respectively. Any changes of the materials and/or proportions of the mix design will require a concrete mix resubmittal.

1. Criteria applicable to Class DS1, Class DS2 and Class DS3 concrete:

Minimum Compressive Strength at 28 days shall be 4000 psi {30 MPa}.

The amount of cementitious material shall be a minimum of 600 pounds {360 kg} and a maximum of 800 pounds per cubic yard {475 kg per cubic meter} of concrete.

An air-entraining admixture is required in the concrete mix; the range of total air content shall be 2.5 % to 6.0 % by volume.

The maximum water to total cementitious material ratio shall be 0.40.

Slump requirements:

The allowable range of consistency slump during concrete placement shall be from 6 inches to 9 inches {150 mm to 230 mm}.

The minimum consistency slump for all of the concrete placed in an individual shaft shall be no less than 4 inches {100 mm} at the end of the concrete placement in that shaft.

The temperature of the concrete, at the time of placement in the shaft, shall not be less than 50 °F {10 °C} nor more than 95 °F {35 °C}.

Gradation of the coarse aggregate used shall meet the requirements for either ALDOT Size No. 57, No. 67 or No. 7.

All materials used in manufacturing the concrete shall conform to the requirements of the Specifications.

2. Additional criteria applicable to Class DS1 concrete:

Either Type I or Type II cement shall be used.

The cementitious content may be composed of up to 30% by weight {mass} substitution of either Class C or Class F fly ash additive. In lieu of fly ash, ground granulated blast furnace slag may be substituted for cement up to a minimum substitution rate of 25% and a maximum substitution rate of 50% by weight {mass}.

3. Additional criteria applicable to Class DS2 concrete:

Type II cement shall be used.

The cementitious content shall be composed of no less than 20% nor more than 30% by weight {mass} of Class F fly ash additive. In lieu of fly ash, ground granulated blast furnace slag may be substituted for cement up to a minimum substitution rate of 35% and a maximum substitution rate of 50% by weight {mass}.

4. Additional criteria applicable to Class DS3 concrete:

Type II cement shall be used.

The cementitious content shall be composed of 20% by weight {mass} of Class F fly ash and 10% by weight {mass} of microsilica additives. In lieu of the percentages of fly ash and microsilica, the cementitious content may be composed of 50% by weight {mass} substitution of ground granulated blast furnace slag and 5% by weight {mass} addition of microsilica additives.

(c) SLURRY.

When use of slurry is either shown to be required in the contract documents or selected by the Contractor, mineral slurries shall be used unless another type of slurry is proposed for use by the Contractor and approved by the Engineer. The following minimum requirements apply to material components used in slurries:

1. APPROVED MINERALS.

Sodium Bentonite or Attapulgite shall be used as the principal mineral constituents of slurry. The Engineer may approve use of other minerals upon receipt of demonstrated proof that the requested alternate mineral insures shaft stability at the applicable shaft construction site.

2. MIXING WATER.

Mixing water shall be capable of meeting drinking water standards as outlined in Section 807.

3. SAND.

Clean, locally available sand meeting the requirements of Section 802 (not to exceed four (4) percent by volume) may be mixed in drilling slurries.