SPECIAL SPECIFICATION

3247

Pressure Grouting

1. **Description.** This Item shall consist of stabilizing abutments by pumping grout of a specified mixture of Portland cement, a fluidifier, fly ash and water under the abutments. The purpose of this operation is to fill voids with a mixture that will form a hard insoluble mass.

2. **Materials.** The materials shall consist of a mixture of Type I or II Portland cement, a fluidifier, fly ash and water proportion as specified, or as directed by the Engineer. All materials shall be furnished by the Contractor.

   Type I or II Portland cement shall conform to the requirements of the Item 524, "Hydraulic Cement".

   The fluidifier shall be a cement dispersing agent, as directed by the Engineer, possessing such characteristics that will inhibit early stiffening of the pumpable mortar, tend to hold the solid constituents of the fluid mortar in suspension and prevent completely all setting shrinkage of the grout.

   Water shall be clean and free from industrial wastes and other objectionable matter.

   Fly ash shall meet the requirements of Departmental Material Specification DMS-8900 and be of the type selected by the Engineer and from an approved source. A list of approved sources is maintained by the Materials Section of the Construction Division. Unless otherwise requested by the Engineer, testing of the fly ash for compliance with departmental Material Specification DMS-8900 is waived.

3. **Equipment.** The equipment used shall be that customarily used in the pressure grouting of earthen embankments or in the mudjacking or pressure grouting of concrete pavement. It shall consist of at least the following:

   (1) Air compressors of sufficient capacity for operating pneumatic hammers.

   (2) Pneumatic hammers equipped with drills that will cut one and one-half (1-1/2) inch diameter or other approved diameter holes through the rigid pavement. The equipment shall be in satisfactory operating condition and operated in such a manner so as to prevent unnecessary damage to the abutment.

   (3) Cylindrical wooden plugs or other approved plugs to satisfactorily plug holes until the grout has set.
4. **Proportioning Grout Mixture.** The mixture used in pressure grouting shall consist of proportions of Portland cement (by dry volume), fly ash (by dry volume), fluidifier (by weight) and water.

The mix design is as follows:

One (1) part (by volume) Portland cement Type I or II, three (3) parts (by volume) fly ash. Any deviation from the dry mix portion (Portland cement or fly ash) must be approved by the Engineer. The water content will be established as required for local climatic conditions to insure maximum pumpability and fluidity as an initial set or resistance to flow in or near one (1) hour.

The Contractor shall add a fluidifier approved by the Engineer. The proportions are to be approved by the Engineer. The quantity of mixing water shall be that which will produce a grout of such consistency that the time of efflux from the flow cone will be a minimum of 10 seconds and a maximum of 20 seconds. That flow test shall be performed in accordance with Tex Method Tex-437-A, "Method of Test for Flow of Grout Mixtures (Flow-Cone Method)".

5. **Construction Methods.** One and one-half (1-1/2) inch diameter or other approved diameter holes shall be drilled at the locations indicated on the plans or designated by the Engineer. For holes nearest the edges of the abutments, the joints or a major crack, a maximum of three (3) inches from the precise marked location is considered to be reasonable. For other holes a maximum six (6) inch tolerance is considered to be reasonable. The drills shall be rotated to avoid cracking the pavement and to provide satisfactory holes of the proper diameter for effective operations in pressure grouting. When drilling holes, the drills shall be held as nearly perpendicular as possible to the surface. Irregular or unsatisfactory holes which cannot be satisfactorily used in pressure grouting shall be filled with grout and new holes shall be drilled. No more holes shall be drilled during a day's operations than can be grouted during the same day, unless specific approval is given by the Engineer.
After the holes are drilled, a pipe connected to the discharge hose on the pressure grout pump shall be lowered into the holes. The discharge end of the pipe shall not extend below the lower surface of the abutment.

To fill all voids, pumping of grout will be required in holes designated by the Engineer. Normally, indication that the abutment is beginning to rise or the flowing grout out of an adjacent hole or joint or the edge of the abutment is sufficient evidence that all cavities or voids are filled within the range of the hole being grouted, and pumping in such hole may cease.

After grouting has been completed in any one (1) hole, the discharge pipe shall be withdrawn from that hole and the hole plugged immediately. Temporary plugs may be used since additional grout may be placed in particular holes to complete the required work in that area. Grouting of any designated abutment shall be continued until the Engineer is reasonably sure that all cavities or voids are filled.

Temporary plugs shall be removed when sufficient time has elapsed to permit the grout to set sufficiently so that back pressure will not force it through the hole, and space occupied by the plug filled with a reasonable stiff grout or an approved concrete mixture, and compacted.

In the event the Engineer determines that continued grout injection at any specific location is no longer economically feasible, he may direct the Contractor to cease grout injection at that location.

The Contractor shall pressure grout the abutments in areas throughout the limits of this project, as designated by the Engineer, where stabilization is necessary.

The construction methods outlined above may, for sufficient justification, be modified by the Engineer as field conditions dictate.

The Contractor shall use such approved measures as are necessary to keep all pavement surfaces adjacent to the actual grouting operation in progress reasonably clean of excess grout and other materials at all times.

The pavement, including adjacent shoulders, shall be cleaned to the satisfaction of the Engineer, prior to the placement of traffic on the work area.

All traffic shall be kept off a grouted abutment for at least one (1) hour after grouting. Pressure grouting operations shall cease at least one (1) hour before sundown, except that on cloudy days pressure grouting operations shall cease earlier as necessary to permit grout to harden at least one (1) hour prior to allowing traffic back over the grouted abutment before first darkness. The Engineer may require ceasing work more than one (1) hour prior to darkness as he deems necessary for an initial set.

6. **Measurement**. Portland cement and fly ash for pressure grouting incorporated into the completed work will each be measured by the cubic foot of dry material.
7. **Payment.** The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Portland Cement (Pressure Grouting)" and "Fly Ash (Pressure Grouting)". The prices shall be full compensation for furnishing all materials including all fluidifier and water, for all manipulations required, for all hauling and freight involved, for drilling of holes, for all tools, equipment, labor, and for all incidentals necessary to complete the work.