



Designation: E1266 – 88 (Reapproved 2005)

# Standard Practice for Processing Mixtures of Lime, Fly Ash, and Heavy Metal Wastes in Structural Fills and Other Construction Applications<sup>1</sup>

This standard is issued under the fixed designation E1266; 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 ( $\epsilon$ ) 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:<sup>2</sup>

- C5 Specification for Quicklime for Structural Purposes
- C25 Test Methods for Chemical Analysis of Limestone, Quicklime, and Hydrated Lime
- C109/C109M Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens)
- C110 Test Methods for Physical Testing of Quicklime, Hydrated Lime, and Limestone
- C206 Specification for Finishing Hydrated Lime
- C207 Specification for Hydrated Lime for Masonry Purposes
- C311 Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland-Cement Concrete
- C400 Test Methods for Quicklime and Hydrated Lime for Neutralization of Waste Acid
- C593 Specification for Fly Ash and Other Pozzolans for Use With Lime for Soil Stabilization
- C618 Specification for Coal Fly Ash and Raw or Calcined

- Natural Pozzolan for Use in Concrete
  - C821 Specification for Lime for Use with Pozzolans
  - C911 Specification for Quicklime, Hydrated Lime, and Limestone for Selected Chemical and Industrial Uses
  - C977 Specification for Quicklime and Hydrated Lime for Soil Stabilization
  - D559 Test Methods for Wetting and Drying Compacted Soil-Cement Mixtures (Withdrawn 2012)<sup>3</sup>
  - D560 Test Methods for Freezing and Thawing Compacted Soil-Cement Mixtures (Withdrawn 2012)<sup>3</sup>
  - D1557 Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>))
  - D1633 Test Methods for Compressive Strength of Molded Soil-Cement Cylinders
  - D2434 Test Method for Permeability of Granular Soils (Constant Head)
  - D2435 Test Methods for One-Dimensional Consolidation Properties of Soils Using Incremental Loading
  - D3877 Test Methods for One-Dimensional Expansion, Shrinkage, and Uplift Pressure of Soil-Lime Mixtures
  - D3987 Test Method for Shake Extraction of Solid Waste with Water
  - D4318 Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
  - E850 Guide for Characterization of Inorganic Process Wastes for Use as Structural Fill
- ### 2.2 Environmental Protection Agency Documents:
- EPA Resource Conservation and Recovery Act (RCRA)<sup>4</sup>
  - EPA/SW-846 Test Methods for Evaluation of Solid Waste<sup>5</sup>
  - EPA Method 1310 Extraction Procedure (EP) Toxicity Test Method and Structural Integrity Test<sup>5</sup>
  - EPA/SW-872 Properties of Stabilized/Solidified Waste<sup>5</sup>
  - RCRA Document EPA-IAG-D4-0569 Guide to the Disposal

<sup>1</sup> This practice is under the jurisdiction of ASTM Committee D34 on Waste Management and is the direct responsibility of Subcommittee D34.03 on Treatment, Recovery and Reuse.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> The last approved version of this historical standard is referenced on [www.astm.org](http://www.astm.org).

<sup>4</sup> 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.

<sup>5</sup> Available from Environmental Protection Agency, U.S. Government Printing Office.

of Chemically Stabilized and Solidified Waste<sup>5</sup>  
Solvents<sup>6</sup>

Hazardous and Solid Waste Amendments (HSWA)<sup>6</sup>

Method 9095 Paint Filter Liquid Test (PFLT)<sup>5</sup>

EPA/530-SW-85-0031 Petitions to Delist Hazardous Waste:  
A Guidance Manual, NTIS: PB 85-194488<sup>5</sup>

EPA/530-SW-86-008 OWSER Policy Directive No.  
9527.00-1A, Guidance Manual for Research,  
Development, and Demonstration Permits Under 40 CFR  
270.65<sup>5</sup>

EPA/530-SW-86-016 OWSER Policy Directive No.  
9487.00-2A, Prohibition on the Placement of Bulk Liquid  
Hazardous Waste in Landfills<sup>5</sup>

EPA/540-2-86-001 Handbook for Stabilization/  
Solidification of Hazardous Waste, Superfund Document<sup>5</sup>

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, 1988<sup>6</sup>

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), 1974<sup>7</sup>

2.5 Corps of Engineers Document:

1110-2-1906 Permeability of Fine Materials, Falling Head  
Aug. 12, 1987.<sup>8</sup>

### 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 Speci-  
fications C593 and C618.

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 calcina-  
tion 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 pro-  
duced 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 treat-  
ment 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 require-  
ments. (See 40 CFR 268.)

### 4. Significance and Use

4.1 This practice provides users with current methods for  
preconditioning, handling, processing, and means of character-  
izing 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 recov-  
ery 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.

<sup>6</sup> Amendments available from Federal Register.

<sup>7</sup> Available from Bureau of Reclamation, Department of the Interior, Code  
D/7923A, P.O. Box 25007, Denver, CO 80225.

<sup>8</sup> Available from Department of the Army, U.S. Army Corps of Engineers, Public  
Depot, 2803 52nd Ave., Hyattsville, MD 20781.