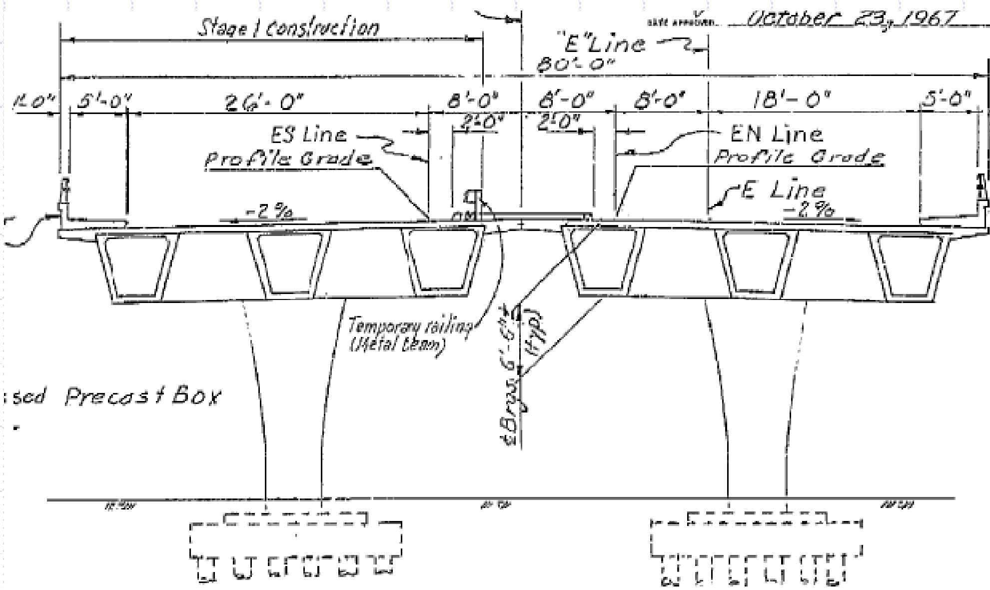
Harbor Blvd. OC (A Spliced Precast Bath-Tub Girder Structure)

Bartt Gunter, PE – Caltrans, Structure Design
Tony Tipton, PE – Caltrans, Structure Construction

Photo Courtesy Josh Burke – Caltrans Structure Construction

Existing Bridge: Typical Section

- 2 independent, side by side PC/PS bathtub girder bridges connected by transverse joint



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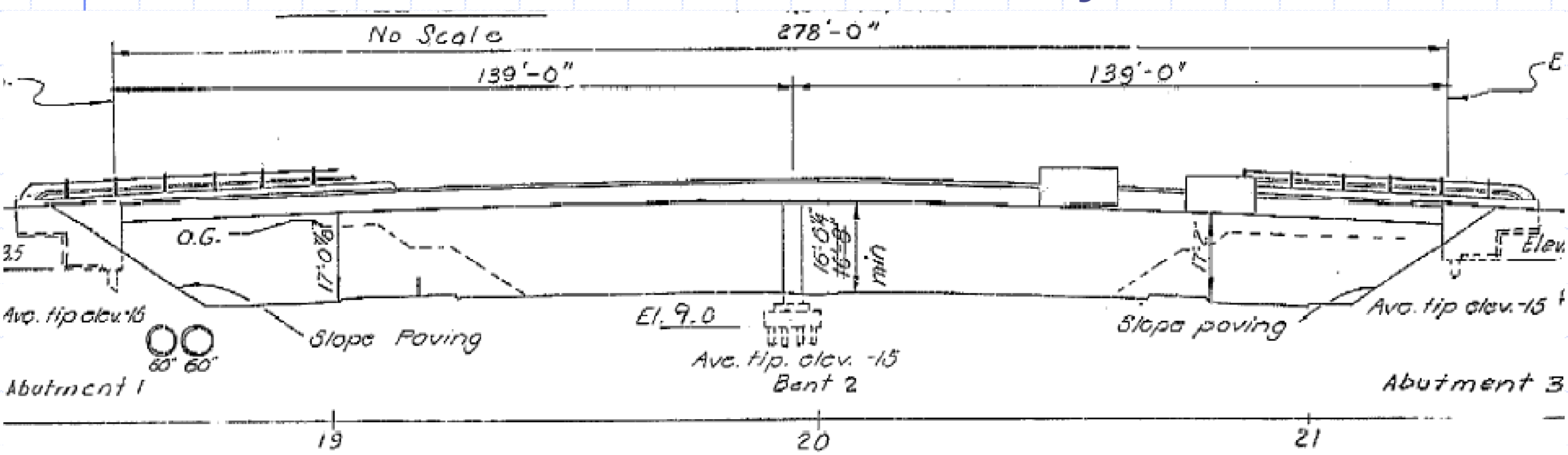
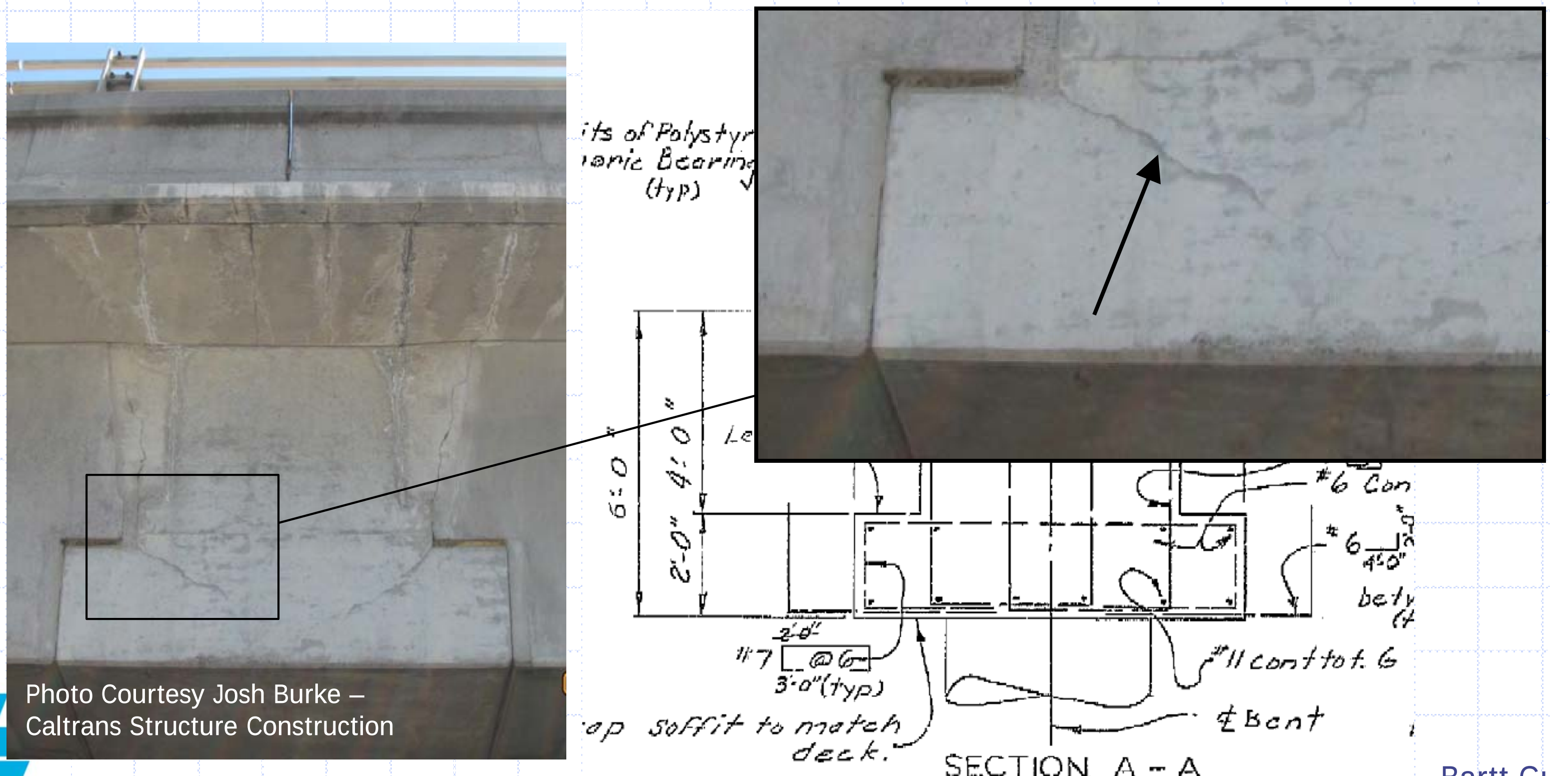
Existing Bridge: Elevation View

- 2-139' Spans
- Existing clearance 16'-6"
- Continuous for live load only



Inverted-T Cap

- Existing bridge has Bathtub girders sitting on inverted-T cap



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Advantages of PC/PS-PT Continuous Superstructure

- Fixed-pinned columns
- No moment into the footing means smaller footings, less piles.
- Continuity for all loads equates to smaller d/s and therefore, less DL.
- No Falsework Required

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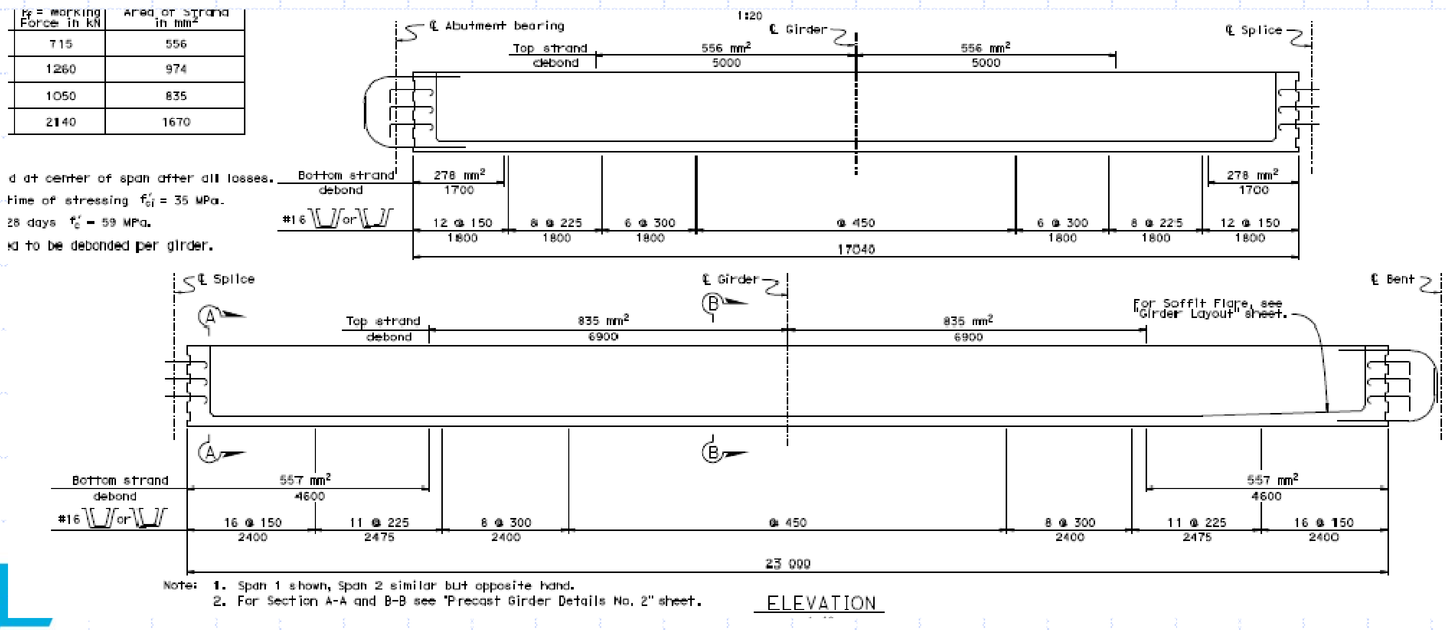
Constraints on PC Continuous bridge

- PC Girders were broken down into 2 – sub-girders for transportation reasons.
- 55'-11" and 75'-5" sub-girder Lengths



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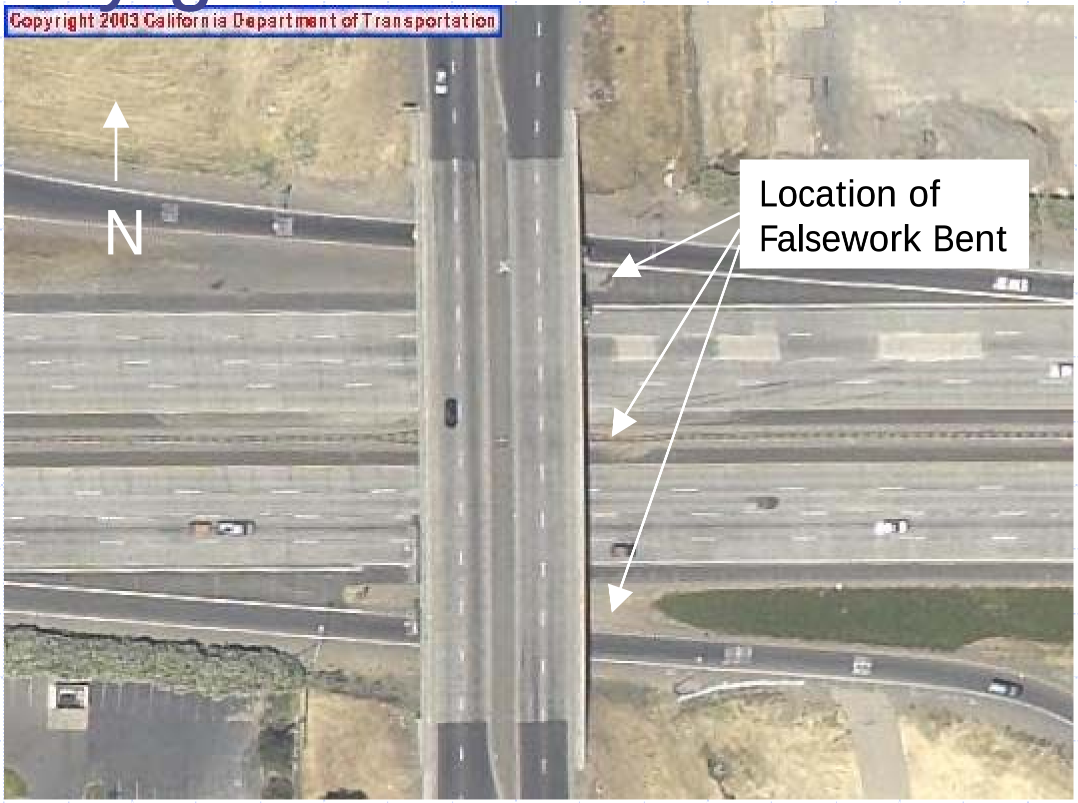
Locate temporary supports

- Locations for temporary supports were chosen by gore area locations in HWY 50.



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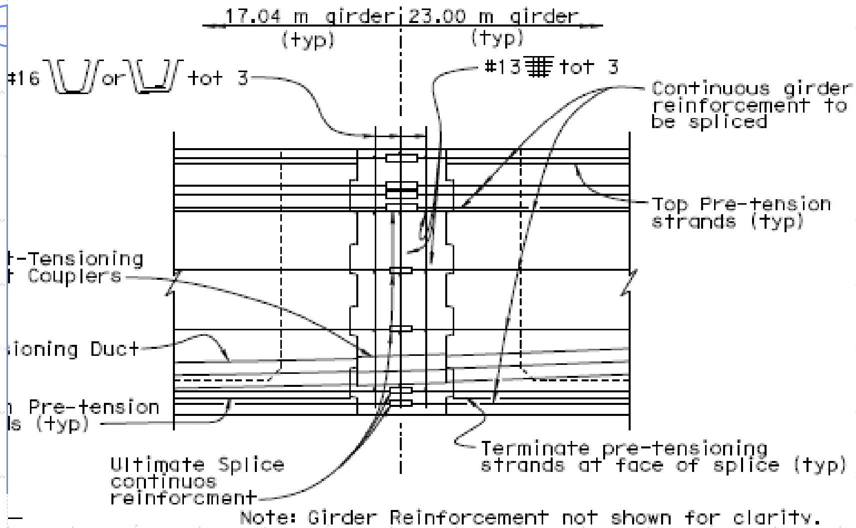
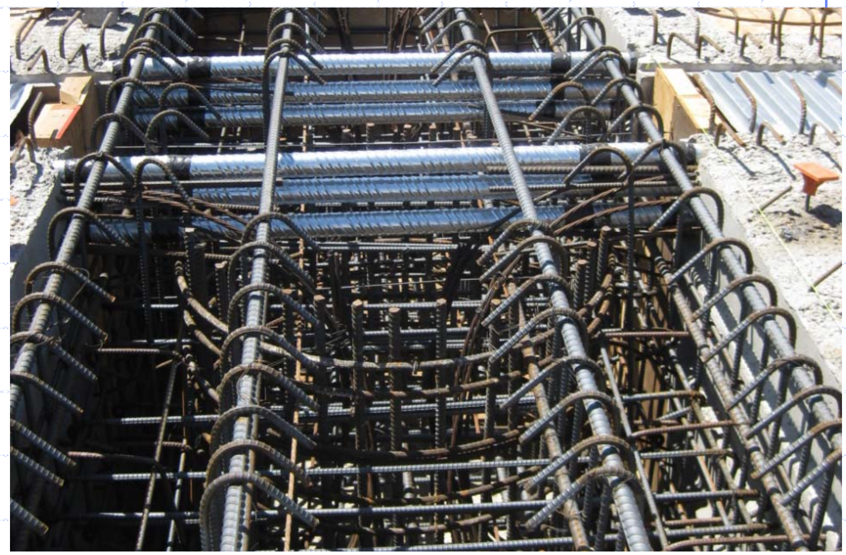
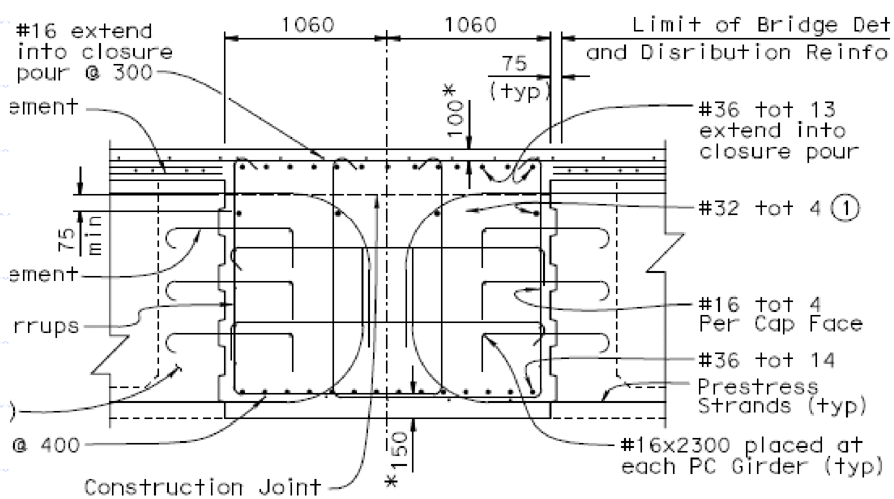
CIP Fills







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Method of calculation

- Design was accomplished using a spreadsheet
- This spreadsheet incorporated time dependent staging.

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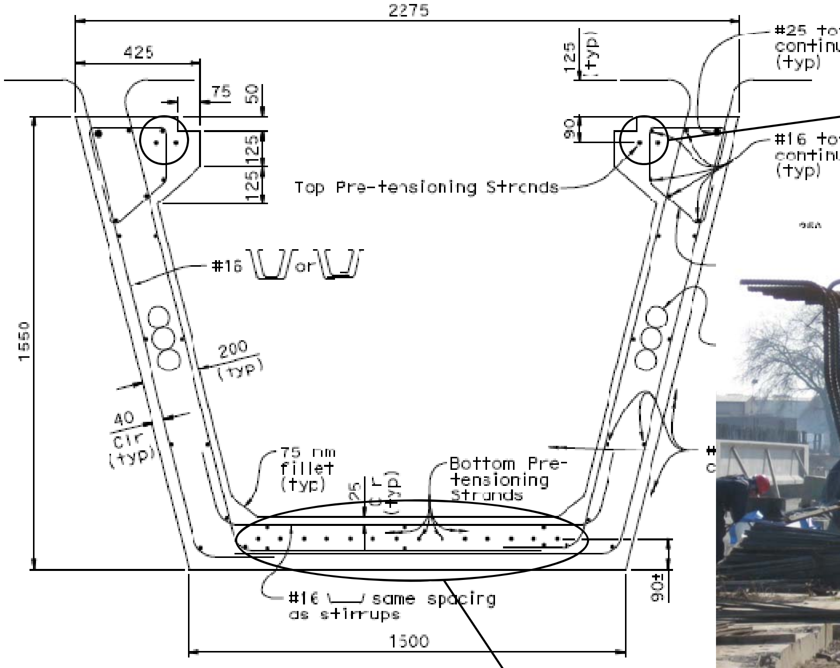
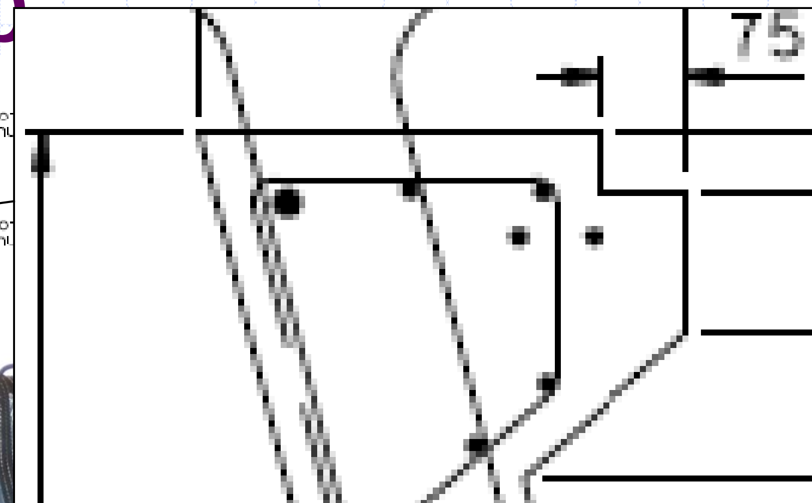
PC/PS-PT Bathtub





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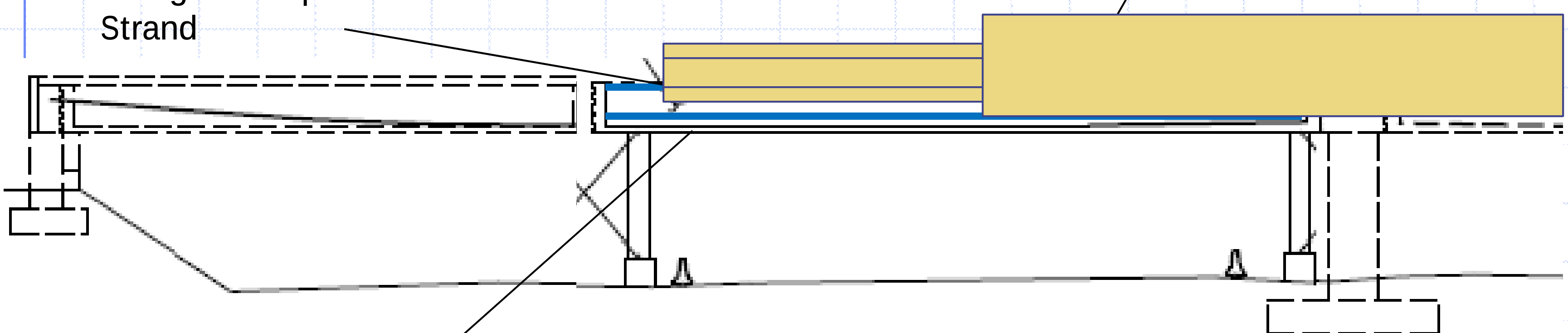
PS/PT Interaction

- Bridge PT had to overcome effects of sub-girder PS.



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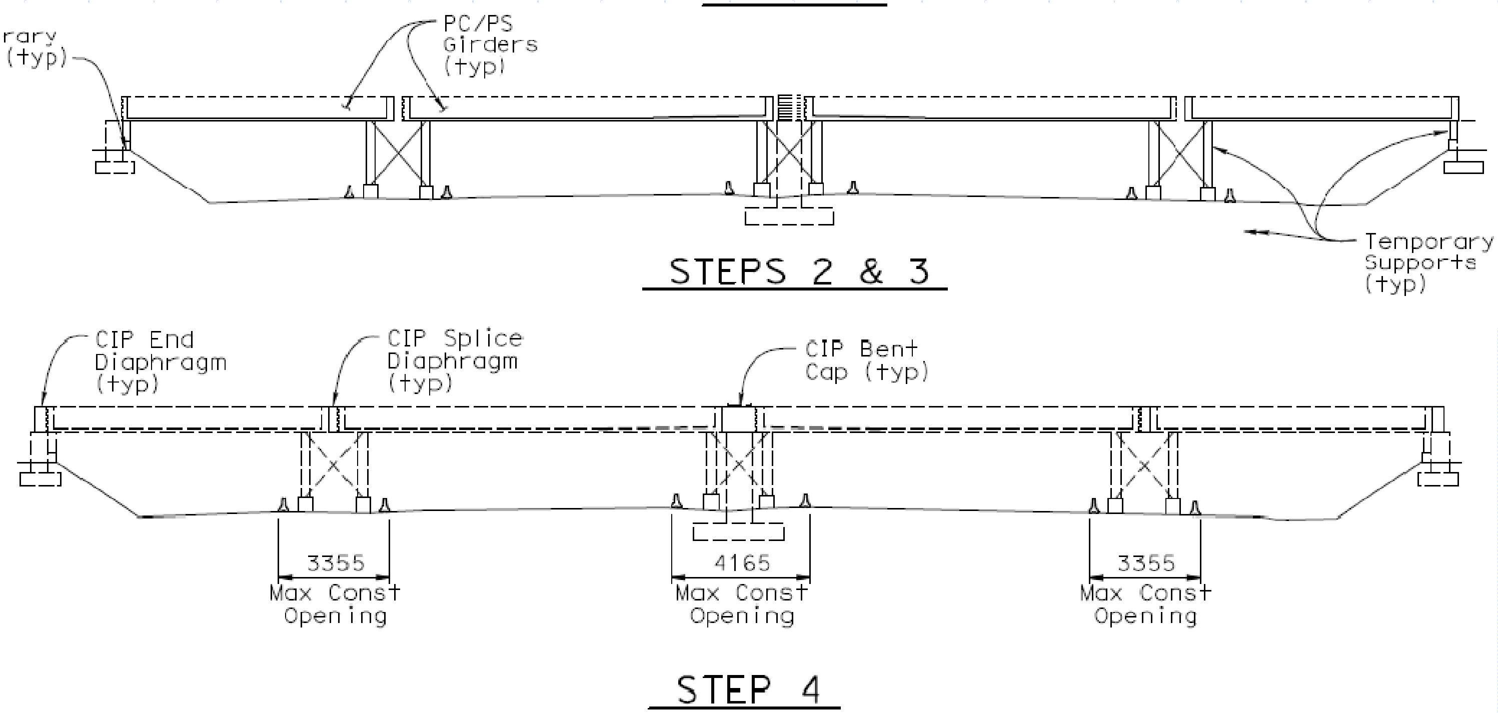
Construction Sequence



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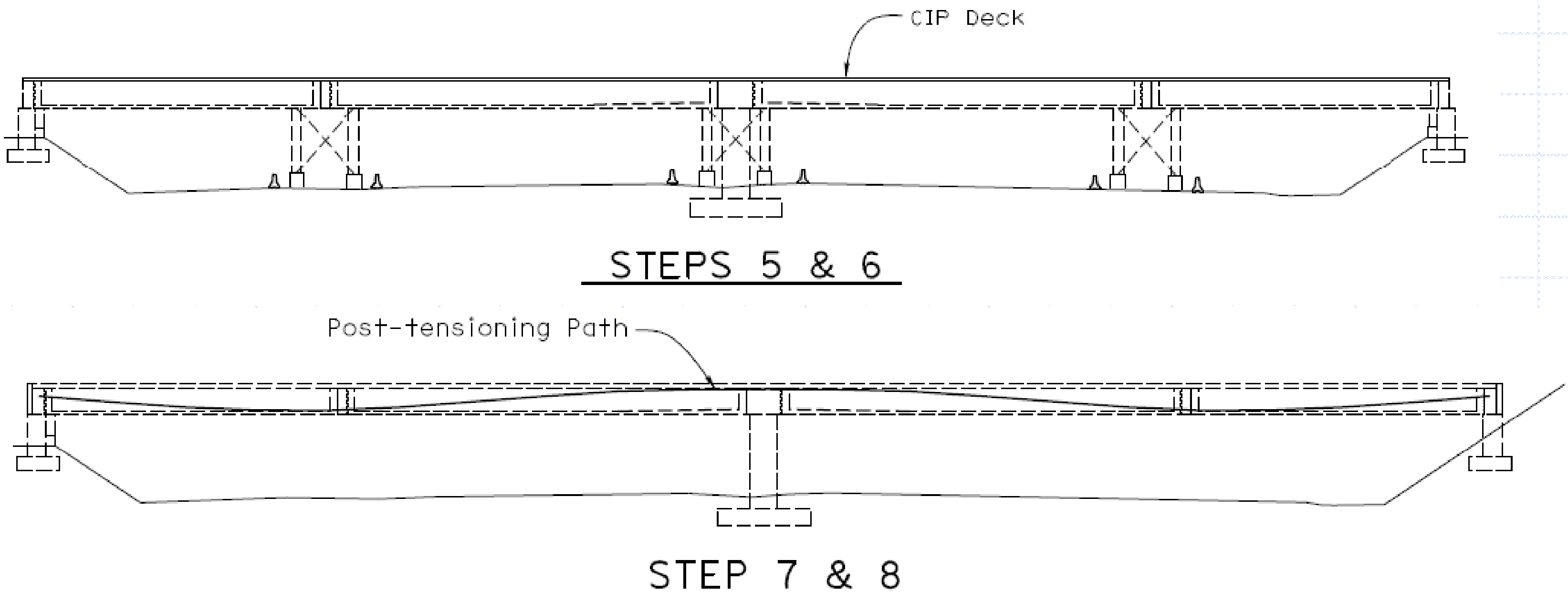
Construction Sequence



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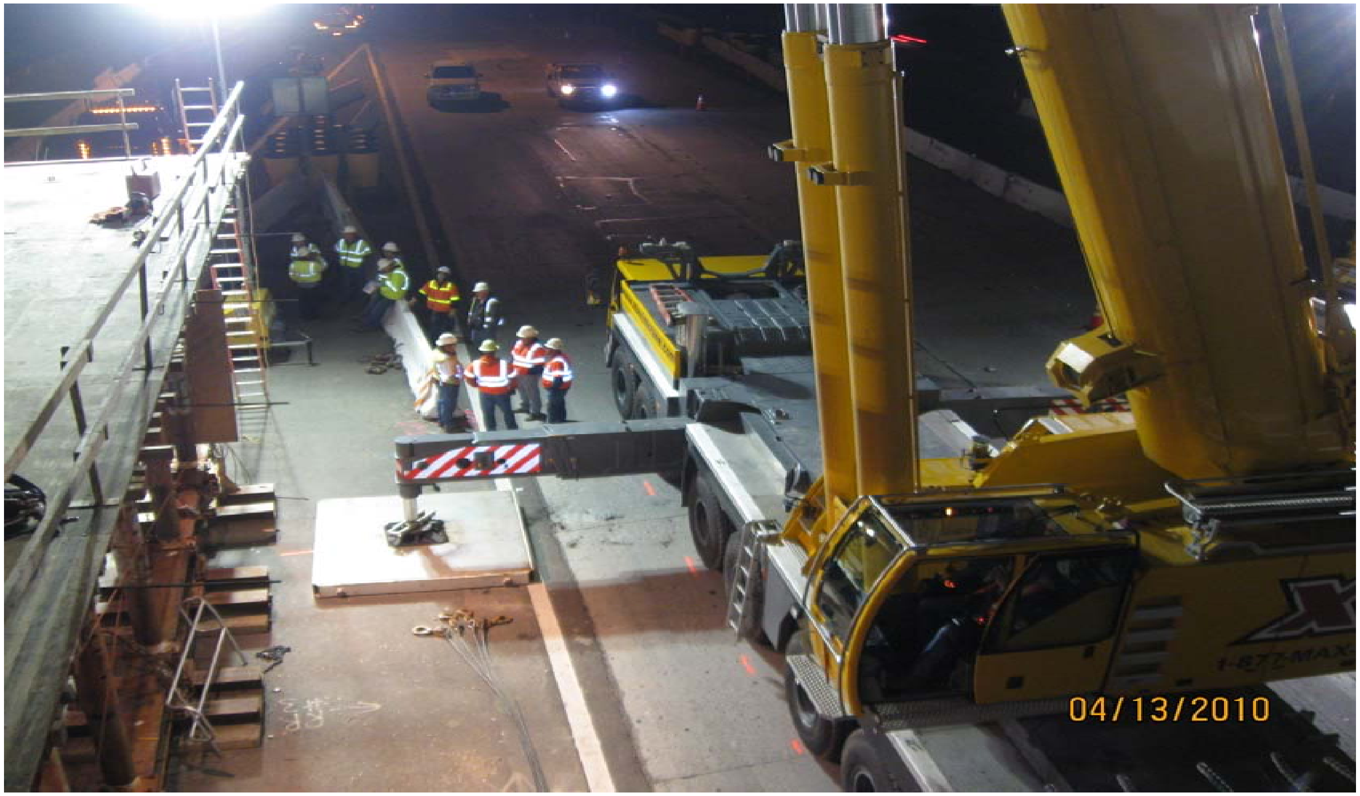
Construction Sequence



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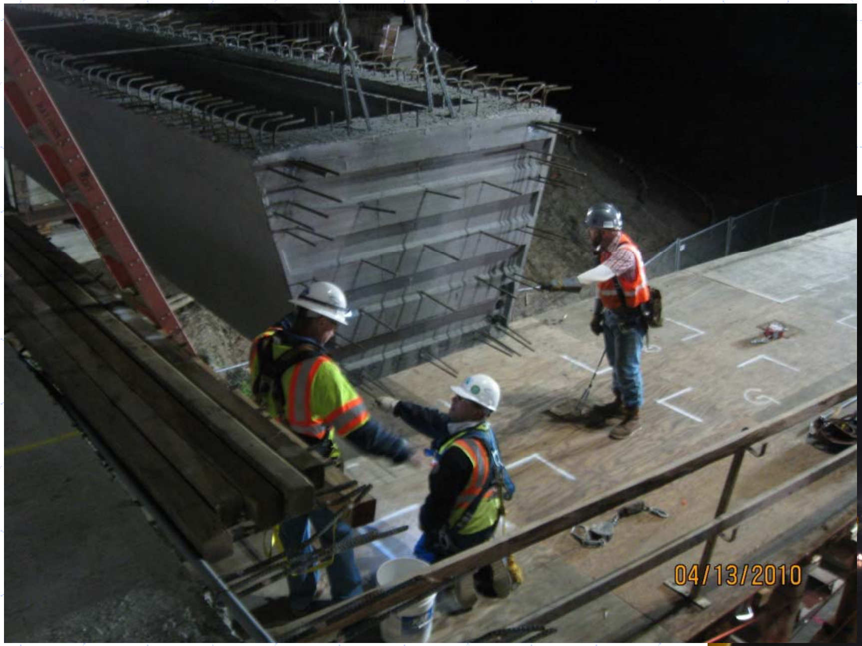

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Lessons Learned

- Elimination of Greased Metal sheet in Bearing Pad Detail
  - Greased metal sheets would have made PC girder erection more difficult
  - Movement was expected due to PT.
  - Taller bearing pads were designed to compensate.

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Lessons Learned

- PC girders on a vertical curve
  - Bridge has vertical curve
  - Girders are cast flat
  - Straight line segments are cast together to mimic vertical curve.

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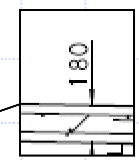
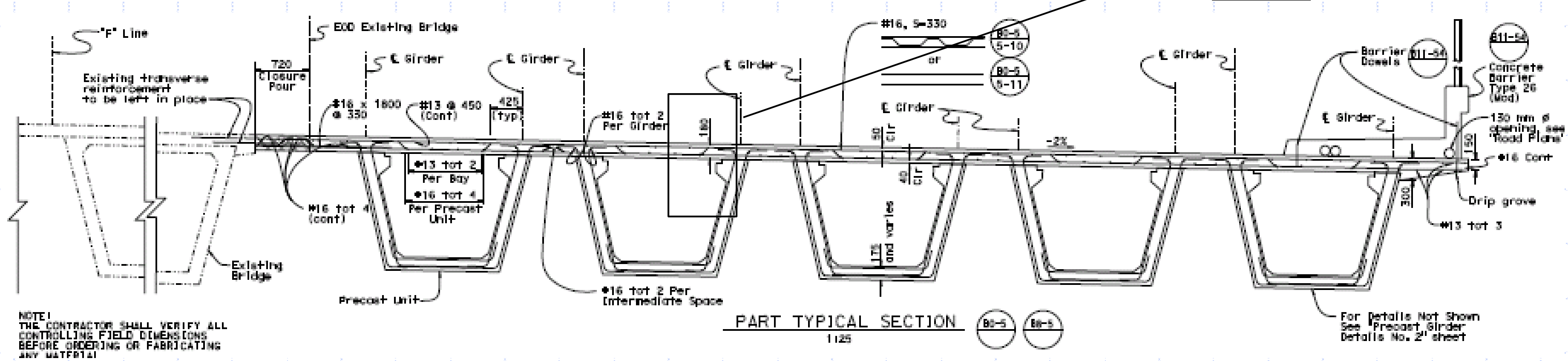
Lessons Learned

- PC girders on a vertical curve
  - The deck must be a variable thickness so that the roadway vertical curve can be transitioned into the flat girders





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Lessons Learned

- Camber Diagram
  - PC structures typically have a table for camber.
  - CIP structures have a camber diagram.

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Lessons Learned

- Camber Diagram
  - This bridge used neither.
  - Instead, calculations were made and submitted to construction to determine the correct camber.
  - Control is necessary over the final placement of the girders.
  - This is something the PC-Community (Primes, PC Subs, and CT) needs to discuss as a best practice.

Lessons Learned

- Slope of Roadway and PS Profile
  - Roadway slope was somewhat greater than that shown on the plans, had wing walls been constructed to plan, they would have been high.
  - Prestress profile did not allow room for duct to fit below the deck in the bent cap. Keep in mind that spliced areas need a bit extra room (+/- 1 inch each.)

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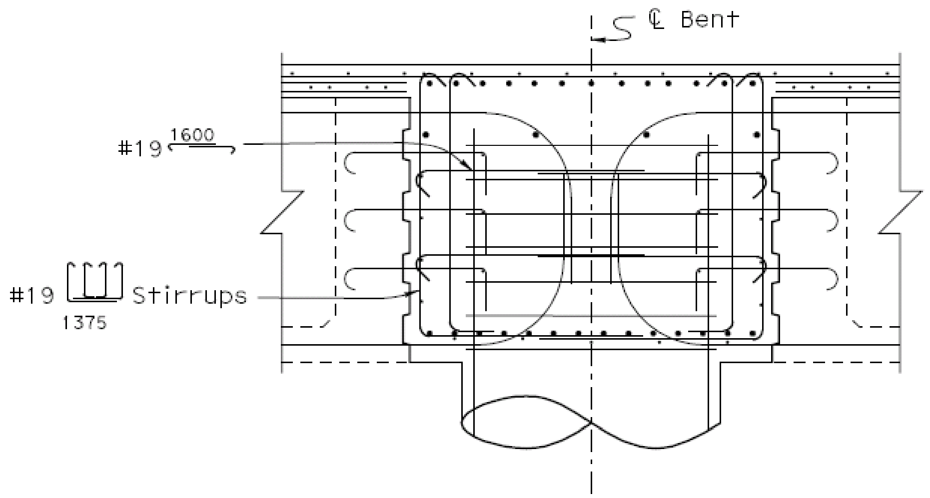
Lessons Learned

- Bent Cap Reinforcement Congestion
  - It is optimal for the seismic design to have girders and columns align.
  - There is a more reinforcement in PC/PS-PT girders across the girder/bent cap interface



Lessons Learned

- Bent Cap Reinforcement Congestion
  - To avoid congestion, try not align girders and columns.

Lessons Learned

- Bent Cap Reinforcement Congestion

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Lessons Learned

- Bent Cap Reinforcement Congestion

We CAN Do It!

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Lessons Learned

- Quality Control

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Lessons Learned

- Quality Control

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Lessons Learned

- Minimum Construction Areas – Load Imposed On The Grade:
  - Given areas for splice temporary supports had soil loads in excess of 2.5 TSF.
  - On one side we were able to increase the area.
  - On the other, we were required to obtain Geotechnical release for the load.

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Questions?

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