SECTION 515: FLOWABLE FILL

515.1 DESCRIPTION

This work consists of providing, placing, and testing flowable fill for use in trenches when it is not feasible to place and compact trench backfill materials, or for filling of voids.

515.2 MATERIALS

515.2.1 General

Flowable fill is a flowable mixture of Portland cement, fly ash, aggregates, admixtures and water.

515.2.2 Mix Design Submittals

The Contractor shall provide a mix design either by following the requirements of Section 500: Portland Cement Concrete Materials of these specifications or utilize a current NMDOT approved mix design.

515.2.3 Cement

The Contractor shall use cement that is the same as the approved mix design.

515.2.4 Aggregate

The Contractor shall provide a uniform mixture of fine aggregate or coarse and fine aggregate. The Contractor shall provide coarse and fine aggregate with a gradation in accordance with Table 515.2.4:1, "Aggregate Mixture Gradation Requirements."

Table 515.2.4:1
Aggregate Mixture Gradation Requirements

Sieve Size	% Passing
One (1) Inch	100
3/8 inch	95-100
No. 4	80-100
No. 8	60-95
No. 16	45-80
No. 30	25-60
No. 50	5-45
No. 100	5-35
No. 200	0-30

515.2.5 Water

The Contractor shall provide concrete mix water in accordance with the Section 500: Portland Cement Concrete Materials of these specifications.

515.2.6 Air-Entraining Admixture

If included in the mix design, the Contractor may use an air-entraining admixture to provide air entrainment no greater than 35% in the flowable fill.

515.2.7 Fly Ash

If included in the mix design, the Contractor shall use fly ash of the class specified.

515.2.8 Water-Reducing Admixture

If included in the mix design, the Contractor shall use a water-reducing admixture.

515.2.9 Proportioning and Physical Property Requirements in the Laboratory

The Contractor shall provide a flowable fill mix design in accordance with the following limits, the City Engineer or designee will perform the field and laboratory testing listed:

1. Cement, maximum 50 lbs./yd^3.
2. Fly Ash, from 150 lbs./yd^3 to 300 lbs./yd^3.
3. Air Content, optional.
4. Slump, from eight (8) inch to eleven (11) inches.
5. Water/cement ratio, proportioned by weight to produce a slump within the prescribed limits.
6. Consistent aggregate throughout the concrete mixture.
7. Compressive strength will not exceed 150 psi at 28 Days.
8. Cast the test specimens in four (4) inch × eight (8) inch test cylinders, perforated on the bottom with four (4) ¼-inch diameter holes for free draining.
9. Keep the test cylinders in a moist environment, but do not cure in a curing tank.
10. Cast six (6) compressive strength test cylinders in the Laboratory. Test two (2) cylinders at seven (7) Days, two (2) at 28 Days, and two (2) at 56 Days.

If passing compressive strength results are achieved for flowable fill on a project and the minimum testing rates are met, the mix design used to produce and provide the flowable fill can be used for the remainder of the project with no additional compressive strength tests required.

515.3 CONSTRUCTION REQUIREMENTS

515.3.1 Batching, Mixing, and Transporting

The Contractor shall perform batching, mixing, and transporting in accordance with Section 505: Concrete Placement and Finishing of these specifications. Flowable fill is to be batched in a central-mixed concrete plant, ready-mix concrete truck, pug mill, or other approved method.

515.3.2 Testing Flowable Fill in the Field

The Contractor shall obtain the City Engineer or designee's approval of the flowable fill mix properties before using the mix in the field.

For field testing, the Contractor shall use a standard (15 lb.) T-post fence driver to drive a #6 reinforcing bar with a flat end into the flowable fill material 24 hours after placement. The Contractor shall lift the driver until the bottom of the driver is even with a mark located six (6) inches below the top

of the rebar, and then allow the driver to fall under its own weight. The Contractor shall remove and replace the flowable fill if fewer than six (6) blows or more than 25 blows are required to drive the rebar twelve (12) inches into the fill. The Contractor shall not use compressive strength test cylinders for field-testing purposes.

515.3.3 Pre-Placement Requirements

Before placing flowable fill, the Contractor shall remove any loose or un-compacted soils from the area to be filled. The Contractor shall ensure that all areas in which soils or construction materials have sloughed off or collected are completely cleared. The Contractor shall not place flowable fill against loose or un-compacted surfaces/materials.

The Contractor shall ensure that all pipes or other embedded items which would otherwise float to the top of the flowable fill are adequately secured to prevent their floating out of position.

515.3.4 Placing

The Contractor shall place flowable fill uniformly to prevent voids in or segregation of the bedding and filling material. The Contractor shall secure the culvert or pipe from movement.

The Contractor shall place the flowable fill by direct discharge from a ready-mix truck, pumping, or other method approved by the City Engineer or designee. The Contractor shall place the flowable fill in layers no more than twelve (12) feet high. The Contractor shall place the flowable fill in layers no more than four (4) feet high for areas that require forming. The Contractor shall not place the individual layers until flowable fill in a previously placed layer has been in place at least two (2) hours.

Flowable fill shall not be placed to a height above top of pipe exceeding two (2) feet when used to fill a pipe zone. The Contractor shall submit a written request and obtain written approval from the City Engineer or designee before placing the flowable fill in a full depth layer.

The Contractor shall not place the flowable fill on frozen ground or while it is raining. The Contractor shall protect flowable fill from flooding for at least twenty-four (24) hours after placement. If necessary, the Contractor may place flowable fill in standing water that is positioned to keep the outside water from contaminating or mixing with the flowable fill.

The Contractor shall not allow any embedded items to float or otherwise dislodge. The Contractor shall secure pipe to compensate for buoyancy.

The Contractor shall fill the areas between the walls of an existing concrete box culvert and/or an inserted corrugated metal pipe thoroughly.

The Contractor shall not disturb the flowable fill Material for at least twenty-four (24) hours after placement. The Contractor may reduce this 24-hour period, if the penetration resistance of the material justifies, as tested in accordance with Section 515.3.2, “Testing Flowable Fill in the Field.”

515.3.5 Application of Load

The Contractor may cover the flowable fill within twenty-four (24) hours after placement, if a person weighing at least 150-lbs. does not sink into the material more than one (1) inch, if standing on a four (4) inch × four (4) inch wooden block.

515.3.6 Temperature and Weather Limitations

The Contractor shall not place flowable fill when the air temperature is lower than 35 °F. The Contractor may begin placement only when weather conditions are favorable and the air temperature is a least 35 °F and rising. If the air temperature at the time of placement is less than 40 °F, the Contractor shall place flowable fill that has a temperature of at least 50 °F.

The Contractor shall cure the flowable fill at a minimum temperature of 40°F for twenty-four (24) hours after placement.

515.4 METHOD OF MEASUREMENT

If flowable fill is specified in the contract or required by the City Engineer or designee based on field conditions, it will be measured using the dimensions shown in the contract or required based on field conditions.

The Contractor has the option to use flowable fill in place of conventional backfill and compaction for trench construction associated with culverts. Any flowable fill used at the Contractor's option will be considered incidental to the associated bid item with no direct payment therefore.

515.5 BASIS OF PAYMENT

PAY ITEM	PAY UNIT
Flowable Fill	Cubic Yard

When flowable fill is specified in the contract or required by the City Engineer or designee based on field conditions, it shall be paid for at the contract unit price, or as Extra Work if no contract unit price exists. Payment will be considered compensation for all costs associated with the labor, material, and equipment required to provide complete in-place flowable fill, and includes removal and disposal of the excess material generated by use of flowable fill.

When flowable fill is used as an option by the Contractor, no direct payment will be made therefore and it shall be considered incidental to the item for which it is used.