FLOWABLE BACKFILL

The Standard Specifications are revised as follows:

SECTION 213, DELETE LINES 1 THROUGH 112.

SECTION 213, BEGIN LINE 113, INSERT AS FOLLOWS:

SECTION 213 -- FLOWABLE BACKFILL

213.01 Description. *This work shall consist of placing flowable backfill in trenches for pipe structures, culverts, utility cuts and other work extending under pavement locations, to fill cavities beneath slopewalls and other locations in accordance with 105.03.*

MATERIALS

213.02 Materials. *Materials shall be in accordance with the following:*

Concrete Admixtures	*912.03*
*Fine Aggregate**	*904*
Fly Ash	*901.02*
Portland Cement	*901.01(b)*
Water	*913.01*

** Except that steel furnace slag shall not be used*

If fly ash is used as a filler and not as a pozzolan, the fly ash shall be in accordance with 904.

The supplier may elect to use gradations in accordance with 904 or may propose the use of alternate gradations. The alternate gradation and proposed tolerances of material passing each sieve shall be included in the flowable backfill mix design.

213.03 Flowable Backfill Mix Design. *The Contractor shall submit a flowable backfill mix design, FBMD, to the Engineer and arrange a trial batch. The FBMD will be approved based on compliance with 213.04. The FBMD shall be submitted in a format acceptable to the Engineer and shall include the following:*

a) a list of all ingredients
b) the source of all materials
c) the gradation of the aggregates
d) the batch mass (weight)
e) the names of all admixtures
f) the admixture dosage rates and manufacturer's recommended range

FBMD's which were used on contracts in the current or previous calendar year, may be submitted to the District Materials and Tests Engineer for approval. Effective January 1, 2004, all FBMD's shall meet the requirements of 213.05

After the completion of the trial batch and all test results have been reviewed for compliance with the specifications, a mixture number will be assigned by the Engineer.

Mix design changes will not be allowed after the FBMD approval, except for adjustments to compensate for routine moisture fluctuations. All other changes require a new FBMD.

213.04 Flowable Backfill Mix Criteria. *The FBMD shall produce a workable mixture with the following properties:*

Minimum Unconfined Compressive Strength at 28-days	*350 kPa (50 psi)*
Maximum Unconfined Compressive Strength at 28-days	*1050 kPa (150 psi)*
Minimum Fill Spread Diameter	*200 mm (8 in.)*

213.05 Flowable Backfill Trial Batch. *A trial batch shall be produced by the Contractor and tested by the District Materials and Tests Engineer to verify that the FBMD meets the flowable backfill mix criteria. The flowable backfill shall be batched within the proportioning tolerances of 508.02(b). The Engineer will determine and provide the Contractor with test results for the unconfined compressive strength test and the flowable backfill spread diameter. The trial batch shall be of sufficient quantity to allow the Contractor and the Engineer to perform all required tests from the same batch. Trial batch flowable backfill shall not be used for more than one test.*

Compressive strength testing shall be conducted in accordance with ITM 588. Flow testing shall be conducted in accordance with ASTM D 6103.

The Contractor shall determine the penetration resistance of the flowable backfill produced during the trial batch in accordance with ITM 213 at one, three, seven, and fourteen days. The results shall be submitted to the Engineer.

FBMD's which were used on contracts in the current or previous calendar year, may be submitted to the District Materials and Tests Engineer for approval.

213.06 Mixing Equipment. *The mixing equipment shall be in accordance with the applicable requirements of 702 or 722, except that in lieu of the calibration requirements of 722.11, the mixer operator shall make delivery in a properly calibrated continuous mixer.*

CONSTRUCTION REQUIREMENTS

213.07 Placement*. The flowable backfill shall not be placed on frozen ground. Flowable backfill shall be protected from freezing until the material has set.*

The diameter of the flowable backfill spread shall be at least 200 mm (8 in.) at time of placement.

The flowable backfill shall be brought up uniformly to the fill line as shown on the plans or as directed.

The flowable backfill shall not be subject to load nor disturbed by construction activities until penetration resistance testing in accordance with ITM 213 has been completed. The minimum penetration resistance shall be as follows:

For PCCP ..... 500 kPa (70 psi)
For all Other Applications ..... 8000 kPa (1200 psi)

213.08 Method of Measurement. *Flowable backfill will be measured by the cubic meter (cubic yard) as computed from the neat line limits shown on the plans, or as adjusted. If neat line limits are not shown on the plans, the volume in cubic meters (cubic yards) of flowable backfill furnished and placed will be computed from the nominal volume of each batch and a count of the batches. Unused and wasted flowable backfill will be estimated and deducted. Drilled holes will be measured by the number of holes drilled.*

213.09 Basis of Payment. *The accepted quantities of flowable backfill will be paid for at the contract unit price per cubic meter (cubic yard) furnished and placed. Holes drilled in the pavement will be paid for at the contract unit price per each.*

Payment will be made under:

Pay Item	*Metric Pay Unit Symbol (English Pay Unit Symbol)*
Drilled Hole for Flowable Backfill	*EACH*
Flowable Backfill	*m3 (CYS)*

The cost of material placed outside the neat line limits, material placed outside the adjusted limits, and unused or wasted flowable backfill shall be included in the cost of this work.

SECTION 211, BEGIN LINE 205, DELETE AND INSERT AS FOLLOWS:

When structure backfill is specified, the Contractor may substitute flowable ~~mortar~~ backfill in accordance with 213. However, flowable ~~mortar~~ backfill shall not be placed into or through standing water, unless approved in writing.

SECTION 211, BEGIN LINE 338, DELETE AND INSERT AS FOLLOWS:

Flowable ~~mortar~~ backfill which is substituted for structure backfill will be paid for as structure backfill.

SECTION 715, BEGIN LINE 23, DELETE AND INSERT AS FOLLOWS:

~~B Borrow for Structure Backfill ..... 211~~
Bituminous Mastic Pipe Joint Sealer 906.05
Concrete 702
Flowable ~~Mortar~~ *Backfill* 213

SECTION 715, BEGIN LINE 266, DELETE AND INSERT AS FOLLOWS:

715.08 Backfilling. All plastic pipes, except longitudinal underdrains, which are not fabricated with hydrostatic design basis rated resins and are installed within 1.5 m (5 ft) of mainline or public road approach pavement, paved shoulders, or sidewalks shall be backfilled with flowable ~~mortar~~ *backfill*. Flowable ~~mortar~~ *backfill* shall be placed in accordance with ~~213.04(c)~~ *213.07*. All other pipe installations shall be backfilled as shown on the plans or as directed. ~~B borrow for structure~~ *Structure* backfill shall be placed in accordance with 211.04.

Prior to placing flowable ~~mortar~~ backfill, all standing water shall be removed from the trench. If the water cannot be removed from the trench, ~~B borrow for~~ structure backfill shall be used in lieu of flowable ~~mortar~~ *backfill* to an elevation 0.6 m (2 ft) above the groundwater. The remainder of the trench shall be backfilled as shown on the plans.

Except where prohibited due to groundwater, flowable ~~mortar~~ *backfill* may be used as a substitute for ~~B borrow for~~ structure backfill.

SECTION 715, BEGIN LINE 281, DELETE AND INSERT AS FOLLOWS:

After the completion of the backfill operation and prior to beginning the paving operation, all plastic pipes, except longitudinal underdrains, not fabricated with hydrostatic design basis rated resins installed within 1.5 m (5 ft) of mainline or public road approach pavement, paved shoulders, or sidewalks shall be mandrel tested. The mandrel shall be a go/no go mandrel with a minimum of nine arms or prongs and a diameter of 5% less than the pipe pay item diameter. If the mandrel does not pass through the pipe when pulled by hand or the mandrel damages the pipe, the deficient pipe shall be removed, replaced, and mandrel tested after the flowable ~~mortar~~ backfill has been replaced.

Where material other than ~~B borrow for~~ structure backfill or flowable ~~mortar~~ *backfill* is permitted and used for backfilling, it shall be of such nature that compacts readily. That portion around and for 150 mm (6 in.) above the top of the pipe shall be free from large stones. This material shall be placed in layers not to exceed 150 mm (6 in.), loose measurement, and each layer compacted thoroughly by means of mechanical tamps.

SECTION 715, LINE 368, DELETE AND INSERT AS FOLLOWS:

~~B Borrow for structure~~ *Structure* backfill will be measured in accordance with 211.09. Flowable ~~mortar~~ *backfill* will be measured in accordance with ~~213.06~~ *213.08*.

SECTION 715, BEGIN LINE 382, DELETE AND INSERT AS FOLLOWS:

Pipe end sections, concrete anchors, and safety metal end sections will be paid for at the contract unit price per each for the size specified, complete in place. A concrete anchor attached at one end of twin pipes will be paid for as two concrete anchors. A concrete anchor attached at one end of triple pipes will be paid for as three concrete anchors. ~~B borrow for structure~~ *Structure* backfill will be paid for in accordance with 211.10. If utilized as a substitute for ~~B borrow for~~ structure backfill or if used to backfill thermoplastic pipes fabricated of non-hydrostatic design basis resins, flowable ~~mortar~~ *backfill* will be paid for as ~~B borrow for~~ structure backfill. Otherwise, flowable ~~mortar~~ *backfill* will be paid for in accordance with ~~213.07~~ *213.09*.

SECTION 715, BEGIN LINE 621, DELETE AND INSERT AS FOLLOWS:

The cost~~s~~ of sawing of pavement, excavation above the trench bottom elevation shown on plans, backfilling with material other than ~~B borrow for~~ structure backfill or flowable ~~mortar~~ *backfill*, dewatering, shoring, timber mats, pavement replacement, class A

SECTION 717, BEGIN LINE 9, DELETE AND INSERT AS FOLLOWS:

~~B Borrow for Structure Backfill ..... 211~~
Bituminous Mastic Pipe Joint Sealer 906.05
Concrete, Class A 702
Flowable ~~Mortar~~ *Backfill* 213
Grouted Riprap ..... ~~616.02(d)~~ *904*
Reinforcing Steel 910.01
Structure Backfill 904
Structural Plate Arches 908.09
Structural Plate Pipe and Pipe-Arches 908.09

SECTION 717, BEGIN LINE 78, DELETE AND INSERT AS FOLLOWS:

717.04 Backfill. Where shown on the plans or when directed, ~~B borrow for~~ structure backfill or flowable ~~mortar~~ *backfill* shall be used in backfilling around pipe and pipe-arch structures. Arch structure backfill shall be ~~B borrow for~~ structure backfill. The amount of camber on the invert of the pipe or pipe-arch shall be varied to suit the height of fill and supporting soil, except the camber grade shall not be above level. The finished backfill grade shall be as shown on the plans.

After the pipe or pipe-arch has been assembled and is in place, backfill material shall be placed in accordance with 211.04 or ~~213.04(c)~~ *213.07*.

SECTION 717, BEGIN LINE 140, DELETE AND INSERT AS FOLLOWS:

~~B borrow for structure~~ *Structure* backfill will be measured in accordance with 211.09. Flowable ~~mortar~~ *backfill* used for backfill will be measured in accordance with ~~213.06~~ *213.08*.

SECTION 717, BEGIN LINE 153, DELETE AND INSERT AS FOLLOWS:

If a pipe or pipe-arch is lowered or relocated, or if rock or unsuitable material is encountered which requires additional excavation, such excavation will be paid for in accordance with 715.12. ~~B borrow for structure~~ *Structure* backfill will be paid for in accordance with 211.10. Flowable ~~mortar~~ *backfill* will be paid for in accordance with ~~715.12~~ *213.09*.

SECTION 719, LINE 14, DELETE AND INSERT AS FOLLOWS:

Flowable ~~Mortar~~ *Backfill* 213

SECTION 719, BEGIN LINE 75, DELETE AND INSERT AS FOLLOWS:

719.07 Method of Measurement. Drain tile and replacement pipe of the type and size specified will be measured in accordance with 715.11. Terminating pipe sections of the type and size specified will be measured per meter (linear foot). ~~B borrow for structure~~ *Structure* backfill *will be measured in accordance with 211.09.* ~~and flowable mortar~~ *Flowable backfill* will be measured in accordance with ~~715.11~~ *213.08*. Riprap will be measured in accordance with 616.11.

SECTION 719, BEGIN LINE 92, DELETE AND INSERT AS FOLLOWS:

719.08 Basis of Payment. The accepted quantities of drain tile and replacement pipe will be paid for in accordance with 715.12. Terminating pipe sections will be paid for at the contract unit price per meter (linear foot) for pipe, drain tile terminal section, of the size specified, complete in place. ~~B borrow for structure~~ *Structure* backfill *will be paid for in accordance with 211.10.* ~~and flowable mortar~~ *Flowable backfill* will be paid for in accordance with ~~715.12~~ *213.09*. Riprap will be paid for in accordance with 616.12.

SECTION 725, LINE 14, DELETE AND INSERT AS FOLLOWS:

Flowable ~~Mortar~~ Backfill 213

SECTION 725, BEGIN LINE 89, DELETE AND INSERT AS FOLLOWS:

***(b) Filling of Cavities Outside the Existing Pipe**. All obvious cavities outside the existing pipe shall be filled with flowable ~~mortar~~ backfill in accordance with 213 prior to the liner installation or with grout placed in conjunction with the grouting operation after the liner is installed.*

SECTION 725, BEGIN LINE 150, DELETE AND INSERT AS FOLLOWS:

The cost of repairing jagged edges or deformities to existing pipe, filling cavities around the existing pipe with flowable ~~mortar~~ backfill or grout, acquisition and restoration of required right-of-entry areas, erection, maintenance, and removal of temporary fence, removing foreign material from the existing pipe, grouting the space between the existing pipe and the liner, and other incidentals will not be paid for separately, but shall be included in the cost of the pay items in this section.