

**SECTION UC-090****PILING FOR AERIAL CROSSING****PART 1 - GENERAL**

## 1.01 SCOPE OF WORK

The Contractor shall furnish all labor, material and equipment required to install precast concrete piles for aerial crossings.

## 1.02 SUBMITTALS

The Contractor shall furnish the Department with manufacturers' certifications and test reports that all materials and construction procedures used in the fabrication of prestressed concrete piling have met all requirements set forth in these Specifications for such materials and construction procedures.

## 1.03 RELATED SECTION

Section 15075 - Aerial Crossing

**PART 2 - PRODUCTS**

## 2.01 PILING

- A. Pilings for the canal crossing shall be precast concrete piles of prestressed construction. Size, depth of penetration below the bottom of the canal/river, and the bearing capacity of each pile shall be indicated. The concrete shall have a compressive strength of not less than 5,000 psi at the time of driving, as verified by tests. The minimum age of concrete at driving shall be seven days.
- B. The cables for prestressing the concrete piles shall be high tensile strength, seven-wire strand, conforming to the requirements of ASTM Standard A416, "Steel Strand, Uncoated Seven-Wire for Prestressed Concrete". The steel spirals for reinforcing the concrete piling may be manufactured from stock meeting the requirements of any grade of reinforcing steel or hard-drawn wire. The amount of stress to be given each cable and the assembly of the reinforcement shall be as shown on the Plans.
- C. The concrete piles shall not be turned or moved from their forms until the concrete has developed a compressive strength, as shown by test cylinders, of at least 4,000 psi. The required cylinder strength of concrete at transfer of the stressing force shall be at least 4,000 psi. Cylinders used as a basis of strength tests shall be cured in the same manner as the prestressed concrete piling.
- D. Forms used shall be rigid and tight, and shall be accessible for tamping and consolidation of the concrete. Concrete shall be placed in each pile in one continuous operation and shall be compacted by mechanical vibration and spading to insure uniformly dense concrete, free from porous spots or grout pockets.

- E. Each concrete pile shall have the date of manufacture and the lifting points clearly marked on one side in the concrete. Piling shall have chamfered corners as shown on the Plans.
- F. All applicable portions of Section 03300, "Concrete", and Section 03400, "Prestressed Concrete", of these Specifications, shall apply to the manufacture of the piling. Pile caps as dimensioned on the Plans shall be constructed after the piles are driven.

## 2.02 REFLECTIVE DEVICES FOR PILES

- A. The Contractor shall place high visibility reflective devices or material on both sides of the pile supported crossings. The reflective devices or material will be placed so as to be seen from the water and shall be in accordance with FDOT index number 600, sheet 9, code "OM 3R", (FDOT design standards, January, 1992). With each reflective device or material installation being approximately 1 foot by 3 feet and having a surface area of 430 square inches or larger.
- B. Reflective devices or material shall be placed on all piles on the upstream and downstream faces of the bridge. Likewise, the upstream and downstream faces of each span shall be equipped the reflective devices or material. Reflective devices or material shall be affixed to piles with the long axis orientated vertically midway between the normal surface elevation and the low member elevation of the adjacent spans. Reflective devices or material shall be affixed to the spans midway between pile bents with the long axis orientated horizontally and with the lower edge not more than 1 inch above the bottom of the bridge low member.

## **PART 3 - EXECUTION**

### 3.01 GENERAL

- A. Installation of aerial crossing shall be in accordance with all permit requirements, provisions imposed by authority having jurisdiction over work, these Specifications and applicable installation requirements of Section 15075, "Aerial Crossing".
- B. The work under this Section covers the installation of prestressed concrete piles and pile caps cast-in-place, and similar items normally associated with this type of construction.
- C. All concrete work shall be constructed in accordance with all of the applicable provisions of Section 03300, "Concrete" and Section 03400, "Prestressed Concrete", using the strength and type of concrete specified in Section UC-033, "Concrete, Mortar and Grout". All structural items shall be constructed in accordance with the details shown on the Plans, with skilled workmen experienced in similar installations, to all applicable codes, and with the best current accepted practices of the building trades.

### 3.02 DRIVING OF PILES

- A. Piles shall be driven with a single-acting or double-acting steam hammer to a safe bearing value at least that shown on the Plans. Depth of pile penetration below the bottom of the canal/river at the location where each pile is driven is shall be shown on the Plans. The use of a diesel hammer or vibratory hammer will be considered, provided that a satisfactory method of determining the bearing value is submitted to and approved by the Engineer of Record, to the

satisfaction of the Department.

- B. The safe bearing value of piles shall be determined by the following formulas:

$$P = \frac{2Wh}{S+0.1} \quad \text{for Drop Hammer}$$

$$P = \frac{2Wd}{S+0.1+0.01Wp} \quad \text{for Single Acting Hammers}$$

$$P = \frac{2(W + Ap)h}{S+0.1+0.01Wp} \quad \text{for Double Acting or Differential Hammers}$$

Where:

- A = area of piston, in square inches
- p = pressure in pounds per square inch at the hammer
- P = allowable total load, in pounds
- W = weight of striking part of hammer, in pounds.
- h = height of fall of strike part, in feet, or stroke, in feet.
- S = rage penetration, in inches, per blow of not less than the five final blows
- E = energy or foot-pounds per blow (furnished by hammer manufacturer).

- C. Driving shall be done with leads which will hold the pile firmly in position and alignment. No pile shall be more than 1/4-inch per foot out of batter and no more than 3 inches from the location shown on the Plans. Suitable anvils or cushions shall be used to prevent undue damage to the pile butts.
- D. Driving of all piles shall be continuous without interruption until the minimum bearing value has been obtained and the penetration is at least that specified. The Contractor shall provide driving logs for the piles. All piles cracked, split, warped or buckled, or damaged or imperfect in any way, shall be removed. The tops of all piles shall be cut off, leaving 12 inches of each cable to be imbedded and tied to the reinforcement in the pile caps. If refusal driving resistance is obtained above the specified depth of penetration, the Contractor shall prebore, jet, or use other methods to advance the pile.
- E. Excavations shall extend beyond the lines of structures to provide room for the installation and removal of forms. The use of excavation walls as forms will not be permitted.

### 3.03 FORMWORK, REINFORCING AND PLACEMENT OF CONCRETE

See Section UC-055, "Structural Work"

END OF SECTION