PRECAST, PRETENSIONED, BENT CAPS

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Overview

1. Cast-In-Place Bent Caps
2. First Generation Precast Bent Caps
3. Second Generation Precast Pretensioned Bent Caps
4. Current Projects
Cast-in-Place Construction
Cast-in-Place Safety
Cast-in-Place Quality

- Inconsistent concrete quality
- Cracks at Service Loading
First Generation Precast Cap

- Introduced in the 1990’s
- Used to address issues with conventional caps
US 290 Ramp G

- Precast Inverted-T straddle bents
- Lower Roadway Closure:
  - With Conventional Caps: 41 days
  - With Precast Alternative: 6 hours
Redfish Bay

- 0.5 mile bridge over Gulf Coast
- 44 Identical Bent Caps
Second Generation Pretensioned, Precast Cap
Design Concept

- Symmetric Strand Pattern
- Mimic TxGirder grid system
Strength & Service Design

- $\Phi M_{n,\text{prestressed}} \geq \Phi M_{n,\text{conventional}}$
- Match Shear Reinforcing
- Initial Stress for Storage/Lifting
- Service Limit Stress
1 Team of 5 workers can:

Construct 3 CIP caps in 8 days
Install 12 PC caps in 1 day
Applicability/Limitations

- Assess practicality of Precast vs Conventional
- Current Design only for Rectangular Bent Caps
- Check Development and Confinement
- Ensure Adequacy of Cap to Support Connection
LP 1604 Bexar County, San Antonio, TX

- 36 Bents Total (18 NB, 18 SB)
- Identical Length and Column Spacing
FM 973 over Colorado River, Austin, TX

- 8 Bents Total (4 NB, 4 SB)
- Accelerated Construction Timeline
Conclusions

- Reduced Construction Time
- Increased Safety
- Improved Structural Performance
Acknowledgements

- Fabricator:
  - Bexar Concrete Works

- Contractor:
  - Texas Sterling Construction Co.
  - Lane Construction
Any Questions?

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