SECTION 214—HYDRAULIC CEMENT

214.01—Description.

These specifications cover cements that harden when mixed with water. The various types have special characteristics to be used as denoted in other parts of these specifications.

214.02—Detail Requirements.

(a) **Blended hydraulic cement** shall conform to the requirements of AASHTO M240, Type I(P) or Type I(S).

(b) **Portland cements** shall conform to the requirements of AASHTO M85 except as follows:

1. The SO_3 content as specified in ASTM C150 will be permitted provided the supporting data specified in ASTM C150 are submitted to the Department for review and acceptance prior to use of the material.

2. Neither Type I nor Type II cement shall contain more than 1.0 percent alkalies (% Na_2O + % $0.658K_20$).

3. When Type II cement is used, a maximum of 65 percent C_3S will be permitted provided the combined amount of C_3S and C_3A is not more than 73 percent.

4. When Type III modified cement is used, the C_3A content of the cement shall be not more than 8 percent.

5. The SiO_2 content shall be at least 20 percent.

SECTION 215—HYDRAULIC CEMENT CONCRETE ADMIXTURES

215.01—Description.

These specifications cover materials that are chemical or organic elements that may be added to a concrete mixture, when permitted elsewhere in these specifications, to achieve some desired effect.

215.02—Materials.

(a) **Air-entraining admixtures** shall conform to the requirements of AASHTO M154.

(b) **Water-reducing and retarding admixtures** shall conform to the requirements of AASHTO M194, Type D, and shall be free from water-soluble chlorides.

Use of water-reducing and retarding admixtures that have not been tested for compatibility with the brand, type, source, and quantity of cement proposed for use will not be permitted until tests have been performed in accordance with the requirements of VTM 16 and the test results conform to the requirements of Table I therein.

(c) **Water-reducing admixtures** shall conform to the requirements of AASHTO M194, Type A, and shall be free from water-soluble chlorides.

(d) **Accelerating admixtures** shall conform to the requirements of AASHTO M194, Type C or E.

(e) **High-range water-reducing and high-range water-reducing and retarding admixtures** shall conform to the requirements of AASHTO M194, Type F or G, and shall be free from water-soluble chlorides.

(f) **Calcium chloride** shall conform to the requirements of AASHTO M144, Type 2.

(g) **Fly ash** shall conform to the requirements of Section 241.

(h) **Granulated iron blast-furnace slag** shall conform to the requirements of ASTM C989, Grade 100 or 120.

(i) **Silica Fume** shall conform to the requirements of AASHTO M307.

(j) **Corrosion Inhibitor** shall be calcium nitrite solution with 30 percent solids or other approved material.

215.03—Detail Requirements.

Approved admixture(s) shall be used in concrete in the proportions recommended by the manufacturer to obtain the optimum effect where seasonal, atmospheric, or job conditions dictate its use.

Only admixtures (a) through (e) that appear on the Department's approved list shall be used. Initial approval will be based on independent laboratory data submitted by the manufacturer. Following initial approval of concrete admixtures, the manufacturer shall annually certify to the Engineer in writing that the material currently being furnished is identical in both composition and chemical concentrations with the material for which the laboratory tests were performed. If the Contractor proposes to use an admixture that differs in concentration from the acceptance sample, a certificate will be required from the manufacturer stating that the material is essentially the same in chemical composition as the approved mixture.

When placing concrete by pumping is authorized, the use of pump-aid admixtures approved by the Department will be allowed provided they are used in accordance with the manufacturer's recommendations.

SECTION 216—WATER FOR USE WITH CEMENT OR LIME

216.01—Description.

These specifications cover water for use in mixing with cement or lime.

216.02—Detail Requirements.

Water shall be clean, clear, and free from oil, acid, salt, alkali, organic matter, or other deleterious substances.

Water that has been approved for drinking purposes may be accepted without testing for use in hydraulic cement concrete, cement, or lime stabilization. Water from other sources and pumping methods shall be approved by the Engineer before use.

The acidity or alkalinity of water will be determined colorimetrically or electrometrically. Water shall have a pH between 4.5 and 8.5. When subjected to the mortar test in accordance with the requirements of AASHTO T26, water shall produce a mortar having a compressive strength of at least 90 percent of a mortar of the same design using distilled water.

Wash water from hydraulic cement concrete mixer operations will be permitted to be reused in the concrete mixture provided it is metered and is 25 percent or less of the total water. A uniform amount of wash water shall be used in consecutive batches, with subsequent admixture rates adjusted accordingly to produce a workable concrete conforming to the specifications. Wash water shall conform to the acceptance criteria of ASTM C94, Tables 1 and 2.

SECTION 217—HYDRAULIC CEMENT CONCRETE

217.01—Description.

These specifications cover materials, design criteria, and mixing and testing procedures for hydraulic cement concrete.

217.02—Materials.

Hydraulic cement concrete shall consist of hydraulic cement, fine aggregate, coarse aggregate, water, and admixture(s) mixed in the approved proportions for the various classes of concrete by one of the methods designated hereinafter.