

SECTION UC-033**CONCRETE, MORTAR AND GROUT (SHORT)****PART 1 - GENERAL**

1.01 SCOPE

- A. The Contractor shall provide all labor, materials, equipment, appurtenances, incidentals, supervision and transportation necessary to complete all concrete, mortar and grout work required to construct the donation main. Such work shall include all related work called for by the Contract Drawings and/or specifications, or reasonably inferable from either or both, as needed for a complete and proper installation.
- B. RELATED WORK

The work of this section includes, but is not limited to:

1. Materials and storage thereof.
2. Concrete proportions and mixes.
3. Admixtures.
4. Protection
5. Laboratory testing.

PART 2 - PRODUCTS

2.01 CONCRETE

A. GENERAL

1. All reinforced concrete shall have a minimum design strength of 4,000 psi, a minimum content of 564 pounds of Type I Portland cement per cubic yard, and a water cement ratio which will produce a slump of 4-inches plus or minus 1-inch. All concrete potentially exposed to sewage gas shall be Type II Portland cement, all other concrete shall have either Type I or Type II Portland cement.

2. Pipe supports, equipment pads and encasements shall have a minimum design strength of 3,000 psi.
3. Non-reinforced concrete for sidewalk, concrete and curb and gutter repairs, if required, shall have a minimum design strength of 3000 psi a minimum content of 517 pounds of Type I Portland cement per cubic yard, and a water-cement ratio which will produce a slump of 4 to 6 inches.
4. Non-reinforced concrete for thrust blocks shall a minimum design strength of 2,500 psi a minimum content of 470 pounds of Type I Portland cement per cubic yard. and a water-cement ratio which will produce a slump of 4 to 6 inches.
5. Tremie concrete shall have 500 pounds of Portland cement per cubic yard, and the W/C ratio

shall not exceed 0.45 with a slump of 7 inches, plus or minus 1 inch.

6. Materials for concrete shall conform to the requirements stated below.

B. CEMENT

1. The cement shall be a standard brand of Portland cement manufactured within the continental limits of the United States. It shall meet the requirements of ASTM Standard C 150 "Portland Cement", Type I or Type II.
2. The Contractor shall provide suitable means for storing and protecting the cement against dampness. Bags of cement which for any reason may become partially set, or which contain lumps of caked cement, shall be rejected. In no instance shall any portion of a bag of damaged cement, or a bag containing lumps of caked cement, be used. Cement salvaged from discarded or used sacks shall not be used. Different brands of cement, even if tested and approved, shall not be mixed during use, nor used alternately in any section of the work without written permission of the Engineer of Record.

C. FINE AGGREGATE

1. The fine aggregate shall consist of sand or stone screenings, composed of hard durable grains, having not more than three percent (3%) by weight of foreign matter, such as loam clay, dirt or other impurities, and shall be free from injurious amounts of organic impurities. When subjected to the calorimetric test for organic impurities and producing a color darker than the standard No. 2 color, it shall be rejected unless it passes the mortar strength test. Fine aggregate, when subjected to the mortar strength test, shall have tensile and compressive strengths at the end of seven (7) and twenty-eight (28) days, not less than 100 percent of those developed by mortar of the same proportions and consistency, made of the same cement and standard Ottawa sand. Fine aggregate, when tested by means of laboratory sieves shall conform to the following requirements:

<u>Size Sieve</u>	<u>Percent Passing</u>
3/8"	100
No.4	90 to 100
No. 8	70 to 95
No. 16	50 to 85
No. 30	30 to 70
No. 50	10 to 45
No. 100	0 to 10

2. Subsequent samples of fine aggregate shall have a fineness modulus varying not more than 0.20 either way from that of the initial sample submitted by the Contractor, when determined by ASTM methods. Fine aggregate from more than one source shall not be mixed nor used alternately in the construction without written permission from the Engineer of Record.

D. COARSE AGGREGATE

1. Coarse aggregate shall consist of gravel, broken stone or local limerock. It shall be free from adherent coatings, and the amount of contained deleterious substances shall not

exceed the following:

Contained Deleterious Matter Percentage by Weight

Removed by decantation	1.0
Shale	0.5
Coal	0.5
Soft fragments	3.0
Other local deleterious substances such as alkali, friable, thin elongated or laminated pieces	3.0
Total shale, coal, clay lumps and soft fragments	3.0

- Tests for impurities shall be made in accordance with applicable methods of the American Society for Testing and Materials.
- Coarse aggregate shall have a loss of not greater than forty (40) percent when tested in accordance with ASTM Standard C 131 "Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine".
- Coarse aggregate, unless otherwise specified, shall meet the following gradation requirements:

<u>Size Sieve</u>	<u>Percent Passing</u>
1 1/2"	100
1"	95 to 100
1/2"	25 to 60
No. 4	0 to 10
No. 8	0 to 6

- Sieve sizes and tests for gradation of fine and coarse aggregate shall be in accordance with applicable specifications of the American Society for Testing and Materials.
- Coarse aggregate from more than one source shall not be mixed or used alternately in the construction without written permission of the Engineer of Record.

E. WATER

- Water used in mixing the concrete that is not in the form of surface moisture on the aggregate shall be from the MD-WASD water supply or other approved source.
- The water measuring equipment shall be capable of accurate measurement to one percent of requirements.
- The amount of water used shall be the design mixture amount for the cement less the amount of surface moisture on the aggregates as represented by the additional weights of fine and coarse aggregate over and above the design mixture amounts. Minor changes to adjust the

slump of the concrete to the proper value may be made, provided that, when a small amount of water is added it be assumed that the variation was in the free moisture on one or both of the aggregates and their weights lessened by that amount. If the amount of water is decreased, the aggregate shall be increased a like amount.

F. ADMIXTURES

The use of admixtures must be approved by the Engineer of Record.

2.02 READY-MIXED CONCRETE

- A. The Contractor will be permitted to use concrete from a ready-mix concrete plant provided he submits the name of the company to the Engineer of Record for approval, and no concrete shall be placed in the work until such approval has been obtained. Concrete obtained from a ready-mix plant shall conform to the requirements of these Specifications, and to all applicable portions of ASTM Standard C94 "Ready-Mixed Concrete".
- B. Central-mixed concrete, shrink-mixed concrete, or truck-mixed concrete will be acceptable from the ready-mix plant providing all requirements of ASTM C94 for these three methods are strictly adhered to.
- C. The ready mix concrete company shall furnish the Engineer of Record with a Delivery Ticket with each load or batch of concrete before unloading at the work site. The Ticket shall contain the following information:
1. Name of ready-mix concrete company
 2. Serial number of ticket
 3. Date and truck number
 4. Name of Contractor, job designation and location
 5. Class of concrete per specifications
 6. Amount of concrete (cubic yards)
 7. Time loaded or of first mixing of cement and other materials
 8. Type and brand of cement
- E. Additional information may be required by the Engineer of Record, and may include :
1. Reading of revolution counter at first addition of water
 2. Signature or initials of ready mix representative
 3. Amount of cement
 4. Total water content (or w/c ratio)
 5. Maximum size of aggregate
 6. Weights of fine and coarse aggregate
 7. Indication that all ingredients are as certified or approved, etc.
- D. Flowable fill for backfill/base within State Road rights-of-way, if required, shall be a mix as specified in Section 03375 "Flowable Fill", from a FDOT approved plant.

2.03 TREMIE CONCRETE

Tremie concrete shall have 7 sacks of Type I Portland cement per cubic yard and W/C/ ratio not

to exceed 0.45 with a slump of 7 inches, plus or minus 1 inch.

2.04 CONCRETE CURING COMPOUND

Curing compound shall be as approved by the Engineer of Record. Where approved, curing compound shall be Horncure 30 D&C, by W.R. Grace, or approved equal.

2.05 CONCRETE COLORANT

Concrete colorant shall be Colorhard "Coral Gables Beige No. 3" or Colorhard "Jade Green, L80" by Lambert Corp., or approved equal.

2.06 MORTAR

_____ Mortar shall be composed of one part of Type I or Type II, as appropriate, Portland cement to three parts of sand, with sufficient lime putty added to secure workability. In no case shall the lime putty exceed 10% of the cement used. (See Section 04100)

2.07 GROUT

Grout shall be composed of one part of Type I or Type II, as appropriate, Portland cement to three parts of sand. (See Section 03600 "Grout" for additional specifications)

PART 3 - EXECUTION

3.01 LABORATORY CONTROL

The Contractor shall obtain the services of a reputable commercial testing laboratory approved by the Engineer of Record to design the concrete mixtures and supervise the mixing of the concrete in accordance with these Specifications. As used hereinafter, Laboratory shall mean the approved laboratory employed by the Contractor. The Laboratory shall furnish the Contractor and the Engineer of Record with complete reports of all tests made, design mixtures, and all concrete mixed for the Project.

A. TEST SAMPLES

1. MATERIALS

The Laboratory shall take samples of the aggregates. Failure of any of these samples to meet Specification requirements shall be cause for rejection of the material represented. The Laboratory shall submit certificates of tests showing the cement to meet Specification requirements. The Contractor may use cement from local supplies which meet the requirements of these Specifications when tested by the Laboratory.

2. CONCRETE

Test specimens of the actual concrete mix used in the work shall be made as designated by

the Engineer of Record. The test specimens will be taken in pairs from the same batch, one of which will be tested when seven days old and the other when twenty-eight days old. The making, storing, and testing of specimens shall be in accordance with the applicable requirements of ASTM methods, Standards C-31 and C-39, latest revisions. The results of tests of these specimens shall serve as an indication of the actual strengths obtained as compared with the design strengths. The Laboratory, on the basis of these tests, shall make such revisions in design mixture or method of mixing, within the limits of these Specifications, as are necessary to keep the test results equal to or greater than the design strength required. In the event the test results indicate that the concrete placed does not meet the Specification requirements, the Contractor shall be required to remove and replace it if, in the opinion of the Engineer of Record, such action is necessary.

B. DESIGN MIXTURES

The Laboratory shall see that the materials meet the Specification requirements, and then, design mixtures for the various classes of concrete, determining the proper proportions of surface dry aggregates in pounds and the amount of mixing water in gallons for each sack of cement to equal or exceed the strengths required in Subsection 2.01A above.

3.02 MIXING CONCRETE

A. MIXING CONDITIONS

The concrete shall be mixed only in such quantity as is required for immediate use and any which has developed initial set or has been mixed longer than 30 minutes shall not be used unless otherwise approved by the Engineer of Record.

B. MIXING TIME

1. Concrete shall be mixed thoroughly in a batch mixer of approved type, for a period of not less than 1-1/2 minutes after all materials are in the drum. The entire contents shall be removed from the drum before materials are placed therein for the succeeding batch.
2. The volume of material mixed per batch shall not exceed the manufacturer's rated capacity of the drum. Mortar or concrete which has partially set shall not be retempered by mixing the mortar or concrete with additional material or mortar.

END OF SECTION