



Designation: E 1266 – 88 (Reapproved 1999)

Standard Practice for Processing Mixtures of Lime, Fly Ash, and Heavy Metal Wastes in Structural Fills and Other Construction Applications¹

This standard is issued under the fixed designation E 1266; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice provides descriptions and references of existing test methods and commercial practices relating to the processing of lime, fly ash, and heavy metal wastes in construction applications.

1.2 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:²

- C 5 Specification for Quicklime for Structural Purposes
- C 25 Test Method for Chemical Analysis of Limestone, Quicklime, and Hydrated Lime
- C 109 Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens)
- C 110 Test Methods for Physical Testing of Quicklime, Hydrated Lime, and Limestone
- C 206 Specification for Finishing Hydrated Lime
- C 207 Specification for Hydrated Lime for Masonry Purposes
- C 311 Test Method for Sampling and Testing Fly Ash or Natural Pozzolans for Use as a Mineral Admixture in Portland Cement Concrete
- C 400 Test Method for Quicklime and Hydrated Lime for Neutralization of Waste Acid
- C 593 Specification for Fly Ash and Other Pozzolans for Use with Lime
- C 618 Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete

- C 821 Specification for Lime for Use with Pozzolans
 - C 911 Specification for Quicklime, Hydrated Lime, and Limestone for Chemical Uses
 - C 977 Specification for Quicklime and Hydrated Lime for Soil Stabilization
 - D 559 Test Methods for Wetting and Drying Compacted Soil-Cement Mixtures
 - D 560 Test Methods for Freezing and Thawing Compacted Soil-Cement Mixtures
 - D 1557 Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³(2,700 kN-m/m³))
 - D 1633 Test Method for Compressive Strength of Molded Soil-Cement Cylinders
 - D 2434 Test Method for Permeability of Granular Soils (Constant Head)
 - D 2435 Test Method for One-Dimensional Consolidation Properties of Soils
 - D 3877 Test Methods for One-Dimensional Expansion, Shrinkage, and Uplift Pressure of Soil-Lime Mixtures
 - D 3987 Test Method for Shake Extraction of Solid Waste with Water
 - D 4318 Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
 - E 850 Practice for Use of Inorganic Process Wastes as Structural Fill
- #### 2.2 Environmental Protection Agency Documents:
- EPA Resource Conservation and Recovery Act (RCRA)³
 - EPA/SW-846 Test Methods for Evaluation of Solid Waste⁴
 - EPA Method 1310 Extraction Procedure (EP) Toxicity Test Method and Structural Integrity Test⁴
 - EPA/SW-872 Properties of Stabilized/Solidified Waste⁴
 - RCRA Document EPA-IAG-D4-0569 Guide to the Disposal of Chemically Stabilized and Solidified Waste⁴
 - Solvents⁵

¹ This practice is under the jurisdiction of ASTM Committee D34 on Waste Management and is the direct responsibility of Subcommittee D34.03.03 on Industrial Recovery and Reuse.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Documents 12/18/78, 9/13/79, 5/26/82, 7/26/82, and 4/4/83, available from *Federal Register* U.S. Government Printing Office, Superintendent of Documents, Washington, DC 20402.

⁴ Available from Environmental Protection Agency, U.S. Government Printing Office.

⁵ Amendments available from Federal Register.

Hazardous and Solid Waste Amendments (HSWA) ⁵
 Method 9095 Paint Filter Liquid Test (PFLT)⁴
 EPA/530-SW-85-0031 Petitions to Delist Hazardous Waste:
 A Guidance Manual, NTIS: PB 85-194488⁴
 EPA/530-SW-86-008 OWSER Policy Directive No.
 9527.00-1A, Guidance Manual for Research, Develop-
 ment, and Demonstration Permits Under 40 CFR 270.65⁴
 EPA/530-SW-86-016 OWSER Policy Directive No.
 9487.00-2A, Prohibition on the Placement of Bulk Liquid
 Hazardous Waste in Landfills⁴
 EPA/540-2-86-001 Handbook for Stabilization/
 Solidification of Hazardous Waste, Superfund Document⁴
2.3 Code of Federal Regulations:
 40 CFR 264 Subpart B, section 264.13, Hazardous Waste
 Management System, Land Disposal Restrictions, Pro-
 posed Rule, Dec. 11, 1988⁵
 40 CFR 268 Hazardous Waste Management System; Land
 Disposal Restrictions; and California List Constituents
2.4 Department of the Interior Document:
 U.S. Department of the Interior Earth Manual (Section
 Edition), 1974⁶
2.5 Corps of Engineers Document:
 1110-2-1906 Permeability of Fine Materials, Falling Head
 Aug. 12, 1987.⁷

3. Terminology

3.1 Definitions:

3.1.1 *fly ash*—finely sized ash generated from combustion of pulverized coal. Descriptions and types are listed in Specifications **C 593** and **C 618**.

3.1.2 *heavy metal wastes*—industrial wastes containing heavy metals such as arsenic, cadmium, chromium, barium, lead, silver, selenium, and mercury; these wastes are generally liquids, sludges, or filter cakes.

3.1.3 Heavy metal wastes may also contain small amounts of organic compounds. Special provisions are referenced to accommodate this class of material as stated in **8.4**.

3.1.4 *lime*—a commercial product derived from the calcination of high calcium or dolomitic limestone. A number of ASTM standards relating to lime are given in **2.1**.

3.1.5 *monolithic mass*—a mass that has good dimensional stability, to freezing and thawing resistance, low permeability, a high bearing capacity, and resistance to attack by biological agents. The EPA states that an end product such as this could be used as a foundation for buildings or roads, or simply buried and covered over in a landfill (EPA/SW-872).

3.1.6 *resource application*—use of stabilized products in specific areas such as earth liners, foundations, road base, backfills, embankments, earth dams, etc.

3.1.7 *resource structural products*—structural products produced by lime, fly ash, and heavy metal waste; examples are block, brick, aggregates, gabions, and miscellaneous structural shapes.

3.1.8 *solidification*—a binding physical and chemical treatment process that transforms materials containing free liquids into a solid, soil-like, or clayey material. This solid material can be a monolithic block with structural integrity.

3.1.9 *stabilization*—a treatment process that involves both a physical and chemical reaction for treating heavy metal waste. Heavy metal wastes are considered stabilized when they meet current applicable regulatory requirements.

3.1.10 *structural landfill*—man-made earth work meeting engineered practices and structural requirements. The fill must also be environmentally acceptable and meet EPA requirements. (See **40 CFR 268**.)

4. Significance and Use

4.1 This practice provides users with current methods for preconditioning, handling, processing, and means of characterizing the materials that are produced.

4.2 Lime and fly ash, and mixtures of lime and fly ash can be useful for treating hazardous and nonhazardous waste as follows:

4.2.1 Treating hazardous waste for potential resource recovery application,

4.2.2 Solidifying liquids and sludges that are banned from land disposal because of excess free liquid content,

4.2.3 Treating hazardous waste that may require treatment because of hazardous constituents prior to land disposal, and,

4.2.4 Treating hazardous waste for potential delisting to a nonhazardous waste status. Each one of these applications, however, must comply with requirements of the Resource Recovery and Conservation Act and the **Hazardous and Solid Waste Amendments**.

5. Properties and Uses of Materials Applicable to the Practice

5.1 *Commercial Lime*—The following are properties and uses of commercial lime.

5.1.1 Neutralizes acids;

5.1.2 Precipitates and reduces the solubilities of heavy metals;

5.1.3 Provides high absorption rates of aqueous and non-aqueous liquids;

5.1.4 Solidifies and hardens a number of inorganic waste sludges;

5.1.5 Reacts chemically with soils, particularly clays, and thereby reduces plasticity; improves dimensional stability; and develops and controls structural applications;

5.1.6 Develops cements when mixed with natural pozzolans, such as diatomaceous earth, cherts, shales, volcanic ash, and also fly ash formed in the combustion of pulverized coal; and

5.1.7 Capable of increasing pH of heavy metal waste.

5.2 *Pulverized Coal Fly Ash*—The following are properties and uses of pulverized coal fly ash.

5.2.1 Serves as a filler in the treatment of liquid waste;

5.2.2 Provides siliceous glass that reacts with lime to form cementitious compounds (tobermorites);

5.2.3 Provides aluminous glass which reacts with lime and sulfates to form cementitious compounds (ettringites); and

⁶ Available from Bureau of Reclamation, Department of the Interior, Code D/7923A, P.O. Box 25007, Denver, CO 80225.

⁷ Available from Department of the Army, U.S. Army Corps of Engineers, Public Depot, 2803 52nd Ave., Hyattsville, MD 20781.