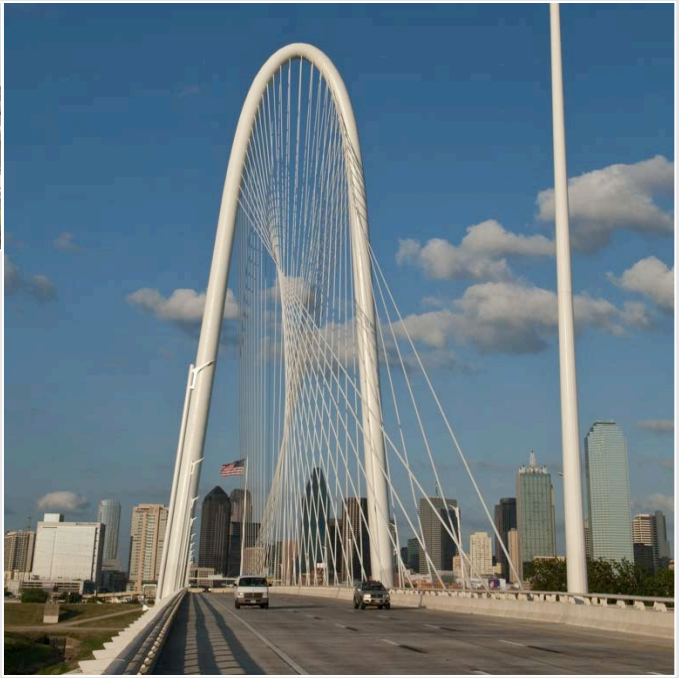


TxDOT ABC/PBES EXPERIENCES

Michael Hyzak, P.E.

TxDOT ABC/PBES Experiences

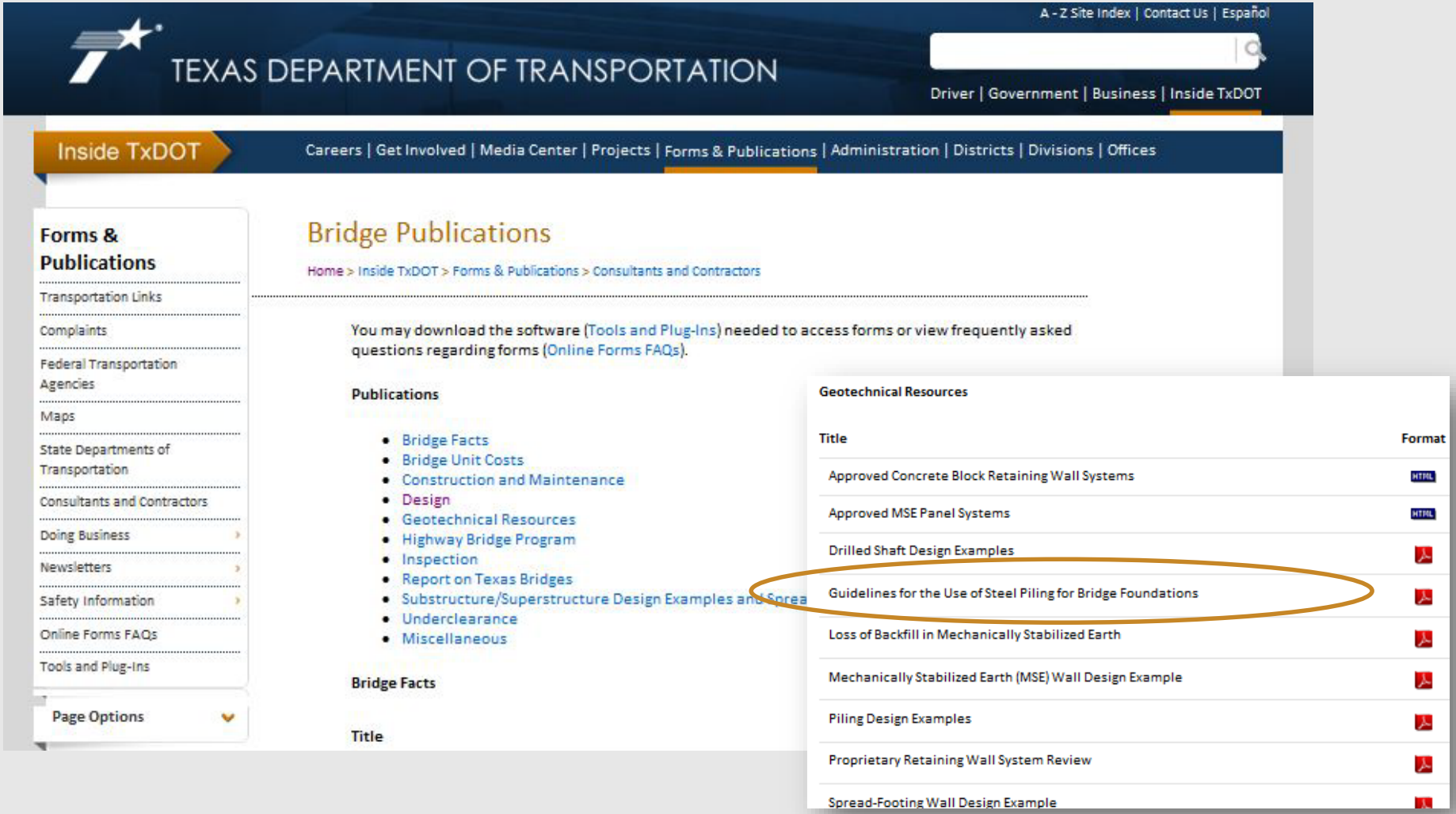
Foundations

- Drilled shafts and precast/prestressed and steel piling

- ABC features in Texas
  - Steel piling: connections and durability provisions
  - Large diameter monoshafts
  - Cylinder piles
  - Large square piling: developing 36” section

Foundations: Steel and Precast/Prestressed Piling

Steel Piling: Guidelines for Use



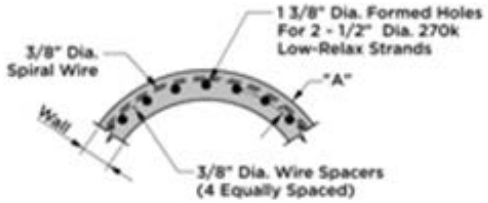
http://ftp.dot.state.tx.us/pub/txdot-info/brg/geotechnical/steel-pilings.pdf

Foundations: Precast Cylinder Piles

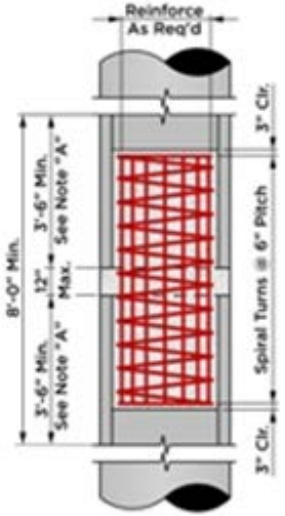
Copano bay bridge (first in TX)

54” and 66” dia.

Foundations: Precast Cylinder Piles

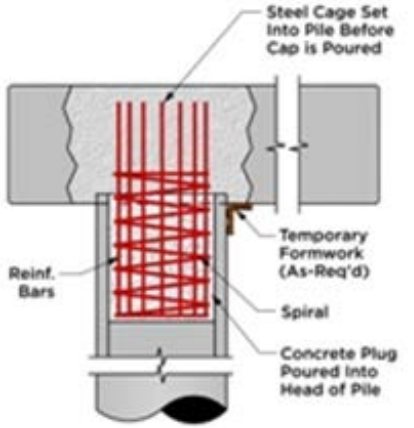


Typical Reinforcing Detail

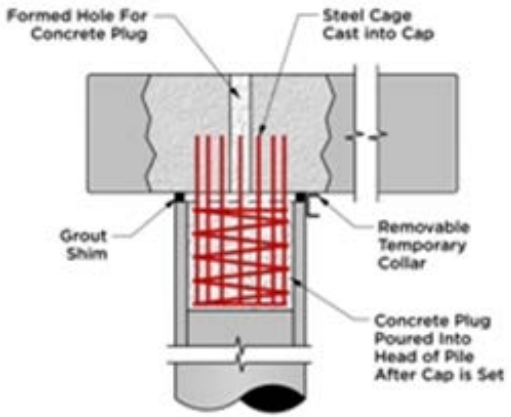


Pile Splice Detail

Note "A":
End surfaces in Good Condition May be Brought Into Contact at Pile Splice. Rough or Damaged Ends Shall Be Shimmed Apart And Spliced in Accordance With This Detail.



Cast In Place Pile Cap Detail



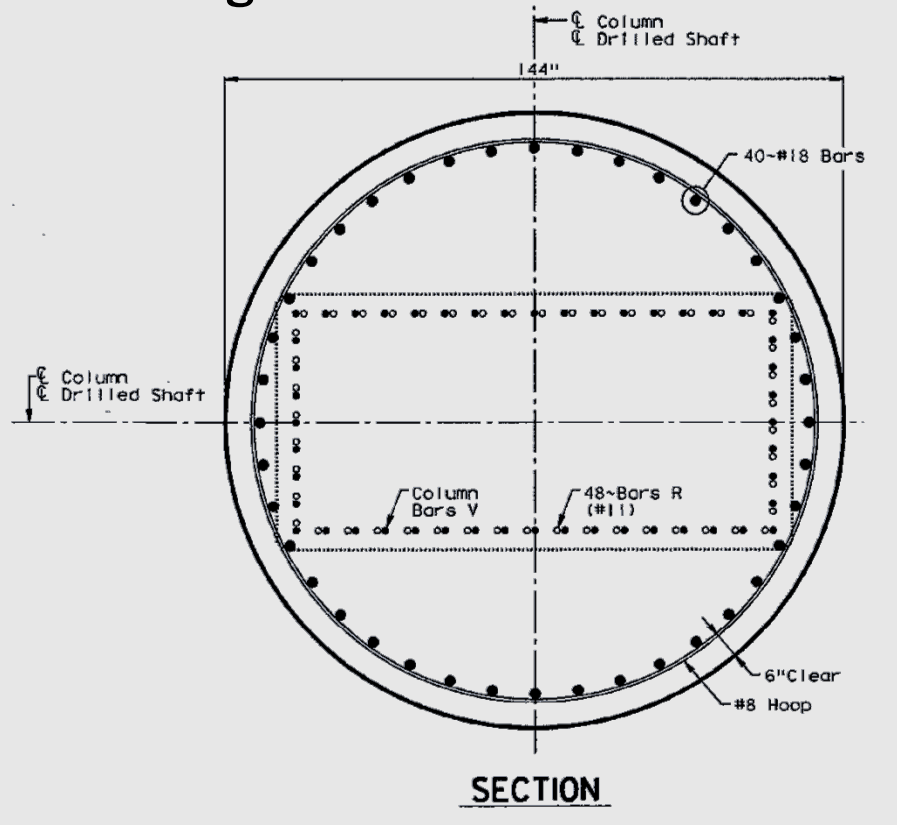
Precast Pile Cap Detail

Foundations: Large Monoshafts

- 12 ft. dia. x 130 ft.
- IH 45 Clear Lake, TX

Foundations: Large Monoshafts

- Directly frames to column w/o footing
- Much quicker: 2 days versus 2 weeks
- Smaller footprint: avoid utilities and existing lanes



Foundations: Large Monoshafts

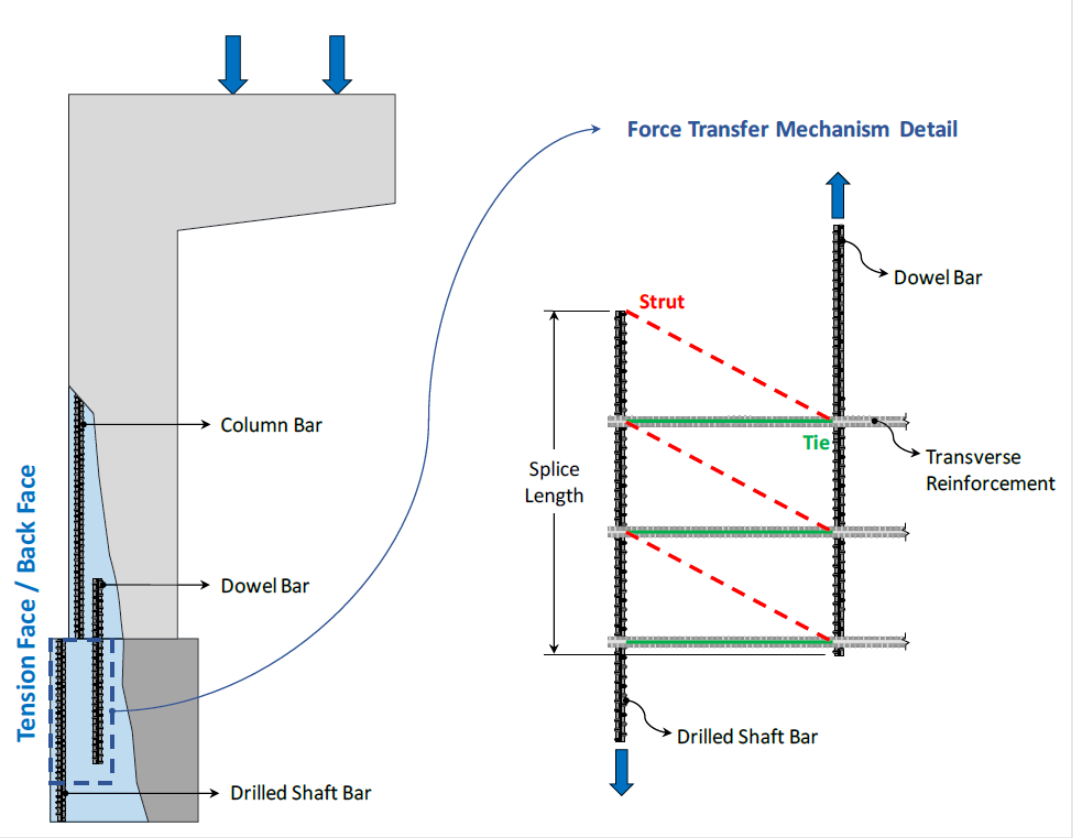
- 40 ~ #18's

Foundations: Large Monoshafts

- Larger equipment and material volumes
- Need quality construction
- Concrete mix design important
- Increased structural demand on substructure

Foundations: Large Monoshafts

- TxDOT Research Project 16-33: “Non-Contact Splices at Drilled Shaft to Bridge Column Interfaces”

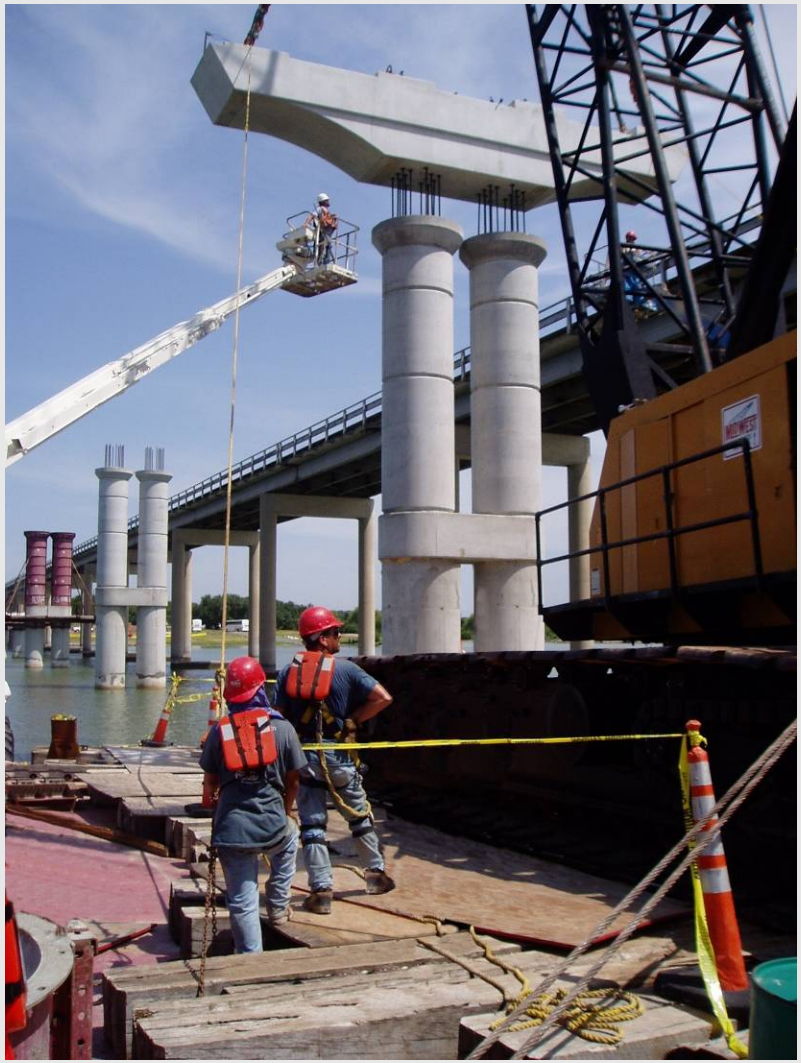


Bent Caps

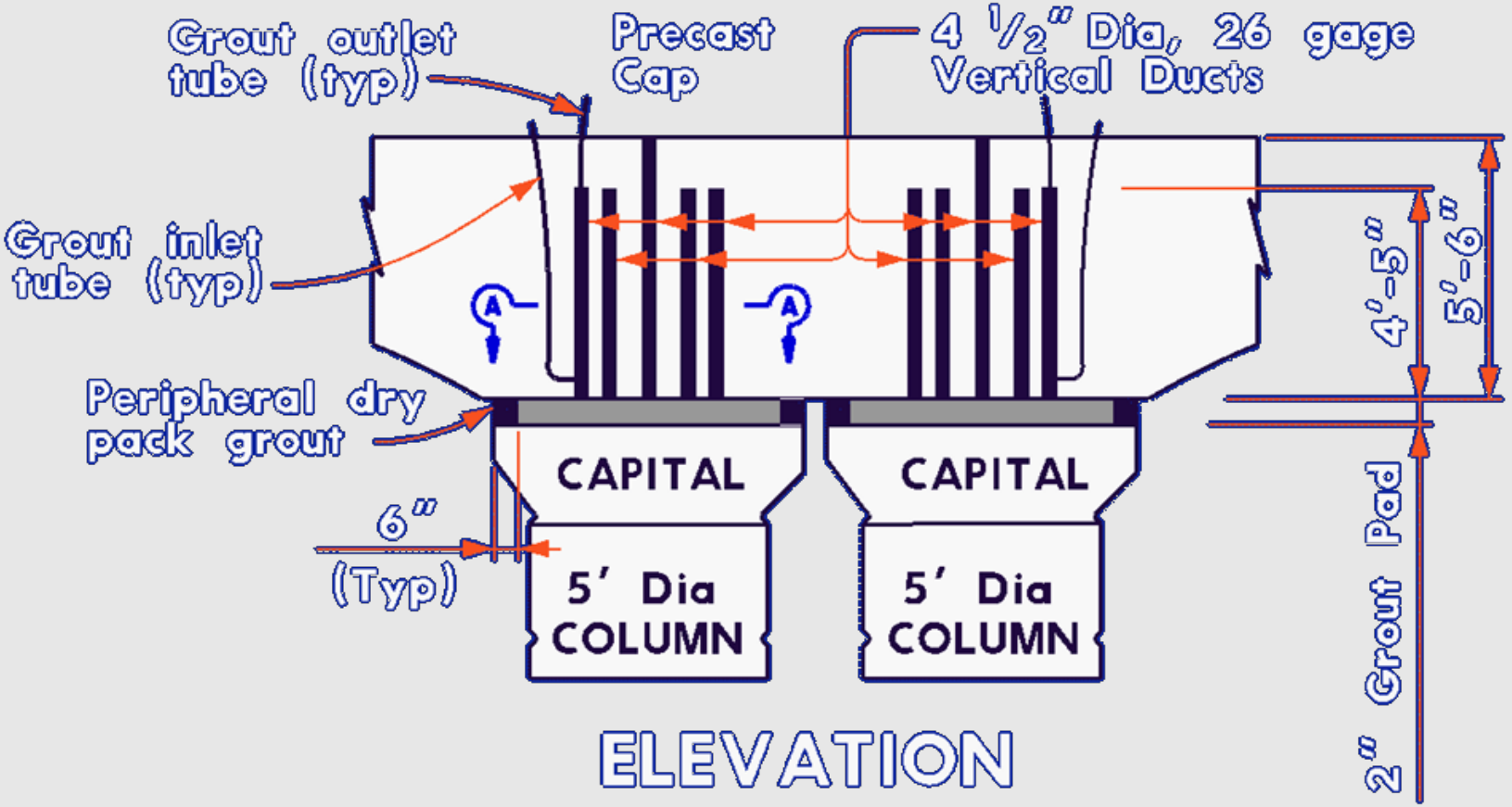
- Precast bent caps
  - First designs in the 1990's
  - Research on connections
  - Pile connections (welded, bars, pockets)
  - Standardized details
  - Pretensioned caps
  - Column pockets
  - Large caps

Precast Bent Caps

- Eliminates many tasks associated w/ CIP construction
- TxDOT Research
  - Project 1748
  - Project 4176
- Grouted vertical duct connections



Precast Cap Connection Design



Precast Cap Connection Design

Multi-Column Precast Bent Cap

Trestle Bents: Concrete Piles

Trestle Pile Bents: Concrete Piles

Trestle Pile Bents: Steel Piles

Precast Concrete Straddle Bent

Precast Hammerhead Caps: Connection Pocket with Columns

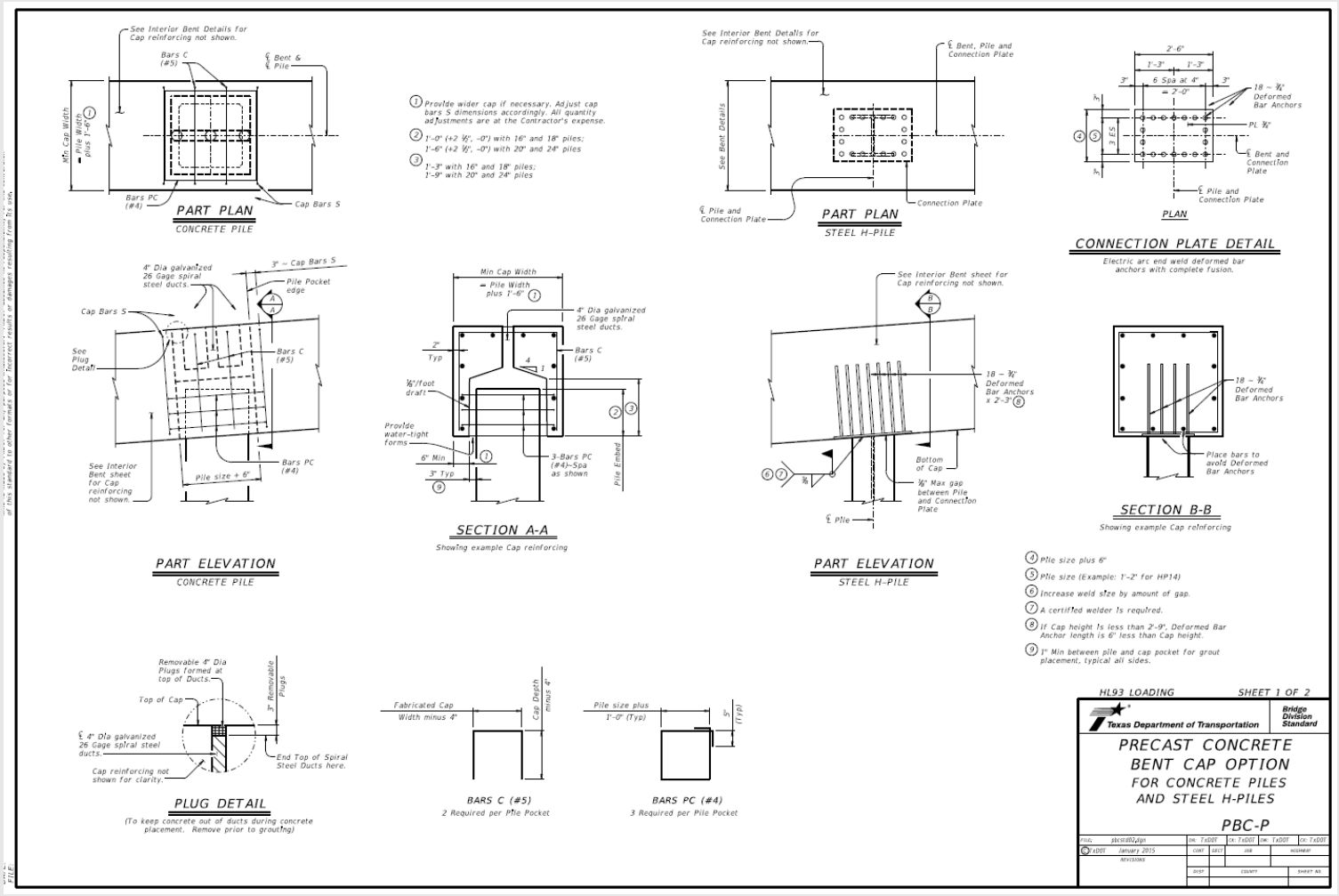
- Value engineered by contractor
- Adapts NCHRP 12-74 Report 681 details

Precast Cap: Connection Pocket with Piles

- Corrugated pocket in bottom

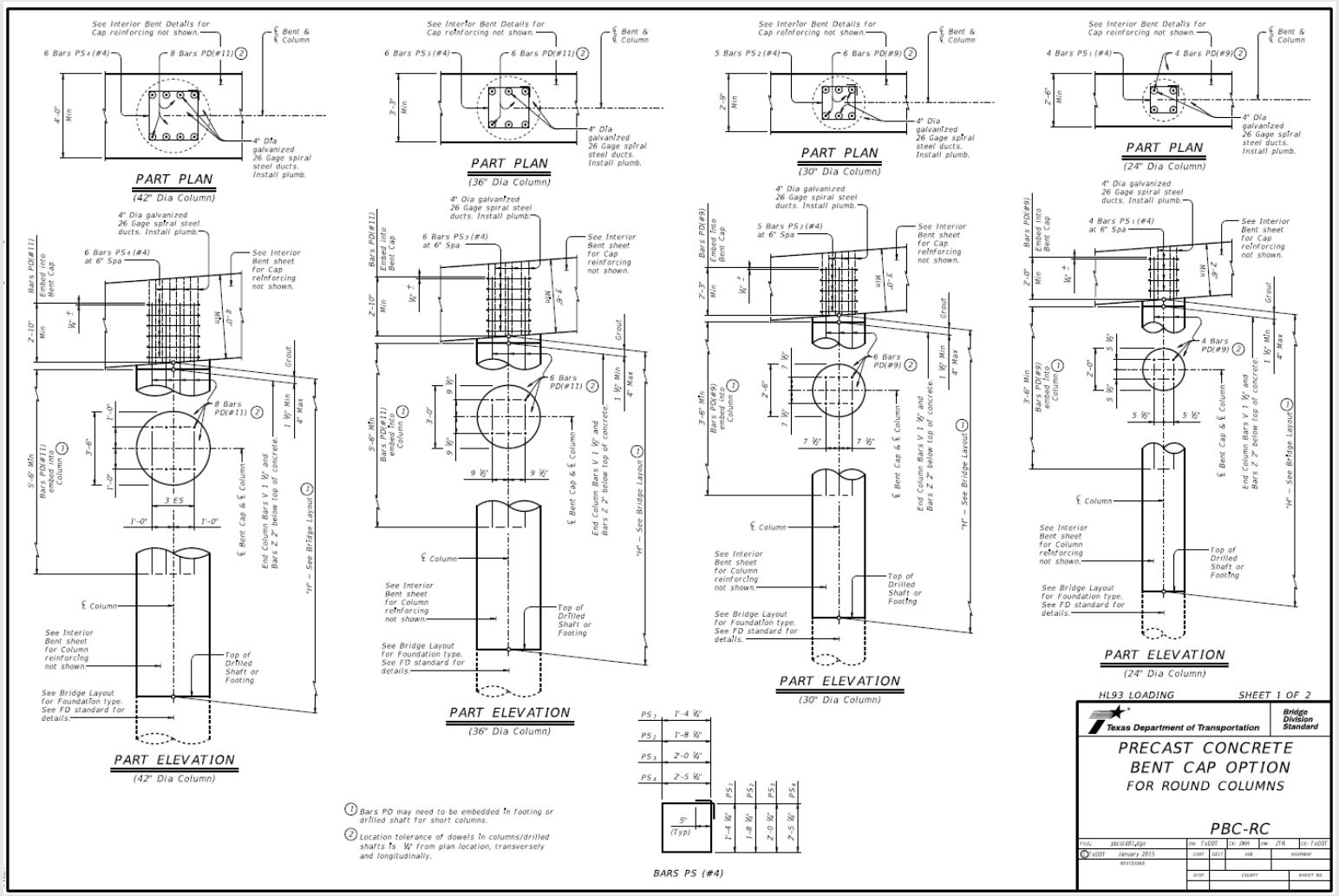
- Filling connection pocket with grout

Precast Cap Option: Pile Connection Standard



http://ftp.dot.state.tx.us/pub/txdot-info/cmd/cserve/standard/bridge/pbcstd02.pdf

Precast Cap Option: Column Connection Standard



http://ftp.dot.state.tx.us/pub/txdot-info/cmd/cserve/standard/bridge/pbcstd01.pdf

Second Generation Pretensioned Precast Cap

- 4 Construction Projects
- Research Project 6863

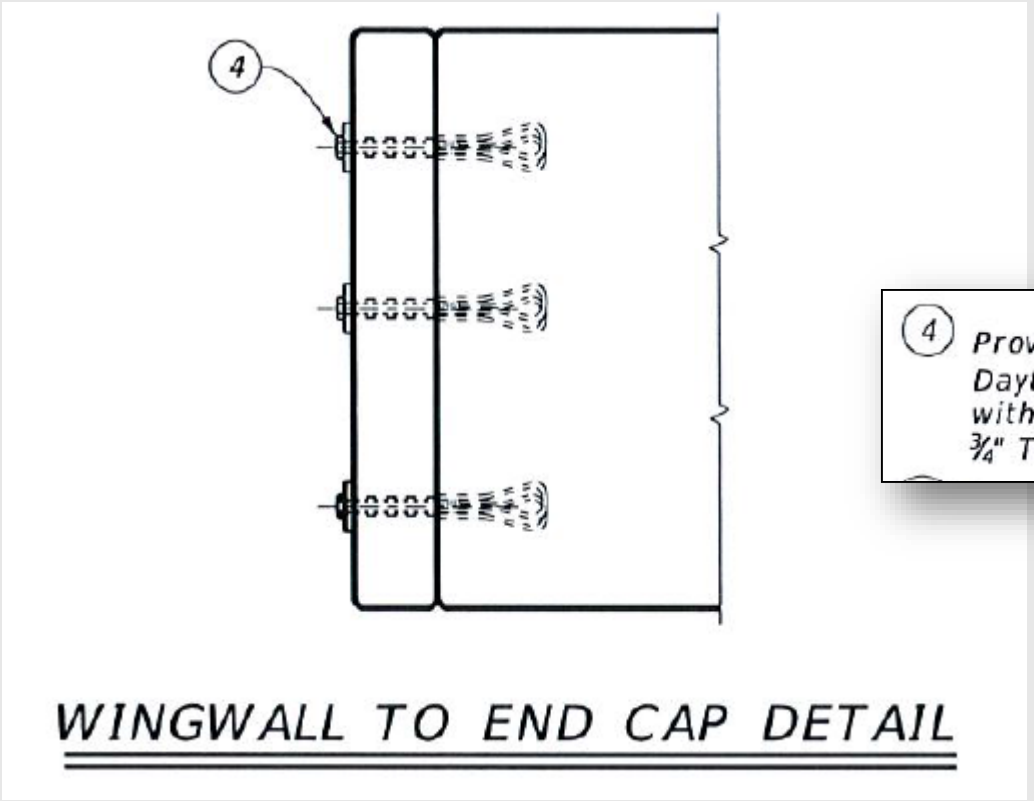
Abutments

- Use spill through abutments

- ABC features in Texas
  - Precast cap concepts adopted with precast backwall
  - Precast wings or tapered
  - Integral abutments not yet, but looking

Precast Abutments

Precast Abutment Wingwall



(4) Provide 1 ¼" Dia. x 13" Coil Bolts, Dayton/Richmond B-14 or equivalent, with plate washer (4" Outside Dia., ¾" Thickness, 1 ⅜" Dia. center hole).

Tapered Precast Abutment

Columns

- Precast columns
  - Segmental
  - Hollow shells

Columns: Segmental Substructures

Hollow Precast Columns

Approach Slabs

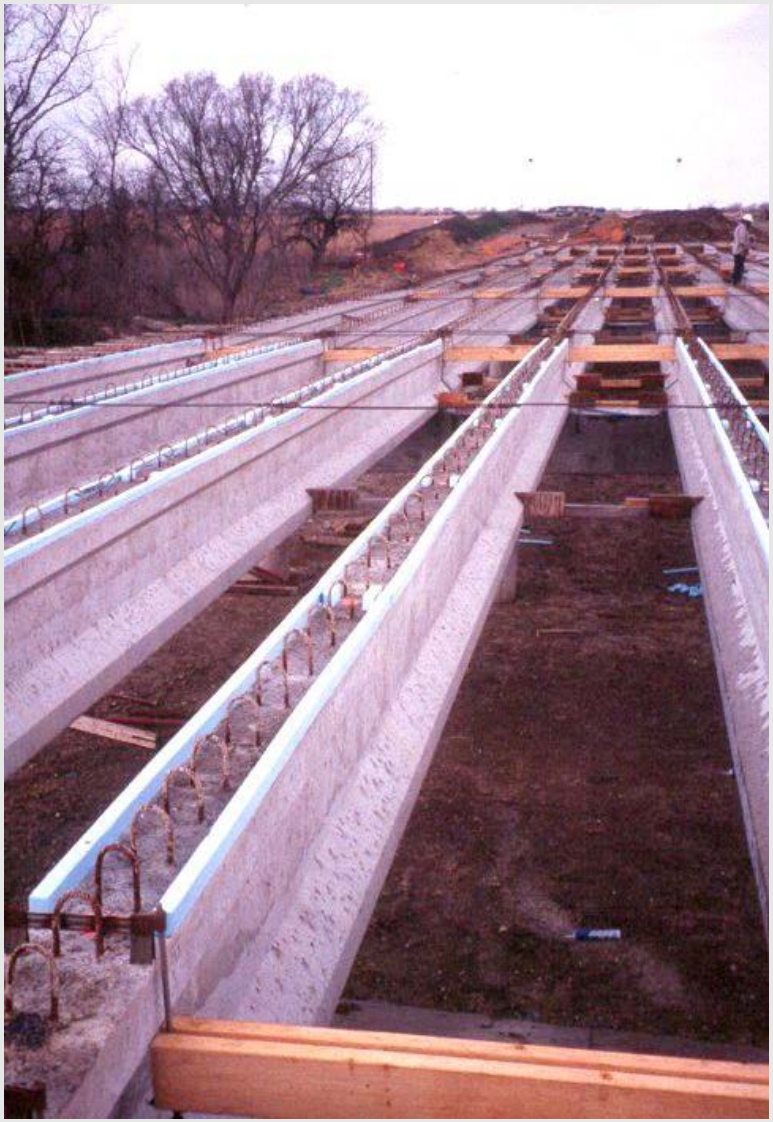
- Only one project
- Synergy with precast pavement

Precast Pavement/Approach Slabs

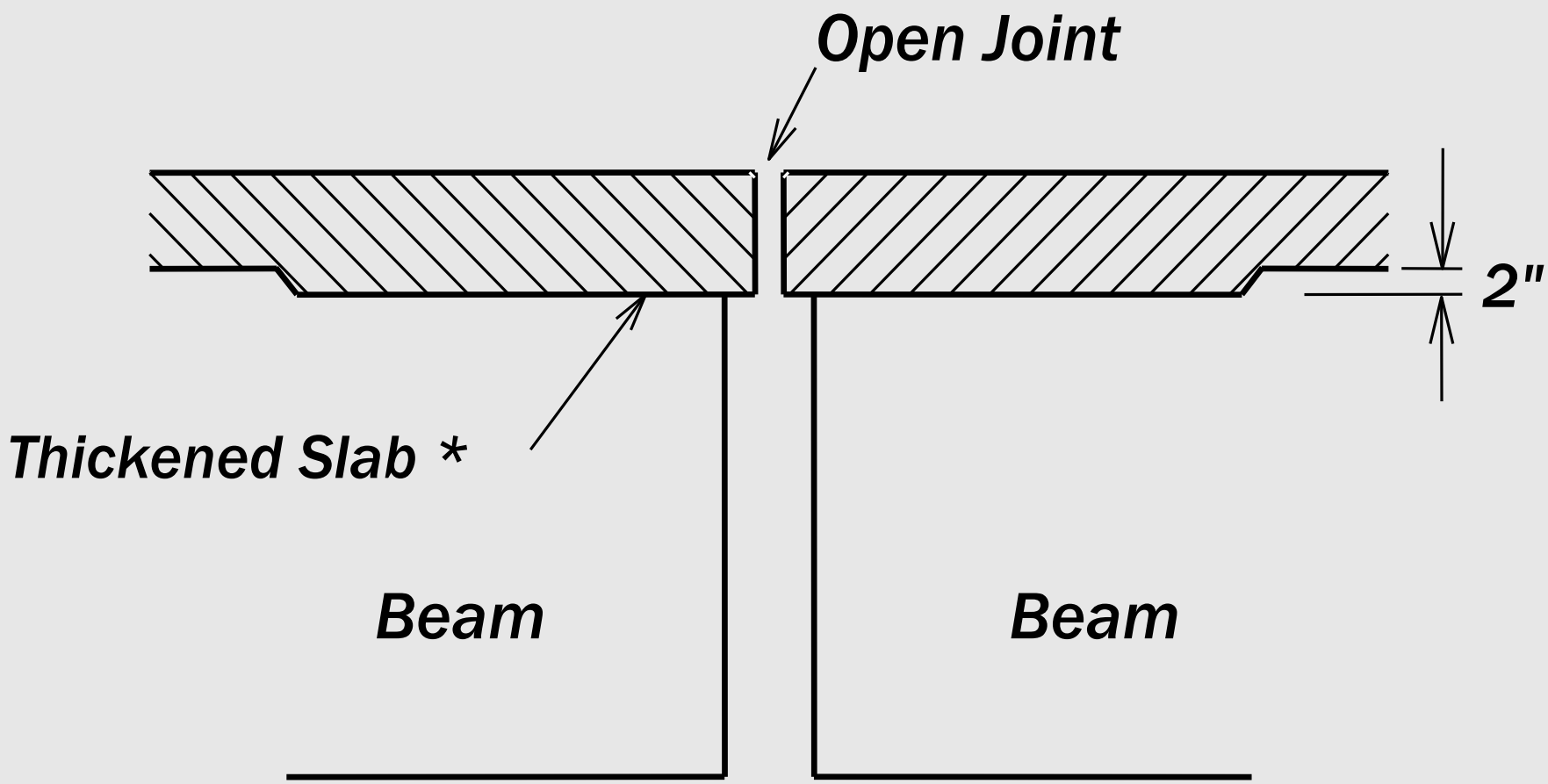
Bridge Decks

- ABC features in Texas
  - Partial depth precast concrete panels (PCP)
  - PCP's to end and skewed panels
  - Limited diaphragms
  - Empirical decks and WWR
  - Precast overhangs
  - Full depth panels

Bridge Decks: PCP



Bridge Decks: Thickened End Diaphragm



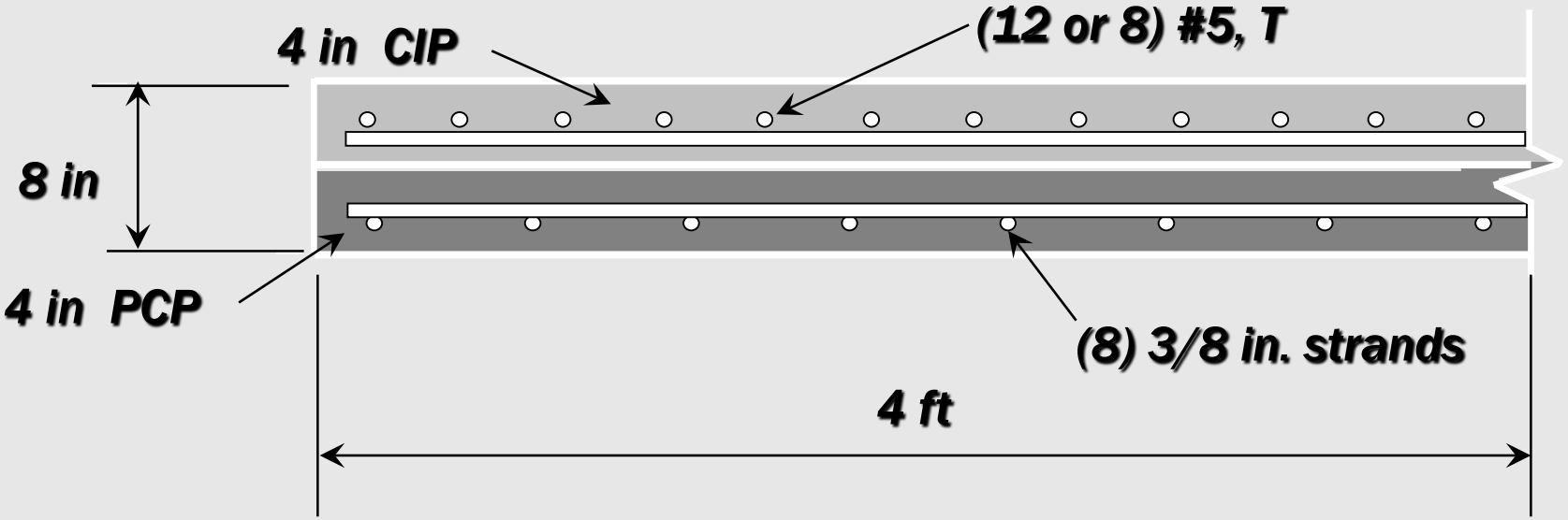
http://ftp.dot.state.tx.us/pub/txdot-info/cmd/cserve/standard/bridge/igtssts1.pdf

PCP's to End of Span

- Old way

- New way

PCP's to End of Span



PCP's to Span Ends

- Advantages
  - Safety (immediate work platform)
  - Quicker: eliminates 1 or 2 steps in construction process (setting plywood or PMDF and removing plywood)
  - Panels seal better than PMDF
  - No PMDF-beam welds to break loose
  - Cost
- Research projects 4418 and 5367
  - Ultimate capacity
  - Fatigue behavior
  - Skewed details

Precast Overhangs

Precast Overhangs

Precast Overhangs: Second Generation

Precast Overhangs: Second Generation

Precast Overhangs: Second Generation

Full Depth Precast Deck Panels

- NCHRP 12-65 / report 584 concept
- Live Oak creek bridge in West Texas

Full Depth Deck Panels

Full Depth Deck Panels: Long Line Casting at Prefabricator

Full Depth Deck Panels: Composite Connections

Full Depth Deck Panels: Panel Connections

Beam Systems

- Bulb tee section unique to Texas: TxGirder
- Slab beams and box beams
- Spread slab beams and box beams
- Spliced concrete girders

Decked Slab Beams

Decked Slab Beams

Spliced Precast Girders

Spliced Precast Girders

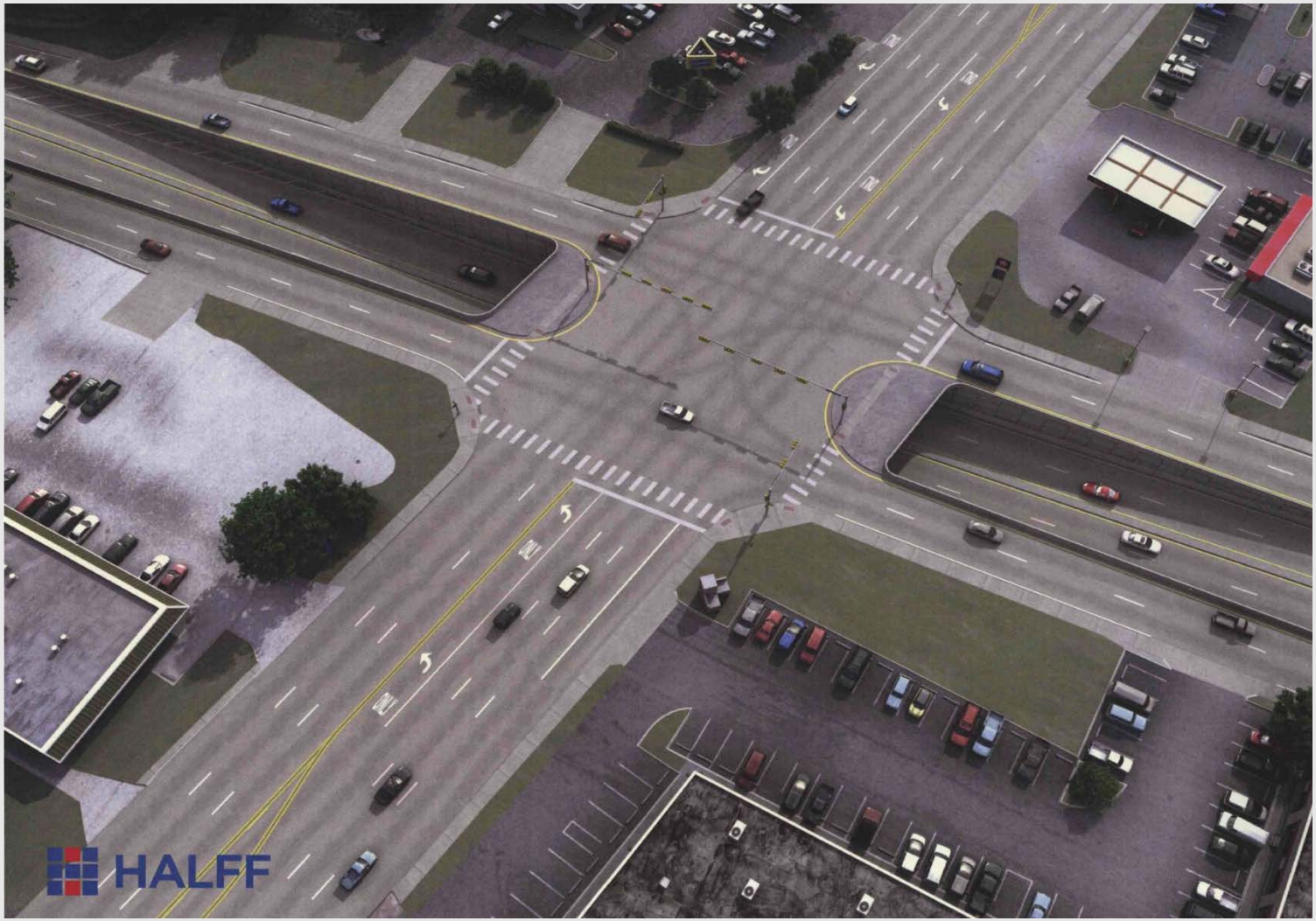
Spliced Precast Girders

Spliced Precast Girders with Haunch

Slides/SPMT/Launching/Creative Phasing

- Lateral slide
  - One project: Loop 345 San Antonio
- SPMT
  - None yet
- Launching
  - Only as an erection technique for concrete girders
- Creative phasing
  - Houston tied arches
  - West 7th precast arches

LP 345 Lateral Bridge Slide



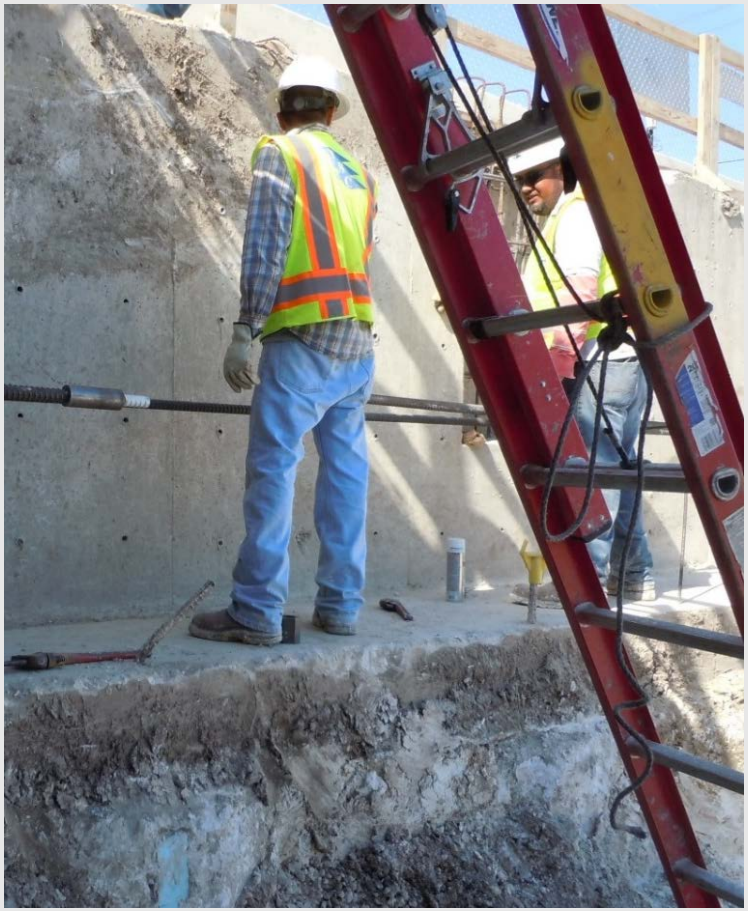
LP 345 Lateral Bridge Slide

Texas Sterling Construction | Texas Department of Transportation | H. Boyle Engineering, Inc.

LP 345 Lateral Bridge Slide

LP 345 Lateral Bridge Slide

LP 345 Lateral Bridge Slide



Houston US 59 Tied Arches

- Existing structure used as erection platform

US 59 Tied Arches

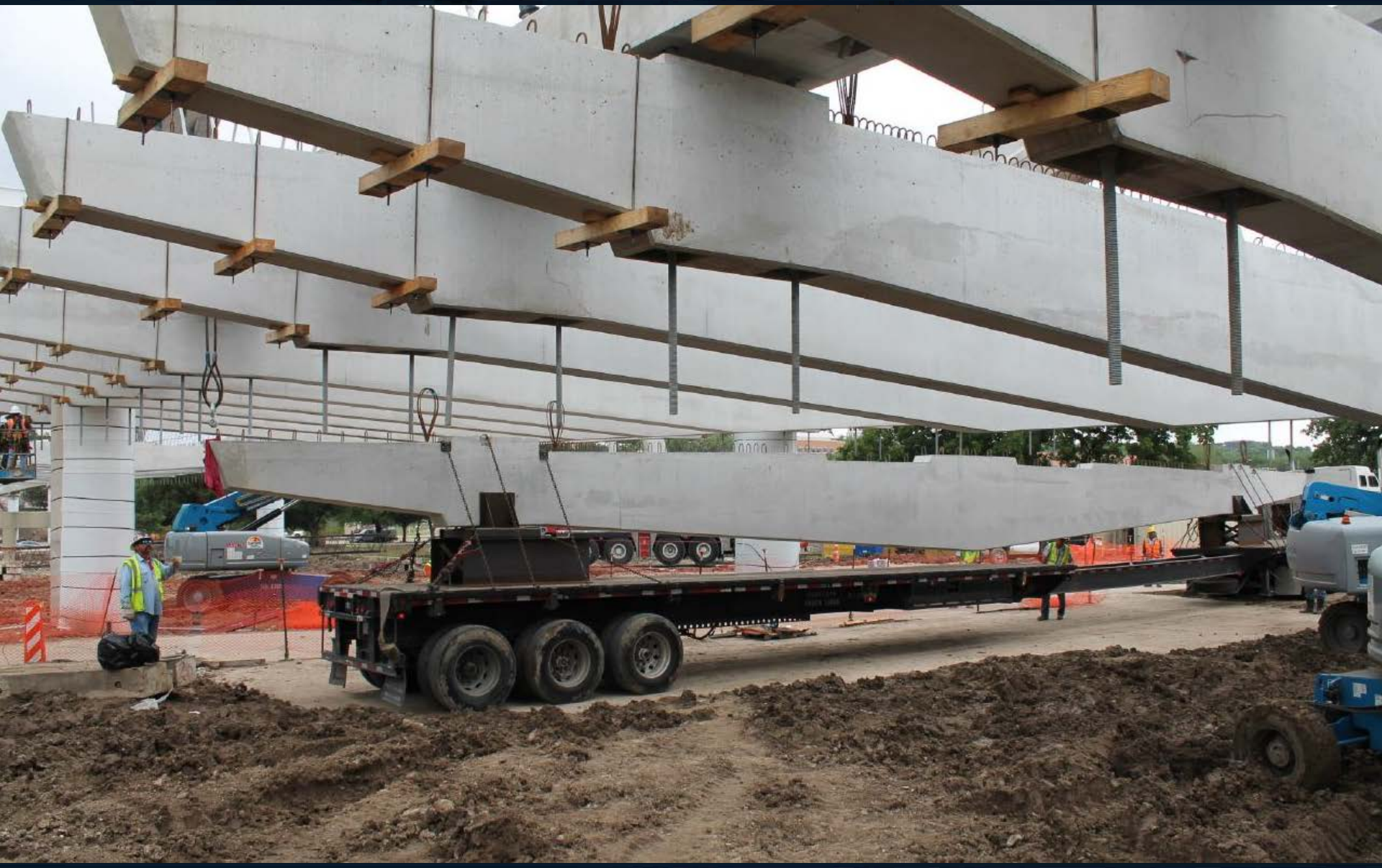
US 59 Tied Arches

West 7th Street – Fort Worth

West 7th Street – Fort Worth

- Substructure and precast arches installed outside of existing bridge
- Floorbeams and deck installed after demolition of existing structure
- Allowed 4 months of total closure
- Finished 30 days early

West 7th Street: Precast Floorbeam Installation



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OUR GOALS

MAINTAIN A SAFE SYSTEM

ADDRESS CONGESTION

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BEST IN CLASS STATE AGENCY

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