

DIVISION III

MATERIALS DETAILS

NOTE: Where pertinent, a "Manufacturer's Certificate of Compliance" covering materials as specified in this Division may be required and shall be furnished by the Contractor, when requested by the Engineer, at no cost to the Contracting Agency.

SECTION 701

PORTLANDHYDRAULIC CEMENT**01SCOPE****701.01.01 MATERIALS COVERED**

- A. This specification covers the types of Hydraulic cement as defined by ASTM C150, ASTM C595, and ASTM C1157. Unless otherwise provided, the cement will be used for all Hydraulic cement concrete, mortar, cement treated base, and cement treated subgrade. The type of cement used shall be as listed in Table 1 with the minimum sack requirements in Section 501, "Portland Cement Concrete."

Table 1 - Types of Cement

<u>Type of Cement Permitted</u>
<u>Type II & Fly Ash</u>
<u>Type MS & Fly Ash</u>
<u>Type 1-IP (MS)</u>
<u>Type V</u>
<u>Type HS</u>
<u>Type V & Fly Ash</u>
<u>Type HS & Fly Ash</u>

~~This specification covers the five types of Portland cement as required under pertinent sections of these specifications and Type I-P. Unless otherwise provided, the cement to be used for all Portland cement concrete, mortar, cement-treated base, and cement-treated subgrade shall be in accordance with the following table:~~

Type of Cement Permitted	Minimum Sacks of Cement Per Per Cubic Yard	Maximum Water (Plus Cement Fly Ash) Ratio
Type II & Fly Ash	6.5^{1,2}	0.45
Type 1-P (MS)	6.5	0.45
Type V	6.5²	0.45
Type V & Fly Ash	6.0^{1,3}	0.45

Note: ~~¹ - Sacks per cubic yard before replacement with fly ash.~~

- ² ~~6.0 sacks per cubic yard for precast products, pipe and box, with zero slump mix design.~~
- ³ ~~5.5 sacks per cubic yard for precast products, pipe and box, with zero slump mix design.~~

MATERIALS

701.02.01 GENERAL

- A. Unless otherwise specified, the type of cement used is ~~shall to~~ be at the Contractor's option based on availability, and no additional compensation will be allowed for substitution of any type of cement for another.

~~Portland cement concrete shall be subject to the requirements of Section 501, Table 1, except as herein noted.~~

- B. Cement to be removed and replaced with fly ash shall be a minimum of 13% to 20 percent of the weight of cement. Fly ash added at the mixer shall be in an equal proportion ~~of 1.2 minimum~~ to the weight of cement removed.
- C. Class F fly ash conforming to the requirements of Section 729, "Fly Ash," shall be used.

03 PHYSICAL PROPERTIES AND TESTS

701.03.01 REQUIREMENTS

- A. ~~The cement, except Type I-P and~~ Type II and Type V Portland cements shall conform to ASTM C150 except as hereinafter provided. ~~meet the requirements set out in the current Standard Specifications for Portland cement, AASHTO Designation M 85.~~
- B. Type I-P blended hydraulic cement shall conform to ~~the specifications of~~ ASTM Designation C595 except as hereinafter provided.
- C. Pozzolan shall conform to Subsection 702.03.054, "Pozzolans (Fly Ash)."
- D. Additionally, Type II, Type V, and Type IP cements shall conform to ~~the specifications of~~ ASTM C150 with the following ~~exceptions~~ requirements:
1. ~~(a) The cement shall not contain more than 0.60 percent by weight mass of alkalis calculated as Na₂O plus 0.658 K₂O when determined by flame photometry, using the direct intensity method in the specifications of ASTM Designation C 114.~~
 2. ~~(b) The percentage of tricalcium silicate shall not be limited~~ Type IP, MS, and HS cements which that exceeds the allowable alkali content may be used if mortar bars made and tested according to Subparagraph 1 above, using the proposed cement and a selected highly alkali-reactive aggregate, show no more than 0.05 percent expansion at 6 months. ~~The percentage of soluble sulfates in the soil shall be determined by an analysis in conformance with California Test Method 417-B or equivalent. Upon approval of the Engineer, the concentrations of soluble sulfates in the soil may be determined from the results of two recent soils tests in the same general area as the location of the proposed off-site construction, or by an equivalent method.~~