SECTION 121
FLOWABLE FILL

121-1 Description.

Furnish and place Flowable Fill as an alternative to compacted soil as approved by the Engineer. Applications for this material includes, beddings, encasements, closures for tanks, pipes, and general backfill for trenches.

121-2 Materials.

Meet the following requirements:

Fine Aggregate*..... Section 902
Portland Cement (Types I, II, or III)..... Section 921
Fly Ash, Slag and other Pozzolanic Materials..... Section 929
Air Entraining Admixtures** ..... Section 924
Water..... Section 923

*Any clean fine aggregate with 100% passing a 3/8 inch [9.5 mm] mesh sieve and not more than 15% passing a No. 200 [75 μm] sieve may be used.

**High air generators or foaming agents may be used in lieu of conventional air entraining admixtures and may be added at jobsite and mixed in accordance with manufacturers recommendation.

121-3 Mix Design.

Flowable Fill is a mixture of portland cement, fly ash, fine aggregate, air entraining admixture and water. Flowable fill contains a low cementitious content for reduced strength development.

Submit mix designs to the Engineer for approval. The following are suggested mix guides for excavatable and non-excavatable flowable fill:

	Excavatable	Non-Excavatable
Cement Type 1	75-100 lb/yd^3 [45-60 kg/m^3]	75-150 lb/yd^3 [45-90 kg/m^3]
Fly Ash	None	150-600 lb/yd^3 [90-355 kg/m^3]
Water	*	*
Air**	5-35%	5-15%
28 Day Compressive Strength**	Maximum 100 psi [690 kPa]	Minimum 125 psi [860 kPa]
Unit Weight (Wet)**	90-110 lb/yd^3 [1,440-1,760 kg/m^3]	100-125 lb/yd^3 [1,600-2,000 kg/m^3]
*Mix designs shall produce a consistency that will result in a flowable self-leveling product at time of placement. **The requirements for percent air, compressive strength and unit weight are for laboratory designs only and are not intended for jobsite acceptance requirements. Fine Aggregate shall be proportioned to yield 1 yd^3 [1 m^3].		

121-4 Production and Placing.

Use flowable fill manufactured at plants that qualify as approved sources in accordance with the Standard Operating Procedure for Ready-Mix concrete. Revolution counter requirements are waived.

Deliver flowable fill using concrete construction equipment. Place flowable fill by chute, pumping or other methods approved by the Engineer. Tremie flowable fill through water.

121-5 Construction Requirements.

Use straps, soil anchors or other approved means of restraint to ensure correct alignment when flowable fill is used as backfill for pipe or where flotation or misalignment may occur.

Protect flowable fill from freezing for a period of 36 hours after placement.

Place flowable fill to the designated fill line without vibration or other means of compaction. Do not place flowable fill during inclement weather, e.g. rain or ambient temperatures below 40ºF [4ºC]. Take all necessary precautions to prevent any damages caused by the hydraulic pressure of the fill during placement prior to hardening. Provide the means to confine the material within the designated space.

121-6 Acceptance.

Acceptance of flowable fill will be based on the following documentation and a minimum temperature of flowable fill at the point of delivery of 50ºF [10ºC].

Furnish a delivery ticket to the Engineer for each load of flowable fill delivered to the worksite. Ensure that each ticket contains the following information:

(1) Project designation,
(2) Date,
(3) Time,
(4) Class and quantity of flowable fill,
(5) Actual batch proportions,
(6) Free moisture content of aggregates,
(7) Quantity of water withheld.

Leave the fill undisturbed until the material obtains sufficient strength. Sufficient strength is 35 psi [240 kPa] penetration resistance as measured using a hand held penetrometer in accordance with FM 1-T 197. Provide a hand held penetrometer to measure the penetration resistance of the hardened flowable fill.

121-7 Basis of Payment.

When the item of flowable fill is included in the Contract, payment will be made at the Contract unit price per cubic yard [cubic meter]. Such price and payment will include all cost of the mixture, in place and accepted, determined as specified above. No measurement and payment will be made for material placed outside the neat line limits or outside the adjusted limits, or for unused or wasted material.

Payment will be made under:

Item No.	121-70-	Flowable Fill - per cubic yard.
Item No.	2121-70-	Flowable Fill - per cubic meter.