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ARIZONA
DEPARTMENT OF TRANSPORTATION

**STANDARD
SPECIFICATIONS**

for

**ROAD AND BRIDGE
CONSTRUCTION**



2008

SECTION 609

If the testing indicates the presence of voids, intrusions or zones of unconsolidated concrete in the drilled shaft foundation, or if the Engineer determines that construction defects may have occurred, the contractor shall conduct three-dimensional tomographic surveys of the anomalies, at no additional cost to the Department. If testing cannot be performed because of blockage of the tubes, the contractor shall core-drill or otherwise determine the extent of any defects in the concrete as approved by the Engineer. The contractor shall repair, replace, or supplement the defective work in a manner approved by the Engineer, which may include constructing one or more additional drilled shafts at the locations directed by the Engineer, at no additional cost to the Department.

Concrete volumetric charts shall be completed for every drilled shaft.

After all inspection has been completed, all holes and test pipes in all drilled shaft foundations shall be filled with an approved grout from the bottom up.

609-3.06 Reinforcing Steel, Cage Construction and Placement:

The reinforcing steel cage for the drilled shaft, consisting of longitudinal bars and spiral hooping or lateral ties shall be completely assembled and placed into the shaft as a unit. All reinforcing steel intersections shall be tied as specified herein. The reinforcing steel unit shall be placed in the shaft no sooner than two hours prior to the start of concreting operations, and shall be placed in accordance with the details shown on the plans.

If approved in writing by the Engineer, bundling of vertical or horizontal reinforcing steel may be allowed if necessary to maintain a minimum bar spacing equal to five times the maximum aggregate size of the concrete. Bundling of spiral reinforcing will not be allowed. A maximum of three bars may be bundled. Bundled vertical or horizontal steel shall be spaced uniformly. The contractor shall also make the necessary modifications, in accordance with the appropriate ACI specifications, to the splicing and tying details for the reinforcing steel, and submit these to the Engineer for approval along with the contractor's request for bundling of steel.

The reinforcing cage shall be adequately supported and anchored from the top to prevent movement from the required location during and for four hours after completion of concrete placement. If temporary casing is used, the reinforcing cage shall be supported prior to removing casing, and for four hours following removal of the casing. The rebar cage shall be kept plumb. The rebar cage shall not rest directly on the bottom of the excavation. Spacers shall be at sufficient intervals along the shaft to ensure concentric location of the reinforcing cage for the entire length of shaft. Spacers shall be placed at a maximum vertical spacing of 15 feet, with a minimum of four spacers around the circumference at each vertical elevation. For all drilled shafts of less

than six feet in diameter, the spacers shall provide for a minimum of three inches of concrete cover between the reinforcing steel and the excavation wall. For all drilled shafts of six feet in diameter or greater, or for drilled shafts of any diameter constructed with the wet method, the spacers shall provide for a minimum of six inches of concrete cover between the reinforcing steel and the excavation wall. Only spacers approved by the Engineer shall be allowed, and in no case shall "dobies" or other rectangular "blocks" tied to the reinforcing steel be allowed in excavations with the wet method. When "dobies" are used, they shall be made from concrete of the same compressive strength as the concrete used in the drilled shafts.

If the shaft is lengthened and the plans indicate full depth reinforcement, the Engineer shall be notified to determine if extension of the reinforcement is needed. The Engineer will provide details for additional reinforcing if required. Such additional reinforcing will be paid for in accordance with Subsection 109.04.

The contractor shall submit a written request to the Engineer for approval of any variation from the splices for reinforcing steel specified in the contract documents.

All reinforcing cages shall be fabricated and supported to avoid damage during the lifting and placing. Any temporary bracing and supports shall be removed prior to final placement. Equipment used for lifting reinforcing cages shall have adequate capacity and boom length to lift the cage clear of the ground. Reinforcing cages shall not be dragged while being moved. Reinforcing cages shall be placed with splices in the lowest possible position within the excavation.

609-3.07 Concrete Placement:

(A) General:

The contractor shall begin placement of concrete within 24 hours after the completion of the drilled shaft excavation. All concrete shall be placed in accordance with Section 601 and as specified herein. If slurry excavation is used, concrete shall be placed the same day the excavation is completed. Unless otherwise specified in the project documents, or as directed by the Engineer, the slump shall be five \pm one inches for dry, uncased excavations. For all others, the concrete slump shall be eight \pm one inches at the time placement begins.

Prior to concrete placement, the contractor shall make all necessary arrangements to assure the uninterrupted delivery of concrete so that all drilled shaft foundations will be constructed without cold joints. During concrete placement, from start to finish, the rate of rise of the top of concrete in the drilled shaft shall be at least 40 feet per hour.

Tremie downpipes and pump pipes shall be made of steel; no aluminum shall be allowed. The inside diameter of the tremie pipe shall be at