NEW MEXICO DEPARTMENT OF TRANSPORTATION
SUPPLEMENTAL SPECIFICATIONS FOR

DRILLED SHAFT CONCRETE BEARING PILES
SECTION 502

All pertinent provisions of the New Mexico Department Of Transportation's Standard Specifications For Highway And Bridge Construction shall apply in addition to the following:

Delete SECTION 502 - DRILLED SHAFT CONCRETE BEARING PILES in its entirety and substitute the following:

502.1 DESCRIPTION.

502.11. This work shall consist of furnishing all necessary labor, material and equipment and performing all operations needed to construct "drilled shaft" concrete bearing piles (hereafter referred to as drilled shafts). Construction of drilled shafts, with or without underreamed bottoms ("bell bottoms"), shall include the placing of reinforcing steel and concrete. Drilled shafts shall conform to and be constructed in accordance with the specifications and at the location, elevation and details shown in the contract.

502.12 Work Experience. Within the last two years prior to the bid date for the particular project, the Contractor or subcontractor performing the work must have been involved in the successful construction of at least two projects involving the type and the method of construction that is required of those shown in the contract. The superintendent who will be in charge of the work shall have been the superintendent on at least one of the projects listed. The Contractor or subcontractor, if the work is subcontracted, shall be able to demonstrate to the satisfaction of the State Geotechnical Engineer the ability to satisfactorily complete the work.

502.13 Approvals. All submittals as required below shall be made to the Project Manager for approval by the State Geotechnical Engineer. All other construction and/or field design changes will be submitted to the Project Manager for review and approval by a Department Foundation Engineer who will be assigned by the State Geotechnical Engineer.

502.2 MATERIALS.

502.21 General. Materials for drilled shafts shall conform to the requirements of the specified AASHTO, ASTM material specifications, or referenced Sections of the Standard Specifications as listed in Table 502-A.

Table 502-A
APPLICABLE BEARING PILE STANDARDS

Material Description	Standard
Portland Cement Concrete, Class G	Section 510
Reinforcing Steel Cage	Section 540
Reinforcing Steel HP Pile	AASHTO M 183
Permanent Steel Pipe Casing	AASHTO M 183

502.22 Additional Requirements. The following material requirements for drilled shafts shall be in addition to the referenced specifications.

502.221 Concrete. See Section 510 for Class G concrete mix requirements for admixtures, and slump.

502.222 Temporary Casings. Temporary casings shall be steel and shall be smooth, clean, watertight and of ample strength to withstand both handling and driving stresses and the pressures of concrete and the surrounding soils. The outside diameter of the casing shall be at least the size of shaft specified in the contract.

502.223 Permanent Casings. The wall thickness of permanent casings shown in the contract is the minimum thickness required for the constructed condition of the shaft. The Contractor shall provide a greater wall thickness as necessary, to withstand handling and installation stresses. The dimensions of casings are subject to American Pipe Institute tolerances applicable to regular steel pipe. When approved, the Contractor may elect to provide a casing larger in diameter than shown in the contract at no increase in contract unit price.

502.3 CONSTRUCTION REQUIREMENTS.

502.31 Equipment. The Contractor's equipment shall be suitable for the design requirements of the foundation and for the materials encountered in excavating the shaft and underreams. The equipment shall meet the general requirements as follows:

502.311 Excavation and Drilling Equipment. The excavation and drilling equipment shall have kelley bar length, adequate power, torque and down thrust to excavate a hole of the specified diameter to a depth of 20% beyond the depths shown in the contract. The excavation and underreaming tools shall be of adequate design, size and strength to perform the work shown in the contract. Excavation equipment shall be capable of producing a completed shaft excavation having a planar bottom. The cutting edges of the excavation equipment shall be normal to the vertical axis of the equipment within a tolerance of ± 30 mm/m (± 0.36 in./ft) of diameter. As a minimum, underreaming tools shall be capable of excavating to at least the bearing area and height shown in the contract. Actual base diameter produced by the Contractor's tool shall not exceed three times the specified shaft diameter. All other plan dimensions shown for the underreaming may be varied, when approved by the Foundation Engineer, to

accommodate the Contractor's equipment. When overreaming of the shaft sidewall is required by the Foundation Engineer, an overreaming bucket, grooving tool, or other approved equipment shall be utilized. The overreaming tool shall effect an oversized shaft diameter to a minimum of 15 mm (0.6 in.) and a maximum of 75 mm (3 in.). When the material encountered cannot be drilled, using conventional earth augers with soil or rock teeth, drill buckets, or underreaming tools, the Contractor shall provide special drilling equipment including, but not limited to rock core barrels, rock tools, blasting materials, and other equipment as necessary to construct the shaft excavation required. Approval by the Project Manager is required before blasting is permitted.

502.312 Slurry Equipment. Desanding equipment shall be provided by the Contractor as necessary to control slurry sand content to less than 8% by volume for mineral slurry and 1% by volume for polymer slurry at any point in the shaft excavation after recycling or equilibrating the slurry in the shaft. Slurry tanks of adequate capacity shall be required for slurry circulation, storage, and treatment. No excavated slurry pits will be allowed in lieu of slurry tanks without the written permission of the Project Manager. A slurry sampling tool shall be utilized by the Contractor for making the required slurry control tests as covered in subsection 502.342(c), 2, Slurry Control Tests. The slurry sampler shall consist of a cable with a weighted cone shaped stopper, a cylindrical sampler center stayed for alignment, and a top stopper with a hole drilled through the center for slipping onto the cable.

502.313 Concrete Placement Equipment. Depending on the type of shaft construction, placement of concrete in the excavated shaft shall be accomplished with a rigid tremie pipe, a concrete pump line, or a drop chute.

A. Tremies. Rigid tremie pipe used to place concrete shall consist of a tube of sufficient length, weight, and diameter to discharge concrete at the shaft base elevation. The tremie shall not contain aluminum parts which will have contact with the concrete. The tremie inside diameter shall not be less than 250 mm (10 in.). The inside and outside surfaces of the tremie shall be clean and smooth to permit both flow of concrete and unimpeded withdrawal during concreting. The wall thickness of the tremie shall be adequate to prevent crimping or sharp bends which restrict concrete placement. The tremie used for slurry displacement concrete placement shall be watertight. In slurry displacement shafts, a plug, valve, or bottom plate shall be used to separate the concrete from the displacement fluid until the concrete is flowing through the orifice. Plugs, if left in the shaft concrete, shall be of a material approved by the Project Manager, which will not cause a defect in the shaft. The discharge end of the tremie shall be constructed to permit the free radial flow of concrete during placement operations.

B. Concrete Pumps and Lines. All pump lines shall be a minimum of 125 mm (5 in.) in diameter (Schedule-40 steel pipe or heavier) constructed with watertight joints. A plug shall be as described for tremies.

C. **Drop Chutes.** Drop chutes shall consist of a rigid pipe of either one piece construction or sections, which can be added and removed from a metal hopper. Flexible trunk line hose will not be permitted.

502.32 Submittals. For the particular type of drilled shaft construction identified herein, the Contractor shall furnish the required submittals to the State Geotechnical Engineer for review and approval. Where the Contractor has provided Work Experience and Proposed Construction Procedure submittals to the State Geotechnical Engineer from previous Department projects of similar size, difficulty and geology, and has had successful completion of those projects, the Contractor may reference the previously completed project(s) in lieu of the detailed submittal requirements listed below.

502.321 Work Experience. Documentation shall be submitted verifying that the Contractor or subcontractor has performed the required work experience as described in subsection 502.12, Work Experience. Such documentation shall include the names and phone numbers of owners' representatives who can verify the Contractor's successful completion of the projects listed.

502.322 Proposed Construction Procedure. At least 30 days before work is to begin, the Contractor shall submit a complete written description of the Contractor's proposed construction procedure. The information required in this submittal shall be as follows:

A. Name and experience record of the superintendent in charge of drilled shaft operations;

B. List of proposed equipment to be used including cranes, drills, augers, bailing buckets, final cleaning equipment, desanding equipment, slurry pumps, core sampling equipment, tremies or concrete pumps, casing, etc.;

C. Description of overall construction operation sequence;

D. Description of shaft excavation methods;

E. Details of the methods to mix, circulate, and desand slurry, when slurry is required;

F. Manufacturer and type of apparatus to be used to test slurry as required;

G. Description of methods to clean the shaft excavation;

H. Details of reinforcement placement including support and centralization methods; and

I. Details of concrete placement including proposed operational procedures for free fall, tremie or pumping methods.