Designation: E956 – 83 (Reapproved 2015)

Standard Classification for Municipal-Mixed Nonferrous Metals (MNM)[1]

This standard is issued under the fixed designation E956; 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 classification covers municipal mixed nonferrous metals (MNM), not source-separated, that are recovered from municipal waste destined for disposal.

1.2 The mixed nonferrous metals (MNM) have been subdivided according to processing history, nonferrous metal content, size, and moisture content.

1.3 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.4 *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]

D2013 Practice for Preparing Coal Samples for Analysis

E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves

E122 Practice for Calculating Sample Size to Estimate, With Specified Precision, the Average for a Characteristic of a Lot or Process

E276 Test Method for Particle Size or Screen Analysis at No. 4 (4.75-mm) Sieve and Finer for Metal-Bearing Ores and Related Materials

E753 Specification for Municipal Aluminum Scrap (MAS) (Discontinued 2001) (Withdrawn 2001)[3]

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *loose combustible material (organic)*—loose combustible organics (LCO) that consist of, but are not limited to, nonmetallic materials such as paper, rags, plastic, rubber, wood, food wastes, and yard or lawn wastes, etc., which are not permanently attached to noncombustible objects. The LCOs are defined as material larger than No. 12 Mesh (U.S. Standard Sieve) as stated in Specification E11. A determination of LCOs is best done by sampling the material and handpicking, handcleaning, and visually identifying the materials described previously.

3.1.2 *mixed nonferrous metal content*—mixed nonferrous metals remaining after removal of magnetics, combustibles, and other nonmetals (for example, glass, rock, etc.). Further methods of separation and identification may be agreed upon between purchaser and seller and can include picking or dense-media separation.

3.1.3 *moisture percent—liquid content,* as determined by weight loss when sample material is dried to a constant weight at 110° ± 5°C.

3.1.4 *total combustibles*—materials that include paints, lacquers, coatings, plastics, etc., associated with the original nonferrous products, as well as combustible materials (paper, plastic, textile, etc.) which become associated with the nonferrous product after it is manufactured.

4. Significance and Use

4.1 This classification is intended for use in the marketing of mixed nonferrous metals.

4.2 Mixed nonferrous metals covered by this classification are suitable for use by one or more of the following industries:

4.2.1 Secondary aluminum smelters,

4.2.2 Primary aluminum producers,

4.2.3 Scrap dealers and processors,

4.2.4 Zinc refiners, and

4.2.5 Copper refiners.

5. Basis of Classification (refer to Table 1)

5.1 This classification covers material, either processed to recover aluminum or not processed to recover aluminum.

[1] This classification 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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[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] The last approved version of this historical standard is referenced on www.astm.org.

TABLE 1 Classification of Municipal Mixed Nonferrous Metals (MNM)[A]

Classification	Type I Over 90 % MNM	Type II 50 to 90 % MNM	Type III 30 to 50 % MNM	Type IV Less Than 30 % MNM
Grades	1 over 6 in. (150 mm)	2 2 to 6 in. (50 to 150 mm) incl		3 under 2 in. (50 mm)
Class	A high (5 % moisture and over)		B low (under 5 % moisture)	

[A]It is important for both purchaser and seller to note whether material *had been* processed to recover aluminum or whether it *had not been* processed to recover aluminum and what, if any, procedures where used.

5.2 This classification consists of four types of MNM, based on nonferrous metal content. The four types of MNM are further subdivided into three grades, based on size. The three grades of MNM are further subdivided into two classes, based on moisture content.

6. Ordering Information

6.1 Mixed nonferrous metals may be identified using the criteria in Table 1. This is an unusual material, and the table is included for information purposes rather than to establish limits. The unit operations used to recover MNM may aid the purchaser and seller in establishing a classification. Some of the more common unit operations used to recover MNM include the following:

6.1.1 *Wet Processing*—water elutriators, dense media, and mineral jig.

6.1.2 *Dry Processing*—air classifier, air knife, gravity or concentrating table, Humphrey Spiral, eddy-current separator, electrostatic separator, and handpicking.

6.2 It is recognized that variations in the MNM may occur due to the heterogeneous nature of the solid waste stream. The criteria indicated are intended as a means for the purchaser and the seller to establish the value and quality of the MNM.

6.3 Mixed nonferrous metals shall be considered to be of a particular classification if the value for each component specified, as obtained by the test method agreed upon between the purchaser and seller, shall not exceed any of the limits for that grade.

7. Physical Requirements

7.1 In addition to Table 1, the MNM physical requirements include the following:

7.1.1 *Bulk Density*—The density for MNM is not specified and shall be agreed upon between the purchaser and the seller.

7.1.2 *Fineness*—Acceptability of contained fines shall be determined by the purchaser and seller.

7.1.3 *Loose Combustibles*—As agreed upon between purchaser and seller.

7.1.4 *Magnetics*—The presence of free magnetic material is not specified and shall be as agreed upon between the purchaser and seller as part of the purchase contract.

8. Sampling

8.1 Sampling shall be in accordance with the procedures described in Annex A1 or Annex A2. Either procedure may be used, as determined by agreement between the purchaser and the seller.

8.1.1 Annex A1 covers sampling at the point of origin.

8.1.2 Annex A2 covers sampling at the point of receipt.

9. Test Methods

9.1 Determine the properties of fineness, moisture, and metal recovery in accordance with the procedures described in Annex A3.

10. Rejection and Rehearing

10.1 Material that fails to conform to the requirements of this classification may be rejected. Rejection should be reported to the seller promptly and in writing. In case of dissatisfaction with the results of the test, the seller may make claim for a rehearing.

11. Shipping

11.1 Mixed nonferrous metals shall be shipped in rail cars, trailers, or other containers as agreed upon between the purchaser and the seller. The shipping equipment shall be sufficiently water-tight to prevent the MNM from becoming wet during shipment.

ANNEXES

(Mandatory Information)

A1. TEST METHOD FOR COLLECTION OF A SAMPLE OF MNM SCRAP RECOVERED FROM MUNICIPAL SOLID WASTE AND ITS PREPARATION FOR ANALYSIS

A1.1. Scope

A1.1.1 This test method describes procedures for collection of a sample of MNM scrap recovered from municipal refuse, and the preparation and secondary sampling of the metal for analysis.

A1.2. Summary of Test Method

A1.2.1 A selected size, gross sample of MNM scrap, is taken from the metal recovery system conveyor in increments. Sample increments are taken at timed intervals from a full cross section of the conveyor while it is stopped, or by briefly taking the total flow at the discharge of the conveyor while it is moving.

A1.2.2 The quantity of gross sample may be further reduced by mixing, cone-and-quarter sampling, and riffling.

A1.3. General Precautions

A1.3.1 In solids sampling, each step must be designed to eliminate accidental classification by size or gravity. Different sizes usually have different analyses.

A1.3.2 The increments obtained during the sampling period shall be protected from changes in composition due to exposure to the weather.

A1.3.3 Plan the sampling arrangement to avoid contamination of the increments with foreign material.

A1.3.4 A satisfactory sampling arrangement is one that takes an unbiased sample at the desired degree of precision of the constituent for which the sample is to be analyzed. The weight or volume of the collected sample is compared with that of the total lot to ensure a constant sampling ratio.

A1.3.5 It is preferable that the MNM scrap be weighed and sampled at about the same time. If there is a long lapse in time between these two events, both the purchaser and seller should give consideration to changes in moisture during this interval and the consequent shift in relationship of moisture to the true content at the instant when ownership of the nonferrous metal scrap transfers from one to the other.

A1.3.6 Samples and subsamples shall be collected in such a manner that there is no unmeasured loss of moisture of significant amount. The samples shall be weighed before and after drying or other operations to measure all significant weight loss. The material balances shall be adjusted accordingly.

A1.4 Selection of Gross Sample Size

A1.4.1 Choose the gross sample size by methods given in Practice E122, whenever practicable. The chief difficulty for implementing this practice can be that insufficient information concerning possible variation is available. This information should be gathered with practice. Due to the heterogeneity in size and type of material comprising municipal solid waste, the choice of a large sample is desirable.

A1.4.2 Shredding is recommended for metals larger than 4 to 6 in. (100 to 150 mm) for ease in sampling and handling.

A1.5 Taking A Gross Sample

A1.5.1 In order to obtain complete representation of materials in a gross sample, it is desirable that the sample increments be withdrawn from the full cross-section of the stream. The best possible increment is either a full cross section removed from a stopped conveyor belt or the total flow at the discharge of the moving conveyor taken during a suitable interval of time.

A1.5.2 The choice of sample size can be estimated using Practice E122. It is imperative for a given degree of precision that not less than the minimum size and number of sample increments be collected from a lot (see Table A1.1).

A1.5.3 *Number of Gross Samples*—For quantities up to approximately 20 tons, it is recommended that one gross sample represent the lot. Take this sample in accordance with the requirements prescribed in Table A1.1.

A1.5.4 *Distribution of Increments*—It is essential that the increments be distributed throughout the lot to be sampled. The taking of increments shall be at regularly spaced intervals.

A1.6 Sample Preparation

A1.6.1 Cone and quarter the sample until approximately 2 ft^3 (0.06 m^3) remains. Pile the material to be sampled into a conical heap and then spread out into circular cake. Divide the cake into quarters, take two of the diagonally opposite quarters as the sample, and reject the two remaining quarters. Collect the two quarters taken as the sample and repeat the procedure of coning and quartering until the desired size is obtained.

A1.6.2 Divide the sample into approximately equal parts. Take one half 1 ft^3 (0.03 m^3) for use in the melt test (see Annex A3.). Divide the sample by riffling until the analytical sample is obtained. (Typical rifflers can be found in the apparatus section of Method D2013.)

A1.6.3 Store the prepared analytical sample in a covered, labeled, corrosion-resistant metal can or plastic container until needed for chemical analysis.

TABLE A1.1 Number and Weight of Increments for Sampling

Top Size, in. (mm)	⅝ (15)	2 (50)	6 (150)	12 (300)
Minimum number of increments	15	15	15	15
Minimum weight of increments, lb (kg)	2 (1)	6 (3)	18 (9)	36 (18)

A2. SAMPLING AT POINT OF RECEIPT

A2.1 Sampling During Unloading

A2.1.1 *Sample Size*—Take a representative quantity of approximately 1 yd^3 (0.76 m^3) from each car or truck of MNM scrap received.

A2.1.1.1 *Car Sample*—Take two shovels (No. 2 size) of MNM scrap from the top, middle, and bottom of opened doorway area of car in two locations of doorway as shown in Fig. A2.1 to obtain six samples. Take an additional 18 samples as shown in Fig. A2.1. Place all material sampled into a suitable receptacle for the total sample from the car. Adequately identify the sample container. Weigh and record the sample from the car.

A2.1.1.2 *Truck Sample*—Take two shovels (No. 2 size) of MNM scrap from upper, middle, and lower areas of material starting at the rear of the truck. Starting at the truck rear, take samples every 8 ft (2.4 m) at locations one third the distance from the side of the truck. Place all material sampled into a suitable receptacle for the total sample of the truck. Adequately identify the sample container. Weigh and record the sample from the truck.

A2.1.2 *Reduction of Sample Size*—In the event of material larger than 4 to 6 in., (100 to 150 mm) it is recommended that it be shredded to facilitate further processing. Using riffle sampling equipment[4] or coning and quartering (or equivalent method), reduce the size of sample to approximately 1 ft^3 (0.03 m^3) by putting it through the riffle sampler five times. Retain one half of the split sample on each pass through the riffle sampler until a fine sample of approximately 1 ft^3 (0.03 m^3) is attained. Carefully bag and identify the sample for assay, and retain a duplicate sample. Retain the duplicate sample until assay is completed and accepted. If the assay is not accepted, then the duplicate sample may be used for settling the claim.

A2.1.3 *Identity Ticket*—It is recommended that the following information be included on the ticket:

A2.1.3.1 Supplier,

A2.1.3.2 Car number or truck identification,

A2.1.3.3 Net weight of car or truck,

A2.1.3.4 Date unloaded and sampled, and

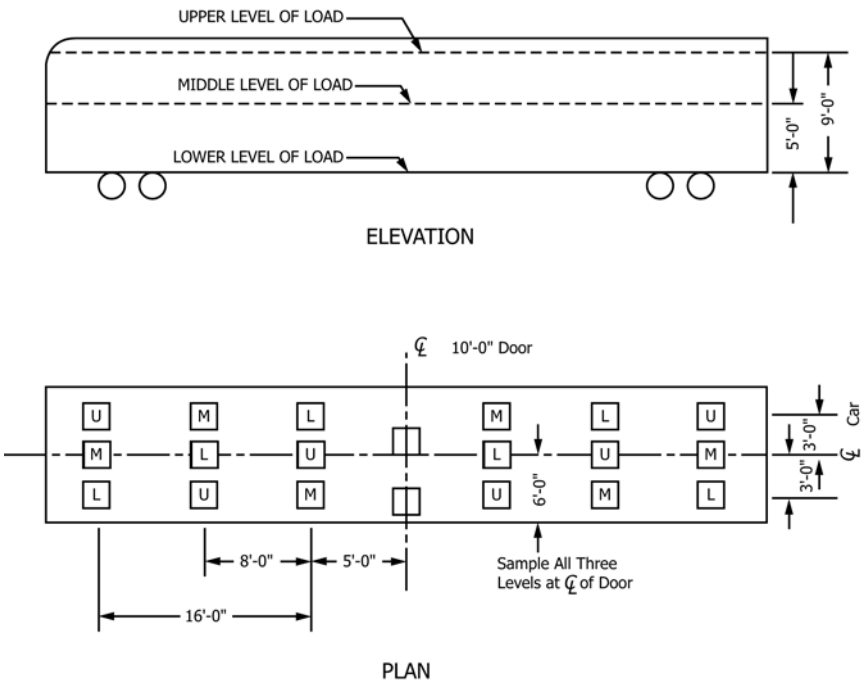
A2.1.3.5 Initial sample weight.

A2.2 Off-Specification Shipments

A2.2.1 *Sampling*—If shipments are received as off-specification material or are suspected of being off-specification, sample the shipment in the doorway of the car or truck using core-sampling equipment,[4] or other acceptable procedure, from at least ten different locations prior to car unloading. Take at least 2 ft^3 (0.06 m^3) of representative sample. Weigh and record the sample weight using a scale accurate to within ±0.1 lb (0.05 kg) or ±0.05 %, whichever is the more precise.

A2.2.2 *Reduction of Sample Size*—In the event of material larger than 4 to 6 in., (100 to 150 mm) it is recommended that it be shredded to facilitate further processing. Using riffle-sampling equipment or coning and quartering (or equivalent procedure), split the sample into equal parts until 1 ft^3 (0.03

[4] Core and riffle sampling equipment, available from W. S. Tyler Co., or equivalent, has been found suitable for this purpose.



NOTE 1—All samples consist of two No. 2 shovels from each location sampled.

FIG. A2.1 Sample Location Chart for 50-ft Railway Car

m^3) remains in each of the last split fractions. Weigh each split fraction, identify, and retain duplicate sample until acceptance or rejection of shipment.

A2.2.3 *Identity Ticket*—It is recommended that the following information be included on the ticket:

A2.2.3.1 Supplier,

A2.2.3.2 Car number or truck identification,

A2.2.3.3 Net weight of car or truck,

A2.2.3.4 Date unloaded and sampled, and

A2.2.3.5 Initial sample weight.

A2.3 Recommended Testing Frequency

A2.3.1 *New Sources*—Test all new sources of supply on an "every shipment" basis until a total of 1 000 000 lb (450 000 kg) have been received on-specification, at which time, the supplier is considered to be an established source.

A2.3.2 *Established Sources:*

A2.3.2.1 Randomly sample shipments from established source, and test a minimum of 20 % of all shipments.

A2.3.2.2 A single shipment from any established or new source of supply that fails to meet the agreed-upon limits within 20 % of any individual factor shown in Table 1 may require that the source be treated as a new source (see A2.3.1).

A2.3.2.3 Any established or new source failing to meet the agreed-upon limits within 10 % on any two or more factors shown in Table 1 may require treatment as a new source (see A2.3.1).

A3. ASSAY AND ANALYSIS PROCEDURE

A3.1 Significance

A3.1.1 This is a laboratory procedure used to produce an analytical specimen, determine the percent of metal recovery by remelting, and determine the amount of contaminants present.

A3.2 Determination of Physical Requirements

A3.2.1 Take approximately one third of the sample, weigh, and record the weight.

A3.2.2 Dry this one-third sample for 2 h at 110°C± 5°C and record the weight of the dried material.

A3.2.3 Remove the magnetic materials and separate, record the weight of the nonmagnetic materials.

A3.2.4 Screen the sample over a 12-mesh (U.S. Standard) sieve using the Dry Screening Procedure of Test Method E276. Record the weight of the sieved material and the material remaining on the screen. This section (A3.2.4) does not apply when the material is shredded at the receiving point.

A3.3 Determination by Chemical Analysis

A3.3.1 For material with high aluminum content, based on 4.1, refer to Specification E753 for assay procedure.

A3.3.2 For material with low aluminum content based on 4.1, use wet analytical procedure in accordance with the ASTM standards referenced in 2.1.