

San Antonio Water System Standard Specifications for Construction

ITEM NO. 299

Flowable Fill

299.1 DESCRIPTION: The work covered by this item consists of furnishing, transporting, mixing, testing and installing flowable fill. Flowable fill is a concrete material suitable as a backfill for utility trenches, abandoned pipes, manholes and valves. It is a heavy material and will exert a high fluid pressure against any forms, embankment, or wall used to contain backfill.

299.2 REFERENCE STANDARDS: Reference standards cited in this Specification Item No. 299 refer to the current reference standard published at the time of the latest revision date.

1. San Antonio Water System (SAWS):
 - a. Specifications for Water and Sanitary Sewer Construction
 - b. SAWS Materials Specifications
2. City of San Antonio (COSA) Standard Specifications for Construction
 - a. ASTM C 31 – Making and Curing Concrete Test Specimens in the field.
 - b. ASTM C 39 – Compressive Strength of Cylindrical Concrete Specimens.
 - c. ASTM C 40 – Organic Impurities in Fine Aggregates for Concrete.
 - d. ASTM C 94 - Ready-Mixed Concrete.
 - e. ASTM C 150 - Portland Cement.
 - f. ASTM C 192 – Making and Curing Concrete Test Specimens in the Laboratory.
 - g. ASTM C 260 – Air-Entraining Admixtures for Concrete.
 - h. ASTM C 494 - Chemical Admixtures for Concrete.
 - i. ASTM C 618 – Coal Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Concrete.
3. ASTM C 4318 – Liquid Limit, Plastic Limit and Plasticity Index of Soils. Texas Department of Transportation (TxDOT)
 - a. TxDOT DMS-4600 Hydraulic Cement
 - b. TxDOT DMS-4610 Fly Ash
 - c. TxDOT DMS 4640 Chemical Admixtures for Concrete
 - d. Tex-401-A
 - e. TxDOT Tex-106-A
 - f. TxDOT-Tex-418-A
 - g. TxDOT-Tex-447-A

299.3 SUBMITTALS:

1. All submittals shall be in accordance with Engineer's requirements. All submittals shall be approved by the Engineer and acknowledge by the Inspector prior to delivery of materials and commencing any portion of the proposed scope of work.
 - a. Submit proposed mix design. Mix design shall state the following information:
 - 1) Mix design number or code designation to order the concrete from the supplier.

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- 2) Design strength at 7 days (unless otherwise noted on the Plans).
- 3) Cement type and brand.
- 4) Fly ash type and brand.
- 5) Admixtures type and brand.
- 6) Proportions of each material used.
- 7) Submit a copy of delivery tickets accompanied by batch tickets, providing the information required by ASTM C 94 to SAWS Inspector in the field at time of delivery.

299.4 MATERIALS:

- 1. Cement. Furnish hydraulic cement that meets the requirements of TxDOT’s DMS-4600, “Hydraulic Cement,” TxDOT’s Hydraulic Cement Quality Monitoring Program (HCQMP), and ASTM C-150 Type I Portland Cement. Sources not on the HCQMP or other sources to be used in combination with an approved source will require approval before use.
- 2. Fly Ash. Furnish fly ash conforming to TxDOT DMS-4610, “Fly Ash.”
- 3. Chemical Admixtures. Furnish chemical admixtures conforming to TxDOT DMS-4640, Chemical Admixtures for Concrete.
- 4. Fine Aggregate. Provide fine aggregate that will stay in suspension in the mortar to the extent required for proper flow and that meets the gradation requirements of Table 1. Test fine aggregate gradation in accordance with TxDOT standard laboratory test procedure Tex-401-A. Plasticity Index (PI) must not exceed 6 when tested in accordance with TxDOT standard laboratory test procedure Tex-106-A.
- 5. Mixing Water. Use mixing water conforming to the requirements of Specification Item No. 300, Concrete (Natural Aggregate).

Table 1 Aggregate Gradation Chart	
<i>Sieve Size</i>	<i>Percent Passing</i>
¾ inch	100
No.200	0-30

299.5 CONSTRUCTION: Unless otherwise shown on the plans, furnish a mix meeting the requirements of this section as set forth below.

- 1. Strength. The compressive strength range shall be between the following strength values unless otherwise directed by the Engineer or shown on the plans:
 - a. Low Strength. Between 80 psi and 150 psi at 28 days,
 - b. High Strength. Greater than 500 psi at 28 days. For emergency repairs, strength shall be greater than 50 psi at 2 hours.
- 2. Consistency. Design the mix to be placed without consolidation and to fill all intended voids.
 - a. Fill an open-ended, 3 inch diameter by 6 inch high cylinder to the top to test the consistency.
 - b. Immediately pull the cylinder straight up. The correct consistency of the mix must produce a minimum 8 inch diameter circular spread with no segregation.

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- c. When necessary, use specialty type admixtures to enhance the flowability, reduce shrinkage, and reduce segregation by maintaining solids in suspension.
 - d. All admixtures must be used and proportioned in accordance with the manufacturer's recommendations.
 - e. Mix the flowable fill using a central-mixed concrete plant, ready-mix concrete truck, pug mill, or other approved method.
3. Shrinkage and Bleeding. Limit shrinkage to 0.5% or less based upon the results from ASTM C 827, "Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures."
- a. Batch, mix and transport flowable fill in accordance with ASTM C 94, except when directed otherwise by the Engineer.
 - b. Mix flowable fill in quantities required for immediate use. Do not use portions which have developed initial set or which are not in place within 90 minutes after the initial water has been added.
 - c. Do not mix flowable fill while the air temperature is at or below 35 degrees F without prior approval from the Engineer.
 - d. Monitor and control the fluid pressure during placement of flowable fill prior to set. Take appropriate measures to avoid excessive pressure that may damage or displace structures or cause flotation. Cease operations if flowable fill is observed leaking from the area.
 - e. Repair or replace damaged or displaced structures at no additional cost to SAWS.
 - f. Clean up excess flowable fill discharged from the work area and remove excess flowable fill from pipes at no additional cost to SAWS.

299.6 TESTING: Testing shall be in accordance with TxDOT standard laboratory test procedure Tex-418-A

1. Contractor to furnish all labor, equipment, tools, containers, and molds required for sampling, making, transporting, curing, removal, and disposal of test specimens. Furnish test molds meeting the requirements of TxDOT standard laboratory test procedure Tex-447-A
2. Two specimens are required for a strength test, and the compressive strength is defined as the average of the breaking strength of the 2 cylinders.
3. Contractor to transport, strip, and cure the test specimens as scheduled at the designated location.
4. Cure test specimens in accordance with TxDOT standard laboratory test procedure Tex-447-A.
5. The Contractor will sample, take, and test all quality control testing.
6. Contractor to dispose of used, broken specimens in an approved location and manner.
7. The frequency of job control testing will be at the direction of the Engineer.
8. SAWS will be responsible for quality assurance testing.

299.7 MEASUREMENT: This Item will be measured by the cubic yard of material placed of accepted work complete in place.

1. Measurement will not include additional volume caused by slips, slides, or cave-ins resulting from the Contractor's operations.

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PAYMENT: The work performed and materials furnished in accordance with this Item and measured as provided under “Measurement” is for full compensation for furnishing, hauling, and placing materials and for equipment, tools, labor, and incidentals and will be paid for at the unit price bid for “Flowable Fill (Low Strength),” “Flowable Fill (High Strength),” or “Flowable Fill (High Strength emergency Repair)” for Pipe. Flowable Fill shall be paid for at the contract unit price per cubic yard based on the maximum trench widths as established per SAWS Construction Specification Item No. 804, schedule of pay or as indicated on the contract plans and is for full compensation for furnishing, hauling, and placing materials and for equipment, tools, labor, and incidentals.

The use of flowable fill around manholes as per specification items Nos. 850, 851, 852, 853, and 855 is incidental and there will be no additional separate payment item for the material.

-End of Specification -