

## **ITEM 10555.10 M – FLOWABLE FILL**

**DESCRIPTION.** This item shall consist of all work necessary to gain access to, prepare and place stabilized flowable fill in accordance with these Specifications and as directed by the Engineer. The flowable fill shall be used to fill an abandoned drainage pipe, and if necessary, to fill voids in the north approach embankment as directed by the Engineer.

**MATERIALS.** The Contractor shall provide all materials and equipment in suitable and adequate quantity and quality as necessary to accomplish the work specified herein. Flowable fill shall consist of a mixture of portland cement, fly ash, mineral filler, water and admixtures proportioned to provide a non-segregating, free-flowing, self-consolidating material that will result in a hardened, dense backfill. The Contractor shall prepare a mix design as specified herein to determine the proportion of materials necessary to meet the Specification requirements.

**Material Requirements.** The component materials of the flowable fill shall meet the following Specifications:

Cement	NYSDOT Section 701-01, Type 5
Fly Ash	NYSDOT Section 711-10
Water	NYSDOT Section 712-01
Mineral Filler	NYSDOT Section 703-01
Admixtures	NYSDOT Section 711-08

**Tests and Control Methods.** Only approved materials conforming to the requirements of this Specification and referenced Specifications shall be used in the work. Materials may be subject to inspections and tests at any time during the progress of their preparation for use. The source of supply of each of the materials shall be approved by the Engineer before delivery or use. The Contractor shall submit the manufacturers and suppliers certification of compliance for all materials covered by referenced Specifications. When required by the Engineer or these Specifications, provide representative samples of materials and certified test results from a qualified, independent, and commercial testing laboratory. Materials shall be stored and handled to insure the preservation of their quality and fitness for use and shall be located to facilitate prompt inspection.

**Mix Design.** The flowable fill shall be proportioned to be non-segregating, free-flowing, self-consolidating, low-shrink slurry with a minimum unconfined compressive strength at 28 days of 0.689 MPa (100 psi) as determined in accordance with ASTM D 4832. The flowable fill shall have a minimum unit weight of 11 kN/m<sup>3</sup> (70 pcf). The Contractor and its supplier shall determine the materials and proportions used to meet the requirements of these Specifications. At least 21-days before starting placement of flowable fill, the Contractor shall submit a mix design for the flowable fill to the Engineer. The mix design shall include, but not be limited to, the following information:

- . Certification of compliance of the design mix relative to the mix design requirements of this Specification.
- . Certification of compliance of the component materials used in the mix design relative to this Specification and referenced Specifications.

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- . Representative gradations for aggregate from the designated aggregate source and proposed gradation limits for aggregates to be used in the flowable fill.
- . Plastic characteristics of the design mix including temperature, slump, air entrainment, wet unit weight, yield, and cement factor.
- . Performance characteristics of the hardened flowable fill to include compressive strength of all specimens and the corresponding average compressive strength. Compressive strength tests shall be reported for ages of 1 day, 7 days, and 28 days.
- . Unit weight of all compressive strength specimens at the time of testing and the corresponding average unit weight.
- . The moisture density relationship for the combined cement, fly ash, mineral filler (if used), as determined in accordance with ASTM D 558.

**Mix Design Acceptance.** No flowable backfill shall be placed until the mix design has been reviewed and accepted by the Engineer. The Engineer's acceptance of the mix design shall be understood to indicate conditional acceptance. Final acceptance will be based on conformance with these Specifications and satisfactory test results on field samples during placement as required by these Specifications or as required by the Engineer.

**CONSTRUCTION DETAILS.** Batching, mixing and delivery shall conform to the requirements of either ASTM C 94 or C 685. Flowable fill shall be placed when the weather conditions are favorable and when the ambient temperature is above 4.4 degrees C, (40 degrees F), or above 1.1 degrees C, (34 degrees F) and rising. Flowable fill placement shall stop when the ambient temperature is below 2.2 degrees C, (36 degrees F) and falling. At the time of placement, flowable fill shall have a temperature of at least 10 degrees C, (50 degrees F). Flowable fill shall be cured at a minimum temperature of 4.4 degrees C (40 degrees F) for at least 24 hours after placement.

**Tests.** The flowable fill shall be sampled and tested in the field in conformance with either ASTM C 94 or C 685 and in conformance with these Specifications. Samples for tests shall be taken for every 115 cubic meters (150 cubic yards) of material, or fraction thereof, for each day's placement. Tests shall include temperature and four compressive strength cylinders. Compressive strength sampling and testing shall conform to ASTM D 4832 with one specimen tested at 7 days, two at 28 days, and one held for each batch of four specimens.

The sampling and testing shall be performed by a qualified, independent commercial testing laboratory employed by the Contractor with results submitted to the Engineer within 48 hours of completion of testing. The Engineer may perform his own testing of

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the flowable fill using any or all of the above test methods. The Contractor shall cooperate with the Engineer in his testing of the flowable fill.

**Placement.** The Contractor shall verify, through site investigation, that the appropriate drainage pipe is going to be filled. No functioning pipes shall be filled with flowable fill. The Contractor shall make a reasonable attempt, as determined by the Engineer, to ascertain if the abandoned drainage pipe is clogged. Two methods of construction exist:

- . If it is determined that the abandoned drainage pipe is not clogged or that the drainage pipe is sufficiently open to allow the flowable fill to gravity feed the entire length of the pipe, the Contractor shall seal the lower end of the pipe by means suitable to the Engineer. The seal shall be vented such that air voids do not form in the pipe when the flowable fill is placed. The flowable fill shall be discharged from a mixer into the high end of the abandoned drainage pipe by any means acceptable to the Engineer. No flowable fill shall be placed into the adjacent pipes or manhole to render these structures non-functional. After completing the work, both ends of the abandoned drainage pipe should be sealed in a neat, workmanlike manner that is acceptable to the Engineer.
- . If it is determined that the abandoned drainage pipe is clogged, the Contractor shall make a reasonable attempt to clear the obstruction. If the Engineer determines that the obstruction(s) can not be removed, the Contractor shall first fill the low end of the pipe with flowable fill. The flowable fill shall be discharged from a mixer into the low end of the abandoned drainage pipe by any means acceptable to the Engineer. A seal will be required to fill the low end of the pipe. The Contractor shall seal the low end of the pipe by means suitable to the Engineer. After completing work at the low end of the pipe, the Contractor shall place the flowable fill in the high end of the pipe as indicated in Section 1 above.

After completing the work, the Contractor shall remove from the project site any excess flowable fill that resulted from spillage, et cetera, and restore the project site to a condition that is acceptable to the Engineer. If excavation is required to reach the abandoned pipe, the contractor shall restore the area to its original condition as directed by the Engineer.

**METHOD OF MEASUREMENT.** The quantity to be paid for under this item shall be the actual number of cubic meters of flowable fill placed in the pipe and/or the north approach embankment. All other items required to gain access to the abandoned pipe, place the flowable fill, restore the work area and to satisfy these Specifications shall be incidental and shall not be measured.

**BASIS OF PAYMENT.** Payment will be made at the unit bid price per cubic meter.