ITEM 16563.64 M - SPLICED PRESTRESSED CONCRETE BEAMS USING HIGH PERFORMANCE CONCRETE FOR BEAMS

DESCRIPTION.

This work shall consist of furnishing and placing prestressed concrete units for structures, as specified in the contract documents. Closure placements are part of the work. The temporary bents, their installation, and their removal are also part of the work. The Contractor shall notify the D.C.E.S. of the source of prestressed units, for approval within (7) days after the award of the contract.

MATERIALS.

All materials shall meet the requirements of the P.C.C.M., except as noted below.

A. Precast Concrete. The concrete shall meet the requirements of 718-47.

B. Cast-In-Place Concrete. Materials shall meet §555-2 except classes of concrete shall not apply. For mix design criteria, see Table 1.

C. Reinforcement for Cast-In-Place Concrete. The bar reinforcement shall be stainless steel meeting the mechanical property requirements of ASTM A955M Grade 420 and meeting the chemical requirements of either ASTM 276 UNS S31653 or UNS S31803.

D. Grout for Post-Tensioning Ducts. The grout shall be a pre-packaged, non-metallic, cementitious material that meets the following when mixed with water at the proposed water/cementitious material ratio (w/c <= 0.40).

Shrinkage. None on setting but may expand slightly (<= 0.40%). Test in accordance with ASTM C-1090.

Compressive Strength. Test according to ASTM C-942

Cure Time	Minimum Strength
24 hour air cure @ 24°	20 MPa
7 day air cure @ 24°	40 MPa
28 day air cure @ 24°	50 MPa

Initial Set. Minimum 90 minutes. Test according to ASTM C-953.

Fluidity Test. Efflux time - 11 to 30 seconds. Test according to ASTM C-939.

Thixotropic Grouts: If used, modify ASTM C-939 testing as follows:

a) Efflux time - 9 to 30 seconds for a 1 liter discharge of grout.
b) Allow the grout to idle for 30 minutes, then remix it for 30 seconds. Efflux time immediately after remixing - <= 30 seconds.

Acceptance criteria: At least 30 days before intended use submit two bags of the grout to the Materials Bureau for testing and acceptance. Contact the Materials Bureau to determine the amount of grout required. The Manufacturer is required to print on the container the manufacturing location, month, and year of manufacture, and the shelf life. The material may be rejected if , in the Engineer's opinion, it is unsuitable.

CONSTRUCTION DETAILS.

Fabrication. Fabrication of all precast elements shall be according to the PCCM.

Installation. Installation of all precast elements shall be according to the approved installation

drawings. Installation drawings shall meet the PCCM and the following:

A. Details of all joints including all materials and a step by step procedure for installing them shall be shown on the installation drawings.

B. All welding operations during installation shall be shown on the installation drawings and shall meet the SCM.

C. Details for all cast-in-place concrete. Cast-in-place concrete shall consist of a homogeneous mixture which meets the requirements of Table 1: Mix Criteria. The requirements of §555 and the following shall apply:

Concrete cylinders shall be cast by the Contractor from each truck load of concrete used in the work. The contractor shall provide a system, subject to the Engineer's approval, for identifying the cylinders and the concrete they represent. Cylinders shall be cured with the concrete they represent. Cylinders shall be cast for testing at 1,3,7, 14, and 28 days. The contractor may cast additional cylinders for testing at other time intervals.

Erection Drawings. A separate set of erection drawings shall be prepared and submitted for review and approval of the Department as per the provisions of Section **2.6 ERECTION DRAWINGS of the PCCM.**

A. General. The requirements of the P.C.C.M. shall apply for installation of the beams and post-tensioning.

B. Curing of Field Placed Concrete.

a. Concrete in the closure placements shall be cured for 28 days or until the concrete reaches the required strength.

b. Curing of closure placement concrete shall be by curing covers and forms. The Contractor may accelerate the strength gain of the concrete by insulating to retain heat or by adding external heat using saturated steam or heat blankets. Salamanders and other direct combustion heating systems shall not be allowed. If the temperature during the curing period is forecast or likely to go below 15°C the Contractor shall enclose the splice area and provide external heat using the above allowed systems.

When external heat is added, the temperature of the forms shall not be heated at a rate exceeding 10°C per hour and the temperature of the forms shall not exceed 70°C. After the curing is completed the forms shall be allowed to gradually cool, at a rate not to exceed 10°C per hour, until the forms are within 10°C of the ambient temperature.

c. Forms for closure placements shall not be removed until the end of the curing period.

3. Post-tensioning. Post-tensioning work shall not commence until the concrete in the closure placements has reached a compressive strength of 50 MPa or as approved by the DCES. Post-tensioning, grouting of ducts, and protection of the prestress anchorages shall be in accordance with the PCCM and the approved Installation Drawings.

METHOD OF MEASUREMENT.

The quantity to be paid for under this work shall be the number of meters (horizontal length center-

to-center of end bearings or anchor dowels, as shown on the plans) of each beam furnished and placed in accordance with the plans and specifications. No separate measurement shall be made for the closure placements.

BASIS OF PAYMENT.

The unit price bid shall include all labor, materials and equipment necessary to complete the work except that bearings shall be paid for under their respective items.

Damaged units which cannot be satisfactorily repaired or which do not meet dimensional tolerances shall be replaced by the Contractor at no cost to the State.

Progress payments will be made when each unit is furnished and placed in accordance with the plans and specifications. Payment will be made at the unit price bid for 80% of the quantity properly placed when the post-tensioning has been completed. The balance of the quantity will be paid upon completion of the work.

Table 1: Mix Criteria

Cement content (kg/m^3)	398
Fly ash content (kg/m^3)	38
Microsilica content (kg/m^3)	38
High Range Water Reducer	As Required
Set Retarding Water Reducer	As Required (At least manufacturer's min.)
Air Entraining Agent	As Required
Sand percent total aggregate (solid volume)	40
Designed water/total cementitious content of 474 kg	0.33*
Desired air content (%) Allowable air content (%)	6.5 5.0 - 8.0
Desired slump (mm) Allowable slump (mm)	150 75 - 200
Type of coarse aggregate gradation	CA 2

NOTE: The criteria are given for design information and the data is based on a fine aggregate fineness modulus of 2.80. The mixture proportions shall be determined using actual conditions for fineness modulus and bulk specific gravities (saturated surface dry for aggregate). The proportions shall be computed according to Department written instructions. The use of a set retarding water reducing admixture AND a high range water reducing admixture is required.

*The water/total cementitious ratio shall remain fixed and no additional water is allowed. Adjust slump with the addition of a high range water reducer.