ITEM 551.11181011 – CAST-IN-PLACE CONCRETE PILE – 18 IN DIAMETER

DESCRIPTION
This work shall consist of furnishing and installing cast-in-place concrete piles of 18 inch diameter as shown on plans and as directed by the Engineer. Furnishing equipment for driving piles, and dynamic pile tests, are covered under the appropriate portions of other Specifications and are not included in this work.

MATERIALS

All of the requirements of Section 551-2 “MATERIALS” of the Standard Specifications shall apply except as modified herein.

Concrete
The provisions of §555-2 shall apply, except as modified herein.

1. Use materials meeting the requirements of 501-2.02

2. Design a concrete mixture proportioned according to the American Concrete Institute Manual of Concrete Practice, ACI 211.1, Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete. Produce a homogeneous mixture of cement, pozzolan (fly ash or GGBFS), fine aggregate, coarse aggregate, air entraining agent, water-reducing and set-retarding admixture, and water as designed. Other NYSDOT Approved List materials may be used as approved by the Director, Materials Bureau.

3. The designed concrete mixture shall meet the following requirements:
   • Strength: 28 day minimum compressive strength of 5,000 psi.
   • Slump: 6” to 9”.
   • Entrained Air: 5 to 8%.
   • Water/Total Cementitious Material Ratio: 0.40 maximum.
   • Use Type I, I/II, or II cement. Use 15% to 35% fly ash or 30% to 70% GGBFS by weight of cementitious materials.
   • Resistivity >21 (kΩ-cm) (AASHTO T358), based on 4”x8” cylinders, or Permeability <2000 Coulombs (AASHTO T 277) at 28 days of age. The time frame may be extended to 56 days moist cure for high pozzolan content mix designs or the Accelerated Moist Curing alternative may be used.

4. Perform mix development testing in accordance with ASTM C143, C231, C192 and C39, to assure all performance criteria can be achieved during production and placement.

5. The maximum aggregate size used in a concrete mixture shall be dependent on the size and shape of the concrete member and on the amount and distribution of reinforcing steel. The Contractor shall select the largest available nominal maximum size of aggregate which does not exceed the following:
   • three-quarters of the clear distance between reinforcing bars and between the reinforcing bars and the forms; and
   • one-third the thickness of the placement.
6. At least 1 month prior to the start of any concrete placement, provide a copy of the proposed mixture design(s) and trial batch test results to the Director, Materials Bureau, submitted through the Regional Materials Engineer, for evaluation. Submit sufficient data to permit the Director to offer an informed evaluation. Include at least the following:

- Concrete mix proportions.
- Material sources. Also include fineness modulus and specific gravity for all aggregates.
- Air content of plastic concrete.
- Slump of plastic concrete.
- Compressive strength at 7, 14, 28, and 56 days, and at any other age tested or deemed necessary.
- Resistivity or Permeability test data showing results of >21 kΩ-cm (AASHTO T358) or <2000 Coulombs (AASHTO T 277) respectively.

Do not interpret having a valid mixture design as approval of the mixture. Also, resubmit any proposed mixture design change to the Director, Materials Bureau, for evaluation. Multiple mixture designs may be used to address performance and placement issues as deemed necessary by the Contractor. Submit each mixture for evaluation, as indicated above, prior to use.

**CONSTRUCTION DETAILS**

All of the requirements of Section 551-3 “CONSTRUCTION DETAILS” of the Standard Specifications shall apply.

**Concrete**

The provisions of §555-3 shall apply, except as modified herein:

Prior to placing any concrete required by this specification, perform a trial placement of at least 8 cubic yards using the proposed mixture design(s). This trial placement(s), when approved by the Engineer, may be incorporated into the project as a substitute for the placement of another Class of concrete shown on the plans. If used in another element as a trial placement, the entire placement for that element on the day of the trial must use the same concrete. The Department will make and test concrete cylinders from the trial placement(s) to verify laboratory test results.

The loading limitations of §555-3.10 apply, except that concrete cylinder sets designated for early loading must attain an average compression strength of 5000 psi, or greater, with no individual cylinder less than 4500 psi.

1. To evaluate 28 day strength of the concrete, the Department will cast cylinders following the requirements and frequency of Materials Method 9.2 for each placement, with a minimum of two (2) 6”x12” cylinders for each day. The results of all test cylinder specimens representing an element placed, or part thereof, on a given day will be averaged to determine the ultimate compressive strength for each placement. The average shall be 5,000 psi with no individual cylinder less than 4,500 psi.
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If any strength test falls below the criteria established above, the Engineer will determine if investigation is required. The investigation may consist of, but is not limited to, review of the following:

- Sampling and testing of plastic concrete,
- Handling of cylinders,
- Cylinder curing procedures, or
- Compressive strength testing procedures.

Make any repairs as per the provisions of §555-3.13, Damaged or Defective Concrete. The Engineer will reject any concrete represented by a 28-day cylinder set with an average compressive strength less than 5,000 psi, or an individual cylinder with a compressive strength less than 4,500 psi. Proposed repairs require Deputy Chief Engineer, Structures approval.

METHOD OF MEASUREMENT
All of the requirements of Section 551-4.01 “PILES” of the Standard Specifications shall apply.

BASIS OF PAYMENT
All of the requirements of Section 551-5.02 “PILES” of the Standard Specifications shall apply except as modified herein.

All costs associated with furnishing and placing the concrete mix as well as the cost of the mix design, laboratory testing for mixture acceptance and trial placement shall be also be included.

Pay adjustments will be made for cast-in-place concrete that does not meet specified performance characteristics and shall be computed on the actual quantity of concrete representing an element placed, or part thereof, on a given day. The concrete pay adjustment (CPA) will be made for non-conforming material according to the formulas defined as follows:

For concrete not meeting strength requirement, but allowed to remain in place, the payment representing the quantity of concrete for a given day / element’s placement shall be reduced as follows:

<table>
<thead>
<tr>
<th>Compressive Strength</th>
<th>Pay Factor (PF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;95.0% and &lt;100.0% of $f'_c$</td>
<td>The Department will pay 87.5%</td>
</tr>
<tr>
<td>&gt;90.0% and &lt;95.0% of $f'_c$</td>
<td>The Department will pay 75%</td>
</tr>
<tr>
<td>&lt; 90.0% of $f'_c$</td>
<td>Reject concrete</td>
</tr>
</tbody>
</table>