(BSP August 2, 2010)

Micropiles

Materials for micropiles shall consist of the following:

Admixtures for grout shall conform to Section 9-23.6. Admixtures that control bleed, improve flowability, reduce water content, and retard set may be used in the grout, subject to the review and acceptance of the Engineer. Admixtures shall be compatible with the grout and mixed in accordance with the manufacturer's recommendations. Accelerators are not permitted. Admixtures containing chlorides are not permitted.

All cement shall be Portland cement conforming to Section 9-01.2(1).

Centralizers and spacers shall be fabricated from schedule 40 PVC pipe or tube, steel. Wood shall not be used. Centralizers and spacers shall be securely attached to the reinforcement; sized to position the reinforcement within 3/8 inch of plan location from center of micropile; sized to allow grout tremie pipe insertion to the bottom of the drillhole; and sized to allow grout.to freely flow up the drillhole and casing and between adjacent reinforcing bars.

Encapsulation (double corrosion protection) shall be shop fabricated using high-density, corrugated polyethylene tubing conforming to the requirements of AASHTO M 252 with a nominal wall thickness of 1/32 inch. The inside annulus between the reinforcing bars and the encapsulating tube shall be a minimum of 1/4 inch and be fully grouted with grout as defined below.

Epoxy coating shall conform to Section 9-07.3. Bearing plates and nuts encased in the micropile concrete footing need not be epoxy coated.

Fine aggregate for sand-cement grout shall be sand conforming to AASHTO M 45.

Grout shall be a neat cement or sand/cement mixture with a minimum seven day compressive strength of 4,000 psi in accordance with Section 9-20.3(4).

Steel pipe casing for micropiles shall have the diameter and at least the minimum wall thickness shown in the Working Drawings. Steel pipe casing shall conform to one of the following:

1. ASTM A 252, Grade 2 or 3. If the casing is to be welded, the carbon equivalency (CE) as defined in AWS D 1.1, Section Xl 5.1, shall not exceed 0.45, and the sulfur content shall not exceed 0.05 percent.

2. API 5L Grade X52 or better.

3. API 5CT Grade N80 or better.

4. Another equivalent steel pipe specification acceptable to the Engineer.

The manufacturer or fabricator of steel piling shall furnish a certificate of compliance in accordance with Section 1-06.3 stating that the piling being supplied conforms to these specifications. The certificate of compliance shall include test reports for tensile and chemical tests. Samples for testing shall be taken from the

base metal, steel, coil or from the manufactured or fabricated piling. The certificate of compliance shall be in English units. As an alternative to steel pipe with mill certificate of compliance documentation, new structural grade or mill secondary steel pipe may be furnished for micropile casing without certified mill test reports under the following conditions:

1. The steel pipe shall meet or exceed the mechanical requirements of API 5L Grade X52 or better or API 5CT Grade N80 or better.

2. The CD shall not exceed 0.45 and the sulfur content shall not exceed 0.05 percent, if welding of the casing is required.

3. Two unique coupon tests with reports, conforming to ASTM A 370, including Annex A2, shall be provided for each truckload of pipe supplied,

4. The pipe shall be free of defects (dents, cracks, and tears).

The alternate testing for non-mill certified steel pipe is not permitted if domestic steel is required for the project.

Welded circumferential joints in pipe shall develop the strength of the pipe section. Threaded pipe joints shall develop at least the nominal resistance used in the design of the micropile.

Structural steel plates and shapes for micropile top attachments shall conform to either ASTM A 36 or ASTM A 572 Grade 50.

Reinforcing steel shall be deformed bars in accordance with Sections 9-07.4 or 9-07.11. When a bearing plate and nut are required to be threaded onto the top end of reinforcing bars for the micropile top to footing anchorage, the threading may be continuous spiral deformed ribbing provided by the bar deformations or may be cut into a reinforcing bar. If threads are cut into a reinforcing bar, the next larger bar number designation from that shown on the Plans shall be provided, at no additional cost to the Contracting Agency. Reinforcing bars for micropiles shall be epoxy coated in accordance with Section 6-02.3(24)H and 9-07.3.

Bar tendon couplers, if required, shall develop the ultimate tensile strength of the bars.