

9-01 PORTLAND CEMENT**9-01.1 Types of Cement**

Cement shall be classified as Portland cement or blended hydraulic cement.

9-01.2 Specifications**9-01.2(1) Portland Cement**

Portland cement shall conform to the requirements for Types I, II, or III cement of the Standard Specifications for Portland Cement, AASHTO M 85 or ASTM C 150, except that the content of alkalis shall not exceed 0.75 percent by weight calculated as Na_2O plus $0.658 \text{K}_2\text{O}$ and except that the content of Tricalcium aluminate (C_3A) shall not exceed 8 percent by weight calculated as $2.650\text{Al}_2\text{O}_3$ minus $1.692\text{Fe}_2\text{O}_3$. The total amount of processing additions used shall not exceed 1% of the weight of portland cement clinker and up to 3.0% cement kiln dust by mass of the cement as long as it complies with the requirements of ASTM C-465.

The time of setting shall be determined by the Vicat Test method, AASHTO T 131 or ASTM C 191.

9-01.2(3) Low Alkali Cement

When the Special Provisions state that low alkali cement shall be used, the percentage of alkalis in the cement shall not exceed 0.60 percent by weight calculated as Na_2O plus $0.658 \text{K}_2\text{O}$. This limitation shall apply to all types of Portland cement.

9-01.2(4) Blended Hydraulic Cement

Blended hydraulic cement shall be either Type IP (MS), Type I (SM) (MS) or Type I (PM) (MS) cement conforming to AASHTO M 240, except that the content of alkalis shall not exceed 0.75 percent by weight calculated as Na_2O plus $0.658 \text{K}_2\text{O}$ and except that the content of Tricalcium aluminate (C_3A) shall not exceed 8 percent by weight calculated as $2.650\text{Al}_2\text{O}_3$ minus $1.692\text{Fe}_2\text{O}_3$, and meet the following additional requirements:

1. Type IP(MS) Portland - Pozzolan Cement with moderate sulfate resistance.
This product shall be limited to Portland Cement and Pozzolan. Pozzolan shall be limited to fly ash or ground granulated blast furnace slag. Fly ash is limited between 15 percent and 35 percent by weight of the cementitious material. Ground granulated blast furnace slag is limited between 15 percent and 25 percent by weight of the cementitious material.
2. Type I(SM) (MS) Slag Modified Portland Cement with moderate sulfate resistance.
This product shall be limited to Portland Cement and ground granulated blast furnace slag. The addition of ground granulated blast furnace slag shall be limited to a maximum of 25 percent by weight of the cementitious material.
3. Type I(PM)(MS) Pozzolan – Modified Portland Cement with moderate sulfate resistance.
The product shall be limited to Portland Cement and pozzolan. The pozzolan shall be limited to fly ash or ground granulated blast furnace slag at a maximum of 15 percent by weight of the cementitious material.

The source and weight of the fly ash or ground granulated blast furnace slag shall be certified on the cement mill test certificate and shall be reported as a percent by weight

of the total cementitious material. The fly ash or ground granulated blast furnace slag constituent content in the finished cement will not vary more than plus or minus 5 percent by weight of the finished cement from the certified value.

Fly ash shall meet the requirements of [Section 9-23.9](#) of these Standard Specifications.

Ground granulated blast furnace slag shall meet the requirements of [Section 9-23.10](#) of these Standard Specifications.

9-01.3 Tests and Acceptance

Cement may be accepted by the Engineer based on the Manufacturer's Mill Test Report number indicating full conformance to the Specifications. All shipments of the cement to the Contractor or concrete supplier shall identify the applicable Mill Test Report Number. The concrete supplier or Contractor shall provide mill test identification on all concrete deliveries.

Cement producers, importers/distributors, and suppliers that certify Portland cement or blended cement shall participate in the Cement Acceptance Program as described in WSDOT Standard Practice QC 1.

Each mixing facility or plant utilizing Portland cement shall be equipped with a suitable means or device for obtaining a representative sample of the cement. The device shall enable the sample to be readily taken in proximity to the cement weigh hopper and from a container or conveyor holding only cement.

Cement may be tested using samples taken at the job site by the Engineer for submission to the State Materials Laboratory for testing.

9-01.4 Storage on the Work Site

The cement shall be stored on the site in a manner as to permit easy access for inspection and identification.

Cement shall be adequately protected at all times from rain and dampness. Cement which, in the opinion of the Engineer, contains lumps that will not be pulverized in the mixer shall be rejected.

Type III Portland cement stored by the Contractor for a period longer than 30 days, or Types I or II Portland cement stored by the Contractor for a period longer than 60 days, shall be held for retest. If the cement has lost strength during the period of storage, as shown by tests of the Contracting Agency, sufficient additional cement shall be added to the mix at the Contractor's expense to overcome such loss, or the cement may be rejected. The amount of cement to be added to the mix shall be determined by the Engineer.