



Designation: C 390 – 02<sub>3</sub>

## Standard Practice for Sampling and Acceptance of Thermal Insulation Lots<sup>1</sup>

This standard is issued under the fixed designation C 390; 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.

*This standard has been approved for use by agencies of the Department of Defense.*

<sup>1</sup> This practice is under the jurisdiction of ASTM Committee C16 on Thermal Insulation and is the direct responsibility of Subcommittee C16.31 on Chemical and Physical Properties.

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### 1. Scope

1.1 This standard provides criteria for establishing the acceptability of lots of shipments of preformed board, preformed block and pipe, and batts and blanket thermal insulation based on sampling and inspection.

1.2 This standard is intended for use in conjunction with appropriate ASTM material specifications that classify and describe the specific physical requirements for the product in terms of qualification requirements and inspection requirements. Determination of nonconformity shall be based on the tolerances for individual sample test values prescribed in the material specification.

1.3 This standard may require inspection substantially different from that performed in the normal course of production. If the purchaser requires sampling and acceptance inspection in accordance with this practice, he shall so specify in the order or contract.

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 ~~U.S. Military Standard: ASTM Standards:~~  
~~MIL-STD-105E Sampling Procedures and Tables for Inspection by Attributes~~  
C 168 Terminology Relating to Thermal Insulation<sup>2</sup>

2.2 ~~U.S. Military Standard:~~  
~~MIL-STD-105E Sampling Procedures and Tables for Inspection by Attributes<sup>3</sup>~~

### 3. Terminology

#### 3.1 Definitions:

3.1.1 acceptable quality level (AQL)—when a continuous series of lots is considered, the quality level which for purposes of sampling inspection is the limit of a satisfactory process average. The listed AQL (AQL=10%) is the maximum percent defective level accepted 95% of the time by the sampling plan.

3.1.2 acceptance number—the maximum number of the nonconformities or nonconforming units in the sample that will permit acceptance of the inspected lot or batch.

3.1.2<sub>3</sub> inspection—the process of measuring, examining, testing, gaging, or otherwise comparing the unit with the applicable requirements.

3.1.3<sub>4</sub> inspection lot—a collection of units of product from which a sample is drawn and inspected to determine conformance with the acceptability criteria.

3.1.3<sub>4</sub>.1 Discussion—An inspection lot may differ from a lot defined for other purposes.

3.1.4<sub>5</sub> inspection, normal—inspection that is used in accordance with an acceptance sampling scheme when a process is considered to be operating at, or slightly better than, its acceptable quality level.

3.1.5<sub>6</sub> inspection, tightened—a feature of a sampling scheme using stricter acceptance criteria than those used in normal

<sup>2</sup> Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

<sup>2</sup> Annual Book of ASTM Standards, Vol 04.06.

<sup>3</sup> Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

inspection. Tightened inspection is used in some sampling schemes as a protective measure to increase the probability of rejecting lots when experience shows the level of submitted quality has deteriorated significantly.

3.1.56.1 *Discussion*—It is expected that the higher rate of rejections inherent with tightened inspection will lead the supplier to improve the quality of the submitted product. The criteria for determining when quality has deteriorated significantly must be defined in objective terms for any given sampling scheme.

3.1.67 *lot (batch)*—a definite quantity of some product manufactured under conditions of production that are considered uniform.

3.1.78 *lot size*—the number of units in a lot or inspection lot.

3.1.89 *nonconforming unit*—a unit of product or service containing at least one nonconformity.

3.1.910 *nonconformity*—a departure of a quality characteristic from its intended level or state that occurs with a severity sufficient to cause the product or service not to meet a specification requirement.

3.1.101 *sample*—a group of units, portion of material, or observations taken from the inspection lot that serves to provide information that may be used as a basis for making a decision concerning the lot being inspected.

3.1.142 *sample size*—the number of units in a sample or the number of observations in a sample.

3.1.123 *unit*—an object on which a measurement or observation may be made.

3.2 *Descriptions of Terms Specific to This Standard:*

3.2.1 *lot*—an *inspection lot* as defined in 3.1.34.

3.2.2 *shipping package*—the smallest discrete package of thermal insulation for purposes of shipping. Typically, a shipping package is one roll, bundle, bag, or carton of thermal insulation.

3.2.3 *unit*—a *shipping package* as described in 3.2.2.

#### 4. Significance and Use

4.1 The sampling and inspection prescribed in this standard afford the purchaser a practical level of quality assurance on incoming material. They are based on cost/risk relationships considered typical for preformed thermal insulations offered for general use. In all cases, the purchaser should review this standard and determine its suitability in terms of his specific needs.

4.2 This procedure is intended primarily for the inspection of a continuing stream of lots, and there is not a high probability of rejecting occasional off lots. Consumer protection is based on economic pressure on the producer, through greater risk of lot rejection, to maintain the process average at 90 % conformance or better. Operating characteristic curves for the sampling plans employed can be found in MIL-STD-105DE, Table X-C through Table X-F.

4.3 It is not the intent of this procedure to estimate lot quality, control the quality of production, relieve the supplier of responsibility for the quality of material offered, or determine the disposition of material found to be defective after receipt by the purchaser.

#### 5. Classification of Requirements

5.1 ASTM material specifications shall classify physical requirements in two categories:

5.1.1 *Qualification Requirements*—Those requirements which establish the general suitability of the product but are not judged necessary, or practical, for routine inspection. These requirements usually relate to the inherent properties of the material, involve high inspection costs, require long-term tests, or are controlled indirectly by other requirements.

5.1.2 *Inspection Requirements*—Those requirements which can and should be monitored on a routine basis. These requirements are characterized by a high benefit/cost ratio. They may include visual and dimensional requirements, requirements for properties with potentially high variability, or requirements providing indirect control of performance characteristics.

#### 6. Acceptance for Qualification Requirements

6.1 The supplier's certificate of compliance or a third party's certificate of compliance shall be sufficient basis for acceptance of the lot for qualification requirements.

6.1.1 The certificate shall state that compliance to the qualification requirements has been verified by actual inspection of material manufactured within the past three years using the same basic ingredients and manufacturing process as the material offered.

6.1.2 The supplier shall furnish an inspection report upon request.

#### 7. Acceptance for Inspection Requirements

7.1 The acceptance of a lot for inspection requirements shall be based on the sampling plans and acceptance criteria prescribed in Table 1 (preformed board, and preformed block and pipe) and Table 2 (batts and blanket). Single Inspection and AQL = 10 % shall be used.

7.2 Sampling and inspection shall be carried out as described in Section 8. Test sample shall be randomly selected from the lot.

7.3 For preformed board, and preformed block and pipe lots of 150 units or less, or batts and blanket lots of 16 146 ft<sup>2</sup> (1500 m<sup>2</sup>) or less, not subject to tightened inspection, the supplier's certificate of compliance or a third party's certificate of compliance shall be sufficient basis for acceptance of the lot for inspection requirements.

7.3.1 The certificate shall state that compliance to inspection requirements has been verified by actual inspection of material of the same type, class, form, size, and thickness manufactured within the same production period as the material offered.

**TABLE 1 Sampling Plan and Acceptance Criteria for Inspection Requirements<sup>A</sup> (Preformed Board, and Preformed Block and Pipe)**

| Lot Size (Shipping Units) | Normal Inspection               |  | Tightened Inspection            |  |
|---------------------------|---------------------------------|--|---------------------------------|--|
|                           | Sample Size (Shipping Packages) | Acceptance Number, Maximum Number of Nonconforming Units | Sample Size (Shipping Packages) | Acceptance Number, Maximum Number of Nonconforming Units |
| 150 or less               | see 7.3                         | see 7.3  | 5                               | 1  |
| 151 to 1200               | 5                               | 1  | 8                               | 1  |
| 1201 to 35 000            | 8                               | 2  | 8                               | 1  |
| 35 000 and over           | 13                              | 3  | 13                              | 2  |

<sup>A</sup> The plan for normal inspection of lot sizes of 151 units and over, and the entire plan for tightened inspection are taken from MIL-STD-105E, using Special Inspection Level S-2, AQL = 10 %.

**TABLE 2 Sampling Plan and Acceptance Criteria for Inspection Requirements<sup>A</sup> (Batts and Blankets)**

| Lot Size (m <sup>2</sup> ) <sup>B</sup> | Normal Inspection               |  | Tightened Inspection            |  |
|---|---------------------------------|--|---------------------------------|--|
|   | Sample Size (Shipping Packages) | Acceptance Number, Maximum Number of Nonconforming Units | Sample Size (Shipping Packages) | Acceptance Number, Maximum Number of Nonconforming Units |
| 1500 or less                            | see 7.3                         | see 7.3  | 5                               | 1  |
| 1501 to 2500                            | 5                               | 1  | 8                               | 1  |
| 2501 to 5000                            | 8                               | 2  | 8                               | 1  |
| 5001 to 9000                            | 13                              | 3  | 13                              | 2  |
| 9001 to 15 000                          | 20                              | 5  | 20                              | 3  |
| 15 001 to 28 000                        | 32                              | 7  | 32                              | 5  |
| 28 001 and over                         | 50                              | 10   | 50                              | 8  |

<sup>A</sup> The plan for normal inspection of lot sizes of 1500 m<sup>2</sup> and over, and the entire plan for tightened inspection are taken from MIL-STD-105E, using Normal Inspection Level II, AQL = 10 % and sample size based on 1080 ft<sup>2</sup> (100 m<sup>2</sup>) per unit.

<sup>B</sup> Lot sizes for ft<sup>2</sup> are 16 146 or less, 16 417 to 26 911, 26 912 to 53 821, 53 822 to 96 878, 96 879 to 161 460, 161 461 to 301 399, and 301 400 and over.

7.3.2 The supplier shall furnish pertinent inspection records upon request.

## 8. Procedure for Sampling and Inspection

8.1 Establish the grouping of product to be considered the lot and determine the lot size:

8.1.1 Unless otherwise specified in the material specification, order, or contract, the lot shall consist of all thermal insulation of one type, class, form, size, and thickness produced under the same conditions and procured at the same time.

8.1.2 The lot size shall be equal to the number of shipping packages in the lot.

8.2 Determine the required sample size from Table 1, expressed in terms of shipping units:

8.2.1 Use normal inspection at the start of inspection and for any single lot.

8.2.2 Shift from normal to tightened inspection when two of five consecutive lots have been rejected.

8.2.3 Shift from tightened to normal inspection after five consecutive lots have been accepted.

8.2.4 In the event that ten consecutive lots remain on tightened inspection, discontinue inspection under this standard pending action to improve the quality of submitted product.

8.3 Select the sample from the lot:

8.3.1 The sample shall consist of the number of shipping packages determined as the sample size in 8.2.

8.3.2 Select individual shipping packages from the entire lot at random and without regard to expected quality. When appropriate, select units from different sublots identified by some rational criterion such as shipment or production groupings.

8.4 Perform the inspection called for in the ASTM material specification:

8.4.1 From each shipping package in the sample, draw sufficient insulation material to perform the complete inspection. This may require a full shipping package or a portion thereof, as one or more pieces cut from a roll or one or more boards or sections from a carton. Select the material at random and without regard to quality.

8.4.2 Inspect the insulation material drawn from each shipping package in the sample. Perform the number of determinations prescribed in the product specification or specified test methods.

8.5 Establish the number of nonconforming units in the sample:

8.5.1 Compare the inspection results on the material drawn from each shipping unit to the requirements of the material specification.

8.5.2 Classify the shipping unit as a nonconforming unit if the inspection results show one or more nonconformities to the material specification.

8.6 Determine the acceptability of the lot:

8.6.1 If the number of nonconforming units is equal to or less than the appropriate acceptance number in Table 1, accept the lot.

8.6.2 If the number of nonconforming units is greater than the acceptance number, reject the lot.

## 9. Keywords

9.1 batts; blanket; block; board; pipe; preformed; sampling and acceptance; thermal insulation

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