



Iowa Department of Transportation

SPECIAL PROVISIONS FOR FLY ASH-TREATED SUBGRADE

City of Knoxville
Marion County
JL-4040(607)—7R-63

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May 18, 2010

THE STANDARD SPECIFICATIONS, SERIES 2009, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

PART 1 – GENERAL

1.01 SECTION INCLUDES

This work consists of construction of one or more courses of a mixture of soil, fly ash, and water as indicated on the plans.

1.02 SUBMITTALS

- A. Construction sequencing.
- B. Results of Standard Proctor moisture-density relationships and In-Place Density Tests.
- C. Results of chemical and physical composition analyses on each source of fly ash.
- D. Job mix formula.
- E. The Contractor shall provide material certifications to the Engineer.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Fly Ash

Fly ash shall meet ASTM C 618, Section 4.3 when sampled and tested in accordance with ASTM C 618, Sections 5, 6, and 8, unless otherwise shown on the plans. Fly ash shall be Class C containing a minimum of 22% CaO. The source of the ash shall be identified and approved in advance of stabilization operations in order that laboratory test can be completed prior to commencing work.

Fly ash shall be stored and handled in closed weatherproof containers until immediately before distribution. Fly ash exposed to moisture prior to mixing with soils shall be discarded.

B. Water

Water used for mixing or curing shall be reasonably clean and free of oil, salt acid, alkali, sugar, vegetable, or other substances injurious to the finished product. Water shall meet the requirements of AASHTO T 26. Water known to be of potable quality may be used without testing.

C. Soil

Soil for this work consists of materials on the site or selected materials from other sources and shall be uniform in quality and gradation, and shall be approved by the Engineer. The soil shall be free of roots, sod, weeds, and stones larger than 1.5 inches.

2.02 COMPOSITION

A. Fly Ash

Fly ash shall be applied at a rate of 18% by volume for the depth of subgrade treatment shown on the plans.

B. Tolerances

At final compaction, the fly ash and water content for each course of subgrade treatment shall conform to the following tolerances:

<u>Material</u>	<u>Tolerance</u>
Fly Ash	+0.5%, -0%
Water	+4%, -1%

PART 3 – EXECUTION

3.01 WEATHER LIMITATIONS

A. Weather Limitations

The fly ash-treated subgrade shall not be mixed while the atmospheric temperature is below 40°F or when conditions indicate that temperatures may fall below 40°F within 24 hours, when it is foggy, rainy, windy or when soil or subgrade is frozen.

3.02 EQUIPMENT

A. Equipment

The equipment required shall include all equipment necessary to complete this item such as: grading and scarifying equipment, a spreader for the fly ash, mixing or pulverizing equipment, sheepsfoot and pneumatic or vibrating rollers, sprinkling equipment, and trucks.

Due to the type of in-situ soils and high moisture content, the Contractor is cautioned against using vibratory compaction equipment due to their tendency to draw up groundwater. Pneumatic equipment is recommended.

3.03 CONSTRUCTION METHODS

A. General

It is the primary requirement of this specification to secure a completed stabilized subgrade containing a uniform fly ash mixture, free from loose or segregated areas, of uniform density and moisture content, well bound for its full depth, and with a smooth surface suitable for placing subsequent courses. The Contractor shall regulate the sequence of work, to use the proper amount of fly ash, maintain the work, and rework the courses as necessary to meet the above requirements.

B. Application

Fly ash shall be spread only on areas where the mixing and compaction operations can be completed within 2 hours. The amount of fly ash spread shall be the amount required to obtain 18% fly ash content by volume in each 6 inch layer of the fly ash treated subgrade.

The fly ash shall be spread uniformly over the top of the subgrade by an approved screw-type spreader box or other approved spreading equipment. The fly ash shall be distributed in such manner that scattering by wind will not occur. Fly ash shall not be applied when wind conditions, in the opinion of the Engineer, are detrimental to a proper application. Fly ash shall be applied and mixed between the hours of 8:30 a.m. and 4:00 p.m.

C. Mixing

The full depth of the treated subgrade shall be mixed with the pulvamixer. Fly ash shall not be left exposed for more than 30 minutes after application. The pulvamixer shall make two passes to incorporate the fly ash into the soil. Water shall be added through use of a pulvamixer equipped with a spray bar in the mixing drum capable of applying sufficient quantities of water to achieve the required moisture content of the soil-fly ash mixture. The system shall be capable of being regulated to the degree as to maintain moisture contents within the specified range.

Specified moisture contents shall be established based on laboratory tests with the site soils and the specific fly ash to be used for the treatment. Final moisture content of the mix, immediately prior to compaction, shall be within 1% below and 4% above the optimum moisture content for maximum density of the mix as determined in accordance with ASTM D 698. If moisture contents exceed the specified limits, additional fly ash may be added to lower the moisture content to the required limits. Lowering moisture contents by aeration following addition of the fly ash will not be permitted.

D. Compaction

Compaction of the soil-fly ash mixture shall begin immediately after mixing of the fly ash and be completed within two hours following incorporation of the fly ash. The field density of the compacted mixture shall be at least 95% of the maximum density of laboratory specimens prepared from samples taken from the material in place. The specimens shall be compacted and tested in accordance with ASTM D 698.

The in-place density of the fly ash-treated subgrade layer shall be determined in accordance with ASTM D 1556 at intervals so that each test shall represent no more than 300 square yards.

Irregularities, depressions, or weak spots, which develop, shall be corrected immediately by scarifying the area affected, adding or removing material as required, and reshaping and re-compacting. The surface of the course shall be maintained in a smooth condition, free from undulations and ruts, until other work is placed thereon or the work is accepted.

In addition to the requirements specified for density, the full depth of the material shown on the plans shall be compacted to the extent necessary to remain firm and stable under construction equipment. After each section is completed, tests will be made by the Engineer. If the material fails to meet the density requirements, it shall be reworked to meet these requirements. Throughout this operation, the shape of the course shall be maintained by blading, and the surface upon completion shall be smooth and shall conform with the typical section shown on the plans and to the established lines and grades. Should the material lose the required stability, density, and finish before the next course is placed or the work is accepted; it shall be recompacted and refinished at no additional cost to the Contracting Authority.

E. Finishing and Curing

After the final layer or course of the fly ash-treated subgrade has been compacted, it shall be brought to the required lines and grades in accordance with the typical sections. The finished surfaces shall not vary more than 3/8 inch when tested with a 16 foot straightedge applied parallel with and at right angles to the pavement centerline. Any variations in excess of this tolerance shall be corrected by the Contractor, at no additional cost to the Contracting Authority, and in a manner satisfactory to the Engineer.

After the fly ash-treated course has been finished as specified herein, the surface shall be protected against rapid drying and maintained in a thorough and continuously moist condition by sprinkling for a period of not less than three days or until the pavement section is placed.

F. Thickness

The thickness of the fly ash-treated subgrade shall be determined by depth checks or cores taken at intervals so that each test will represent no more than 300 square yards. When the base thickness is deficient by more than 0.5 inch, the Contractor shall correct such areas in a manner satisfactory to the Engineer. The Contractor shall replace, at no additional cost to the Contracting Authority, the base material where borings are taken for test purposes.

G. Maintenance

The Contractor shall maintain the fly ash-treated subgrade in good condition from the start of work until all the work has been completed, cured, and accepted by the Engineer.

3.04 TESTING REQUIREMENTS

ASTM D 698 Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5.5 lb Rammer and 12 inch Drop

ASTM D 1556 Density of Soil in Place by the Sand-Cone Method

ASTM D 2922 Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

AASHTO T 26 Quality of Water to be Used in Concrete

3.05 MATERIAL REQUIREMENTS

ASTM C 618 Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete

PART 4 – METHOD OF MEASUREMENT

4.01 MINERAL STABILIZING AGENT, FLY ASH TYPE C

The Engineer will measure the mineral stabilizing agent in tons through a calibrated pump used for metering the total delivery of the agent or by delivery tanker quantity.

PART 5 – BASIS OF PAYEMENT

5.01 MINERAL STABILIZING AGENT, FLY ASH TYPE C

The Contractor will be paid the contract unit price per ton for mineral stabilizing agent. This payment shall be full compensation for all labor, equipment, and material necessary for furnishing the agent and application of the agent into the soil. Item is for Subgrade Treatment, Class C Fly Ash.