Effects of Construction on Shaft Performance

Part II: Temporary Casing in Rock Sockets

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Part II: Problem Statement

- Construction methods affect drilled shaft side shear resistance which is not fully addressed by design.

- The effects from full length or partial length temporary casing can present the same concern.

- The primary objective of this study is to quantify the effects of temporary casing installation and extraction on the resulting side shear in the portions of the rock sockets used to embed and seal the casing.
455-15.7 Casings. Ensure casings are metal . . .

. . . . If temporary casing is advanced deeper than the minimum top of rock socket elevation shown in the Plans or actual top of rock elevation if deeper, withdraw the casing from the rock socket and overream the shaft. If the temporary casing cannot be withdrawn from the rock socket before final cleaning, extend the length of rock socket below the authorized tip elevation one-half of the distance between the minimum top of rock socket elevation or actual elevation if deeper, and the temporary casing tip elevation.
Research Approach

- Task 1 Literature Review
- Task 2 Small Scale Side Shear Test Setup
- Task 3 Small Scale Side Shear Testing and Analysis
- Task 4 Full Scale Field Testing
- Task 5 Draft Final and Final Report
Casing Conditions

- **Permanent**
  - Full length
  - Partial length

- **Temporary**
  - Full length
  - Partial length

- **Telescoping / Combination**
Misconceptions

- Use of casing makes more predictable shaft
- No anomalies occur within permanent cased regions
- Temporary cased sections have more reliable cross sections
Slump Loss in Temporary Casing

![Graph showing relationship between slump at casing extraction and mobilized unit skin friction.](image-url)
Spacing vs Aggregate Size

FHWA Recommended Minimum CSD (3 - 5)

Recommended CSD Range (> 8)

See Figure 7-12
Temporary Casing Removal

(I) Slurry filled cavity formed outside the casing

(II) Pile concreted, casing lifted in cavity under pressure

(III) Casing is lifted higher, concrete slumps into the void contaminated slurry flows into pile
Quantifying the Effects

- How does temporary casing affect the resulting side shear?
- Does concrete flow out and form intimate bond with surrounding rock?
  
  or

- Do residual fragments of crushed rock remain and get squeezed/trapped between outward flowing concrete?
Construction with temporary casing
Effects of casing extraction
Construction of rock sockets
Effects on the side resistance (O’Neill and Hassan, 1994)
Geology of Florida

Silty to finely sandy dolostone
Clayey sands to silty clays
Suwannee Limestone
Ocala Limestone
Avon Park Formation (limestones interbedded with dolostones)
Geology of Florida

- Clayey sands to silty clays
- Suwannee Limestone
- Ocala Limestone
- Sands and limestones, mainly
- Miami Limestone
- Sands and limestones, mainly
- Avon Park Formation (limestones interbedded with dolostones)
Need for Data Sets

- Unpublished load test results
- FDOT load test database??
- District Engineers
- Consultants
Questions for Part II?