



# Standard Practices for Mounting Test Specimens During Sound Absorption Tests<sup>1</sup>

This standard is issued under the fixed designation E 795; 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 These practices cover test specimen mountings to be used during sound absorption tests performed in accordance with Test Method C 423.

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

## 2. Referenced Documents

### 2.1 ASTM Standards:

C 423 Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method<sup>2</sup>  
C 634 Terminology Relating to Environmental Acoustics<sup>2</sup>

### 2.2 ISO Standard:

ISO 354 Measurement of Sound Absorption in a Reverberation Room<sup>3</sup>

## 3. Terminology

### 3.1 Definitions of Terms Specific to This Standard:

3.1.1 Except as noted in 4.2, the terms used in these practices are defined in Terminology C 634.

3.2 The following terms have the meaning noted for these practices only:

3.2.1 *sound-absorbing units* — consists of test specimens that are in direct contact with or suspended from ceilings, walls, or other room surfaces. Sound-absorbing units include, but are not limited to, baffles, draperies, space absorbers, volume absorbers (bass traps), and other three-dimensional objects.

3.2.2 *test surface*—any hard surface over which the test specimen or test specimen mounting is placed for testing in accordance with Test Method C 423. The surface shall satisfy

the room construction requirements of Test Method C 423. In most cases, the surface will be the floor of the reverberation room.

## 4. Significance and Use

4.1 The sound absorption of a material that covers a flat surface depends not only on the physical properties of the material but also on the way in which the material is mounted over the surface. The mountings specified in these practices are intended to simulate in the laboratory conditions that exist in normal use.

4.2 Some of the specified mountings require special fixtures or minor deviations from normal practice. These fixtures or deviations are to be used only during laboratory tests and should not be specified for practical installations. They are noted in the specifications for the mountings in question by the phrase “for laboratory testing only.”

4.3 Test reports may refer to these mountings by type designation instead of providing a detailed description of the mounting used.

## 5. Classification

5.1 The mountings are designated as follows:

5.1.1 *Type A Mounting*—Test specimen laid directly against the test surface (described in detail in Section 6).

5.1.2 *Type B Mounting*—Test specimen cemented to gypsum board and laid directly against the test surface (described in detail in Section 7).

5.1.3 *Type C Mounting*—Test specimen comprising sound-absorptive material behind a perforated, expanded, open facing or other porous material (described in detail in Section 8).

5.1.4 *Type D Mounting*—Test specimen mounted on wood furring strips (described in detail in Section 9).

5.1.5 *Type E Mounting*—Test specimen mounted with an air space behind it (described in detail in Section 10).

5.1.6 *Type G Mounting*—Test specimen is a drapery, window shade, or blind hung parallel to the test surface (described in detail in Section 11).

5.1.7 *Type H Mounting*—Test specimen is a drapery suspended away from any vertical surface (described in detail in Section 12).

<sup>1</sup> These practices are under the jurisdiction of ASTM Committee E-33 on Environmental Acoustics and are the direct responsibility of Subcommittee E33.01 on Sound Absorption.

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

<sup>3</sup> Available from American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.

5.1.8 *Type I Mounting*—The specimen is a spray- or trowel-applied material on an acoustically hard substrate (described in detail in Section 13).

5.1.9 *Type J Mounting*—The specimen is a sound-absorbing unit or set of sound-absorbing units (described in detail in Section 14).

5.1.10 *Type K Mounting*—Test specimen is an office screen (described in detail in Section 15).

5.1.11 *Type L Mounting*—This mounting is for use with concrete blocks or block-like specimens that are normally assembled using mortar (described in detail in Section 16).

5.2 Type C, D, E, and G mountings are further designated by a numerical suffix which indicates the distance (in millimetres) from the specimen to the test surface rounded to the nearest integral multiple of 5 mm. For example, a Type E-400 mounting is a plenum mounting in which the face of the test specimen is 400 mm (15<sup>3</sup>/<sub>4</sub>in.) away from the test surface. The distances specified by the suffixes are as follows:

5.2.1 *For a Type C Mounting*—The thickness of the furring strips.

5.2.2 *For a Type D Mounting*—The thickness of the furring strips.

5.2.3 *For a Type E Mounting*—The distance from the exposed face of the test specimen to the test surface.

5.2.4 *For a Type G Mounting*—The distance from the centerline of the hangers to the test surface.

## 6. Type A Mounting

6.1 Lay the test specimen directly against the test surface as shown in Fig. 1.

6.2 Do not use an adhesive that is likely to leave a thin air space behind the test specimen. However, mechanical fasteners, carpet tape, or contact cement may be used to hold the specimen against a vertical or overhead surface or to keep the specimen in contact with the floor.

6.3 If two or more pieces of material (or separate panels) are butted together to form the test specimen, it may be advisable to cover the joints between adjacent pieces with tape, caulking compound, or other material that is not sound absorptive. If the joints are sealed in this manner, the test report shall describe the method of sealing.

6.4 *Perimeter Seals for Laboratory Testing Only*—If the perimeter edges of the test specimen are not exposed in normal use, seal them by one of the following two methods:

6.4.1 Cover with tape, caulking compound, or a similar product as shown in Fig. 2.

6.4.2 Cover with a wood or metal frame so that the top surface of the frame is flush with the front face of the test specimen as shown in Fig. 2. Minimize air spaces between the frame and the perimeter edge of the test specimen. Air gaps between the bottom of the frame and the test surface shall be sealed with duct tape or caulking.

NOTE 1—The Type A mounting is intended to simulate normal use where a product, such as carpet, wall panels, or ceiling tile is either laid directly on the floor or attached to a wall or ceiling with adhesive or mechanical fasteners. Panels or tile may be arranged in a pattern that simulates their actual installation, but the arrangement shall be explicitly noted and described in the report.

## 7. Type B Mounting

7.1 Adhere the test specimen to gypsum board laid directly against the test surface as shown in Fig. 3. The thickness of the gypsum board is not critical.

7.2 Apply the adhesive in accordance with the manufacturer's instructions. If there are no specific instructions, apply four daubs of adhesive to the back of each piece of the test specimen.

7.3 *For Laboratory Testing Only*—Place 3 by 25 by 25-mm (1/8 by 1 by 1-in.) hardboard shims between the test specimen and the gypsum board at the four corners of each piece of test specimen.

7.4 *Perimeter Seals, for Laboratory Testing Only*—Seal the perimeter edges of the test specimen by one of the following methods:

7.4.1 Cover with tape, caulking compound, or a similar product as shown in Fig. 2.

7.4.2 Cover with a wood or metal frame so that the top surface of the frame is flush with the front face of the test specimen as shown in Fig. 2. Minimize air spaces between the frame and the perimeter edge of the test specimen. Air gaps between the bottom of the frame and the test surface shall be sealed with duct tape or caulking.

NOTE 2—The Type B mounting is intended to simulate acoustical ceiling tiles or other sound-absorptive products adhered to a hard surface with an adhesive. In normal use, this method of application leaves a thin air space between the product and the surface to which it is adhered. The 3-mm (1/8-in.) thick hardboard shims are used to control the depth of the air space during laboratory tests and should not be included in a normal installation.

## 8. Type C Mounting

8.1 The test specimen shall comprise sound-absorptive material behind a perforated, expanded, open facing, or other porous material attached to wood furring strips spaced 600 mm (24 in.) on centers and laid directly against the test surface as shown in Fig. 4. The suffix of the mounting designation shall be the actual thickness of the furring strips rounded to the nearest integral multiple of 5 mm.

8.1.1 The length of the furring strips described in 8.1 shall be shorter than the length of the test specimen by an amount equal to twice the width of the furring strips. This will allow the placement of a furring strip at each end of the system to act as an "end cap" and completely enclose the airspace below the test specimen.

8.2 *Perimeter Seals, for Laboratory Testing Only*—The perimeter furring strips of the test specimen shall be sealed to the test surface with tape or caulking compound.

NOTE 3—The preferred sizes for furring strips are 20 by 40 mm (3/4 by 1 1/2 in.) or 40 by 40 mm (1 1/2 by 1 1/2 in.), which corresponds to a C-20 or C-40 mounting.

## 9. Type D Mounting

9.1 Attach the test specimen to wood furring strips spaced at 300 mm (12 in.) on centers and laid directly against the test surface as shown in Fig. 5. The suffix of the mounting designation shall be the actual thickness of the furring strips rounded to the nearest integral multiple of 5 mm.

9.1.1 The length of the furring strips described in 9.1 shall be shorter than the length of the test specimen by an amount equal to twice the width of the furring strips. This will allow the placement of a furring strip at each end of the system to act as an “end cap” and completely enclose the airspace below the test specimen.

9.2 *Perimeter Seals, for Laboratory Testing Only*—Seal the perimeter edges of the test specimen by one of the following methods:

9.2.1 Cover with tape, caulking compound, or a similar product as shown in Fig. 2.

9.2.2 Cover with a wood or metal frame so that the top surface of the frame is flush with the front face of the test specimen as shown in Fig. 2. Minimize air spaces between the frame and the perimeter edge of the test specimen. Air gaps between the bottom of the frame and the test surface shall be sealed with duct tape or caulking.

NOTE 4—The preferred size for furring strips is 20 by 40 mm ( $\frac{3}{4}$  by  $1\frac{1}{2}$  in.). This is a D-20 mounting.

## 10. Type E Mounting

10.1 Mount the test specimen in a fixture that supports the exposed face of the specimen at a designated distance from the test surface as shown in Fig. 6. The suffix of the mounting designation shall be the distance between the exposed face of the specimen and the test surface rounded to the nearest integral multiple of 5 mm.

10.2 *Mounting Fixture for Laboratory Testing Only*—The mounting fixture shall satisfy the following requirements:

10.2.1 The mounting fixture, test specimen, and test surface shall enclose an air space that has no interior partitions.

10.2.2 The joint between the fixture and the test surface shall be sealed to prevent air leaks between the enclosed space and the outside.

10.2.3 The fixture shall include a rigid grid system that supports the exposed face of the test specimen at the required distance from the test surface. The distance from the exposed face of the test specimen (excluding decorative features) to the test surface shall not vary by more than 5 mm (0.20 in.), across the entire face of the specimen.

10.2.4 The fixture shall seal the perimeter edges of the test specimen, and the top surface of the fixture shall be flush with the front face of the test specimen as shown in Fig. 6.

10.2.5 The mounting fixture shall be made of a sturdy material, such as 20-mm ( $\frac{3}{4}$ -in.) thick plywood or 3-mm ( $\frac{1}{8}$ -in.) thick aluminum.

10.2.6 If a grid system is placed between the panels, on the exposed side of the specimen, the grid size and arrangement shall be noted in the report.

NOTE 5—Type E mountings are intended to simulate a suspended ceiling with an open plenum above it.

NOTE 6—When there is good reason to test on a Type E mounting other than Type E-400, a mounting whose suffix is an integral multiple of 25 is preferred (for example, E-375, E-425, and so forth).

NOTE 7—It has been found that if a gasket is used between the test fixture and the test surface, placing the gasket so that it is flush with the exterior surface of the test fixture will minimize the variability in results.

## 11. Type G Mounting

11.1 The test specimen shall be a drapery, window shade, or window blind hung parallel to the test surface. The suffix of the mounting designation shall be the distance from the test surface to the centerline of the hangers rounded to the nearest integral multiple of 5 mm.

11.2 Attach the hangers to a solid beam or plank that is butted against the test surface as shown in Fig. 7. The beam or plank should prevent sound waves from passing over the top of the test specimen, into or out of the space behind it.

NOTE 8—The preferred distance between the centerline of the hangers and the test surface is 75 mm (3 in.). If another distance is used, it should be an integral multiple of 25 mm.

## 12. Type H Mounting

12.1 The test specimen shall be a drapery. The distance between the suspended drapery and any vertical surface, rotating vane, or diffuser panel shall be consistent with the requirements of Test Method C 423. The drapery shall not be parallel to any wall as shown in Fig. 8.

NOTE 9—Type H mountings are intended to simulate draperies used as sound-absorbing units.

## 13. Type I Mounting

13.1 Spray or trowel the material to be tested on to a substrate that satisfies the following conditions:

13.1.1 The substrate shall be no more than 25 mm (1 in.) thick.

13.1.2 The sound absorption coefficients of the substrate shall be less than 0.05 in each frequency band when tested on a Type A mounting in accordance with Test Method C 423.

13.1.3 The substrate shall not cup or warp after the material has been applied.

13.1.4 There shall be negligible air space between the back of the substrate and the test surface.

13.1.5 If the sound absorption of the material to be tested depends on the orientation and position of the substrate (that is, vertical, horizontal above the material, or horizontal beneath the material), the material shall be applied with the substrate in the orientation and position of interest. The specimen shall remain in that orientation and position until the material has cured completely.

13.1.6 *Joint Seals for Laboratory Tests Only*—If the substrate comprises panels that are fitted together for the test, the joints between the panels shall be sealed with caulking compound.

13.2 *Perimeter Seals, for Laboratory Testing Only*—Seal the perimeter edges of the test specimen by one of the following methods:

13.2.1 Cover with tape, caulking compound, or a similar product as shown in Fig. 2.

13.2.2 Cover with a wood or metal frame so that the top surface of the frame is flush with the front face of the test specimen as shown in Fig. 2. Minimize air spaces between the frame and the perimeter edge of the test specimen. Air gaps between the bottom of the frame and the test surface shall be sealed with duct tape or caulking.

#### 14. Type J Mounting

14.1 The test specimen shall be a sound-absorbing unit or set of sound-absorbing units that are directly attached to or hanging from a ceiling, wall, or other room surface.

14.1.1 Sound-absorbing units, which are normally installed with one edge in direct contact with a ceiling, wall, or other room surface, shall be mounted with one edge resting on or touching the test surface.

14.1.2 Sound-absorbing units which, are normally hanging from a ceiling, wall, or other room surface shall be suspended above or away from the test surface in a manner that simulates the actual installation.

14.2 The units shall be arranged in a pattern that simulates the actual installation and the arrangement shall be explicitly noted and described in the report.

14.3 If the units are suspended flat panels (baffles), and an installation pattern is not specified, it is recommended that the following panel size and arrangement be tested. The panel dimensions shall be 0.61 m (24 in.) by 1.2 m (48 in.). The flat panels shall be suspended vertically in at least four parallel rows with two panels per row. The 1.2-m panel dimension shall be parallel to the floor or test surface. The rows shall not be parallel to the reverberation room walls. The spacing between adjacent rows shall be 0.75 m (30 in.). The spacing between panels in a row shall be 0.3 m (12 in.). The panels shall be suspended 1.2 m (24 in.) from the floor or test surface. Other sizes and arrangements may be tested but they shall be noted in the report.

14.4 The total absorptive area (all exposed surfaces) of the sound-absorbing units shall be at least 10 m<sup>2</sup>.

14.5 The distance between any sound-absorbing unit and any reflective surface (other than the test surface), rotating vane or diffuser panel shall be consistent with the requirements of Test Method C 423.

NOTE 10—The measured sound absorption is in square metres per unit or sabins per unit. The absorption will depend on the test arrangement.

#### 15. Type K Mounting

15.1 The test specimen shall be an office screen comprising a panel or combination of panels and associated support hardware that satisfy the following:

15.1.1 The panel or panels shall have plane or curved parallel surfaces.

15.1.2 The thickness of the panel or panels shall not exceed 125 mm (5 in.).

15.1.3 The support hardware is intended to support the panel or panels in an upright position so that both surfaces are exposed to the sound field. The distance between the office panel and any vertical surface, rotating vane, or diffuser panel shall be consistent with the requirements of Test Method C 423. The office panel shall not be parallel to any wall. The base of the panel should rest on the floor. If the panel, due to height restrictions, must rest on its side and the base of the panel is open or perforated, it shall be treated as an exposed edge and sealed with an appropriate measure.

15.1.4 No shelves, cabinet, or other accessories shall be attached to the specimen.

15.1.5 The panel or panels shall not be attached to a desk, filing cabinet, or other furniture.

15.1.6 If the panel or panels are designed with electrical raceways, the raceway covers shall be installed in accordance with the manufacturer instructions.

15.1.7 If the panel or panels are designed with a top edge cover plate, it shall be installed in accordance with the manufacturer instructions.

15.1.8 If the vertical edges of the panel or panels are perforated and not normally exposed when installed, the edges shall be covered with duct tape to keep sound from entering the interior of the panel.

15.1.9 The requirements for office screens in Test Method C 423 must be satisfied.

15.2 If the height of the bottom edge of the panel or panels that make up the test specimen is adjustable, it shall be set to its minimum value.

NOTE 11—It may be necessary to guy up panels from post-and-panel systems with a lightweight cord or twine.

NOTE 12—For office screens that are asymmetrical in construction, refer to Annex A2 of Test Method C 423.

#### 16. Type L Mounting

16.1 This mounting is for use with concrete blocks or block-like specimens that are normally assembled using mortar. The blocks are laid on the floor in a stack bond pattern, with pieces of 10 mm (<sup>3</sup>/<sub>8</sub> in.) thick, dense pressed, particleboard between them to simulate mortar (Figs. 9 and 10)

16.2 The area of the test specimen should be as close as possible to the standard area given in Test Method C 423.

16.3 *Joint and Perimeter Seals, for Laboratory Testing Only*—Seal the joint and perimeter edges in the following manner:

16.3.1 The short board pieces should be cut to match the length of the blocks. The width of the board should be a few millimetres less than the block thickness as shown in Fig. 9. Where the block is hollow, adhere the short boards to the top and bottom of the blocks with caulking compound. This seals the cavity, as it would be in normal installation.

16.3.2 Cut long strips of board to fit between the stacks of blocks. These should have a width that is a few millimetres less than the block thickness (Fig. 9).

16.3.3 Cover the edges of the block array with perimeter boards that have the same thickness as the blocks. Cover all joints between these boards and where they meet the floor with tape.

16.3.4 Fill the grooves between the blocks with caulking compound to seal all gaps, as shown in Fig. 9. Also fill any gaps between the blocks and the perimeter boards with caulking compound.

NOTE 13—Mortar can be used to adhere the blocks together, but it must be stated in the report.

#### 17. Report

17.1 When one of the mountings specified in these practices is used during a sound absorption test, the test report shall state the mounting type and any additional information that is



required by the Report Section of Test Method C 423. In particular, the following information shall be provided when applicable:

- 17.1.1 A description of the seals used around the perimeter of the test specimen.
- 17.1.2 A description of the facing product or material used with a Type C mounting.
- 17.1.3 The ratio of the area covered in the plane of the drapery to the area of the fabric for Type G and H mountings.
- 17.1.4 The distance between the bottom of the drapery and the floor rounded to the nearest 0.01 m for Type G and H mountings.
- 17.1.5 The method of suspension used to satisfy 11.2.

17.1.6 A description of the substrate used with a Type I mounting.

17.1.7 The orientation and position of the substrate shall be documented when 13.1.5 applies.

17.2 Any exceptions to the mounting specifications defined by these practices shall be explicitly noted in the report.

NOTE 14—Identifying the manufacturer and his product designation can satisfy some of these requirements.

NOTE 15—Information describing the opening sizes, the percent of open area, the material and its thickness, and the pattern of the openings are items to consider when identifying the product.

**18. Keywords**

- 18.1 sound absorption; test specimen mountings

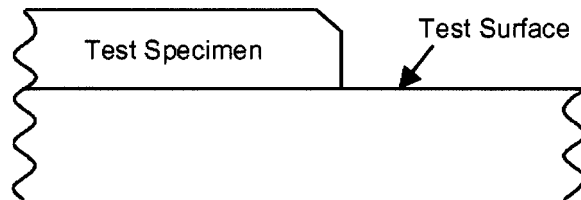
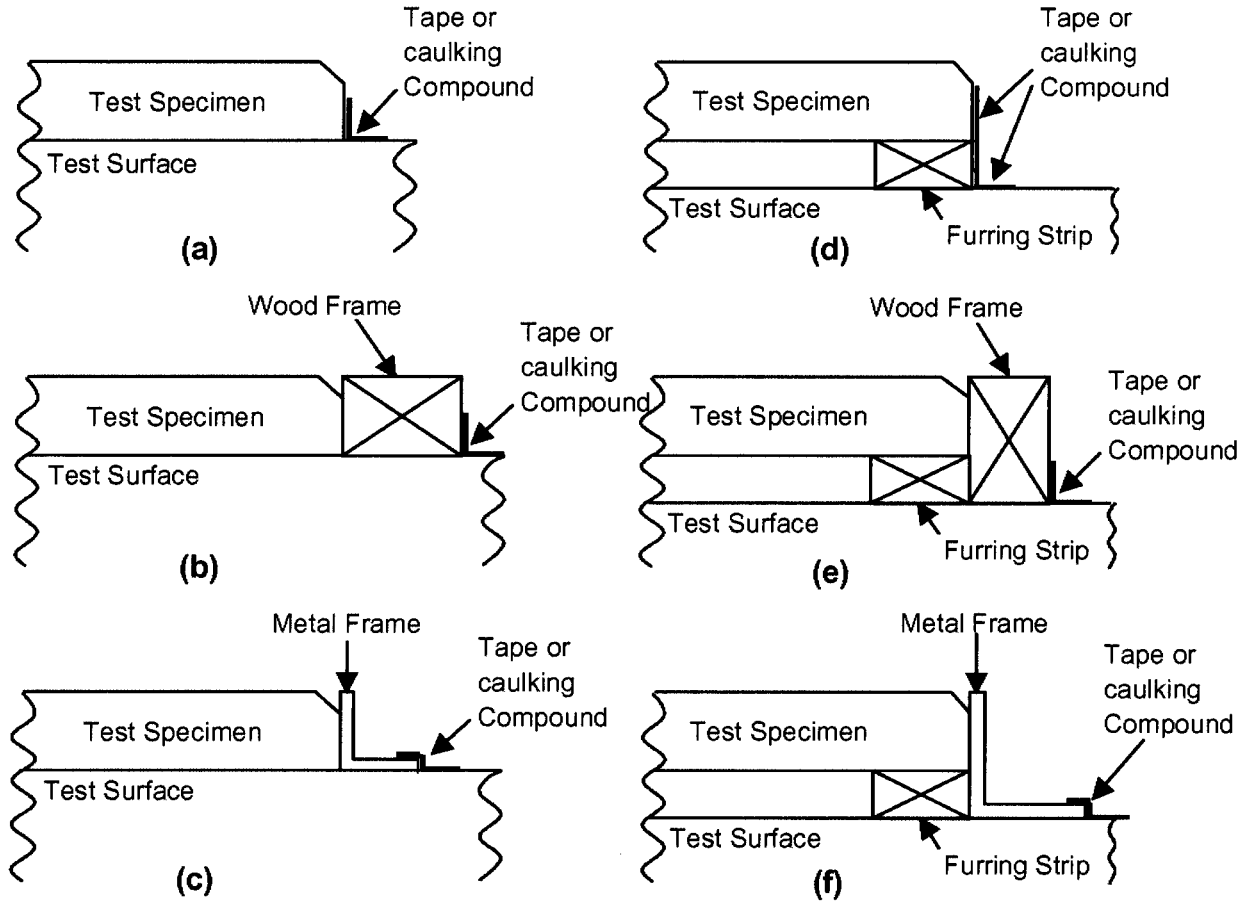


FIG. 1 Type A Mounting



- (a) Tape or caulking compound used to seal a Type A or Type B mounting.
- (b) Wood frame used to seal a Type A or Type B mounting.
- (c) Metal angle frame used to seal Type A or Type B mounting.
- (d) Tape or caulking compound used to seal a Type D mounting.
- (e) Wood frame used to seal a Type D mounting.
- (f) Metal angle frame used to seal a Type D mounting.

FIG. 2 Typical Edge Seals

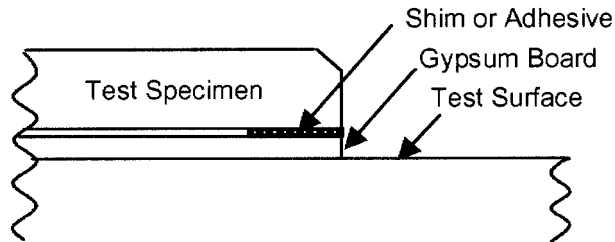


FIG. 3 Type B Mounting

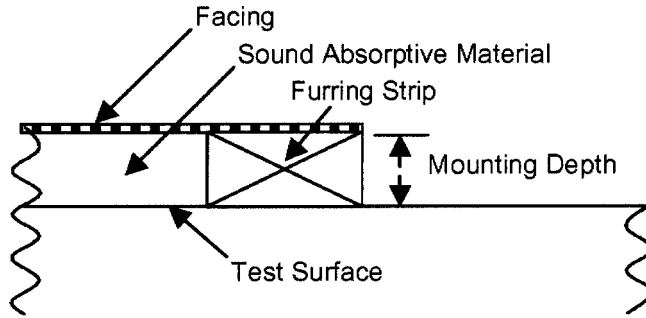


FIG. 4 Type C Mounting

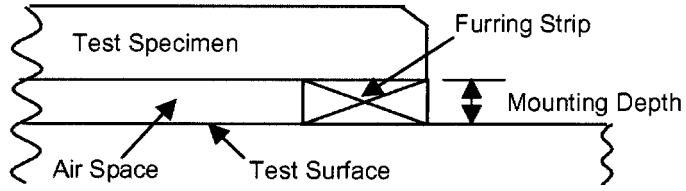


FIG. 5 Type D Mounting

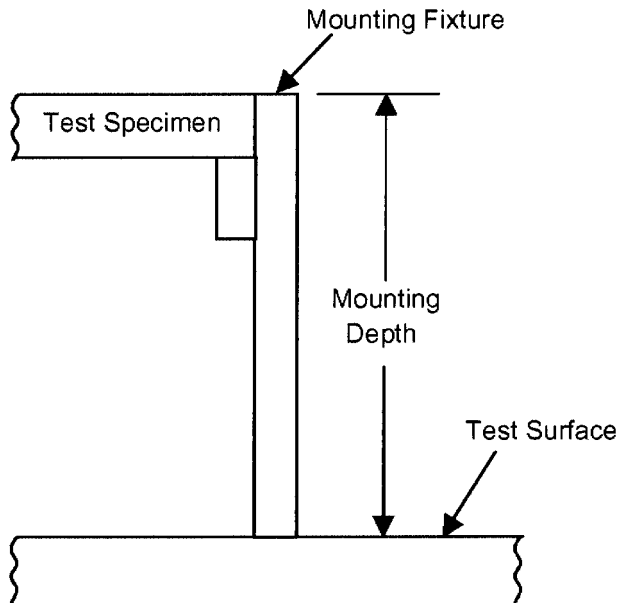


FIG. 6 Type E Mounting

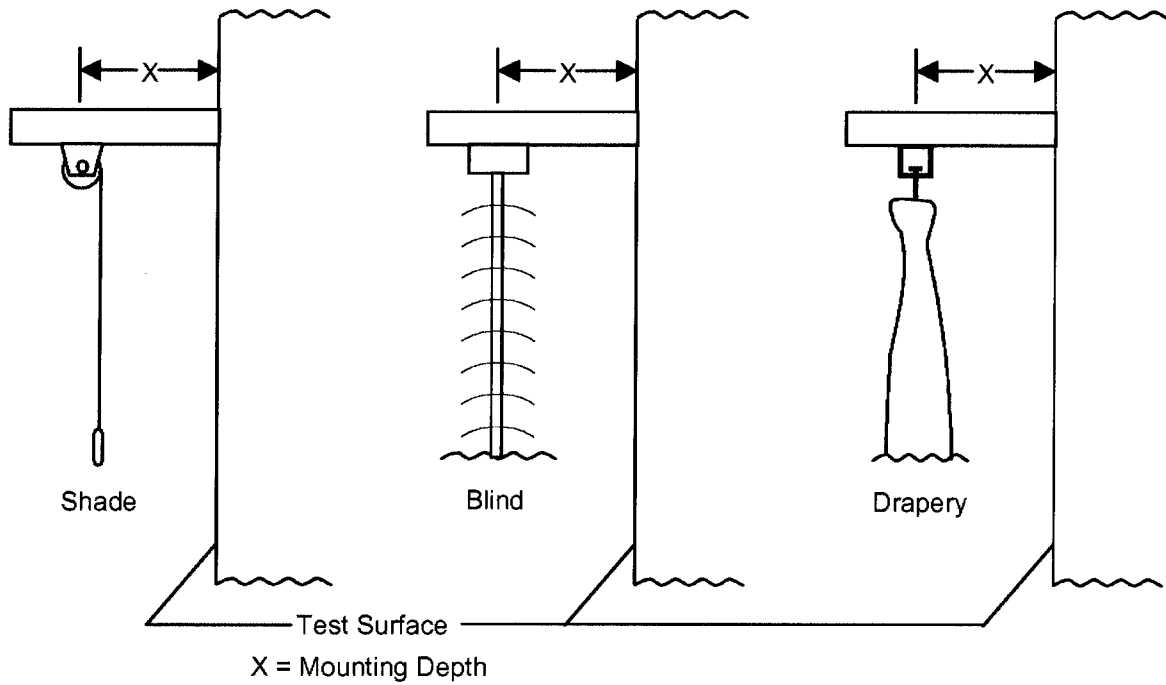
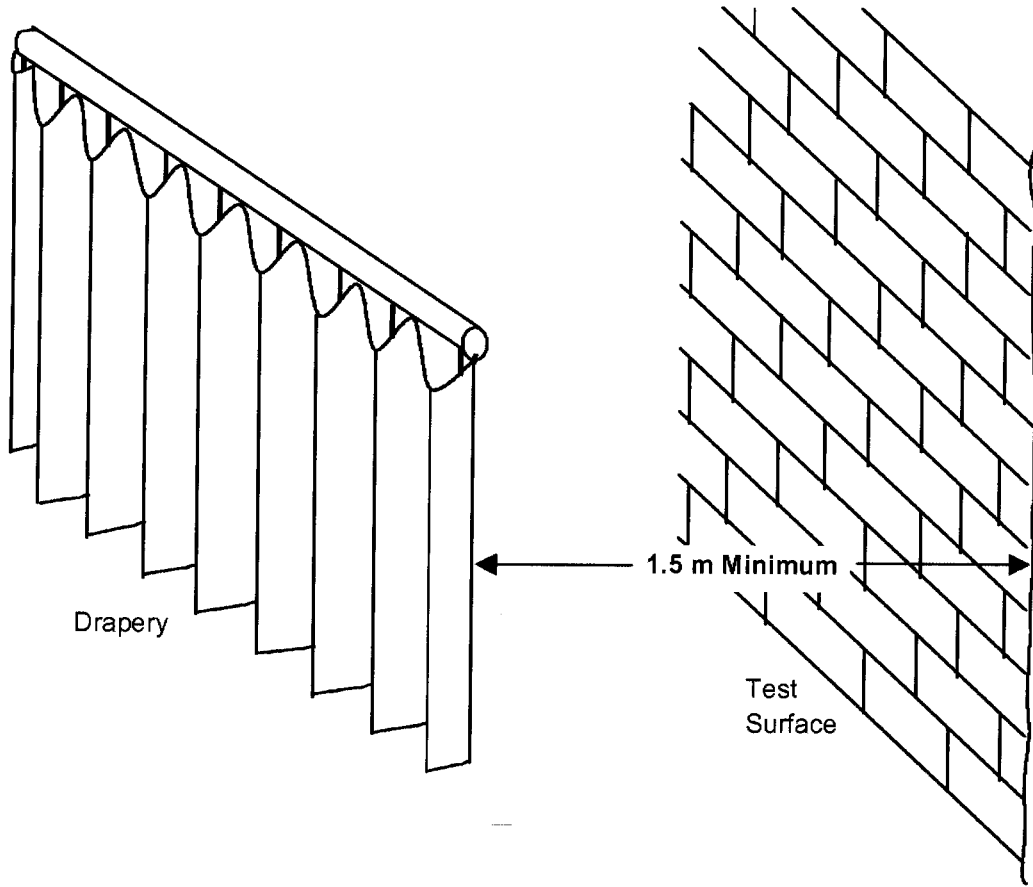


FIG. 7 Type G Mounting





- (a) Tape or caulking compound used to seal a Type A or Type B mounting
- (b) Wood frame used to seal a Type A or Type B mounting
- (c) Wood frame used to seal a Type D mounting
- (d) Tape or caulking compound used to seal a Type D mounting
- (e) Metal angle frame used to seal a Type A or Type B mounting

FIG. 8 Type H Mounting

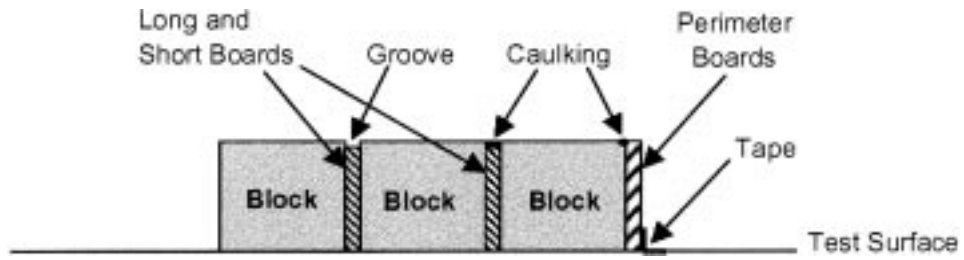


FIG. 9 Type L Mounting (Side view)

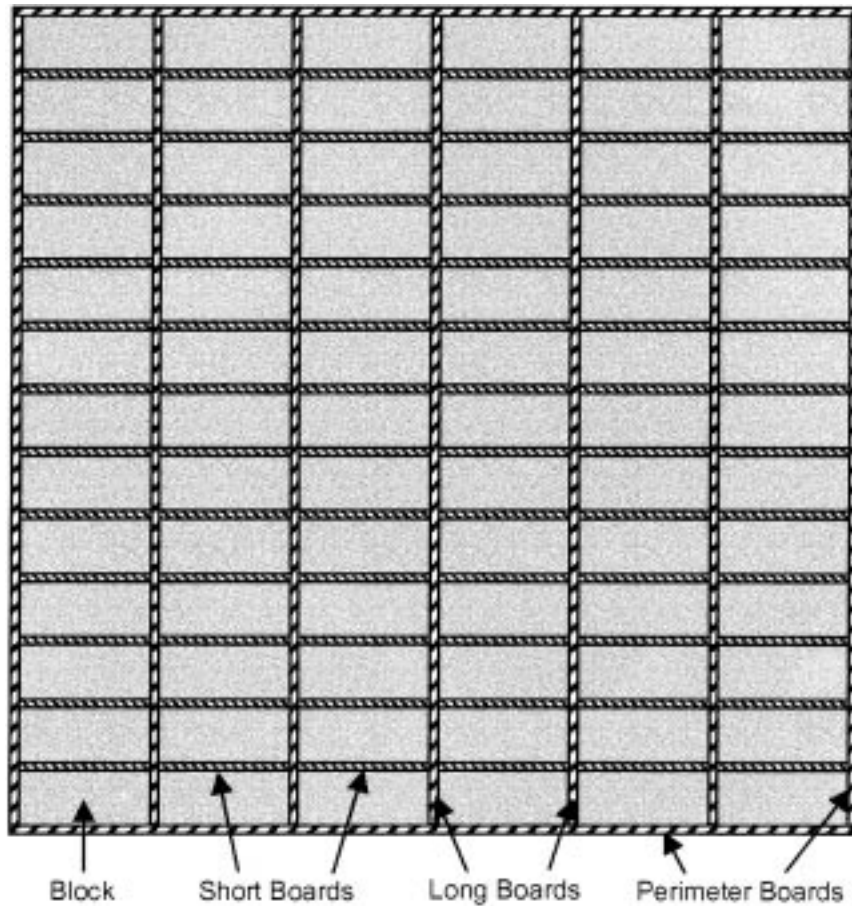


FIG. 10 Type L Mounting (Top view)

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