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**The Design and Construction of Bridge 303
(Precast Segmental) – Israel**

Project Characteristics

- Bridge 303 in Israel, precast box 48,250 ft²



Project Characteristics

- Bridge 303 in Israel, part of big PPP project.
- Design-Build method with Danya-Cebus (Subcontractor), FINLEY responsible for the superstructure design
- Tight schedule for Design submittal, only 2.5 months
- **Knowledge of Contractor's means and methods ESSENTIAL.**



over 10 years
of team work

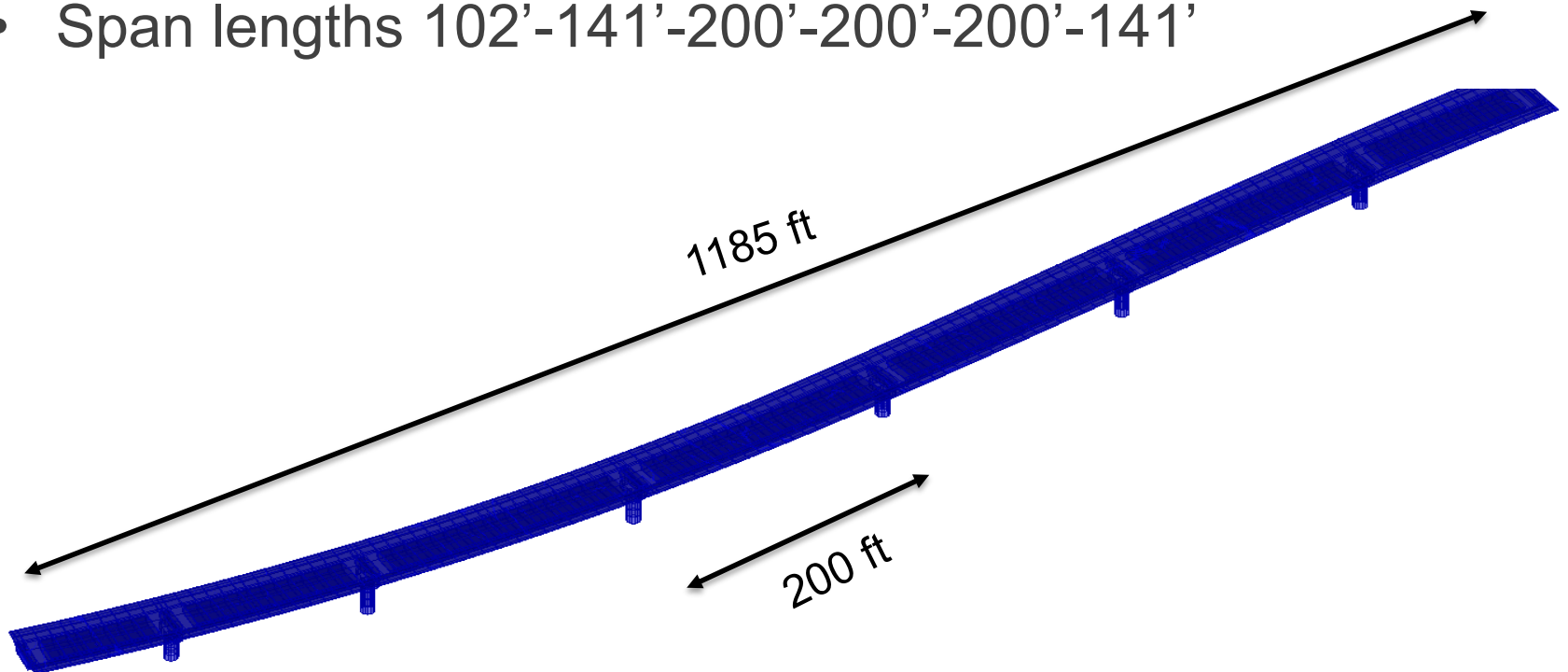


More than 10
segmental
bridges in Israel

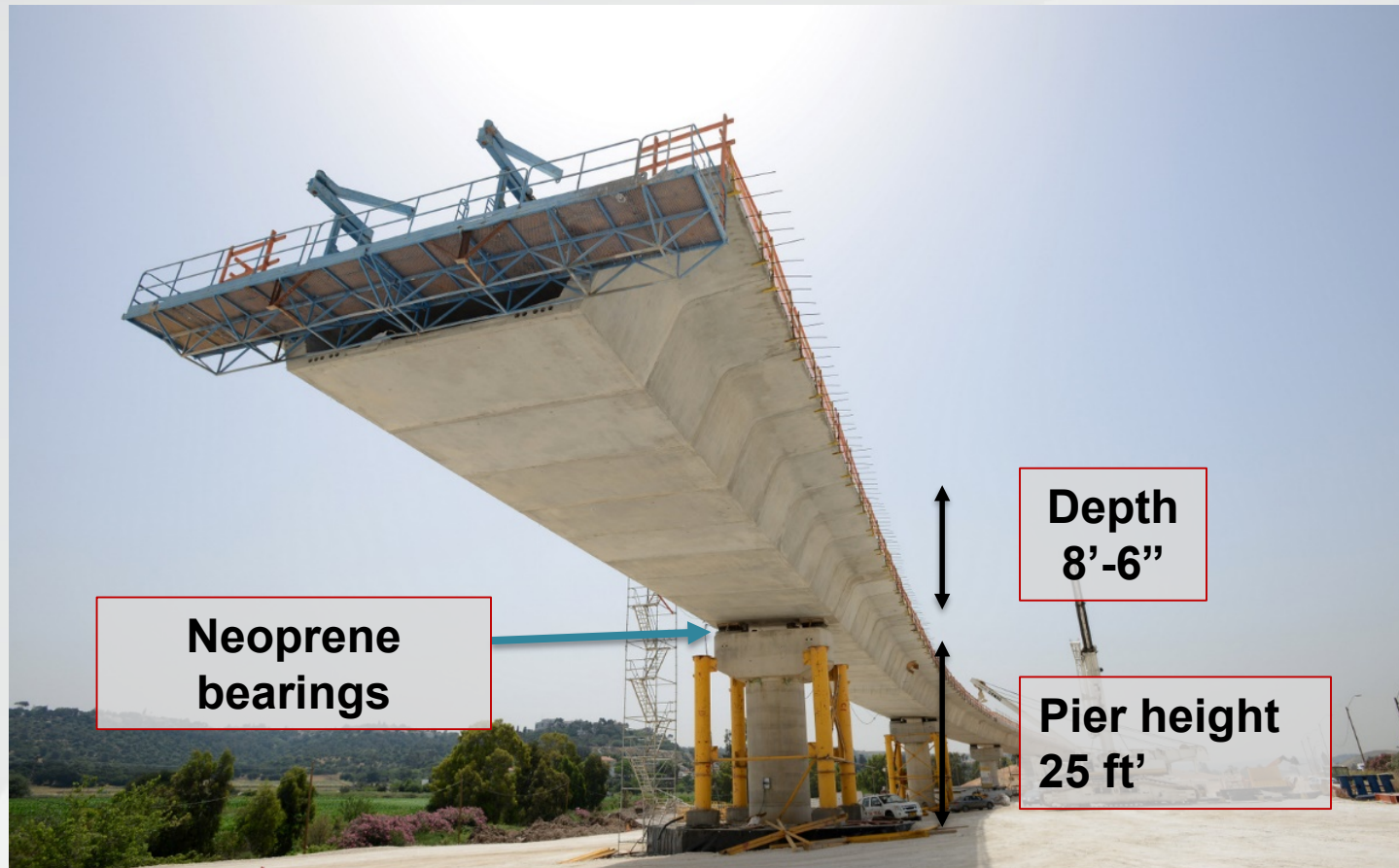


Project Characteristics

- Loads per the Israeli Design Standards.
- Design of concrete per AASHTO LRFD.
- Total length 1185'
- Span lengths 102'-141'-200'-200'-200'-141'



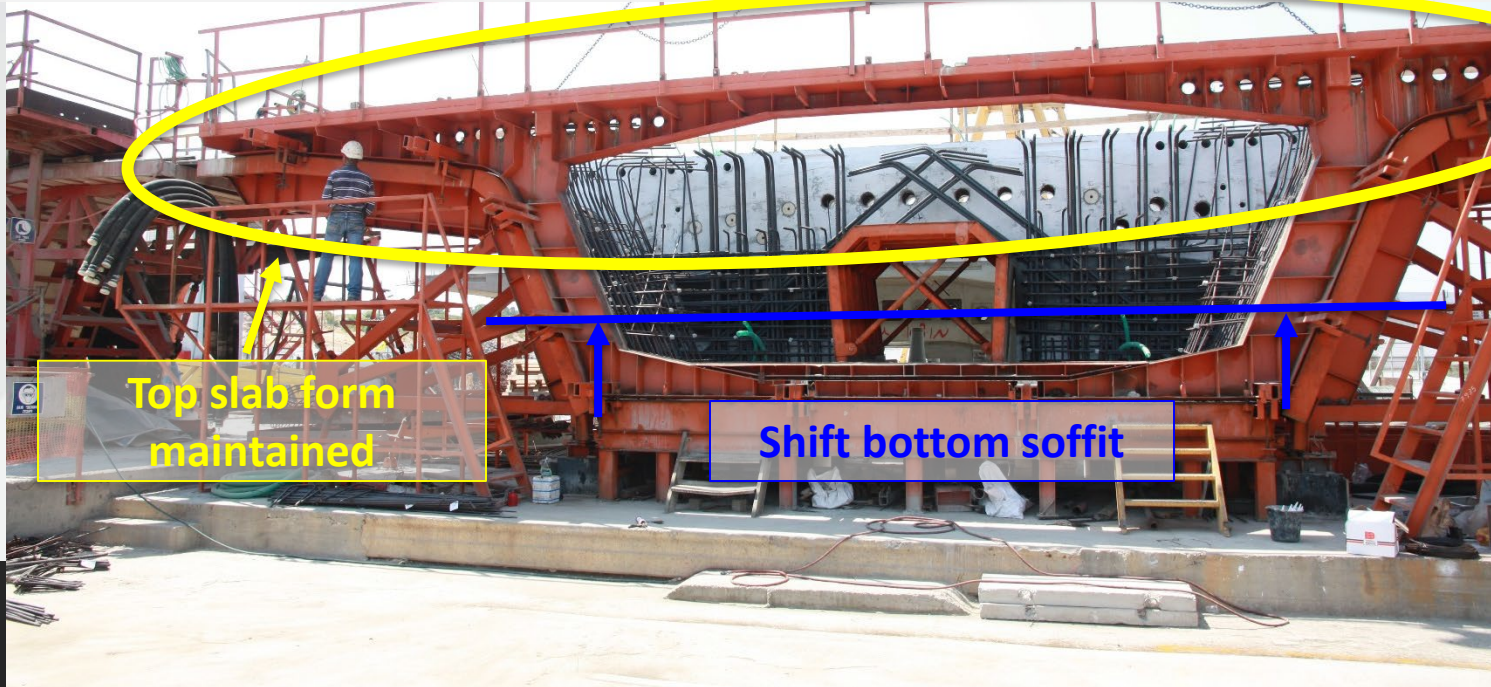
Project Characteristics



- Precast, prestressed box girder, Balanced Cantilever by cranes
- Seismic event 475 years occurrence (Elastic response coeff = 1.33)
- Span-to-depth ratio = 23.5

Reshaping the Mold

- Re-use of Motsa box originally designed for 51'-4" wide deck and 9'-10" depth.
- Change in box depth from 9'-10" to 8'-6".
- Change of top slab width.
- Addition of bottom slab blisters.
- Only 2 segment length 10' or 9'-10" help to accelerate fabrication



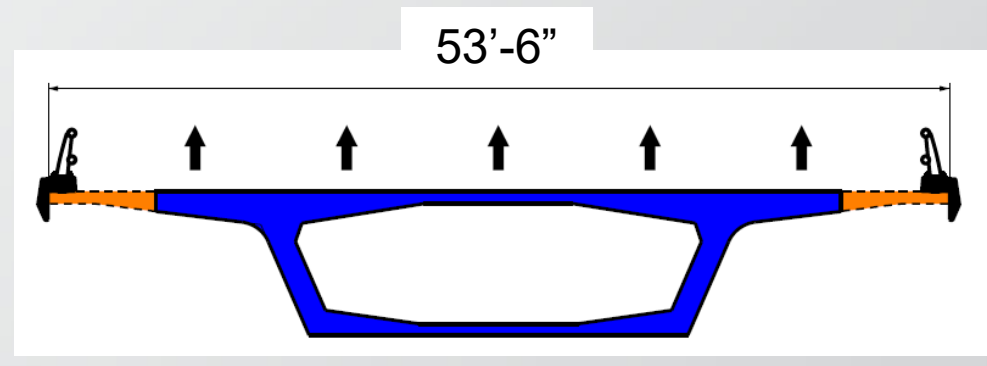
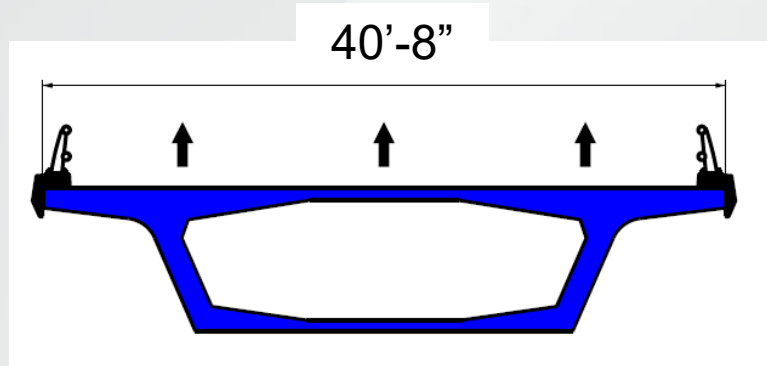
Future Widening

PHASE 1 (40'-8")

- 2 lanes of traffic (3 design lanes)
- Precast Box
- Internal tendons

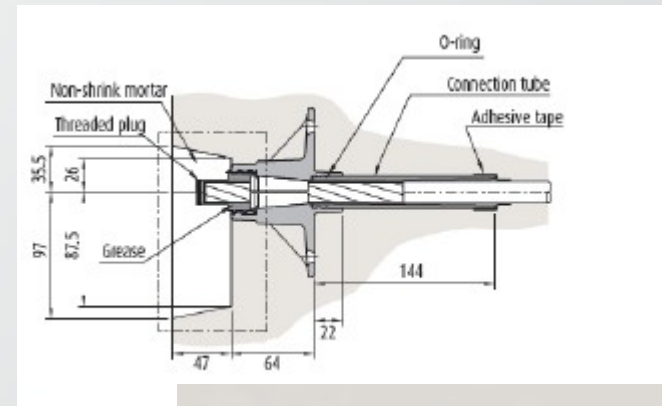
PHASE 2 (53'-6")

- 3 lanes of traffic (5 design lanes)
- Cast-in-place Wing
- External tendons



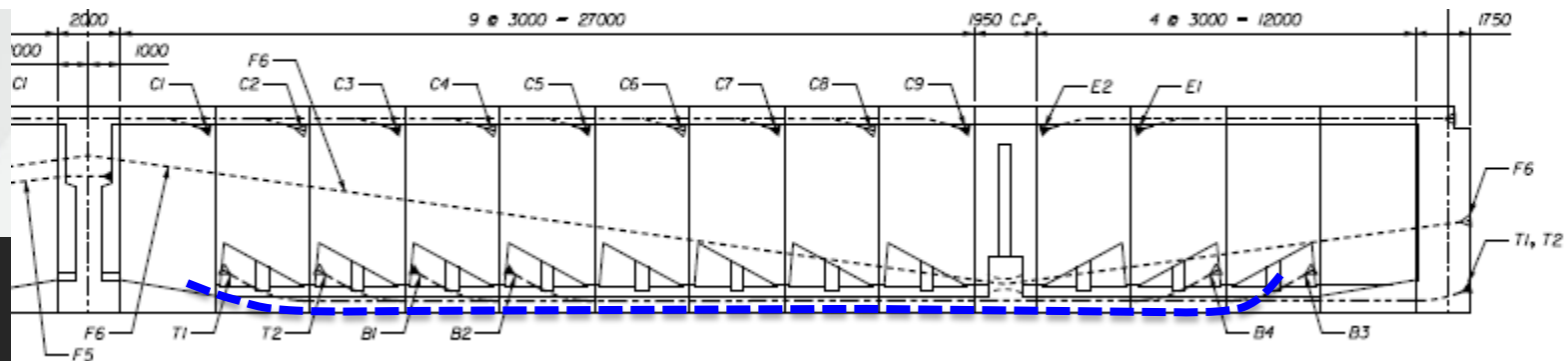
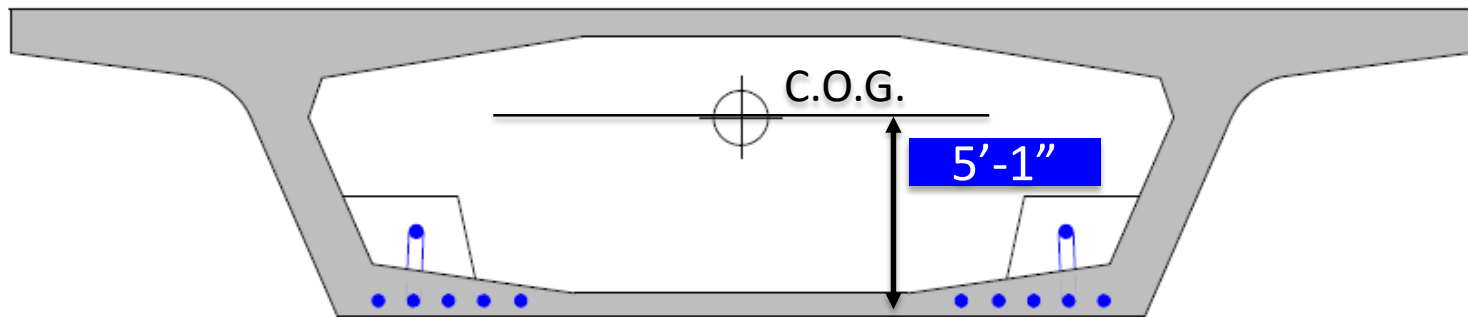
Transverse Design

- Use of transverse P.T.: greased-wrapped monostrand tendons.
- No grouting, simple top slab reinforcing and detailing.



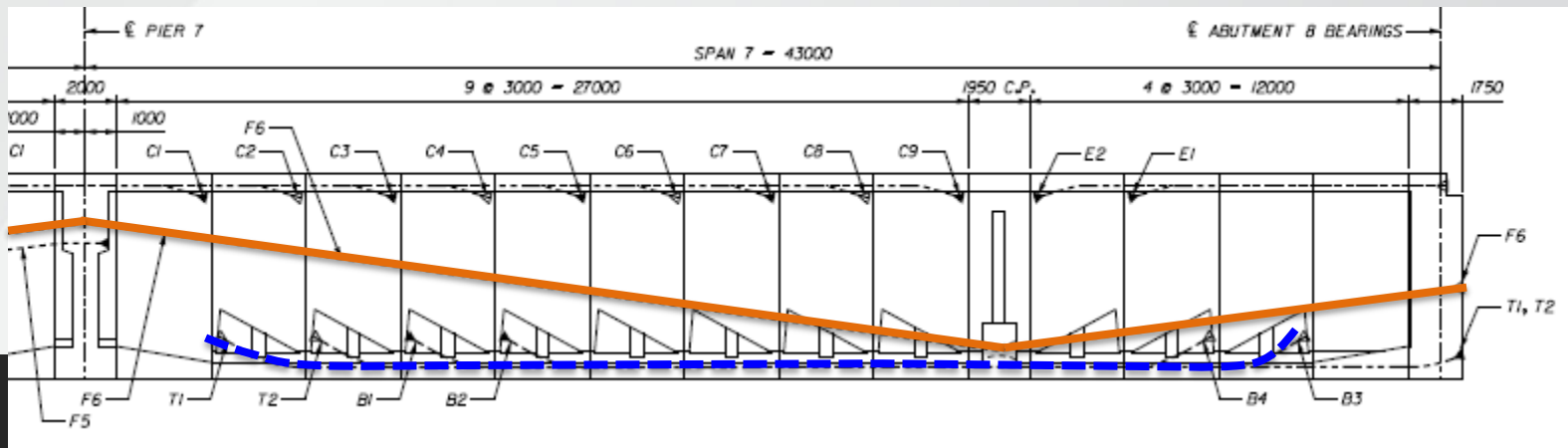
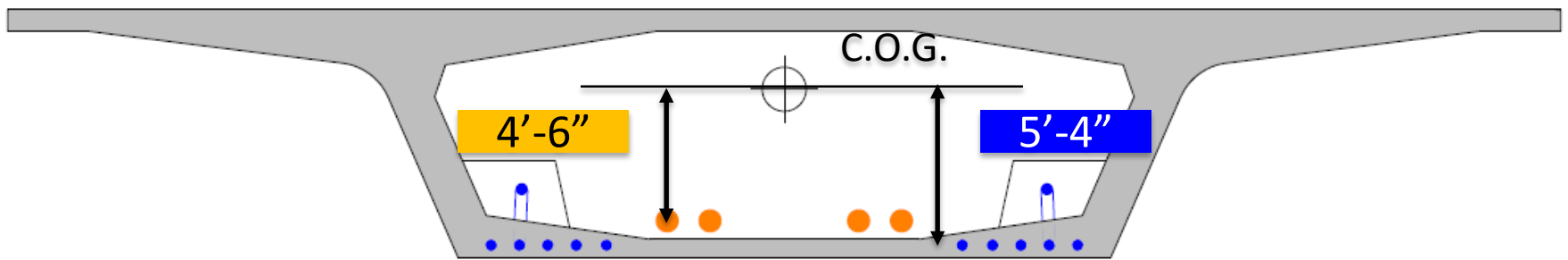
Longitudinal Design

- CANTILEVER Tendons – Internal 19-15.7
- CONTINUITY - PHASE 1 – Internal 19-15.7 tendons
Span-to-depth ratio 23.5 → internal post-tensioning in bottom slab (more effective for (+) moment bending)
First time use of internal continuity tendons for Danya-Cebus.



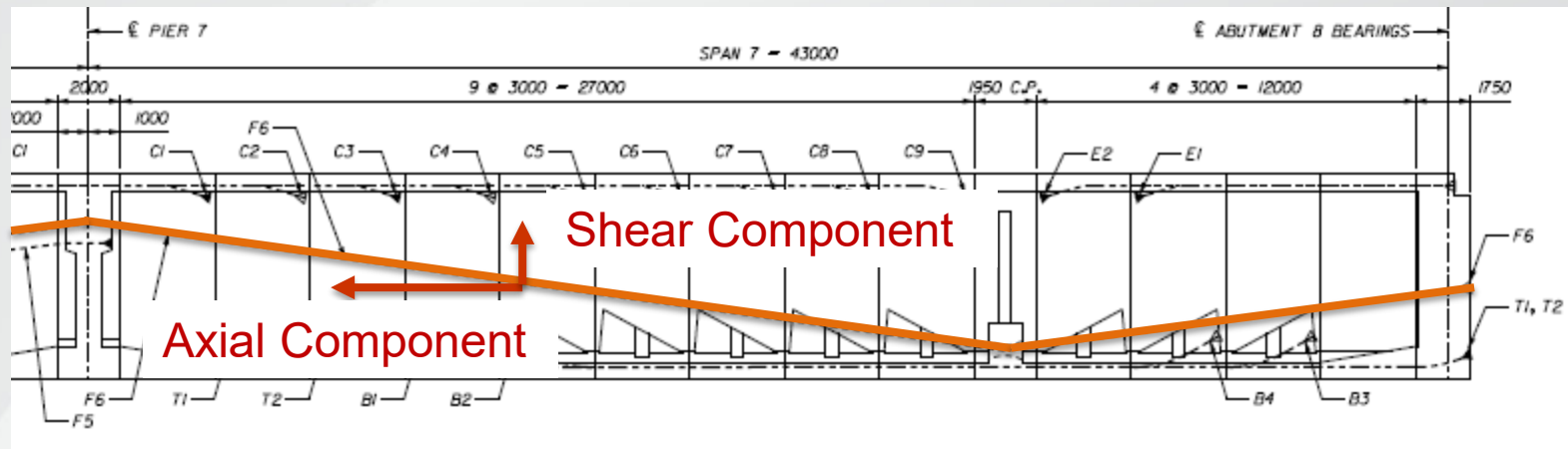
Longitudinal Design

- PHASE 2 CONTINUITY – 19-15.7 External Post-tensioning. Tendons stressed anchored at pier segments and deviated in deviation diaphragms at closure pour.



Advantages of External PT

- Precompression of the entire deck length.
- **Precompression of the top slab** and bottom slab at the same time. Top slab precompression reduces the risk of shrinkage cracks in the freshly poured widening.
- Increase in web shear capacity due to vertical shear component.



Advantages of External PT

- Simple casting procedure utilizing diabolos to form voids at deviation points.
- Easy preparation for the post-tensioning installation in the future

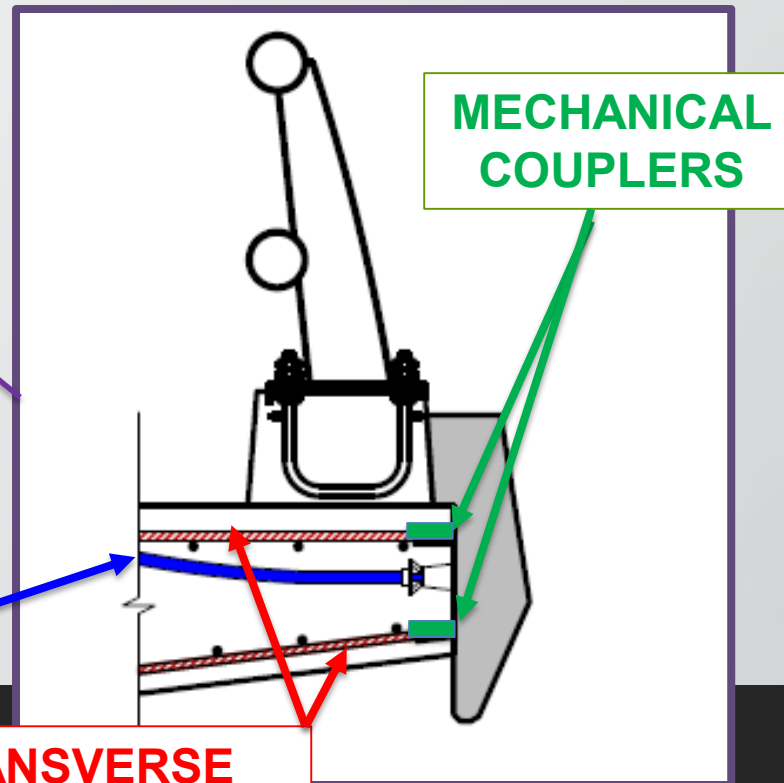


Widening Details

- GOAL: maintain integrity of precast segment
- Use of **mechanical couplers** for all top slab transverse bars.
- Transverse P.T. in the top slab for PHASE 1 only consists of **grease-wrapped monostrands** (no grouting).



TRANSVERSE P.T.

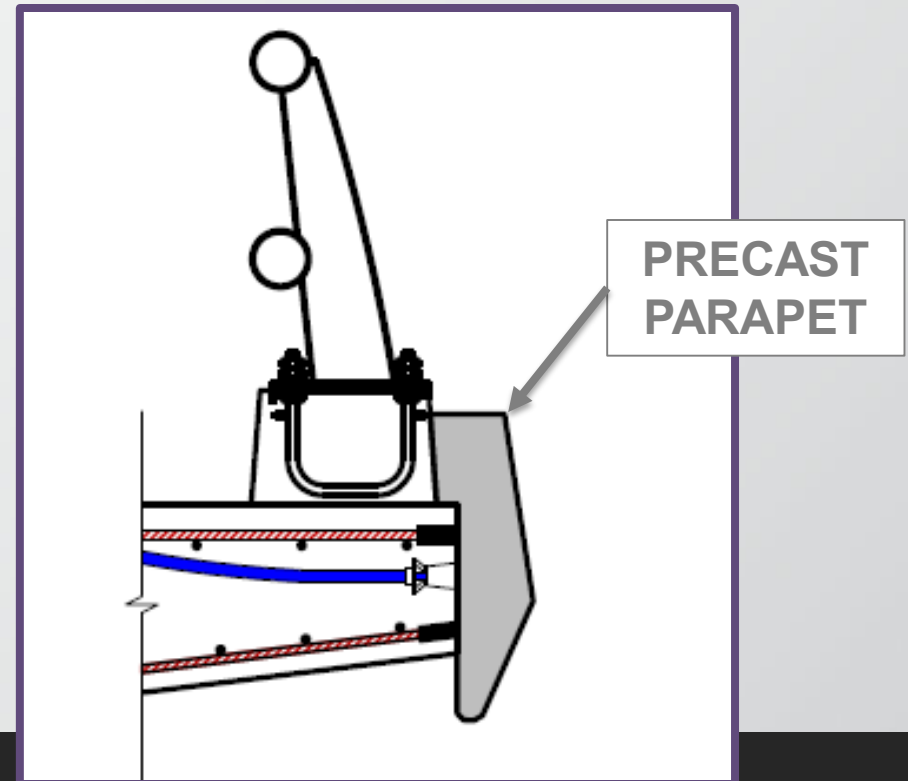


MECHANICAL COUPLERS

TRANSVERSE REBAR

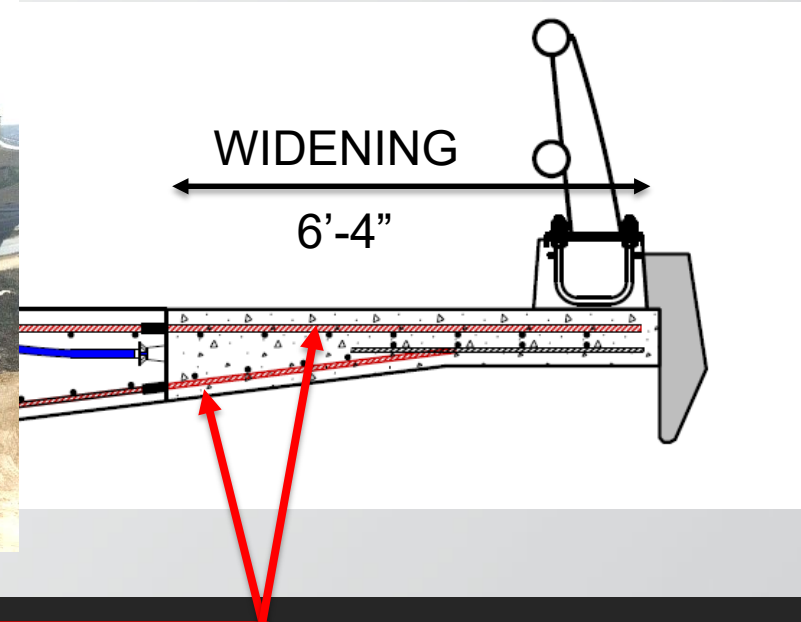
Widening Details

- Precast panels covering the wing edge providing visual continuity and providing additional protection for the couplers.



Widening Details

- Precast panels covering the wing edge providing visual continuity.
- Protect reinforcement couplers.



**TRANSVERSE
REBAR COUPLED**

Construction – Balanced Cantilever



Hydraulic jack 700 tons capacity, stability + geometry adjustment

Temporary steel towers designed by FINLEY, reused from previous project

Construction – Balanced Cantilever



End Span units erected as small balanced cantilevers

Temporary steel towers designed by FINLEY, reused from previous project

Construction – Balanced Cantilever



Summary

- **Design-Build method** allowed quick and efficient design tailored to the Contractor's means and methods.
- Contractor was able to **reuse mold and temporary works from previous project** with little or no modification. This led to significant cost savings.
- Future widening does not require any destructive method. Integrity of the initial structure is maintained.
- Efficient use of **External P.T.** as means for future precompression and increase of bridge capacity

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REGISTERED CONTINUING EDUCATION PROGRAM



Purpose and Learning Objectives

Purpose

The Convention provides an educational forum to learn new techniques used in successful projects, lessons learned from development projects, and showcases a case study allowing for discussion of the project.

Learning Objectives

At the end of this presentation you will:

- Be Knowledgeable About the Advantages of Segmental Construction
- Learn About Segmental Substructures
- Hear About Lessons Learned

Questions



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This Concludes the Educational Content of This Activity

