

## SECTION 312323 - FLOWABLE FILL

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the furnishing and installation of flowable fill in abandoned piping.
- B. Related Sections include the following:
  - 1. Division 2 Section "Site Demolition".
  - 2. Division 2 Section "Site Clearing".
  - 3. Division 2 Section "Earthwork".

#### 1.3 REFERENCES

- A. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the following:
  - 1. ASTM Standards, Specifications, Methods, Test Methods and Classifications:
    - a. C33 - Specification for Concrete Aggregates.
    - b. C39 - Test Method for Compressive Strength of Cylindrical Concrete Specimens.
    - c. C94 - Specification for Ready-Mixed Concrete.
    - d. C136 - Sieve Analysis of Fine and Coarse Aggregates.
    - e. C150 - Specification for Portland Cement.
    - f. C260 - Specification for Air-Entraining Admixtures for Concrete.
    - g. C618 - Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.
  - 2. ACI - American Concrete Institute:
    - a. 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.
    - b. 304R - Guide for Measuring, Mixing, Transporting and Placing Concrete.
    - c. 304.2R - Placing Concrete by Pumping Methods.
    - d. 305R - Hot Weather Concreting.
    - e. 306R - Cold Weather Concreting.
  - 3. MDOT:
    - a. 2012 Standard Specifications for Construction.
    - b. Standard Plans.

#### 1.4 DESIGN AND PERFORMANCE REQUIREMENTS

- A. Formwork: The design and construction of all formwork shall be the responsibility of Contractor.

- B. Mix Proportions: Select flowable fill proportions according to the procedures specified herein to achieve the specified performance requirements.

## 1.5 SUBMITTALS

- A. Design Data:
  - 1. Submit flowable fill mix design.
  - 2. Required Information:
    - a. Dry weights of cement.
    - b. Saturated surface-dried weights of fine aggregate.
    - c. Quantities, type and name of all mix design contents.
    - d. Weight of water.

## 1.6 QUALITY ASSURANCE

- A. Installation Personnel Qualifications:
  - 1. Trained and experienced in the installation of the materials.
  - 2. Knowledgeable of the design and the reviewed mix designs.
- B. Flowable Fill Supplier Qualifications:
  - 1. Ready-mix concrete producer.
  - 2. Experienced in design and control of flowable fill.
- C. Testing of Flowable Fill: Not required.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Cement:
  - 1. Portland cement, ASTM C150, Type I.
  - 2. Do not use different types or manufacturers of cement interchangeably without Engineer's approval.
- B. Fly Ash: ASTM C618, Type C or F.
- C. Aggregates:
  - 1. Grade aggregates according to procedures of ASTM C136.
  - 2. Fine aggregate: ASTM C33 or MDOT 902 Fine Aggregate 2NS.
- D. Water: Clean, fresh, and potable.
- E. Admixtures:

1. Chlorides:
  - a. No admixture shall contain more than 0.1% water soluble chloride ions by mass of cementitious material.
  - b. No admixture shall contain calcium chloride.
2. Air-Entraining: Daravair series or Darex series, by W.R. Grace & Company; Micro Air, by Master Builders; or equal.
3. Stable Air Generator: Darafill, by W.R. Grace & Company; Flow-Air, by Axim Concrete Technologies; or equal.

## 2.2 MIXES

### A. Mix Design Performance Requirements:

1. Flowable fill which may be hand excavated in the future.
2. Compressive Strength Range f'c: 40 to 75 psi at 28 days.
3. Slump: 8 to 10 inches, minimum.
4. Air Content: 15% to 35% utilizing stable air generator.

## 2.3 SOURCE QUALITY CONTROL

### A. Production and Delivery:

1. Batch, mix and transport flowable fill in accordance with ASTM C94.
2. Furnish a delivery ticket with each batch of flowable fill before unloading at the Site, on which is printed, stamped or written the following information:
  - a. Name of ready-mix batch plant.
  - b. Serial number of ticket.
  - c. Date and truck number.
  - d. Name of Contractor.
  - e. Job name and location.
  - f. Specific class or designation of flowable fill.
  - g. Amount of flowable fill (cubic yards).
  - h. Time loaded or of first mixing of cement and aggregates.
  - i. Type, name and amount of admixture.
  - j. Type, brand and amount of cement and fly ash.
  - k. Total water content by producer (or water-cementitious ratio).
  - l. Maximum size of aggregate.
  - m. Weight of fine aggregate.
3. Flowable fill delivered in an outdoor temperature lower than 40 degrees F shall arrive at the Site of the Work having a temperature of not less than 50 degrees F and not greater than 90 degrees F unless otherwise specified or permitted by Engineer's representative.
4. Complete the discharge of the flowable fill within 2-1/2 hours after introduction of mixing water to the cement or 2 hours after arriving at the Site, whichever is sooner.

## PART 3 - EXECUTION

### 3.1 PREPARATION

#### A. Preplacement Inspection:

1. Before placing flowable fill, inspect and complete the formwork installation.
2. Notify other trades to permit the installation of their work; cooperate with other trades in setting such work, as required.

#### B. Components:

1. Seal pipes, manholes and similar components not intended to be filled.
2. Restrain from floatation.

### 3.2 PLACEMENT

#### A. General:

1. Ensure flowable fill fills all cavities required to be filled.
2. Avoid dislocation of components.
3. Place in lifts if required to prevent floatation or to limit fluid pressures on formwork, walls, flexible wall pipe, or similar conditions.
4. Wait 24 hours, minimum, between the start of subsequent placement lifts.

#### B. Handling:

1. Handle flowable fill from mixer to place of final deposit in chutes, carts, buggies, conveyors, pumps or crane buckets.
2. Do not deliver flowable fill by a method with a free fall of more than 3 feet.
3. Take every possible precaution to prevent separation or loss of ingredients while transporting flowable fill.

#### C. Rate: Carry on placement at such a rate that flowable fill surfaces not yet to grade or lift shall not have reached their initial set before additional flowable fill is placed.

#### D. Retempering: Do not add water to the flowable fill once it has left the ready-mix plant.

#### E. Cold-Weather Operations:

1. Comply with the recommendations of ACI 306R.
2. Recommended Protective Measures:
  - a. Heating materials.
  - b. Providing insulating blankets and windbreaks.
  - c. Use heated enclosures.
3. Do not use frozen materials or materials containing ice or snow.
4. Do not place on frozen subgrade.

- F. Hot-Weather Operations:
  - 1. Comply with the recommendations of ACI 305R.
  - 2. Recommended Protective Measures:
    - a. Cooling materials.
    - b. Placement during cooler hours of the day.
    - c. Providing shading and windbreaks.

### 3.3 PROTECTION

- A. Cold Weather:
  - 1. Keep all freshly placed flowable fill from damage due to low temperatures when the mean daily temperature is below 40 degrees F (4.5 degrees C) in accordance with ACI 306R.
  - 2. Protect flowable fill from freezing until hardened, 36 hours minimum.
- B. Loading: Protect flowable fill from construction, traffic or other loads until sufficient strength has been reached.

END OF SECTION 02228