

## ITEM 434

### FLOWABLE FILL

434.1 Description. This item specifies flowable fill to be used as backfill for construction of underground utilities, as called for on the drawings, or in other parts of the specifications. This material may be used in lieu of cement stabilized sand, at the option of the Engineer. Because of the time required for "setting up", this material can only be used at locations where the trench can be left open for approximately twelve hours prior to backfilling. Shoring for excavations and trenches shall meet the requirements of the latest edition of OSHA Regulation 1926, Subpart P.

434.2 Materials. Cement shall be Type I Portland cement conforming to ASTM C150.

Fly ash shall meet the requirements of ASTM C618, Class C. Fly ash shall have a minimum CaO content of 20-percent.

Sand shall be clean, durable sand containing not more than the following:

- A. Deleterious Materials
  1. Clay lumps, when tested in accordance with ASTM C142, shall be less than 0.5 percent.
  2. Lightweight pieces, when tested in accordance with ASTM C123, shall be less than 5.0 percent.
  3. Organic impurities, when tested in accordance with ASTM C40, shall not show a color darker than the standard color.
- B. The plasticity index shall be six (6) or less when tested in accordance with ASTM D4318.
- C. Sand shall be free of organic matter and deleterious substances and shall meet the following gradation requirement:

Square Sieve Size	Percent Passing, by Weight
3/8"	100%
No. 200	0 -10%

Note: It is intended that the sand be a fine sand that will stay in suspension, in the mixture, to the extent required to obtain a flowable consistency. The gradation shall be adjusted to achieve.

Water shall be clean and clear, free of oils, acids, alkalis, organic matter, or other deleterious substances and shall conform to the requirements of ASTM Designation C94.

Admixtures shall conform to ASTM Designations C1017 and/or C494.

434.3 Mix Design. The following are given as typical mix designs for trial mixes. Adjustments of the proportions may be made to achieve proper solid suspension and optimum flowability. Admixtures may be used, if desired, to improve the characteristics of the mix. The suggested quantities of dry material per cubic yard are as follows:

Trial Mix No. 1

Cement	100 lbs.
Fly Ash	250 lbs.
Sand	2800 lbs.
Water	(approx.) 60 gals

Trial Mix No. 2

Cement	100 lbs.
Fly Ash	300 lbs.
Sand	2600 lbs.
Water	(approx.) 70 gals

The above quantities will give an approximate yield of one cubic yard. The flowability of the mixture shall be observed by the Engineer and flowability increased/ decreased by adjusting the water content as well as increasing/decreasing the air entraining admixture content.

Provide a mix design per TxDOT's Material Specification Item 401, "Flowable Backfill", 2004.

434.4 Consistency. The consistency of the mix shall be tested by filling an open-ended three-inch diameter cylinder six-inches high, to the top with flowable fill. The cylinder shall be immediately pulled straight up and the correct consistency of the flowable fill shall produce a minimum eight-inch diameter circular type spread, with no segregation. The flowable fill shall maintain its consistency when placed.

434.5 Batching, Mixing, and Transportation. Materials are to be measured by weight. The flowable fill may be mixed in a central concrete mixer, a ready mix truck, or other means acceptable to the Engineer. The flowable fill shall be transported to the point of placement in a revolving drum mixer or in an agitator unit.

434.6 Placement. The flowable fill shall be placed by direct discharge from the mixer truck, or other approved methods. If necessary to prevent segregation, boots shall be used.

The flowable fill shall be placed in accordance with the drawings attached to Item 430, "Construction of Underground Utilities" and Item 480, "Precast Reinforced Concrete Box Sewers". It will be necessary to use cement

stabilized sand as bedding, as shown by drawings. At the option of the Engineer, the flowable fill may be used above the bedding to the uppermost elevation shown on the referenced drawings.

434.7 Measurement. No direct payment shall be made for flowable fill when used as backfill in accordance with Items 430 and 480, and the drawings attached thereto.

Where used as backfill at other locations, and where measured, flowable fill shall be measured by the **cubic yard**, computed from the dry weight of the material.

434.8 Where measured for payment in accordance with Section 434.7 of this specification, flowable fill shall be paid for at the contract unit price bid per **cubic yard**, for flowable fill, which price shall be full payment for all materials, equipment, labor, and transportation necessary to complete the work.

END OF ITEM 434