



# Standard Practices for Mounting Test Specimens for Sound Transmission Loss Testing of Naval and Marine Ship Bulkhead Treatment Materials<sup>1</sup>

This standard is issued under the fixed designation E 1123; 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 describe test specimen mountings to be used for naval and marine ship applications during sound transmission loss tests performed in accordance with Test Method E 90.

1.2 The structure specified in these practices is intended for mounting of single-layer treatments or composite treatments consisting of various materials and configurations. Acoustical treatment materials may be combinations of acoustical absorber materials, limp mass septums, and insulation materials.

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

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:

- C 634 Terminology Relating to Environmental Acoustics<sup>2</sup>
- E 90 Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements<sup>2</sup>

## 3. Significance and Use

3.1 The sound transmission loss provided by a material that covers a flat surface depends not only on the physical properties of the material but also on the type of structure to which it is mounted and the mounting method used.

3.2 Naval and marine architects and design engineers require specific transmission loss characteristics of acoustical treatment materials as they would exhibit installed on a ship's

structure. The mounting structure and procedures specified in these practices are intended to simulate such a shipboard environment.

3.3 Test reports may refer to this mounting by Practices E 1123 instead of providing a detailed description of the mounting used.

## 4. Mounting Structure and Methods

4.1 The mounting structure consists of a fabricated aluminum bulkhead. This bulkhead is designed to fit within a 2.44-m (8-ft) opening in the filler walls between the reverberation rooms of a test facility. Test result measurements due to the effects of the filler walls may be accounted for as specified in Test Method E 90. A larger mounting structure may be used if it can be demonstrated that this structure yields results comparable to the 2.44 by 2.44-m (8 by 8-ft) mounting structure.

4.1.1 The bulkhead is fabricated in two sections, 1.22 by 2.44 m (4 by 8 ft) and is fastened together by a 10.2 by 10.2 by 10.2-cm (4 by 4 by 4-in.) aluminum I-beam.

4.1.2 The coupling is accomplished by using 8-mm ( $\frac{5}{16}$ -in.) SAE grade B steel stove bolts, torqued to 3.33 m/kg (25 ft/lb).

4.1.3 The 6.4-mm ( $\frac{1}{4}$ -in.) sheet aluminum panels, 1.22 by 2.44 m (4 by 8 ft), are supported with 10.2 by 10.2 cm (4 by 4 in.), 2.976-kg per linear metre (2-lb per linear ft) tee beams.

4.1.3.1 The tee beams are welded to the 6.4-mm ( $\frac{1}{4}$ -in.) aluminum sheets with welds on either side of the center member of the tee at 53.3-cm (21-in.) intervals.

4.1.3.2 Weld areas should be approximately 7.6 cm (3 in.) long. Welding in excess of these intervals may cause severe warpage of the bulkhead. The tee beams are positioned on the aluminum sheets to obtain a distance of 61 cm (2 ft) between tee beam centers with the I-beam serving as the bulkhead center support.

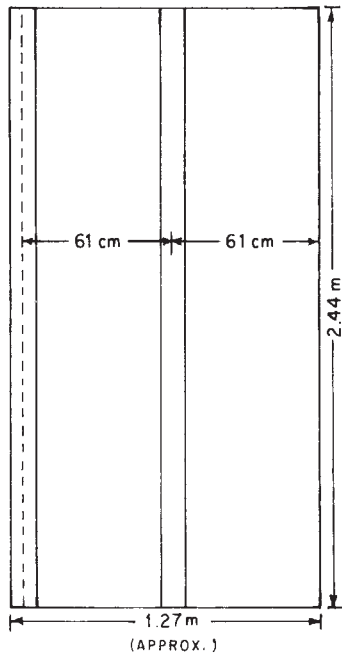
4.1.4 Fig. 1 illustrates the construction details. The bulkhead shall be installed with the smooth side facing the acoustical source room and fastened in the filler wall opening by any means which will provide a secure, rigid structure. Tapered wooden wedges driven between the filler wall at each tee beam support will provide the necessary rigidity. Acoustical sealant shall be applied around the bulkhead edges, between the filler

<sup>1</sup> These practices are under the jurisdiction of ASTM Committee E33 on Environmental Acoustics and are the direct responsibility of Subcommittee E33.03 on Sound Transmission.

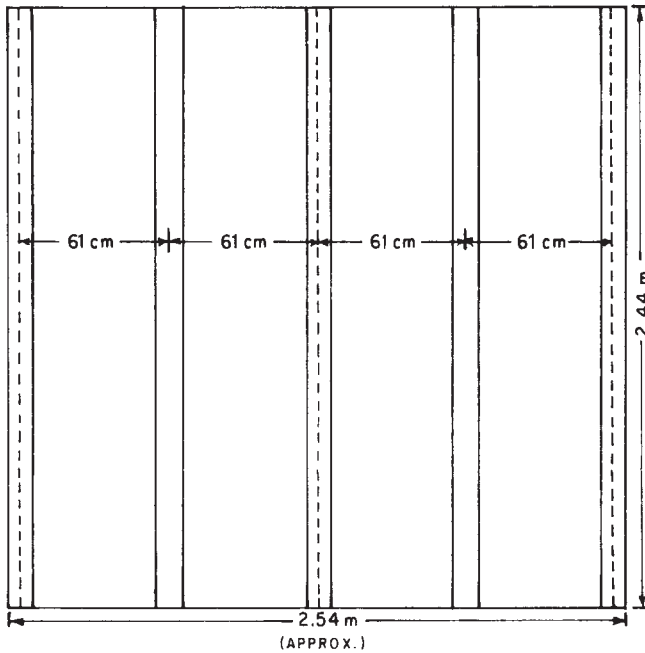
Current edition approved Oct. 1, 2003. Published October 2003. Originally approved in 1986. Last previous edition approved in 1998 as E 1123 – 86 (1998).

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

FRONT VIEW PRE-FAB BULKHEAD SECTION



FRONT VIEW PRE-FAB BULKHEAD SECTIONS, JOINED

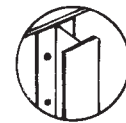


DETAIL A



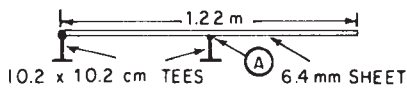
T-BEAMS WELDED ON BOTH SIDES TO SHEET

DETAIL B

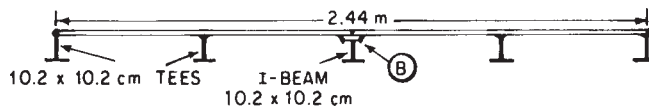


I-BEAM PANEL JOINER  
8 mm SEA GRADE B  
STEEL STOVE BOLTS  
(COUNTERSINK SHEET  
PLATING) TORQUE TO  
3.33 m·kg. BOLT  
CENTERS 19 mm IN  
FROM EDGE, ON 10.2 cm  
CENTERS.

TOP VIEW PRE-FAB BULKHEAD SECTION



TOP VIEW PRE-FAB BULKHEAD SECTIONS, JOINED



- NOTE 1—6.4-mm sheet plate.  
NOTE 2—10.2 by 10.2-cm tees, 2.976 kg per linear metre.  
NOTE 3—Two 1.22 by 2.44-m bulkhead sections joined with I-beam using 8-mm bolts.  
NOTE 4—Bulkhead sections delivered unassembled.

FIG. 1 Aluminum Bulkhead Details

wall and the bulkhead and the I-beam panel connector to ensure an airtight seal. This seal should be confirmed by energizing the acoustical source and listening for spurious noise transmission around the sealed perimeter crevices with a stethoscope on the receiver room side.

4.2 Self-adhesive insulation anchors (stud pins) with 5.1 by 5.1-cm (2 by 2-in.) galvanized steel plates and 12 gage spindles (minimum) shall be installed on the smooth side of the bulkhead (source room side) and shall have the following dimensions:

4.2.1 Stud pins shall be placed on centers not exceeding 30.5 cm (12 in.).

4.2.2 Stud pins shall not be more than 15.2 cm (6 in.) from the edge of the treatment material except for center panel support when a 5-point anchor pattern is used on a 61 by 91.4-cm (2 by 3-ft) panel.

4.2.3 Stud pin length shall be sufficient to accommodate mounting of the maximum thickness of the specimen materials to be tested.

4.2.4 A typical stud pin pattern is shown in Fig. 2.

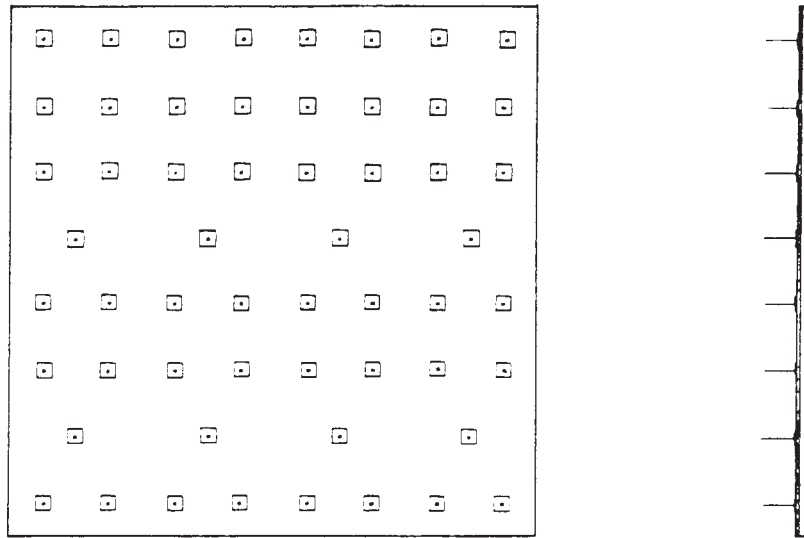
4.3 Acoustical treatment material shall be secured on the stud pins using self-locking galvanized steel washers, 3.8 cm (1½ in.) in diameter. Self-locking washers shall be used only where required to hold treatment materials securely against the bulkhead. Lightweight backing materials used in multiple-layer treatments generally will not require self-locking washers.

4.4 Acoustical treatment materials shall be installed on the aluminum bulkhead as they would be applied on a ship. Butt joints of the acoustical material panels shall be as tight and as evenly aligned as possible.

4.5 When limp mass septums are applied, the following procedures shall be followed:

4.5.1 A 5.1-cm (2-in.) overlap (minimum) shall be provided on all limp mass material seams.

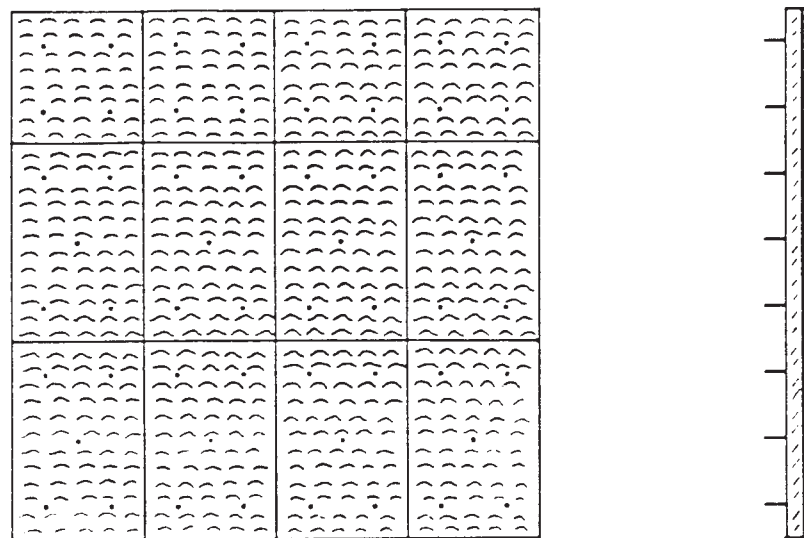
4.5.2 Duct tape or an adhesive tape shall be used to tape over seam areas ensuring the limp mass material is smooth and conforms to the surface of material mounted under the limp mass septum (if installed).



FRONT VIEW

SIDE VIEW

FIG. 2 Typical Stud Pin Pattern for a 2.44 by 2.44-m Structure (30.5-cm Between Stud Centers and 15.2-cm from Material Edges)



FRONT VIEW

SIDE VIEW

Backing Board or Underlayment Installation, 5.1-cm (2 in.) Fibrous Glass Insulation Material Illustrated

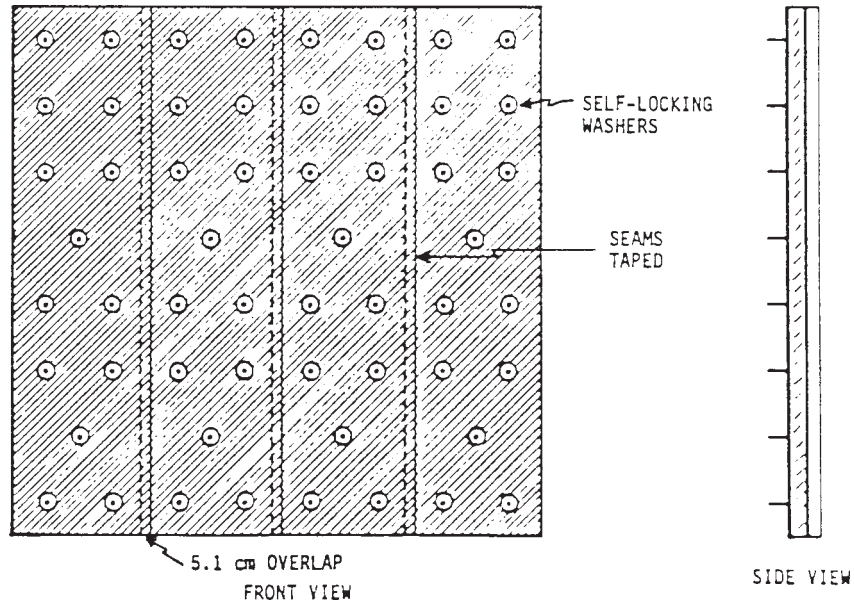
FIG. 3 (a) Acoustic Material Installation Details

4.5.3 For lead-faced fibrous glass panels, a 10.2-cm (4-in.) strip of sheet lead material shall be taped over the butt joint seams.

4.5.4 Self-locking washers shall be applied to secure limp mass septums in place. The washers should be installed in such a fashion that the limp mass septum is tight against the material mounted underneath without over-compressing the backing material.

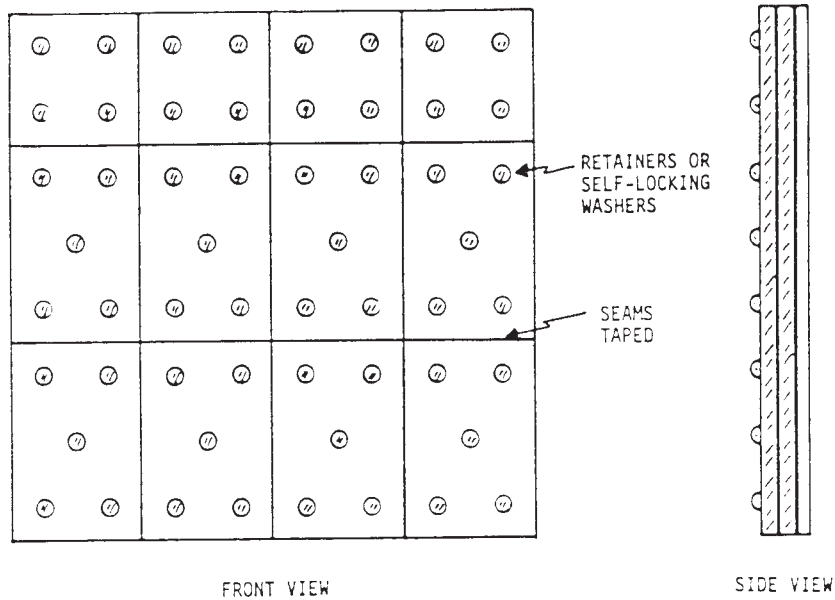
4.5.5 A third layer (if installed) shall be applied as stated in 4.4 and duct tape or an adhesive tape shall be applied over seam areas. Self-locking washers or retainers shall be installed

to ensure the third-layer material is secure against the limp mass observing precautions not to over-compress the third layer material. Figure 3 (a), (b), and (c) illustrate a typical installation of a three-layer acoustical transmission loss treatment.



Limp Mass Septum Installation (66-cm Width Material Shown, Installed over Fibrous Glass Material)

FIG. 3 (b) Acoustic Material Installation Details (continued)



Third Layer (Facing Board) Installation, Absorption Layer Installed over Limp Mass Septum and Fibrous Glass Insulation

FIG. 3 (c) Acoustic Material Installation Details (continued)

## 5. Test Report


5.1 When the mounting structure and methods specified in these practices are used during a sound transmission loss test, the test report shall be stated as follows: The specimen mounting and methods utilized are in accordance with Practices E 1123.

5.1.1 Additional information required by Section 11 of Test Method E 90 shall be included. The test report shall contain

transmission loss values of the bulkhead structure without any treatment materials installed and the transmission loss values with treatment materials installed.

## 6. Keywords

6.1 bulkhead; marine acoustical applications; sound transmission loss

 **E 1123 – 86 (2003)**

*ASTM International takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.*

*This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, at the address shown below.*

*This standard is copyrighted by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States. Individual reprints (single or multiple copies) of this standard may be obtained by contacting ASTM at the above address or at 610-832-9585 (phone), 610-832-9555 (fax), or [service@astm.org](mailto:service@astm.org) (e-mail); or through the ASTM website ([www.astm.org](http://www.astm.org)).*