and at the times determined by the Engineer to ensure that the slurry within the entire excavation meets these Specifications.

Perform sand content tests on slurry samples taken from the bottom of the shaft after placement of the reinforcing cage, but immediately before pouring concrete. Do not place concrete until all testing produces acceptable results.

a. Viscosity: Produce slurry with a viscosity within the range of 30 to 45 seconds per quart (32 to 48 seconds/liter), as measured by the Marsh Cone Method.

b. Density: Produce slurry with a density within the range of 66 to 73 pounds per cubic foot (1060 to 1170 kilograms per cubic meter). If the sidewalls are unstable, or if artesian flow is present, use a weighing additive to increase the density.

c. pH: Produce slurry with a pH within the range of 8 to 11. The pH of the mineral slurry may be adjusted with the use of soda ash.

d. Sand Content: Measure the sand content of the slurry at the bottom of the shaft by the sand content test just prior to concrete placement. When the sand content at the bottom of the shaft exceeds 4%, clean the bottom of the shaft using desanding or other equipment that is approved by the Engineer.

When using polymer slurry, adhere to the following requirements:

1. Submittals: A minimum of 30 working days prior to the use of polymer slurry, submit the following information to the Engineer:

a. A list of ten projects and locations where the polymer slurry has been successfully used on projects of similar size and scope.

b. Project owner names and contact phone numbers

c. Diameter and depth of drilled caissons used on these projects.

Do not use the polymer slurry until the Engineer has reviewed and approved the submittal in writing.

2. Manufacturer's Representative: Ensure that a representative of the polymer slurry manufacturer is on site to provide assistance and guidance with the construction of the test excavation (if applicable), the demonstration caisson (if applicable), the load test caisson (if applicable), and the first two production caissons. Ensure that this representative is also available for on-site assistance if problems with the polymer slurry are encountered with the construction of the remaining production caissons. The cost of all on-site assistance and representation will be considered incidental to the cost of the drilled caissons.

3. Premixing: Mix the polymer thoroughly in a clean, separate vessel using clean water that meets the requirements of section 880 of the Standard Specifications prior to placing the slurry in the excavation. Add polymer to water flowing through a hose, across a stationary surface into a vessel. Mix the polymer for the time recommended by the manufacturer to allow the polymer to develop adequate viscosity to be self-suspending.

4. Testing: Provide the equipment necessary to sample the polymer slurry from the bottom of the excavation, from the upper portion of the excavation, and from the slurry supply tank or vessel at regular intervals during the excavation process. Provide the equipment and materials needed to perform density, viscosity, pH, and sand content tests on these slurry samples. Perform all tests in the presence of the manufacturer's representative and the Engineer. Perform the viscosity, pH and density tests on the polymer slurry taken from the mixing tank or vessel prior to the introduction of the polymer slurry into the excavation. After the polymer slurry is in the excavation, perform all tests (i.e. viscosity, density, pH, and sand content) at the bottom and at the upper section of the excavation, at intervals determined by the Engineer. Maintain written records, showing viscosities, pH values, densities, sand content, times, dates, and depth or locations from which samples were taken.

Perform sand content, density, viscosity, and pH during the static period (the period when the polymer slurry is stabilized and shows no further change over a 30-minute interval during which the excavation is completely static), from mid-point of the excavation and from within 24" (610 mm) of the bottom. Do not place concrete until all testing produces acceptable results as follows:

a. Viscosity: Produce polymer slurry with a viscosity within the range of 30 to 125 seconds/quart (32 to 132 seconds/liter) during drilling and less than or equal to 60 seconds/quart (63 seconds/liter) just prior to placing concrete, as measured by the Marsh Cone Method.

b. Density: Produce polymer slurry with a density within the range of 64 lb/ft^3 (1025* kg/m^3) to 67 lb/ ft^3 (1073* kg/m^3). A weighing additive may be used to increase the density of the polymer slurry if the sidewalls are unstable or if artesian flow is present.

c. pH: Produce polymer slurry with a pH within the range of 8 to 11. The pH of the mix water may be adjusted with the use of soda ash.

d. Sand Content: Measure the sand content of the polymer slurry from the bottom and from the upper portion of the excavation just prior to concrete placement. When the sand content at the bottom of the shaft exceeds 1%, clean the bottom of the shaft using desanding or other equipment that is approved by the Engineer.

* When approved by the Engineer, slurry may be used in salt water, and the allowable densities may be increased by 2 lb/ft^3 (32 Kg/m^3).

Use slurry with a temperature of at least 40^o F (4.4^o C) during testing.

524.3.06 Protection of Existing Structures

Monitor structures for settlement that are within a distance of ten shaft diameters or the estimated shaft depth, whichever is greater, in a manner approved by the Engineer. Record elevations to an accuracy of .01 foot (3 mm). Record elevations before construction begins, during the driving of any required casings, during excavation or blasting, or as directed by the Engineer.

Document thoroughly the condition of the structures with descriptions and photographs made both before and after drilled caissons are constructed. Document all existing cracks, and provide copies of all documentation to the Engineer.