

SECTION 03300

PORTLAND CEMENT CONCRETE

PART 1 - GENERAL

1.01 SCOPE

- A. The work to be performed under this Division shall consist of furnishing all material and equipment and performing all labor necessary to properly construct any concrete shown on the Plans and as instructed by the **HALLSDALE-POWELL UTILITY DISTRICT**.

1.02 MATERIALS

A. PORTLAND CEMENT

1. Portland Cement shall conform to ASTM C-150, Type 1 or if specified it shall conform to ASTM C-150, Type III, High Early-Strength Portland Cement.

B. FINE AGGREGATE

1. Fine aggregate shall conform to ASTM C-33 and shall be clean, hard, strong, sound, durable, uncoated grains of siliceous material, free from lumps of clay or injurious amounts of foreign matter.

C. COARSE AGGREGATE

1. Coarse aggregate shall conform to ASTM C-33 and shall be either crushed stone or washer gravel. Coarse aggregate shall be clean, hard, strong, durable, uncoated particles without injurious amounts of soft, friable, thin, elongated, or laminated pieces, alkali and organic or other deleterious matter.
2. Graduation of the coarse aggregate shall be as follows:

<u>Sieve Size</u> <u>Inches</u>	<u>Percent Passing</u> <u>By Weight</u>
1-1/2	100
1	95-100
3/4	50- 75
3/8	10- 25
No. 4	0 - 5

D. WATER

1. Water used in concrete shall be clean and without injurious amounts of oils, acids, alkalis, salts, organic materials, or other deleterious matter. Potable water is preferred.

E. AIR ENTRAINING ADMIXTURES

1. If specified, air entraining agents shall be added to the concrete mix in accordance with ASTM C-260. The amount of entrained air shall be 4% to 6%. Dairex AEA or approved equal shall be the air entraining agent used.

1.03 MATERIAL STORAGE

A. PORTLAND CEMENT

1. Portland cement shall be stored off the ground on wooden pallets in a thoroughly dry, well ventilated building.

B. AGGREGATE

1. Coarse and fine aggregates shall be stored separately on horizontally placed wooden planks, 2 feet apart, to exclude the entrance of foreign material, to prevent the mixing of aggregate types, and to prevent segregation of the aggregate.

1.04 MATERIAL AND TESTING

- A. Portland cement and both fine and coarse aggregates shall be tested by an independent materials testing laboratory approved by the **HALLSDALE-POWELL UTILITY DISTRICT**. The Contractor shall arrange for all testing, but certified test results (in duplicate) shall be submitted directly to the **HALLSDALE-POWELL UTILITY DISTRICT** from the laboratory. When approved by the **HALLSDALE-POWELL UTILITY DISTRICT**, certified mill test results on cement may be submitted in lieu of independent laboratory test results. All sampling and testing shall be performed at the expense of the contractor. No Portland cement or aggregate may be incorporated into the work prior to receipt of test results and their approval by the **HALLSDALE-POWELL UTILITY DISTRICT**.

- B. Tests shall be made in conformance with the following ASTM specifications:

Cement	ASTM C-150
Coarse Aggregate	ASTM C-33
Fine Aggregate	ASTM C-33

1.05 PROPORTIONING

- A. The materials incorporated into the concrete mix shall be proportioned so as to produce a homogeneous mixture with maximum density and suitable workability subject to the limitations specified herein.
- B. The governing conditions for the two classifications of concrete are as follows:
- | | <u>Class A</u> | <u>Class B</u> |
|--|----------------|----------------|
| C. Minimum 28 Day Compressive Strength | 4,000 psi | 2,500 psi |
| Maximum Water-Cement Ratio | 6.0 gal/bag | 6.5 gal/bag |
| Average Total Air Content | 4-6% | ---- |
| Maximum Slump | 4 in. | 5 in. |
- D. The exact contents of the concrete mix shall be determined by an independent testing laboratory approved by the **HALLSDALE-POWELL UTILITY DISTRICT**. Trial mixes shall be tested to determine the mix to be used. The results of trial mixes shall be submitted to the **HALLSDALE-POWELL UTILITY DISTRICT** along with the mix determined by the testing laboratory to meet the Specifications. Such tests and mix designs shall be approved by the **HALLSDALE-POWELL UTILITY DISTRICT** prior to the beginning of mixing concrete.
- E. No materials or admixtures other than those specified herein shall be incorporated into the concrete mix unless approval of such is given by the **HALLSDALE-POWELL UTILITY DISTRICT** in writing.

1.06 MIXING CONCRETE

- A. Concrete shall be mixed until there is a uniform distribution of the materials and shall be discharged completely before the mixer is recharged.
- B. For job-mixed concrete, mixing shall be done in a batch mixture of approved type. The mixer shall be rotated at a speed recommended by the manufacturer and mixing shall be continued at least 5 minutes after all materials are in the drum.
- C. Ready-mixed concrete shall be mixed and delivered in accordance with ASTM C-94. Loading tickets shall be submitted to the **HALLSDALE-POWELL UTILITY DISTRICT** or their authorized representative prior to placing of ready-mixed concrete.

1.07 PLACING CONCRETE

- A. Concrete forms shall be clean, tight, adequately braced, and treated with a nonstaining parting agent before placement of concrete. Reinforcing steel shall be cleaned of mill scale and hardened concrete. Placing of concrete shall not be initiated until forms and

reinforcing steel have been inspected and approved by the **HALLSDALE-POWELL UTILITY DISTRICT**.

- B. All concrete shall be placed upon clean, damp surfaces. Concrete shall not be placed in water unless approval is given by the **HALLSDALE-POWELL UTILITY DISTRICT**. Concrete shall not be placed when the atmospheric temperature is below 35° Fahrenheit.
- C. If, after concrete has been placed, the atmospheric temperature drops below 35° Fahrenheit, the Contractor shall maintain the temperature of the concrete at 50° Fahrenheit for a period of four days after concrete placement, using artificial means.
- D. Where slabs are to be poured on earth, the subgrade shall be cleared of debris, well-compacted, and covered with a waterproof membrane. If subgrade is unstable, soil shall be removed as directed by the **HALLSDALE-POWELL UTILITY DISTRICT**, and replaced with approved granular material, well compacted after placement.
- E. Before fresh concrete is placed on hardened concrete, the hardened concrete shall be clean, rough, and thoroughly moist. A 1-inch layer of fresh mortar shall be placed over the hardened concrete prior to placement of new concrete. Mortar shall be similar to the concrete being used but without the coarse aggregate.
- F. Concrete shall be placed as nearly as practicable in its final position to avoid segregation due to rehandling or flowing. Placing of concrete shall be carried on at such a rate that concrete is at all times plastic and flows readily into the spaces between reinforcement, into corners, and around embedded items. Concrete shall be placed in uniform horizontal layers not to exceed 12-inch thickness, and each layer shall be consolidated prior to placement of successive layers.
- G. When placing concrete in walls, metal-lined chutes or tremies shall be used. Both shall be kept free of hardened concrete accumulations. Maximum free fall shall be 3 feet to newly placed concrete. Concrete shall be thoroughly consolidated by suitable means during placement. Immersion-type vibrators should normally be used. Care shall be exercised to prevent segregation by excessive consolidation or over-vibration. Puddling shall be performed on all vertical surfaces to remove air bubbles and other surface irregularities.

1.08 FORM WORK

- A. Forms shall be of wood, steel or other approved material. Unless otherwise authorized, the form sheeting against permanently exposed concrete surfaces shall be either steel or plywood of adequate strength. The type, size, quality, strength and methods of support of all forms shall be subject to approval of the **HALLSDALE-POWELL UTILITY DISTRICT**. Forms shall be true to line and grade; shall be mortar tight, and

sufficiently rigid to prevent displacement or sagging between supports. Form surfaces shall be smooth and free of dents, sags, or holes. Internal ties shall be arranged so that, when the forms are removed, no metal will be less than one inch from any concrete surface.

- B. Forms shall remain in place until removal is approved by the **HALLSDALE-POWELL UTILITY DISTRICT**. Removal shall be in such a manner as will prevent injury to the concrete. Forms shall remain until the expiration of the following minimum number of days after placement of concrete:

Slabs	14 Days
Columns and Walls	2 Days
Other Concrete	2 Days

- C. All exposed concrete edges shall be given a 3/4 inch chamfer unless other size chamfers are shown on the Plans.

1.09 CURING CONCRETE

- A. Concrete surfaces shall be kept wet for seven days to allow adequate curing. Water-saturated burlap or other approved means shall be used.

1.10 CONCRETE FINISHING

- A. As soon as the concrete surface has set sufficiently to permit, the Contractor shall begin concrete rubbing on exposed exterior and interior surfaces of all buildings and on exposed exterior surfaces of tank walls above ground and on exposed interior surfaces above waterline.
- B. All permanently exposed concrete surfaces which are above water level, except slabs, shall be given a rubbed finish consisting of the filling of small voids and two rubbings. Plastering and troweling of surfaces is not permitted.
- C. Immediately after the removal of forms, small voids shall be filled with mortar (1 part cement, 2 parts sand), pressed into holes, and floated smooth. Imperfect surfaces shall not be patched but shall be removed and replaced.
- D. Initial rubbing shall be with a No. 20 carborundum stone, and shall be continued until all burrs, form marks, and irregularities have been obliterated. Final rubbing with a burlap sack shall be continued until all marks and surplus materials have been removed from the surface and the surfaces show a uniform, smooth finish.

1.11 CONCRETE JOINTS

- A. GENERAL

1. Joints shall be as shown on the Plans. Additional joints may be made but only with the approval of the **HALLSDALE-POWELL UTILITY DISTRICT**. Joints shall be straight and exactly horizontal or vertical as shown on the Plans. Joints not indicated on the Plans shall be so made and located as indicated as to impair least the strength of the structure. Where a horizontal joint is to be made, the surface of the concrete shall be thoroughly cleaned and all material removed prior to depositing fresh concrete. Concrete at all joints shall have been in place at least 12 hours before fresh concrete is placed on or adjacent to it.
2. Where joints are located below the water line, they shall contain either rubber or polyvinyl water stops. The type and size of water stop to be used for each application shall be as shown on the Plans and shall be manufactured by W. R. Grace & Company or approved equal.

B. **EXPANSION AND CONTRACTION JOINTS**

1. Expansions and contraction joints shall be formed as shown on the Plans and shall contain premolded expansion joint filler ½ inch in thickness for the full length of the joint. Premolded expansion joint filler shall be as manufactured by W. R. Grace & Company or approved equal.

1.12 **WATERTIGHT CONCRETE**

- A. The Contractor shall provide watertight concrete in all structures holding liquids. All cracks and imperfections developing at any point in the work shall be thoroughly repaired in a manner satisfactory to the **HALLSDALE-POWELL UTILITY DISTRICT**. When the concrete work has attained sufficient strength, the Contractor shall fill each basin or tank, or each compartment, with water and shall repair any imperfections which cause the water level to fall more than one/half (½) inch in twenty-four (24) hours. Noticeable leaks shall be repaired in any case, even if the preceding requirements as to water tightness are satisfied. It is expected that with the proper precautions, a dense watertight concrete will be obtained. If a concrete cannot be obtained which passes the above requirements for water tightness, the Contractor shall, under the direction of the **HALLSDALE-POWELL UTILITY DISTRICT** furnish all materials and do all necessary to produce a watertight concrete.

Materials and methods used shall be subject to the approval of the **HALLSDALE-POWELL UTILITY DISTRICT**. All treatment of concrete necessary to fulfill these requirements for water tightness shall be done at the Contractor's own expense.

1.13 **EMBEDDED ITEMS**

- A. Before placing concrete, all embedded items shall be securely fastened in place, and they shall be thoroughly clean and free of any foreign matter.

1.14 CONCRETE TESTING

A. GENERAL

1. Concrete shall be tested to insure that the concrete will meet the requirements of this Specification. The Contractor shall perform all necessary sampling, storing, transporting, handling, and testing and shall provide all equipment or materials necessary to satisfactorily perform this work. All laboratory tests shall be performed by an independent testing laboratory approved by the **HALLSDALE-POWELL UTILITY DISTRICT** and paid for by the contractor.

B. SLUMP TESTS

1. Slump tests shall be made in accordance with ASTM C-143 and with such frequency as to insure proper consistency of the concrete mix.

C. COMPRESSION TESTS

1. Compression test samples shall be made and cured in accordance with ASTM C-31. Not less than four samples shall be made for each test; two of these samples shall be broken at 7 days and two at 28 days. One test shall be made for each 50 cubic yards of concrete poured or not less than one test per day if less than 50 cubic yards are poured. Samples shall be tested in accordance with ASTM C-39.

D. REPORTING TEST RESULTS

1. The testing laboratory shall submit originals of the test results to the **HALLSDALE-POWELL UTILITY DISTRICT**.

1.15 CONCRETE FLOORS

- A. The concrete floors of every structure shall be finished monolithically and shall not vary more than 1/8 inch from a 10 foot straight edge when applied transversely and longitudinally over the surface. Concrete floor slabs on grade shall be placed over a granular backfill and a well tamped and compacted subgrade, as shown on the Plans. Form all recesses for thickened slabs as shown on the Plans over thoroughly compact stone. Lay vapor barrier of 4 mil (.004 in.) thickness polyethylene over fill. Vapor barrier shall follow the contour of thickened slab. All floor drains shall be set one inch lower than grade and the slab pitched thereto. Slabs to receive quarry tile shall be finished by tamping the concrete with special tools to force the aggregate away from the surface, then screeded with straight edges and floated to produce a reasonable true and uniform surface. Other slabs shall be hardened with A.C. Horn's 4-in-1 Clearseal, Master Builder's Masterseal, Sonneborn's Sonothane, or approved equal.

END OF SECTION