



Drilled Shaft Installations, Specifications, Clarifications.

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Installation and Testing Requirements of Drilled Shafts Supporting Miscellaneous Structures



Drilled Shafts Installed For Supporting Misc. Structures Should be Constructed and Inspected at the same rigor as Drilled Shafts for supporting Bridge Structures.

Approval of Drilled Shafts for Miscellaneous Structures (like Shafts for Bridge Structures) are NOT under CQC



DRILLED SHAFTS

Differences between bridge drilled shafts and drilled shafts supporting miscellaneous structures

	Bridges	Miscellaneous Structures
Equipment	Drill to deepest shaft shown in the plans plus 15 feet or plus three times shaft diameter	Drill to deepest shaft shown in the plans plus 5 feet
Excavations	Test holes performed	No test holes done
Steel Temporary Surface Casing	Bridge and all shafts greater than 60" – 1-1/2 times shaft diameters below ground	60" or less, set 1 foot above ground and 5 feet below ground
Slurry	<ul style="list-style-type: none"> a. No polymer b. mineral introduced at any time c. Approved soil testing lab d. Slurry reports signed and sealed by a Specialty Engineer 	<ul style="list-style-type: none"> a. Added prior to auger advancing to bottom of casing b. Cannot use natural slurry c. Approved soil testing lab d. Slurry reports signed and sealed by a Specialty Engineer
Shaft Cleanliness	Bridge and all shafts greater than 60" – 50% of bottom less than ½ inch	60" or less, 1 inch
Time of Excavation	Bridge and all shafts greater than 60" – 36 hours when using slurry and 12 hours if slurry in contact with bottom of shaft	60" or less, 12 hours when using slurry



Temporary Surface Casing



- Precludes the sides of the shaft at the surface from caving in.
- Provides additional slurry head to maintain the integrity of the shaft
- Provides a safer work platform for the workers as they work around the shaft.



Why use slurry

- Maintain stability of the excavation.
- Prevent suspended particles from settling to the bottom.
- Allow clean displacement by concrete.



Exceptions for Drilled Shafts for Miscellaneous Structures

455-15.8.3 Exceptions for Drilled Shafts for Miscellaneous Structures: For drilled shafts up to 60 inches in diameter installed to support mast arms, cantilever signs, overhead truss signs, high mast light poles or other miscellaneous structures:

- a. Provide temporary surface casings from at least one foot above the ground surface to at least five feet below the ground surface to aid shaft alignment and position, to prevent sloughing of the top of the shaft, to provide for additional slurry head inside the shaft and to facilitate over pouring of the shaft during concreting.
- b. Fill the excavation with premixed mineral slurry meeting the requirements of 455-15.8.1 or polymer slurry meeting the requirements of 455-15.8.2 before the drill advances to the bottom of the temporary casing. Do not attempt to excavate the shaft excavation using plain water or “natural” slurry. Polymer slurry may be mixed in the field in accordance with the manufacturer’s published procedures.



Slurry Test Requirements

When using slurry, engage an approved soil testing laboratory to provide a CTQP qualified drilled shaft inspector, or provide an experienced person approved by the Engineer to perform slurry testing. The Department may also perform comparison tests. Provide equipment for such comparison tests when requested by the Engineer.

Furnish reports of all mineral slurry tests required above, signed and sealed by a Specialty Engineer, representing the soil testing laboratory to the Department on completion of each drilled shaft.



Slurry Requirements

For drilled shaft supporting miscellaneous structures, maximum of 2% of polymer additives are permitted to add to Mineral slurry. This mixture is considered as Mineral Slurry. (State Structures Office communication)

Research just started about the hybrid slurry (polymer slurry added to mineral slurry).

Slurry properties for pure mineral slurry and pure polymer slurry usages were established in the latest 455 specifications. However when hybrid slurries made from polymer fortified minerals or admixtures are added to the mineral slurry to modify performance questions remain as to the full effect of these products. To that end, it is unclear if either set of the present slurry property specifications (viscosity, density, pH, and sand content) is more appropriate for hybrid slurries. This forms the basis of the proposed study.



SPECIFICATION 346: TARGET ZONE REMOVAL

The target range requirement will be eliminated in the next 346 Specification revision (Implementation July 2010)

Water can be added as long as slump is inside the tolerance range and the W/C is not exceeded

If the slump is outside the tolerance range but the concrete is placed instead of being sent back to the plant then a price adjustment will be made of twice the invoice price of that load

No price adjustment will be made if the Engineer authorizes concrete placement even if the slump is outside of tolerance

**FLORIDA DEPARTMENT OF TRANSPORTATION -
STATE CONSTRUCTION OFFICE**



CLARIFICATION OF 455-16.3

455-16.3 Provide spacers at the bottom of the drilled shaft reinforcing cage to maintain the specified distance between the bottom of the cage and the bottom of the shaft. Use a minimum of one spacer per 30 inches of cage circumference with a minimum of three spacers. Use spacers constructed of approved material equal in quality and durability to the concrete specified for the shaft. The Engineer will approve spacers subject to satisfactory performance in the field.

Check the elevation of the top of the steel cage before and after placing the concrete. If the rebar cage is not maintained within the specified tolerances, correct it as directed by the Engineer. Do not construct additional shafts until modifying the rebar cage support in a manner satisfactory to the Engineer.



CLARIFICATION OF DCE MEMO 10-09

If the contractor over excavates the planned elevation then the DCE memo 10-09 becomes applicable. And the contractor must detail his means and methods of shaft installation in the Drilled Shaft Installation Plan.

455-16.3..... Last paragraph

Check the elevation of the top of the steel cage before and after placing the concrete. If the rebar cage is not maintained within the specified tolerances, correct it as directed by the Engineer. Do not construct additional shafts until modifying the rebar cage support in a manner satisfactory to the Engineer.



Tremie / Pump line Embedment



- **455-15.9.3** Ensure that the discharge end of the tremie or pump line is embedded at least 10 feet into the concrete at all times during placement operations after 10 feet of concrete has been placed.



Installation of Electrical Conduits



- When inserting conduits, need to know where the vertical rebars are and then count down the seven horizontal hoops (standard index 17745) to find open area.



Good Quality Concrete

Specification 455-17.3 indicates that if the top of shaft elevation is above ground, then the top is to be formed with a removable form. Specification 455-17.1 states that the concrete is to be placed continuously in the shaft to the top elevation of the shaft. And continue placing concrete until good quality concrete is evident at the top of the shaft. The tremie or pump line cannot be pulled until such time that good quality concrete overflows the top of shaft elevation represented by the removable form



GOOD



BAD



Responsibility of Inspection and Documentation

Shaft Installation inspection and documentation is the responsibility of the Department/CEI. Per CPAM Chapter 10.5



Post Concrete Pour

- Contractor inserts anchor bolts into shaft
- Contractor finishes the top of the shaft
- Top and sides of shaft are cured



Cross hole Sonic Logging





Cross hole Sonic Logging

- When to do CSL testing:
 - When a shaft is rejected due to concrete placement logs or the engineer / Inspector observes problems during drilled shaft construction

- What does CSL testing do?
 - CSL test results can locate anomalies by depth and quadrant.

- When to do CSL offset testing?
 - Conduct offset CSL measurements between all tube pair combinations in any drilled shafts with 30% or greater in velocity reduction



Cross hole Sonic Logging

Advantages of Cross-Hole Sonic Logging :

- No shaft length limit for testing.
- Locates defects throughout shaft.
- Interpretation of results is relatively easy.
- Test data not affected by soil/rock resistance.



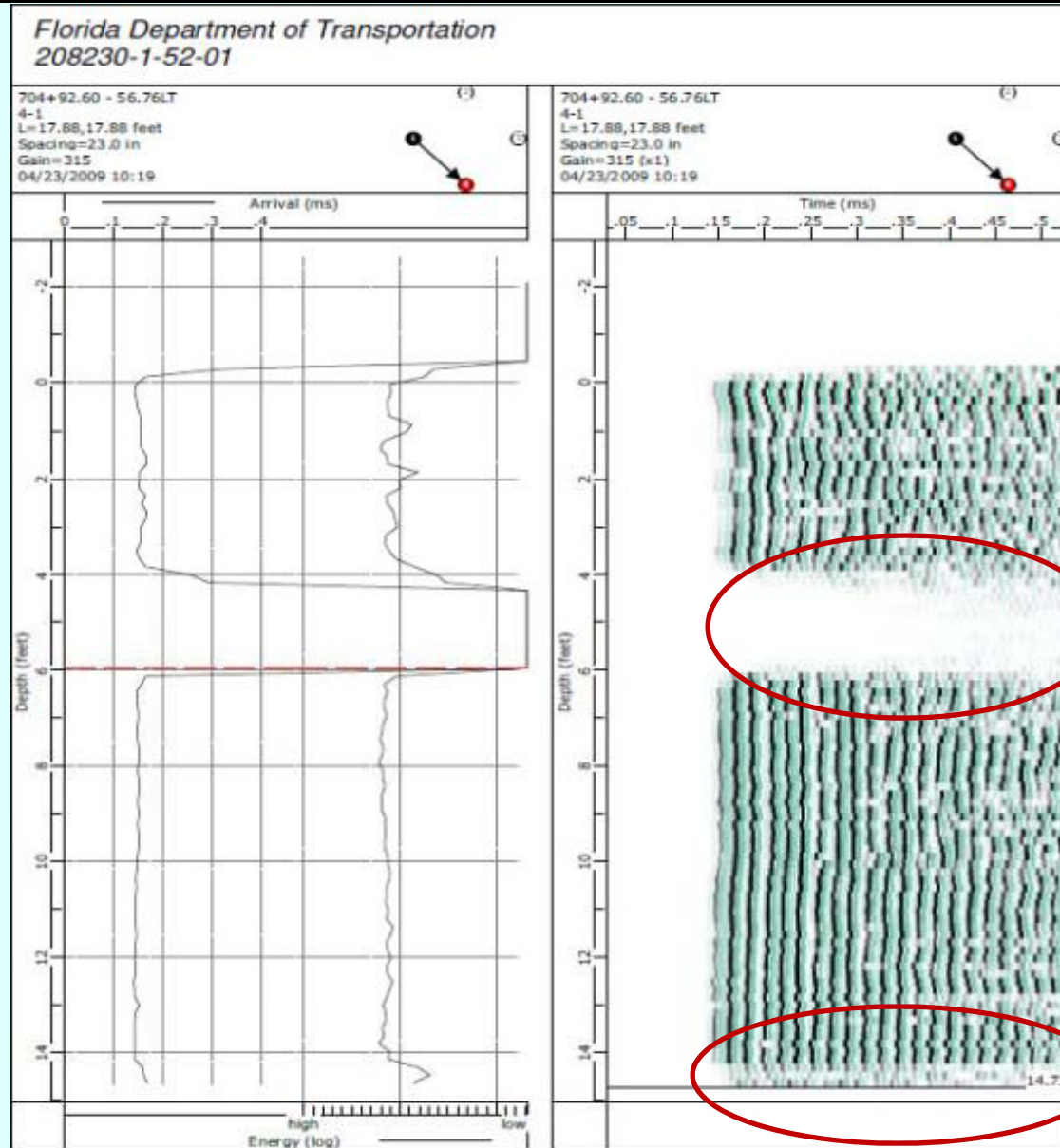
Cross hole Sonic Logging

Limitations of Cross-Hole Sonic Logging:

- Requires planning for access tubes placement during shaft installation.
- Cannot assess concrete outside of steel cage, or below access tubes length.
- Cannot “see” fine cracks.



Cross hole Sonic Logging

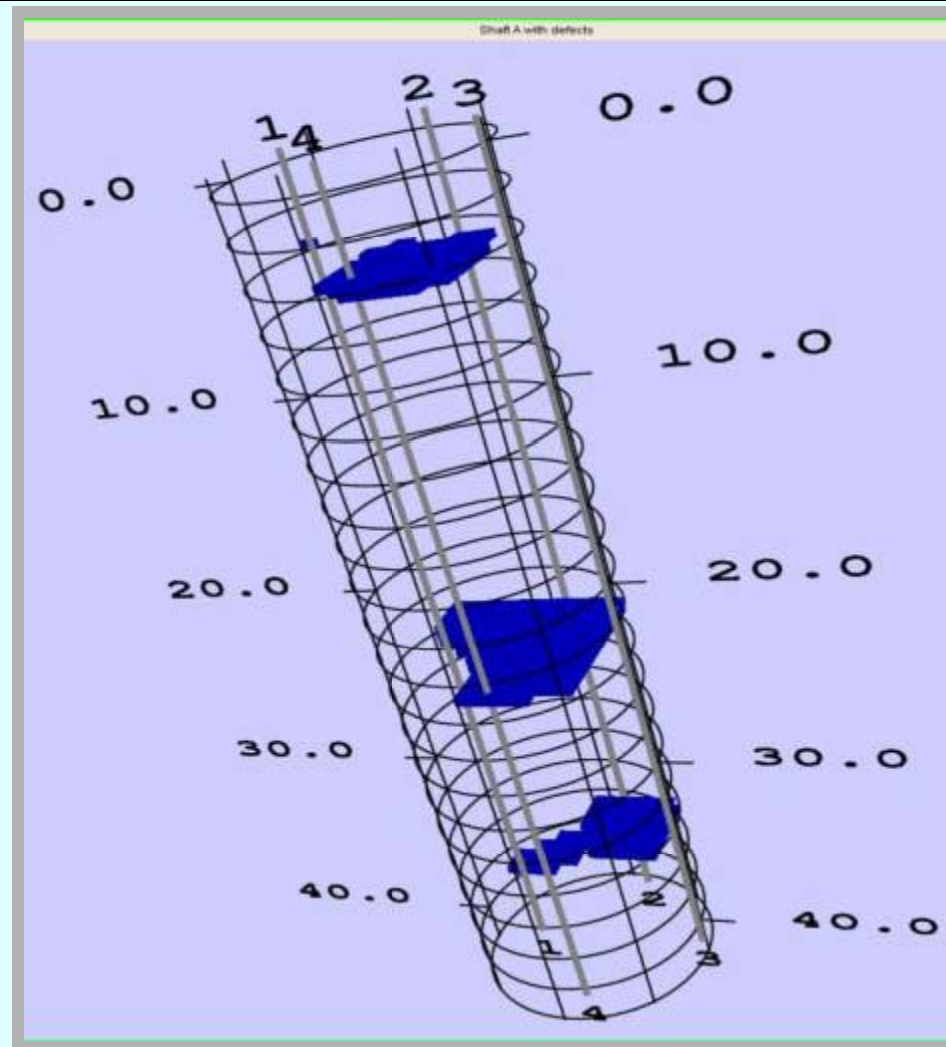


Anomaly

Anomaly



Cross hole Sonic Logging



3D Tomography



Drilled Shafts



Example of too much sediment in bottom of shaft



Drilled Shafts





Drilled Shafts



Example of caving of surface soils and not over filling shaft until good quality concrete is evident at top of shaft



THANK YOU