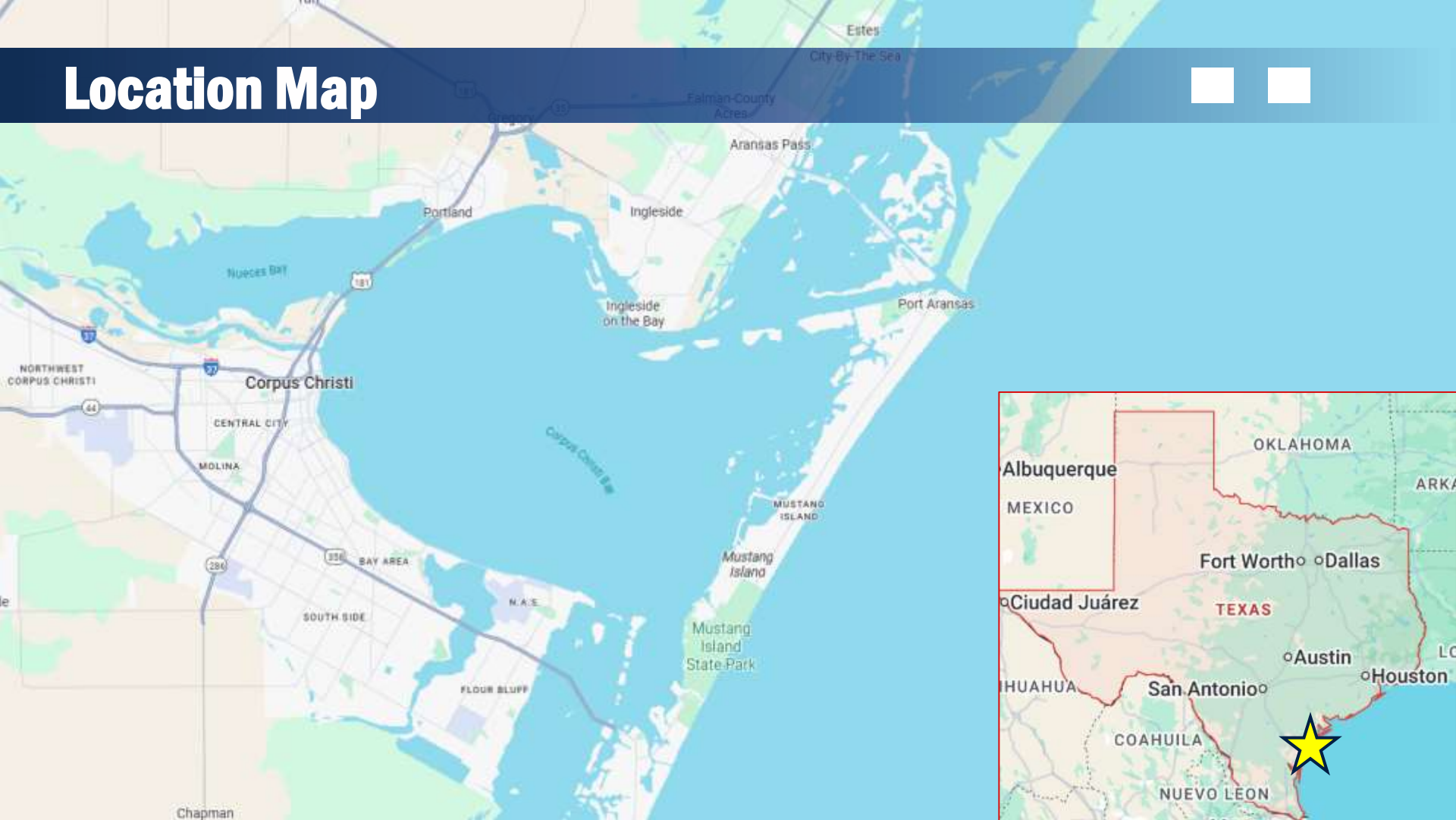
Project Overview and Construction Engineering Highlights

Luke Tarasuik, Arup
Javier Campos, Arup
Quentin Marzari, Arup

February 25, 2026
ASBI Webinar



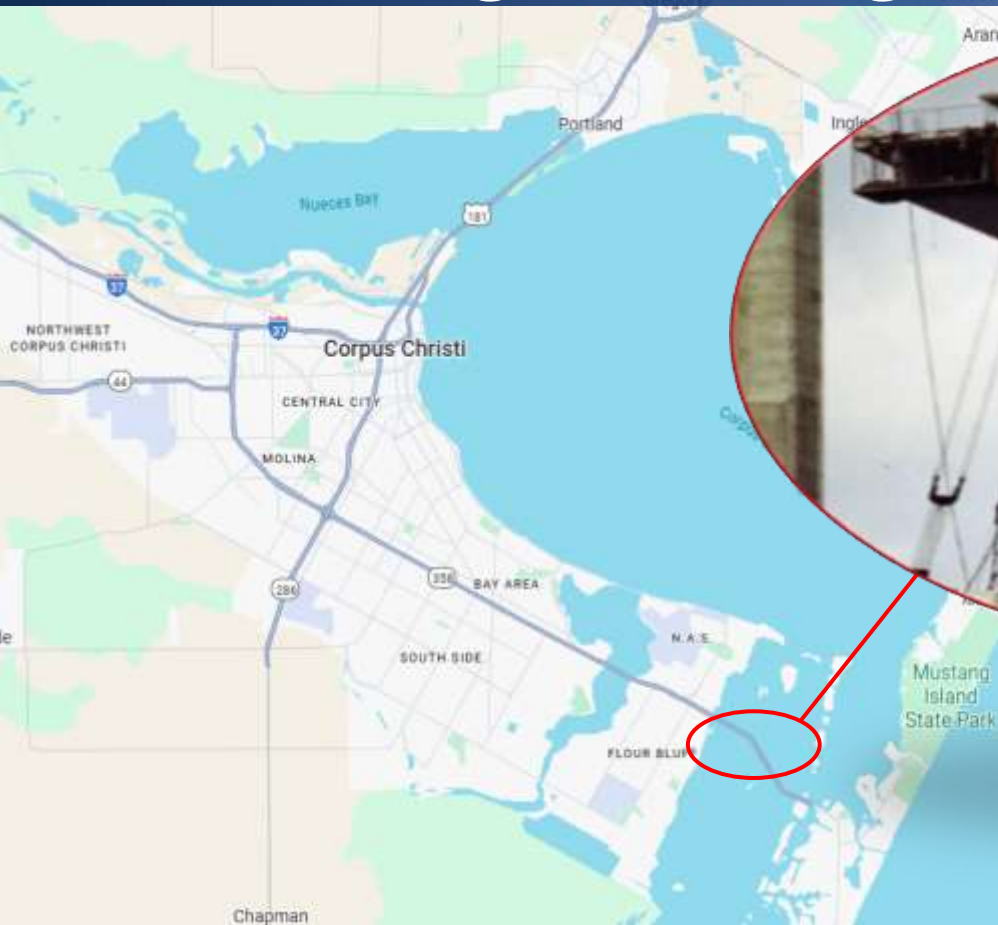
Location Map



Location Map



Historical Segmental Bridge: JFK Causeway



Mustang Island State Park





+540ft elevation

205ft
clearance

1,661ft span

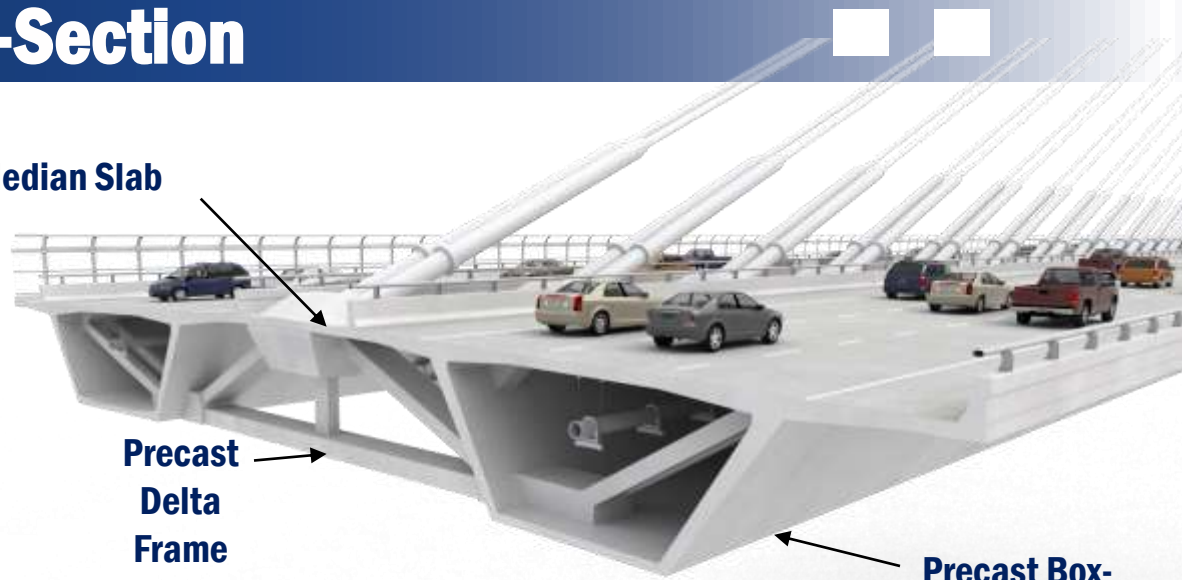
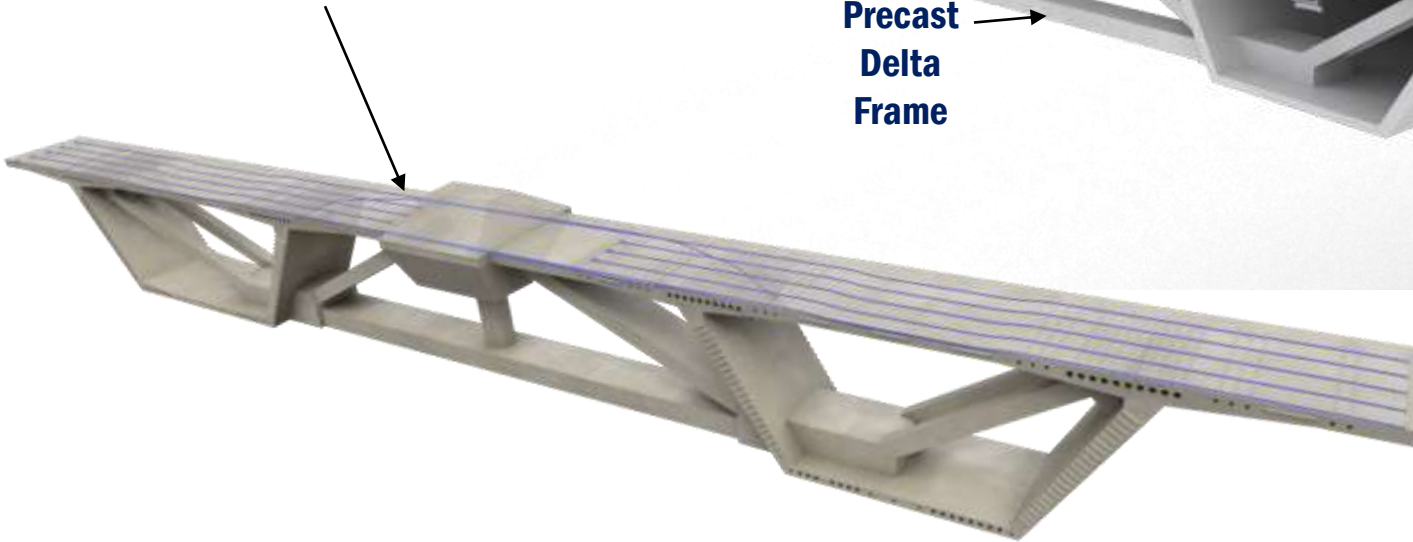
Superstructure Cross-Section

Transverse Post-Tensioning provides the top-slab continuity necessary to tie both box-girders to the delta frame

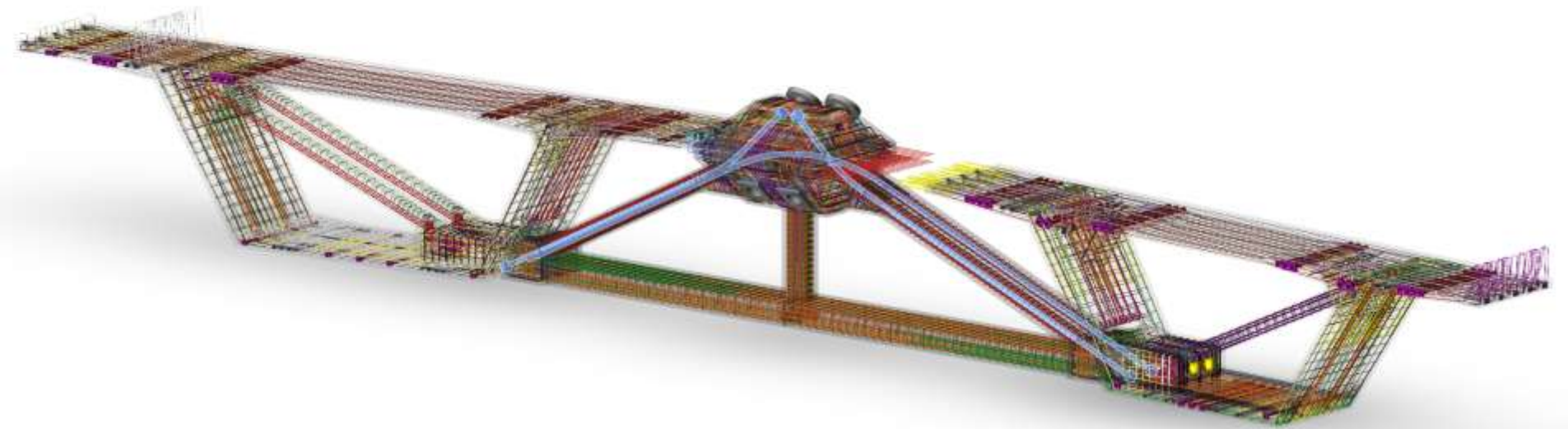
CIP Median Slab

Precast Delta Frame

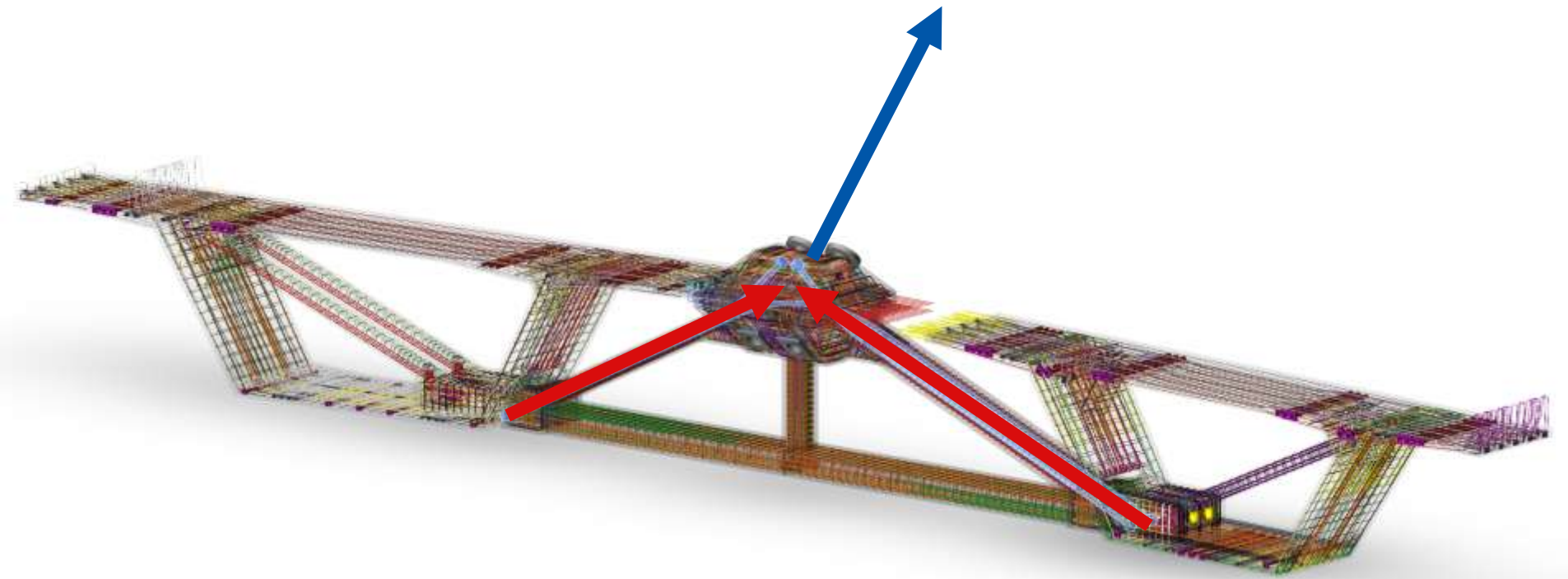
Precast Box-Girder Segment



Delta Frame



Delta Frame



Precast Yard



- **Box Girder Segments**
 - **Typical**
 - **Delta Frame Segments**
 - **Diaphragm Segments**

- **Delta Frames**
 - **Type I, II, III**
- **As-Cast Geometry – 1 source of truth**

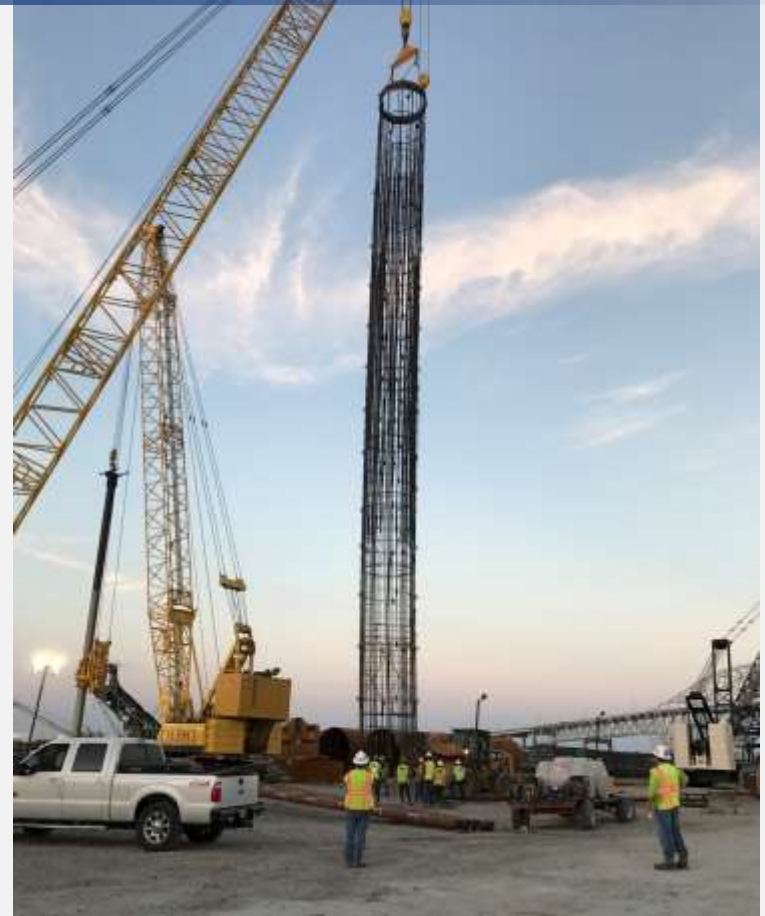


Tower Foundations

10 ft diameter drilled shafts

Average drilled shaft length equal to 212 ft

Permanent 45 ft steel casing is used for the drilled shaft construction



Tower Foundations



Tower Footings

**#20 threaded bars for
bottom mat of
reinforcement**

**Vertical reinforcement
“stitches” the three (3)
vertical lifts together**

**5.5 ksi concrete
compressive strength**

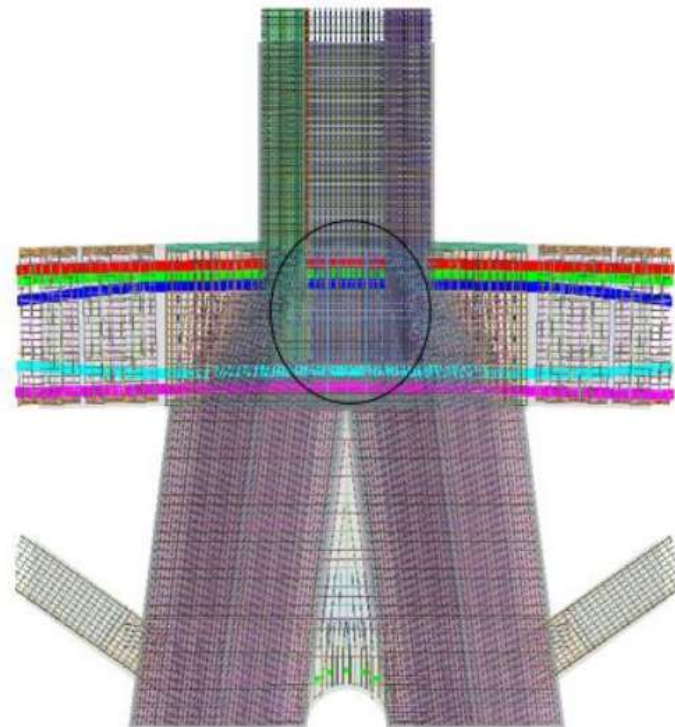
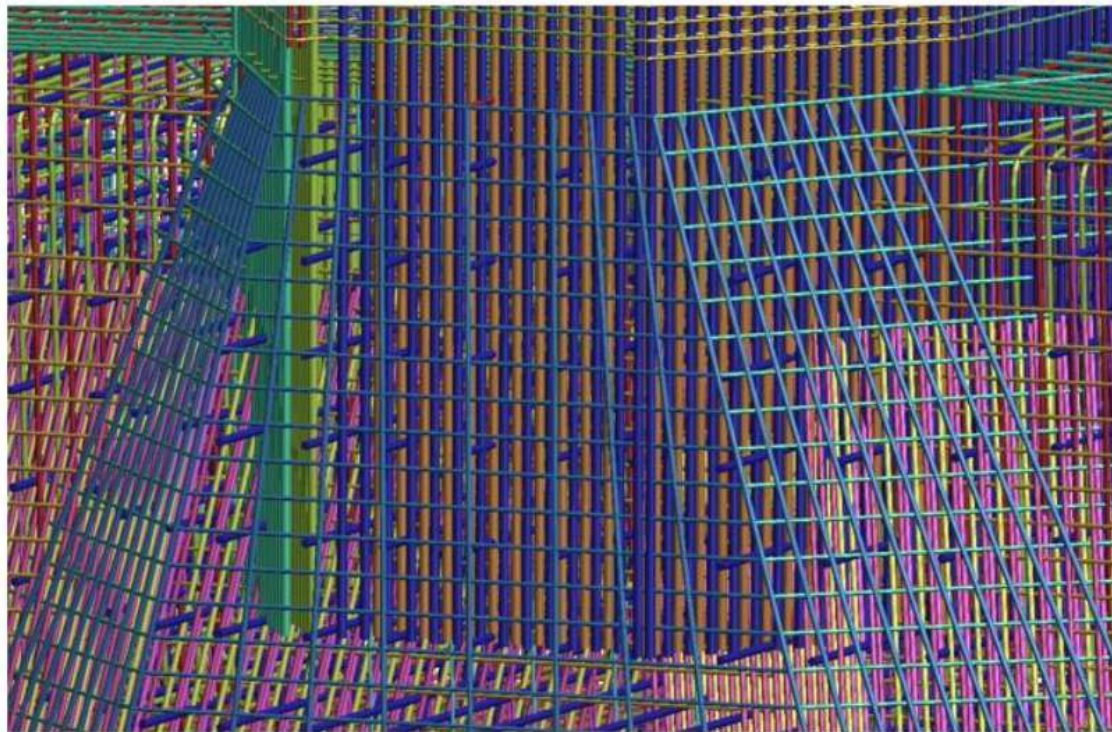


Lower Towers

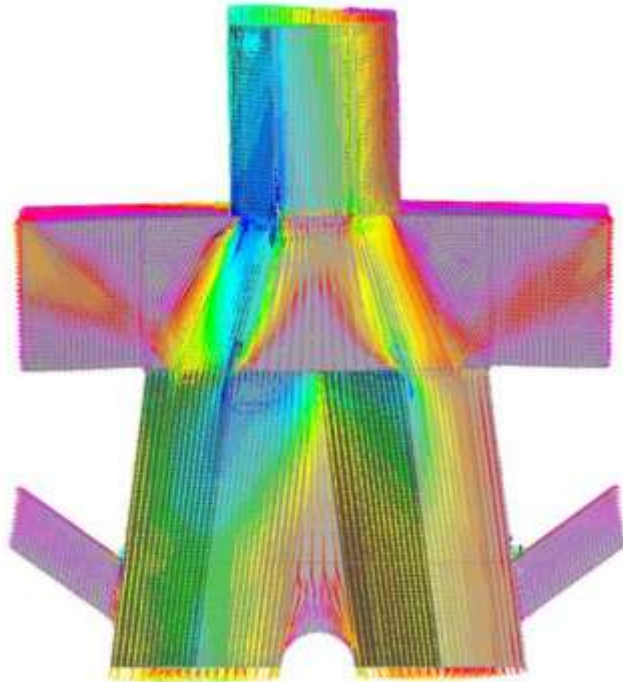
Self-climbing form system is used to erect the lower section of the main towers



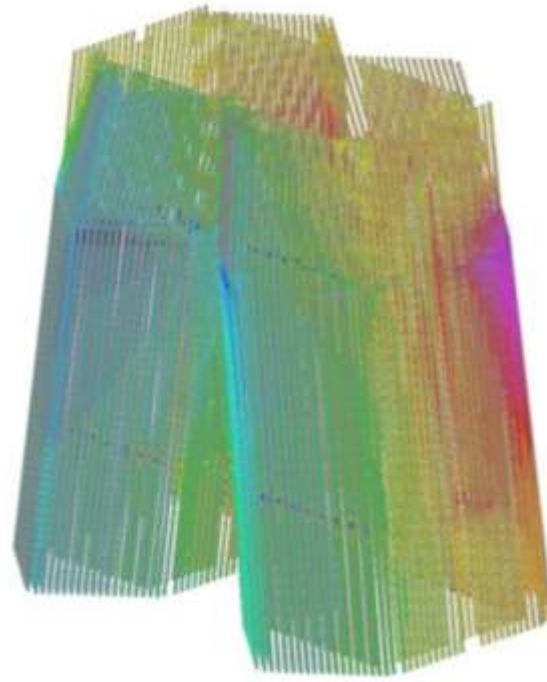
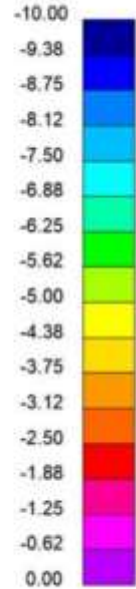
Nodal Zone – Analysis Model



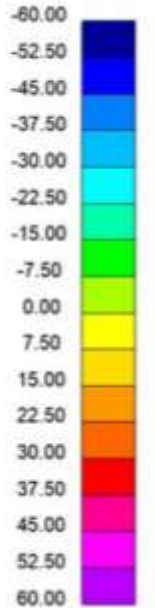
Nodal Zone – Analysis Model



MIN Principal Stress



Axial Stress (ksi)
(Ave all pts)



Tower Table Fabrication



Precast Diaphragms

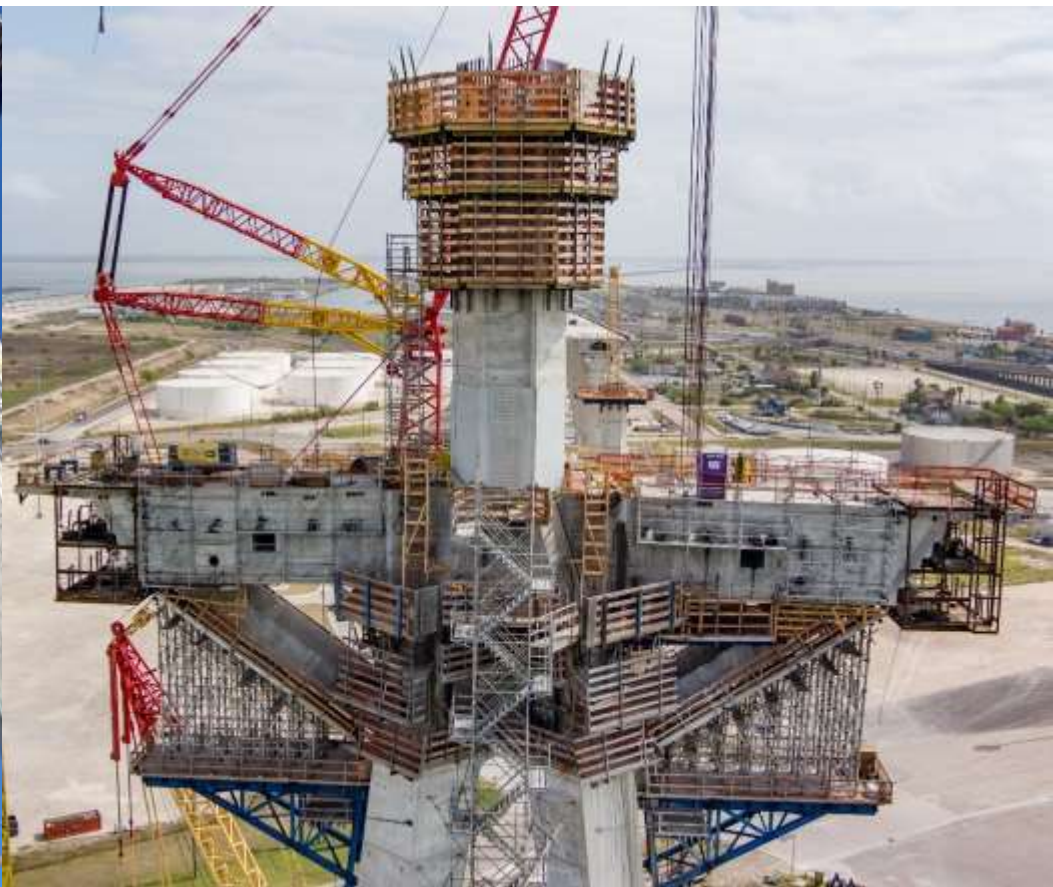
- Long line casting

On-site casting facility

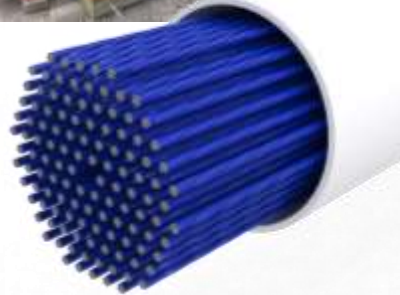
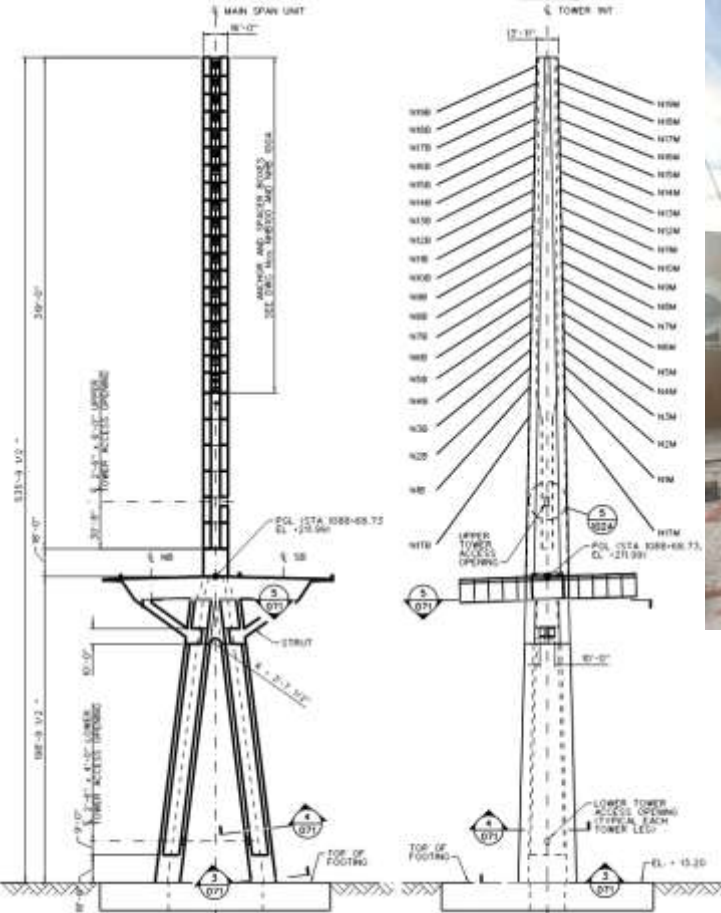
12 total segments at each tower



Tower Table Installation



Upper Tower Components



Wind Modeling and Testing





Geometry Control & Erection Engineering

Precast Balanced Cantilever Construction



Typical Superstructure Cycle

Typical Cycle Activity (MS+BS Together)

- **Segment Erection (16 total segments)**
- **Derrick Launching**
- **Stay Restress**
- **Delta Frame Installation (2 DF/cycle)**
- **Median Slab Concrete Placement**
- **Transverse Post-Tensioning**
- **Stay Installation**
- **Wash-Rinse-Repeat (19 cycles)**



Segment Installation

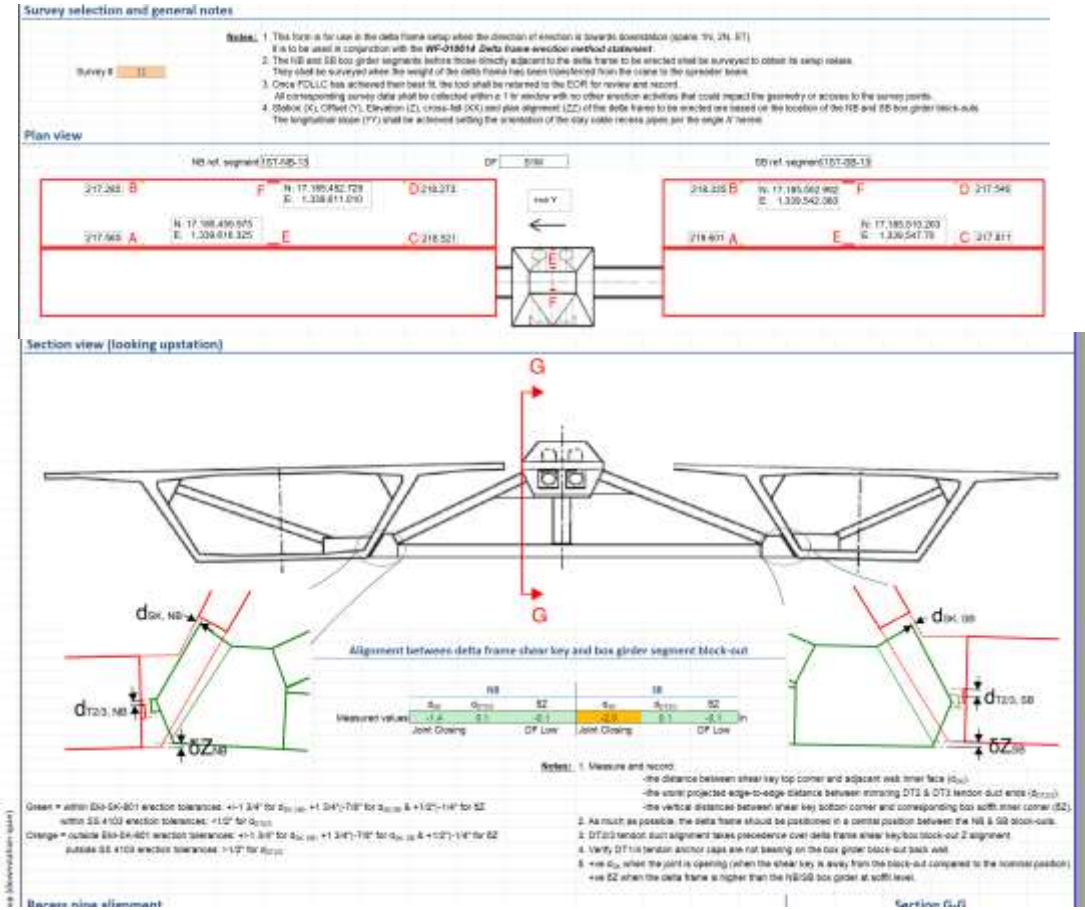


Delta Frame Installation



Tool Development for DF Setup

- Developed to aid the survey team for proper geometry setup DF's
- Provides instantaneous evaluation of best fit for the delta frame based on survey reading



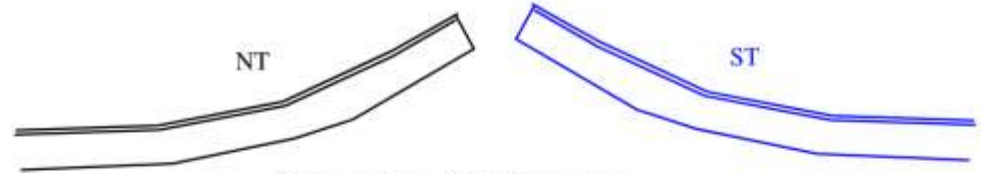
Cast-in-Place Median Slab



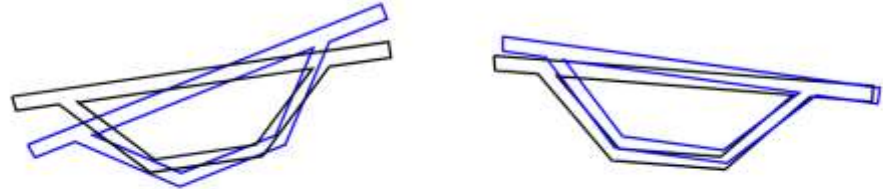
Stay Installation



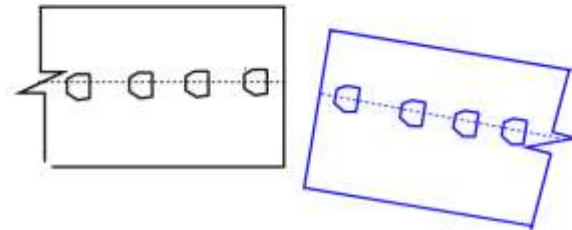
Geometry Control Targets



Slope & Elevation Divergence



Twist Divergence



Steering & Plan Slope Divergence

Global Survey Input

FDLLC Superstructure Land Survey

Segment	Right bolts		Left bolts		Cornerline hairpins				
	Lead	Back	Lead	Back	Lead		Back		F_easting
	A	B	C	D	E_northing	E_easting	F_northing	F_easting	
1NT-NB42	222,541	222,626	221,627	221,506	17,186,381,989	1,340,293,758	17,186,380,241	1,340,299,067	
1NT-NB41	222,423	222,303	221,488	221,367	17,186,389,528	1,340,299,289	17,186,388,796	1,340,304,688	
1NT-NB38	221,934	221,851	221,086	220,908	17,186,412,254	1,340,315,913	17,186,418,540	1,340,321,236	
1NT-NB35	221,548	221,388	220,601	220,440	17,186,434,940	1,340,337,519	17,186,441,229	1,340,343,833	
1NT-NB31	220,838	220,701	219,884	219,740	17,186,465,167	1,340,354,834	17,186,472,435	1,340,359,958	
1NT-NB27	220,168	219,940	219,154	218,935	17,186,495,391	1,340,374,784	17,186,502,253	1,340,381,788	

Delta time	Bolts	
	Left	Right
	A	C
DF N8M	225,958	225,970
DF N7M	225,805	225,412
DF N6M	224,768	224,775
DF N5M	224,045	224,047

Segment	Right bolts		Left bolts		Cornerline hairpins				
	Lead	Back	Lead	Back	Lead		Back		F_easting
	A	B	C	D	E_northing	E_easting	F_northing	F_easting	
1NT-SB42	221,849	221,721	222,534	222,388	17,186,402,565	1,340,224,883	17,186,430,840	1,340,230,193	
1NT-SB41	221,713	221,568	222,393	222,247	17,186,440,348	1,340,235,417	17,186,447,343	1,340,235,680	
1NT-SB38	221,243	221,120	221,953	221,803	17,186,467,830	1,340,246,954	17,186,470,133	1,340,252,338	
1NT-SB34	220,557	220,441	221,291	221,136	17,186,492,045	1,340,269,128	17,186,500,310	1,340,276,466	
1NT-SB23	219,880	219,568	220,387	220,138	17,186,530,845	1,340,294,835	17,186,538,110	1,340,301,154	
1NT-SB27	219,281	219,101	219,977	219,793	17,186,540,960	1,340,307,936	17,186,553,823	1,340,312,941	

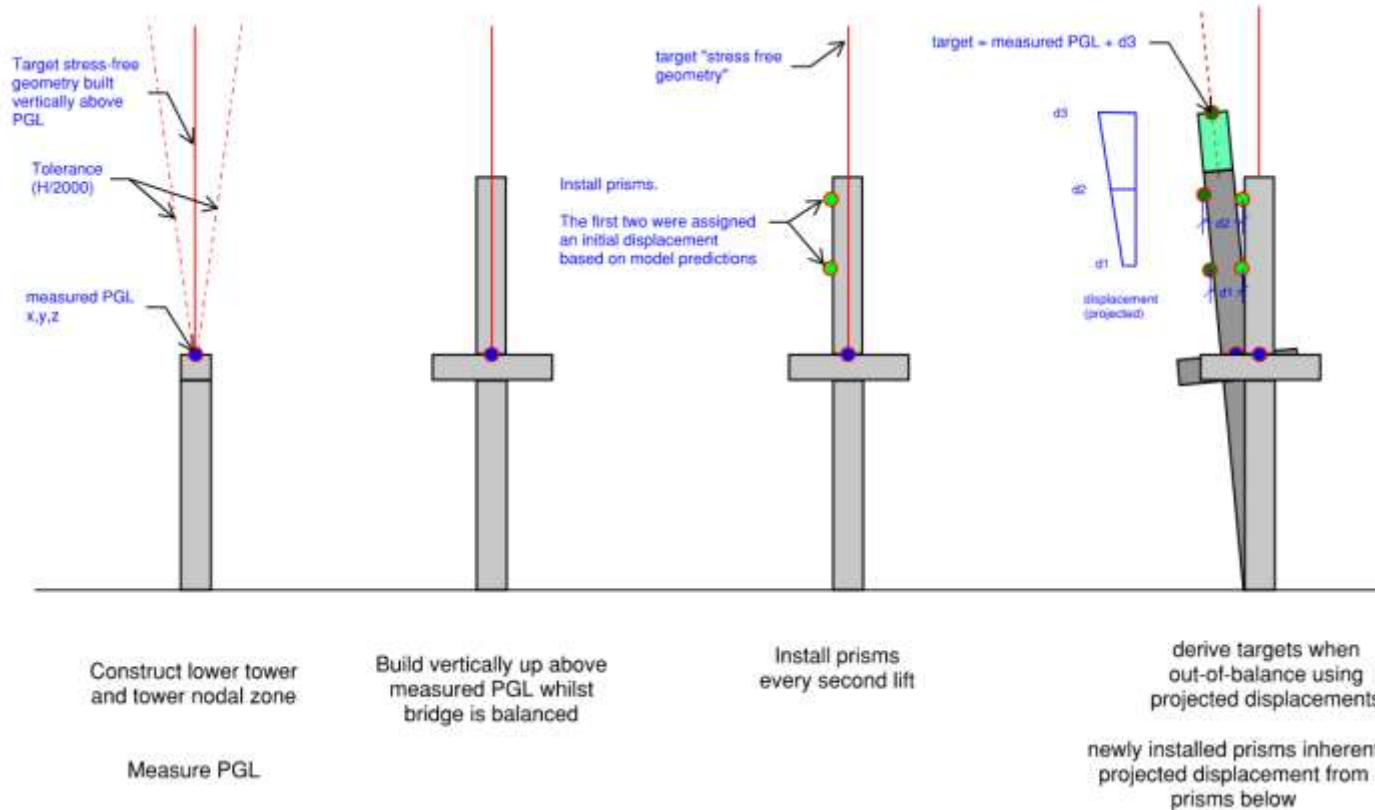


	Northing	Easting	Elevation
NT_PGL	17,186,724.750	1,340,493.509	213.100

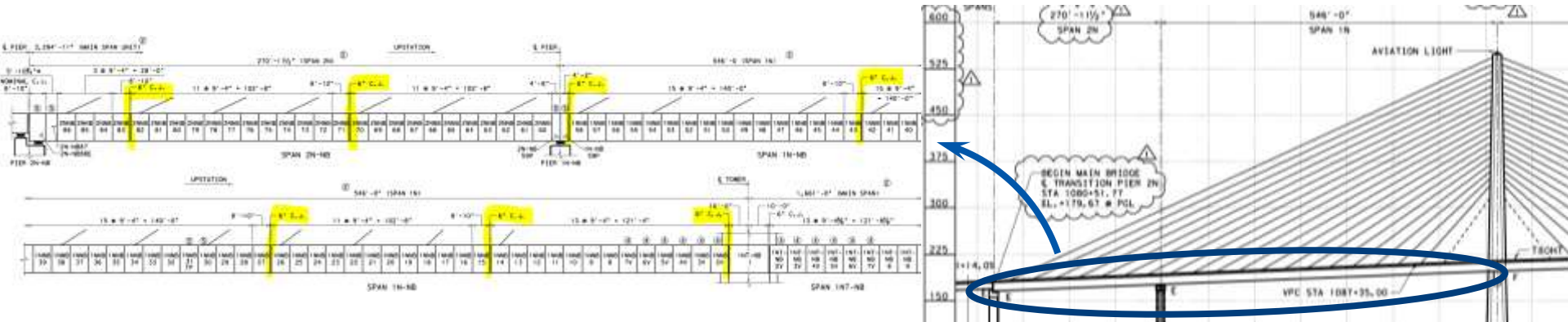
Prism ID	Upper Tower Lift ID		
NT M1	NT_U03	17,186,729.542	1,340,504.770
NT M2	NT_U06	17,186,728.900	1,340,504.216
NT M3	NT_U08	17,186,728.399	1,340,503.796
NT M4	NT_U10	17,186,727.751	1,340,503.347
NT M5	NT_U12	17,186,727.385	1,340,503.003
NT M6	NT_U14	17,186,726.736	1,340,502.602
NT M7	NT_U16	17,186,726.475	1,340,502.449

Name [-]	Anchor [-]	Force [kip]	Name [-]	Anchor [-]	Force [kip]
N4M-NB	Top	1092	N4M-SB	Top	1067
N3M-NB	Top	2250	N3M-SB	Top	2244
N2M-NB	Top	2275	N2M-SB	Top	2250
N1M-NB	Top	2061	N1M-SB	Top	2130
N1B-NB	Top	1987	N1B-SB	Top	1024
N2B-NB	Top	2099	N2B-SB	Top	2113
N3B-NB	Top	2186	N3B-SB	Top	2231
N4B-NB	Top	1198	N4B-SB	Top	1177

Upper Pylon Geometry Control



Corrective CIP Closures



Target alignment

Projection to end of casting unit



Erected site divergence

$$0.15\% * 120' = 2.2''$$

Corrective Break angle

Construction Engineering Highlights

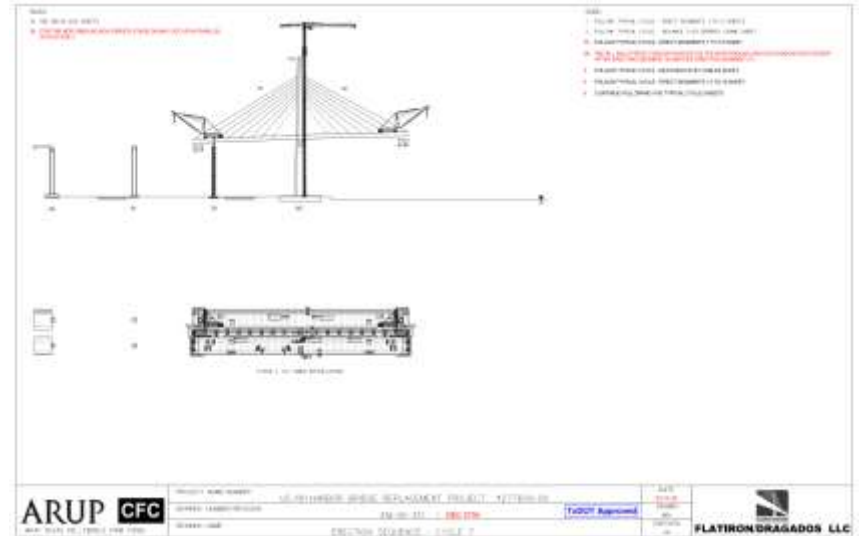


- **Erection Manual**
 - **Construction Analysis Model**
- **Geometry Control**
 - **Model Calibration**
 - **Loading Conditions**
 - **Survey Accuracy**
 - **Developed Tools**



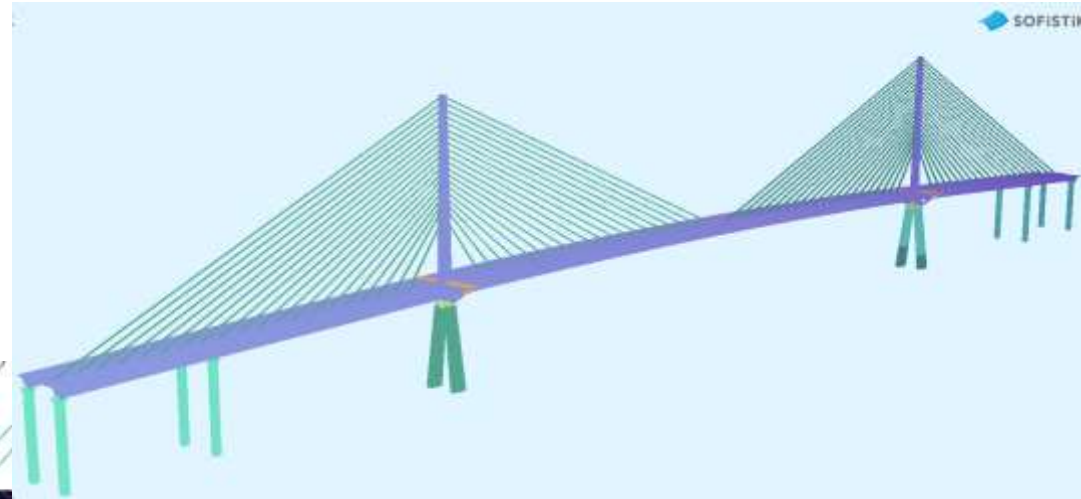
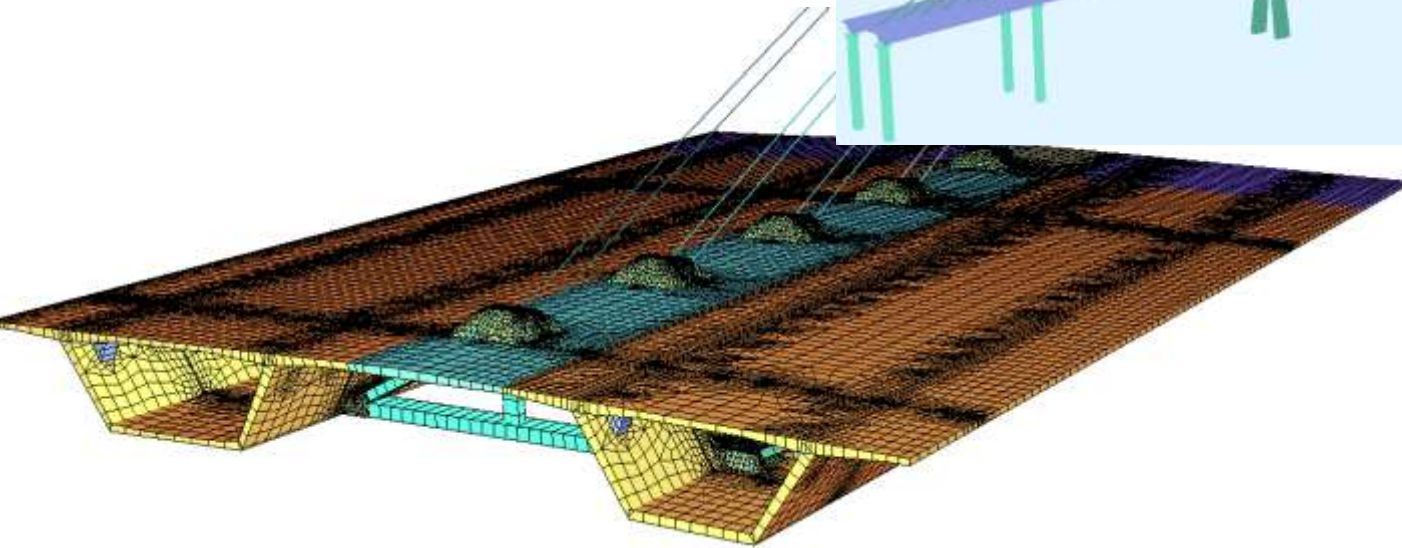
Erection Manual

- Developed collaboratively, centered around the contractors means and methods
- Practical rules are developed to allow on-site changes to be implemented without the need for re-analysis

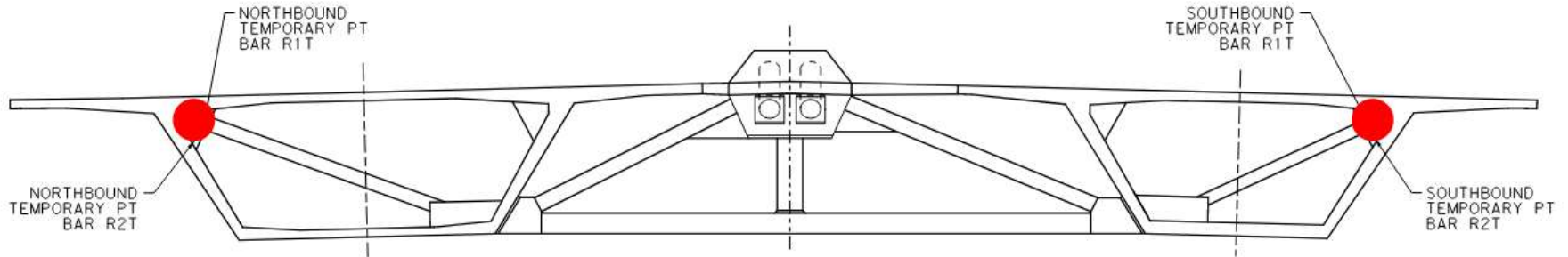
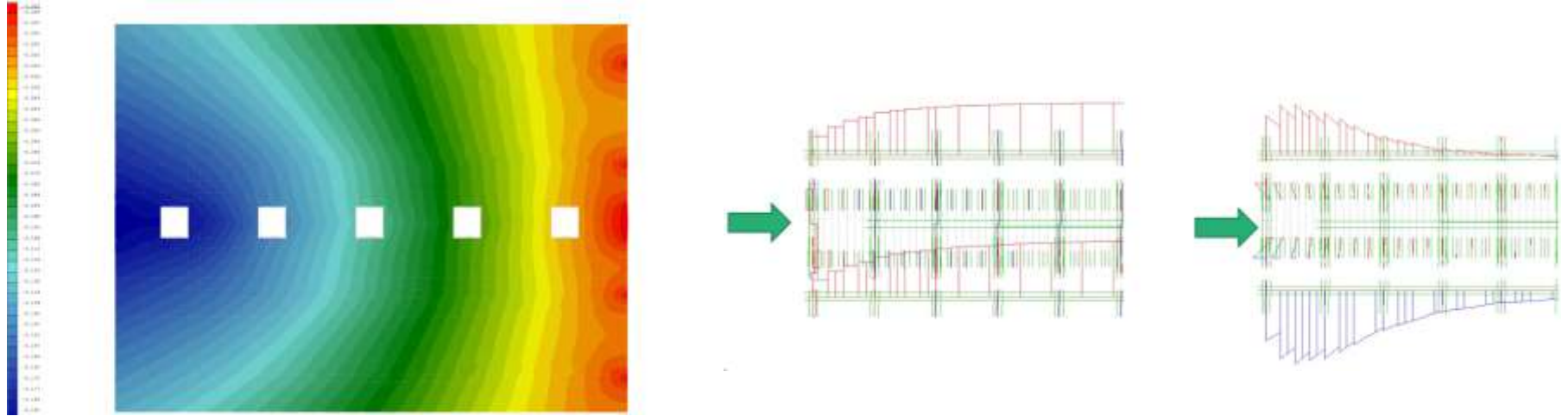


Analysis Models

- **Global Construction Model**
- **Local Model**

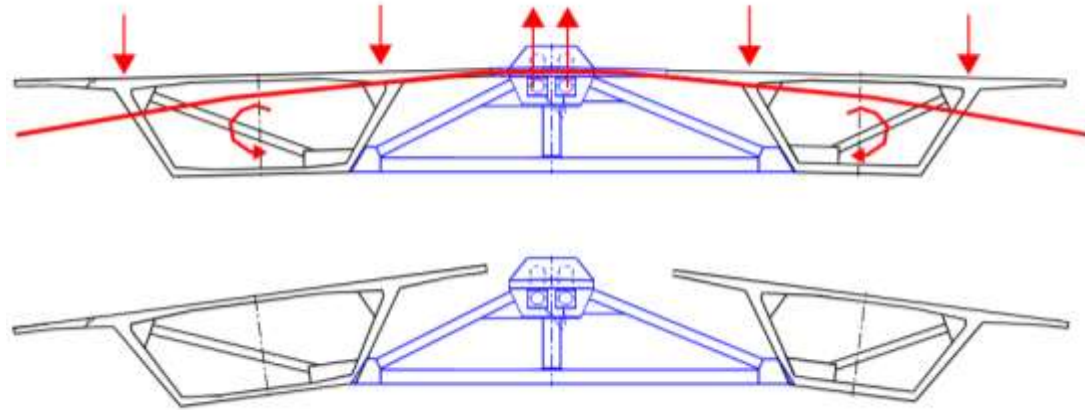


Construction Behavior

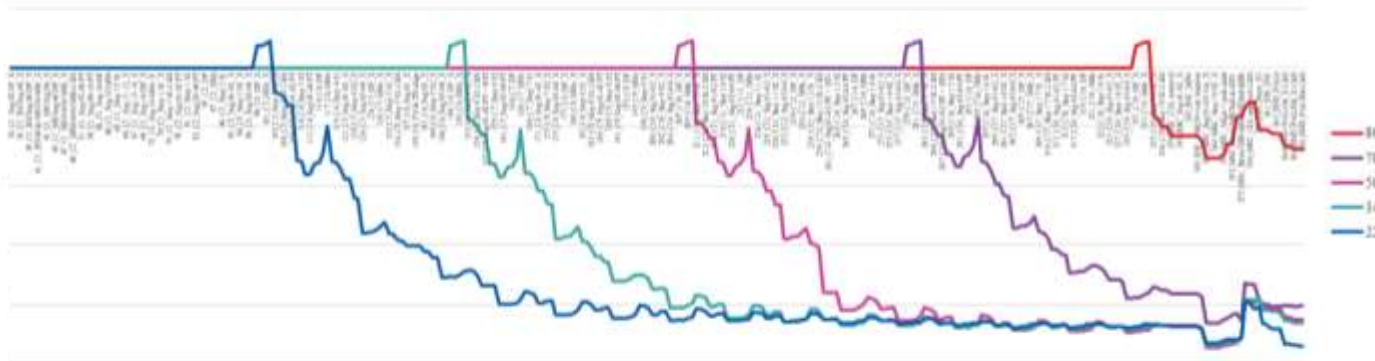


Construction Behavior

- **Locked-In Torsion**
- **Twist Precamber**



Span INT - Torsion during construction



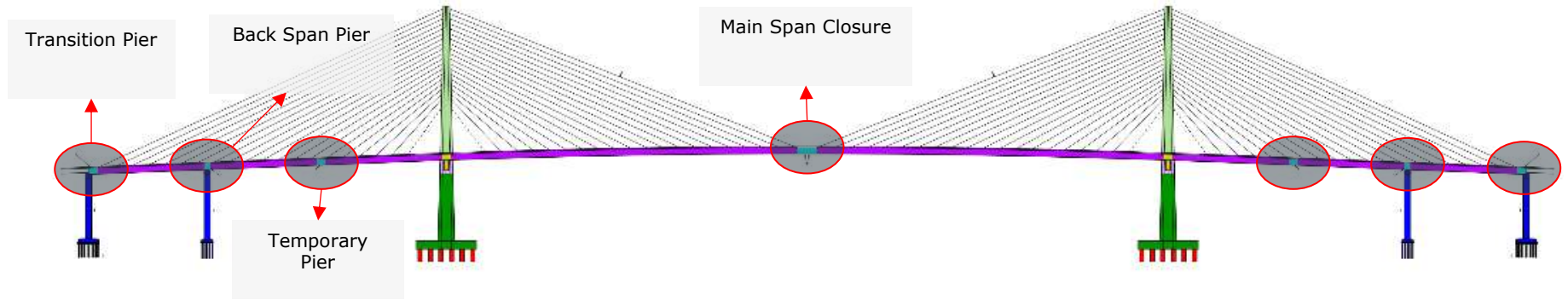
Stay Cable Tuning





Closure engineering & On-site implementation

Closure Engineering



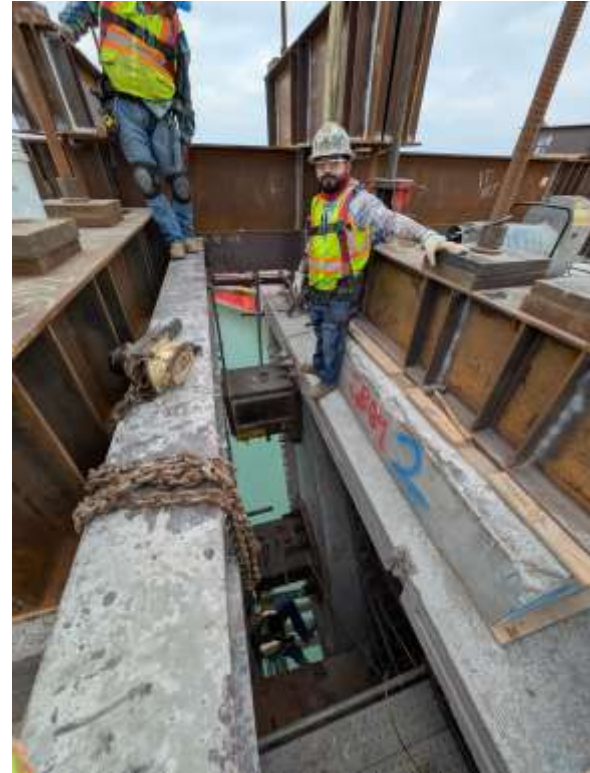
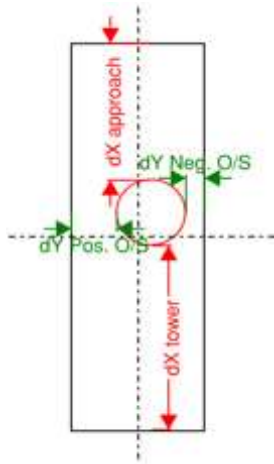
Structural design:

- Bridge tuning/Locked-in forces
- Temporary works design forces
- Permanent structure checks

Geometry:

- Geometric constraints Best Fit
- Smooth transitions

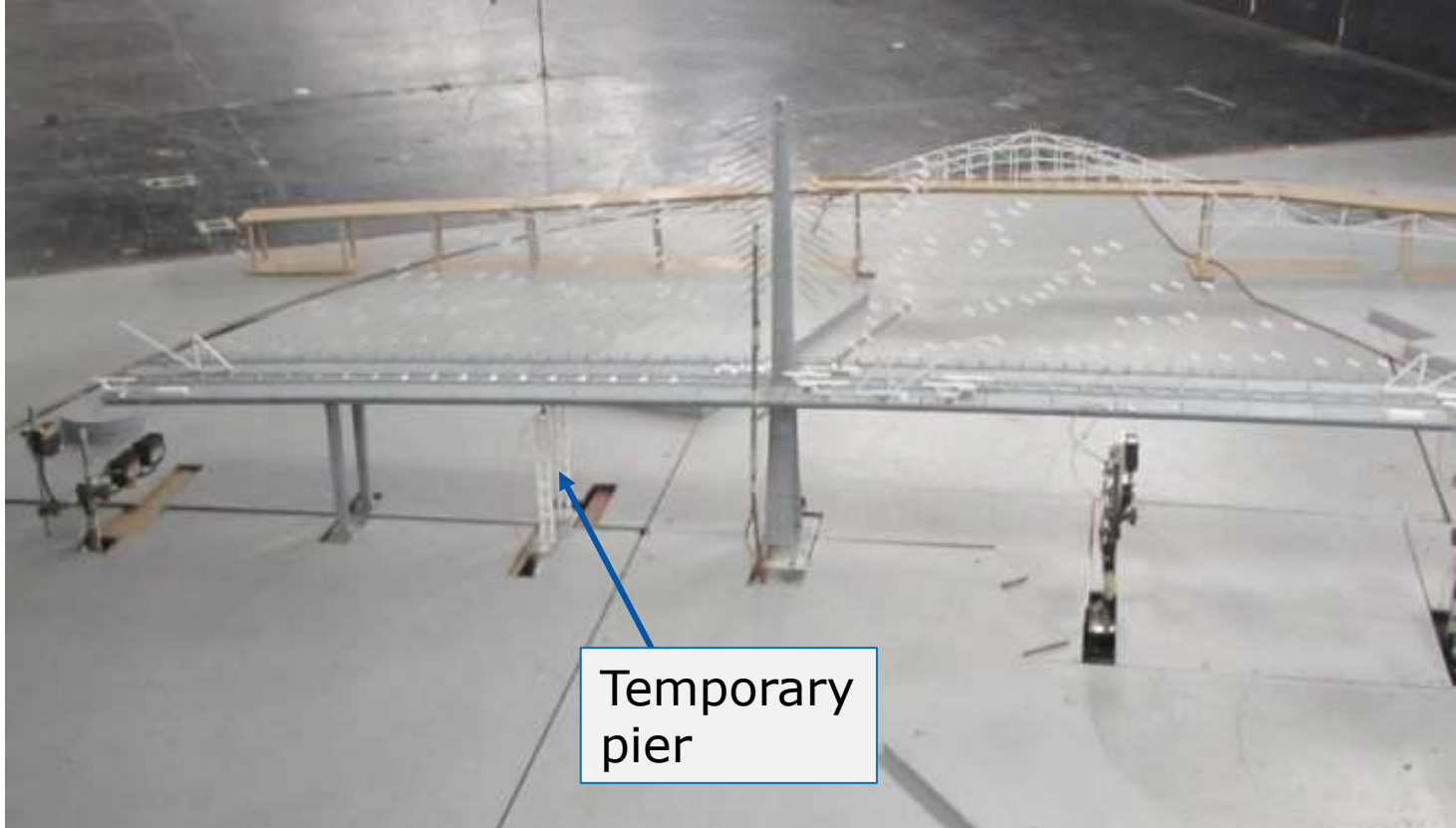
Closure Engineering



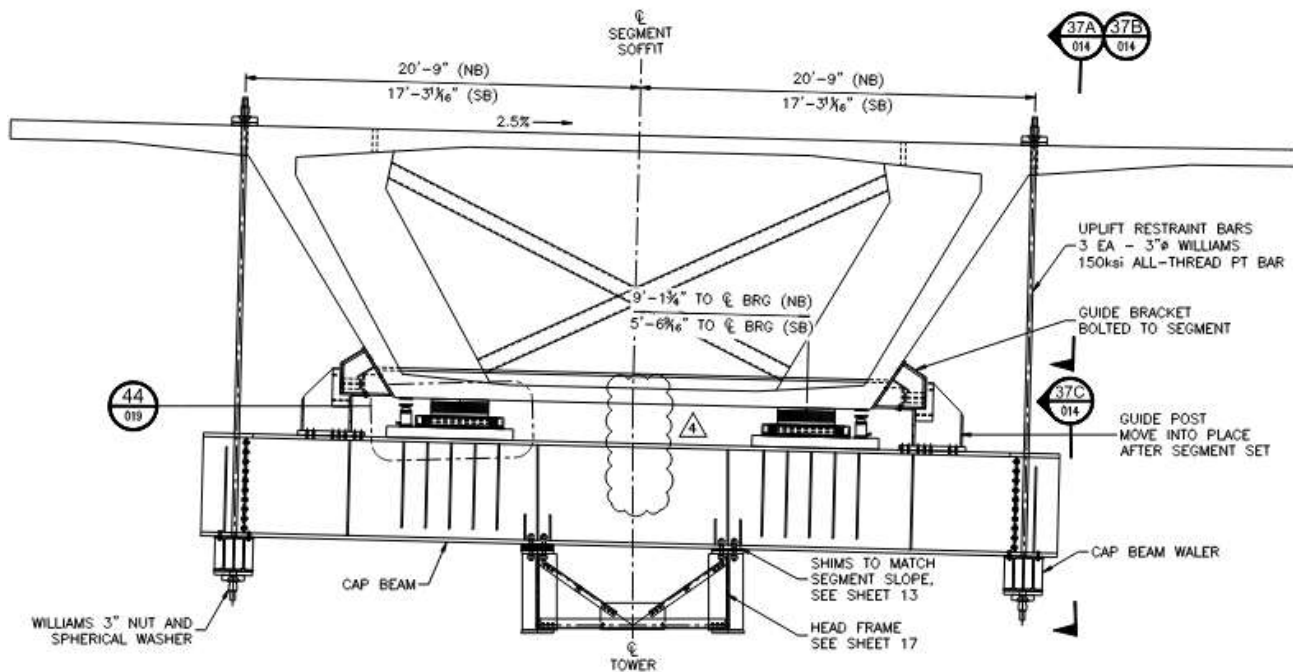
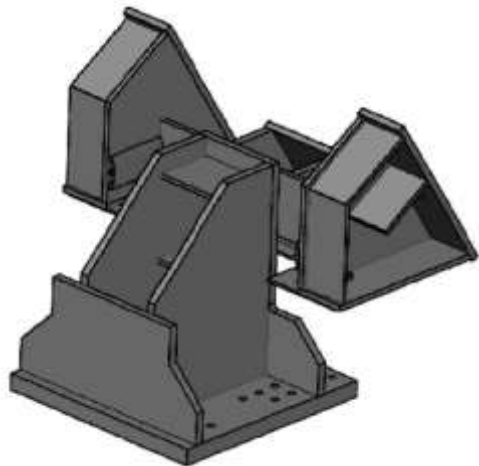
	Exterior vertical tendon		Interior vertical tendon	
	Theoretical	Measured	Theoretical	Measured
dX Tower	16 7/8 in.	18 in.	15 6/8 in.	17 3/8 in.
dX Approach	14 1/8 in.	13 1/8 in.	12 6/8 in.	11 3/8 in.
dY Pos. O/S	3 1/8 in.	2 3/8 in.	5 in.	3 5/8 in.
dY Neg. O/S	3 4/8 in.	4 2/8 in.	5 3/8 in.	6 4/8 in.

Tolerances: dX Tower min 11 4/8 in. dX Approach min 7 7/8 in.
 dY 1" air gap preferred, 1/4" min

Temporary pier closure



Temporary pier closure



Temporary pier closure

Key steps:

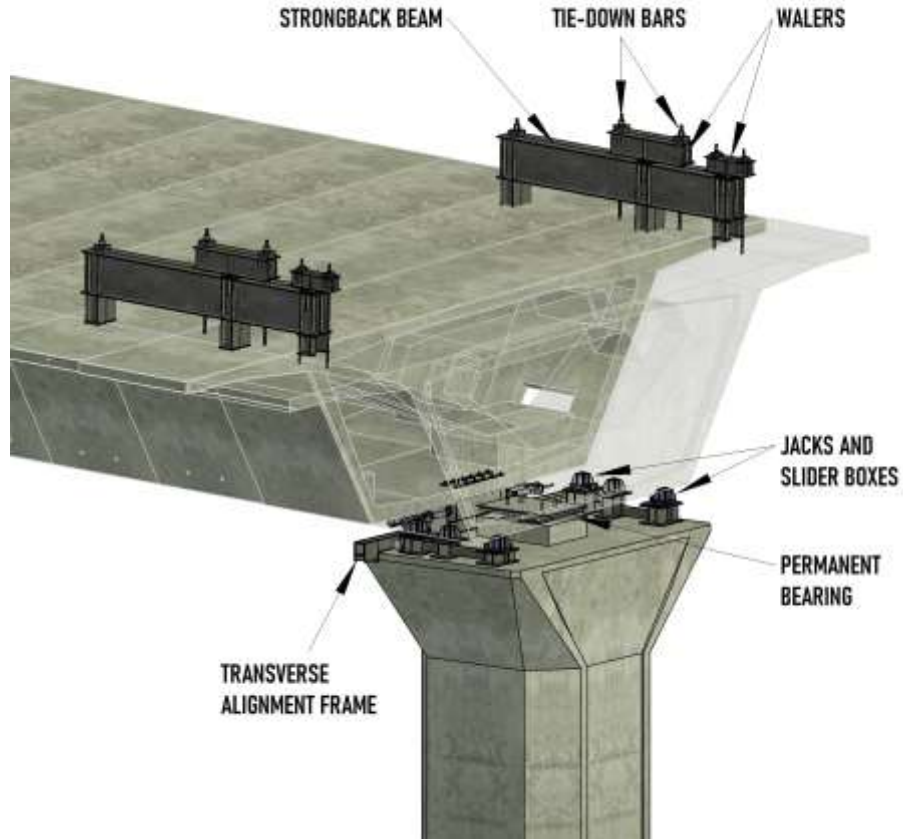
- Construct the temporary pier
- Erect C6 MS Segment 1
- Cantilever C6 BS Segment 1
- Torsional counterweight on the BS SB leading edge
- Vertically jack, survey and lock.



Back span pier closure



Back span pier closure



Back span pier closure

Key steps:

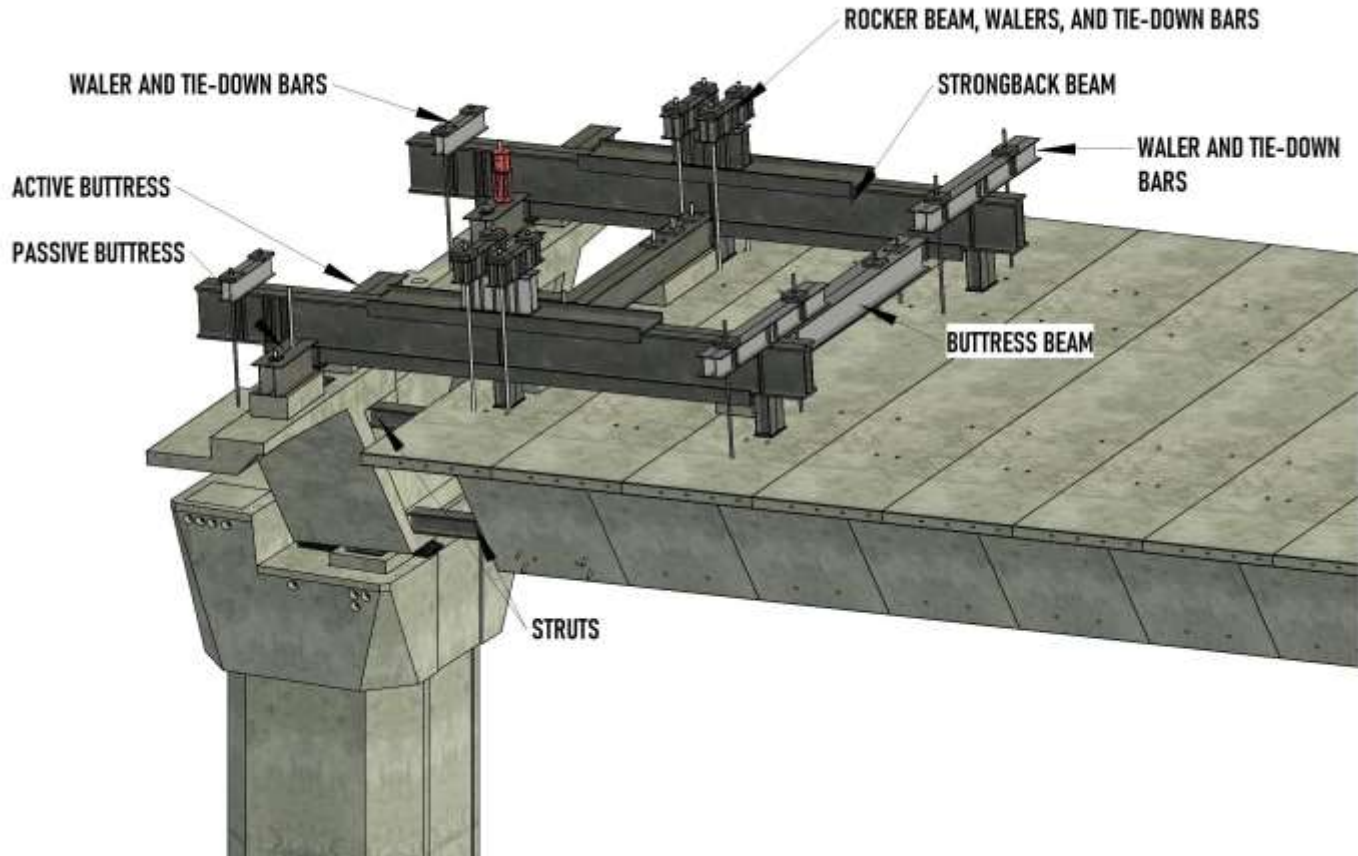
- Cast the pedestal & stage the bearing
- Assemble & set the pier segment
- Torsional CW on the BS SB leading edge
- Alignment dry run & grout the bearing
- Jack, survey, blocking CJ & partial PT
- Pour the closure joint, cure & remaining PT
- Permanent vertical tendons



Transition pier closure



Transition pier closure



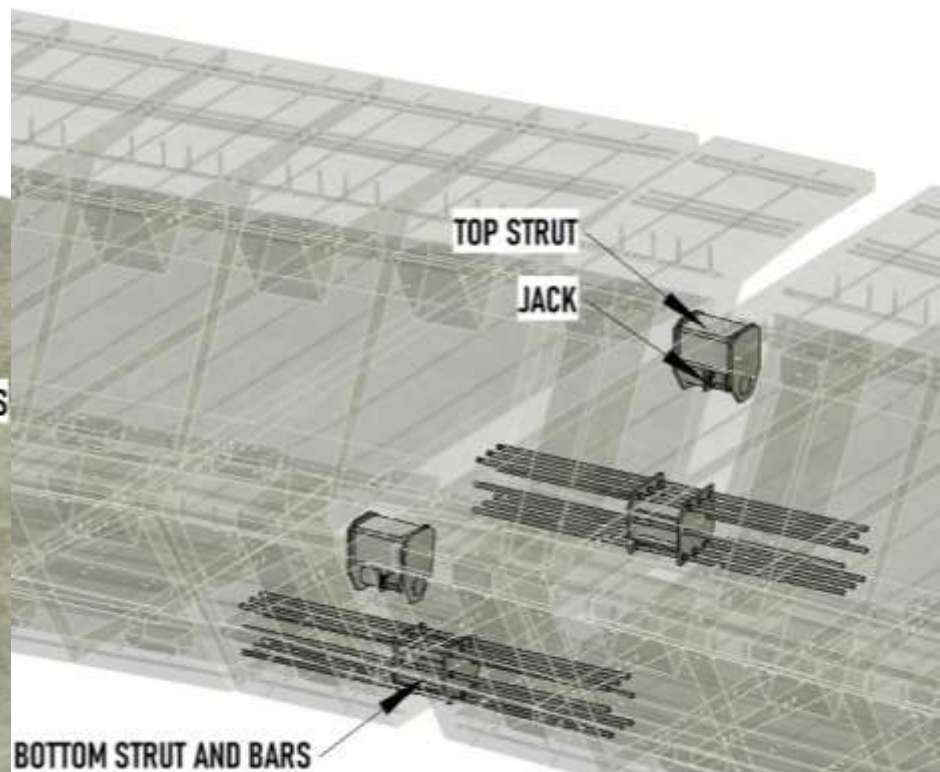
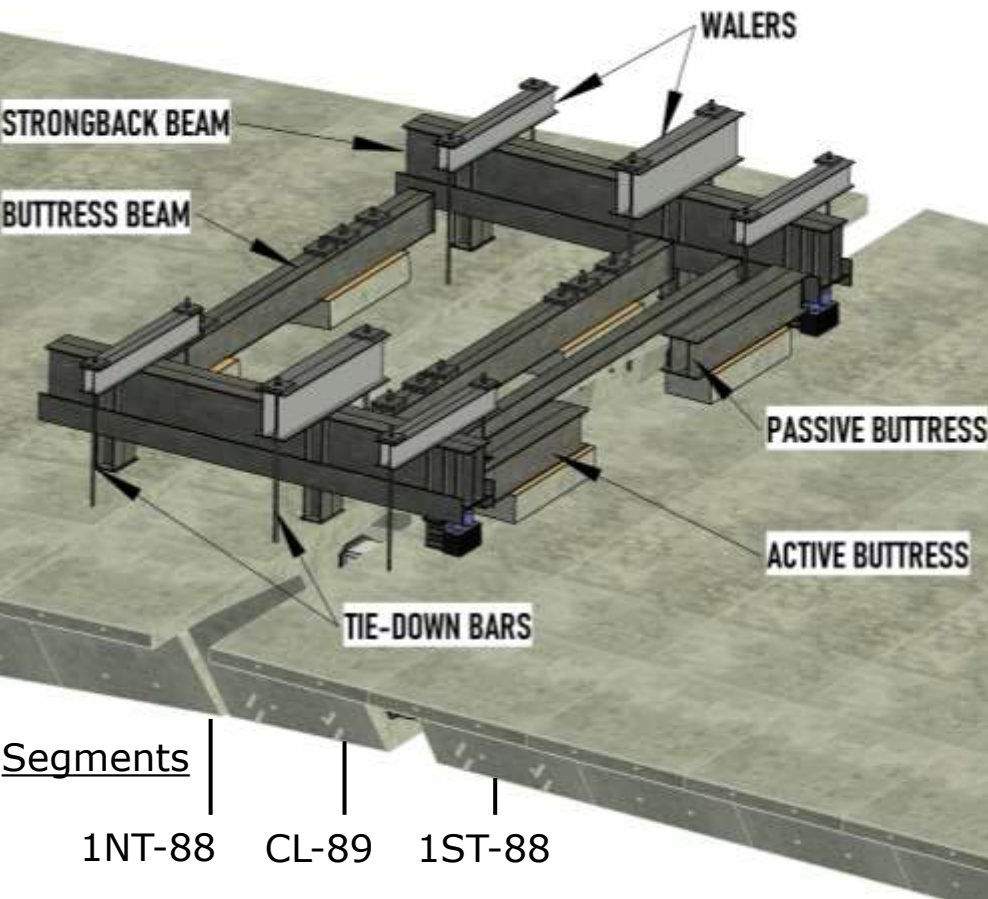
Transition pier closure

Key steps:

- Cast the pedestal & stage the bearing
- Pier segment shell + CIP Diaphragm
- Maneuver segment & grout bearing
- 1st night shift: jack, survey, Steel blocking struts in CJ & partially PT
- 2nd night shift: Pour CJ, initial curing, remove blocking & stress remaining PT
- Permanent vertical tendons



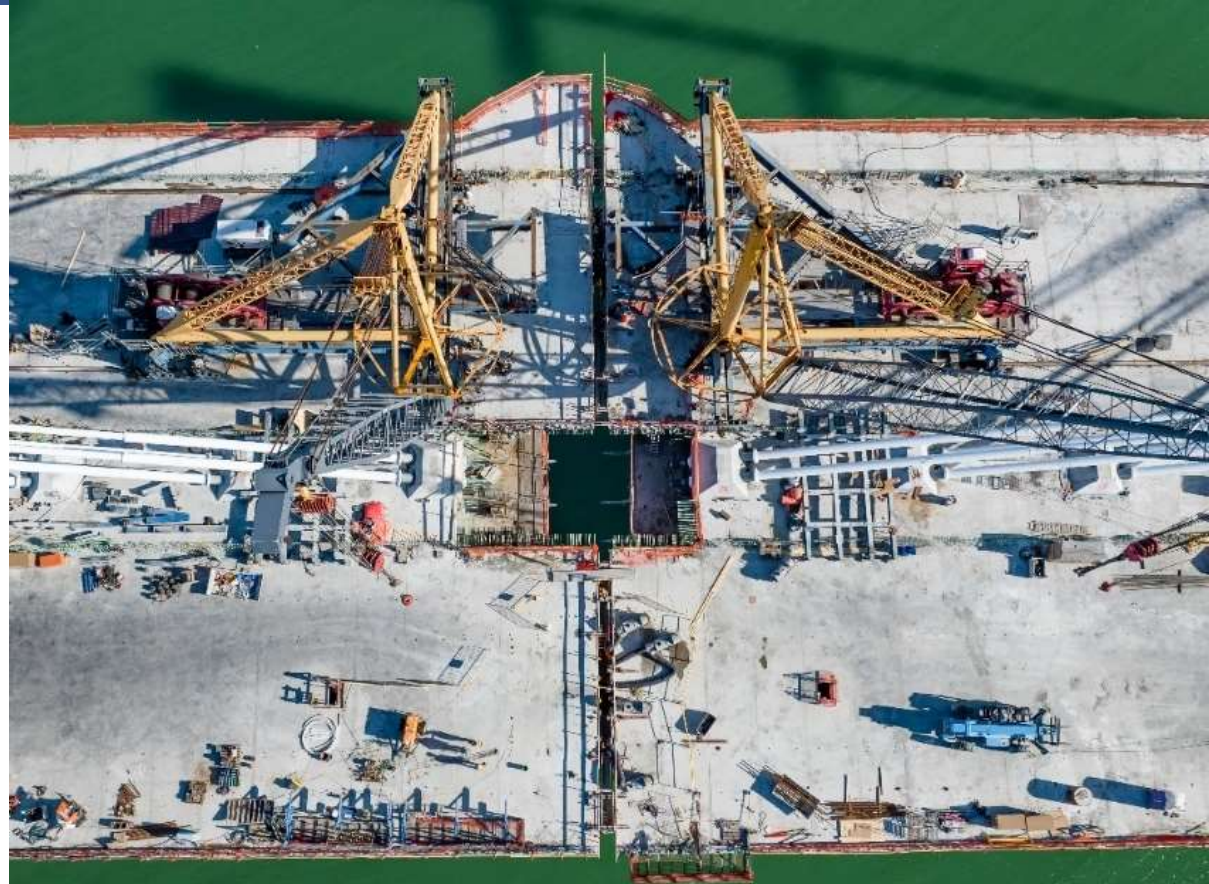
Main span closure



Main span closure

Key steps:

- Segment 89 with 6" wet joint
- CIP Diaphragms either side of 3' CJ
- Curing & install temporary works
- 1st night shift: Jack (V&T), long. jack cantilevers apart, survey, blocking struts & partial PT
- 2nd night shift: Pour CJ, initial curing, remove blocking & stress remaining PT



Span alignment and Closure



“When the two ends of the bridge met over the ship channel, the edges were within a fraction of an inch of predicted values determined by the Construction Engineers.”

- Joseph Briones, TxDOT Project Manager



Open to Traffic!



Ribbon Cutting Ceremony June 28th, 2025

Ongoing Activities



- **Aesthetic Lighting Commissioning**
- **Demolition of Old Harbor Bridge**





Questions.....

This Concludes the Educational Content of this Activity



Luke Tarasuik, PE
USA Bridge Skills Leader
luke.tarasuik@arup.com



Quentin Marzari, PE SE
Senior Engineer
quentin.marzari@arup.com



Javier Campos, PE SE
Senior Engineer
javier.campos@arup.com

**We are hiring at Arup,
please reach out to us!**

