



# Standard Test Method for Mechanical Static Load Testing of Non-Structural Marine Joiner Bulkheads<sup>1</sup>

This standard is issued under the fixed designation F3040/F3040M; 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 test method covers a procedure for evaluating the strength of non structural marine joiner of A, B, and C-Class bulkhead and liner systems. A, B, and C-Class bulkheads are defined and discussed in 2.1.

1.2 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system are not necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of the other, and values from the two systems shall not be combined.

1.3 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

## 2. Referenced Documents

2.1 *International Maritime Organization Publication: SOLAS 2009 Consolidated Edition, Chapter II-2, Part A, Regulation 3, Definitions<sup>2</sup>*

## 3. Summary of Test Method

3.1 Install panels into a mounting test fixture representative of the bulkhead system.

3.2 Attach loading bracket to center panel at mid-width and height of the center panel.

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee F25 on Ships and Marine Technology and is the direct responsibility of Subcommittee F25.03 on Outfitting and Deck Machinery.

Current edition approved July 1, 2023. Published July 2023. Originally approved in 2013. Last previous edition approved in 2018 as F3040/F3040M – 13 (2018). DOI: 10.1520/F3040\_F3040M-13R23.

<sup>2</sup> Available from International Maritime Organization, 4 Albert Embankment, London, Se1 7SR, <http://www.imo.org>. (Fifth Edition.)

3.3 Mount three dial indicators at the back side of the center panel to measure deflection at the centerline of the panel's three vertical quarter points. (See Fig. 1.)

3.4 Load the bracket at no more than 10 kg [22 lb] increments until a total load of 200 kg [441 lb] is obtained. Record deflection from dial indicators at each incremental load or until failure is reached.

3.5 If failure is not reached, extend the loading bracket outward to the next moment arm from the panel and repeat loading.

3.6 Continue to increase applied load until failure or until maximum moment arm and loads are applied.

## 4. Significance and Use

4.1 The test method provides information regarding the behavior of a non-structural A, B, or C-Class bulkhead panel system under a static load. Test data for load, moment and deformation is measured.

4.2 Static load test of non-structural marine joiner panel systems provide a standard method of obtaining data for research and development, quality control, acceptance or rejection under specifications, and special purposes. The tests cannot be considered significant for engineering design in applications differing widely from the loading type and magnitude of the standard test. Such applications shall require additional tests.

## 5. Apparatus

5.1 *Bulkhead Mounting Fixture*—Secures the edges of the panels in a position representative of the bulkhead system installed on a ship. The two edges on the side of the test specimen shall be fitted with typical edge trim. Top and bottom shoes, and panel connection mechanism capable of supporting 2135 mm  $\pm$  3 mm [84 in.] high by 3660 mm  $\pm$  3 mm [144 in.] minimum wide joiner panel system shall be used.

5.2 *Loading Bracket*—Attach the loading bracket through the bulkhead panel. The loading bracket has supports for loading at different distances, 305 mm  $\pm$  3 mm [12 in.], 610 mm  $\pm$  3 mm [24 in.], and 915 mm  $\pm$  3 mm [36 in.] from the bulkhead panel surface. The loading bracket bulkhead plate has four holes 305 mm  $\pm$  3 mm [12 in.] apart vertically and



FIG. 1 Setup to Measure Deflection



FIG. 2 Loading Bracket with Load Applied at 915 mm [36 in.]

5.5 *Dial Indicators*—Indicator shaft bears on the back side of panel at three locations, suitable for measuring displacement of the specimens and accurate to a minimum of  $\pm 1\%$  of the full scale reading and with travel adequate to measure the full displacement anticipated.

## 6. Sampling, Test Specimens, and Test Units

6.1 The test specimen shall include joined panels so that the test panel is supported by the bulkhead joiner system as per the manufacturer installation instructions.

6.2 All components shall be representative of the same quality as components installed on the vessel.

## 7. Procedure

7.1 Define the joiner bulkhead system construction.

7.1.1 Record all the components of the system—panel material and construction, top and bottom shoes, and panel connectors.

7.1.2 Record the geometry of the system—panel quantity, width, height, and thickness.

7.1.3 Record the weight of the bulkhead panel and the weight per length of the bulkhead system.

7.2 Place the bulkhead system into the bulkhead mounting fixture assuring that the panel to be tested is fully supported by bulkhead system. A minimum of three panels are required to comprise a  $2135\text{ mm} \pm 3\text{ mm}$  [84 in.] high by  $3660\text{ mm} \pm 3\text{ mm}$  [144 in.] wide panel system configuration as shown in Fig. 3, bulkhead system. An odd number of panels are required for the test with the center line of the middle panel centered in the fixture. The three center panels shall be the maximum width standard panel of the system.

7.3 Mount three dial indicators to measure displacement at the center, upper, and lower quarter points on the back side of

horizontally with the load centered vertically and horizontally between the two sets of holes. See Fig. 2.

5.3 *Hook on Loading Bracket*—Suspends load plates from the loading bracket at designated distances.

5.4 *Load Plates*—Weights that attach to the loading bracket. Approximately 20 slotted plates not exceeding 10 kg [22 lb] each for a total recommended load at each interval of 200 kg [441 lb].

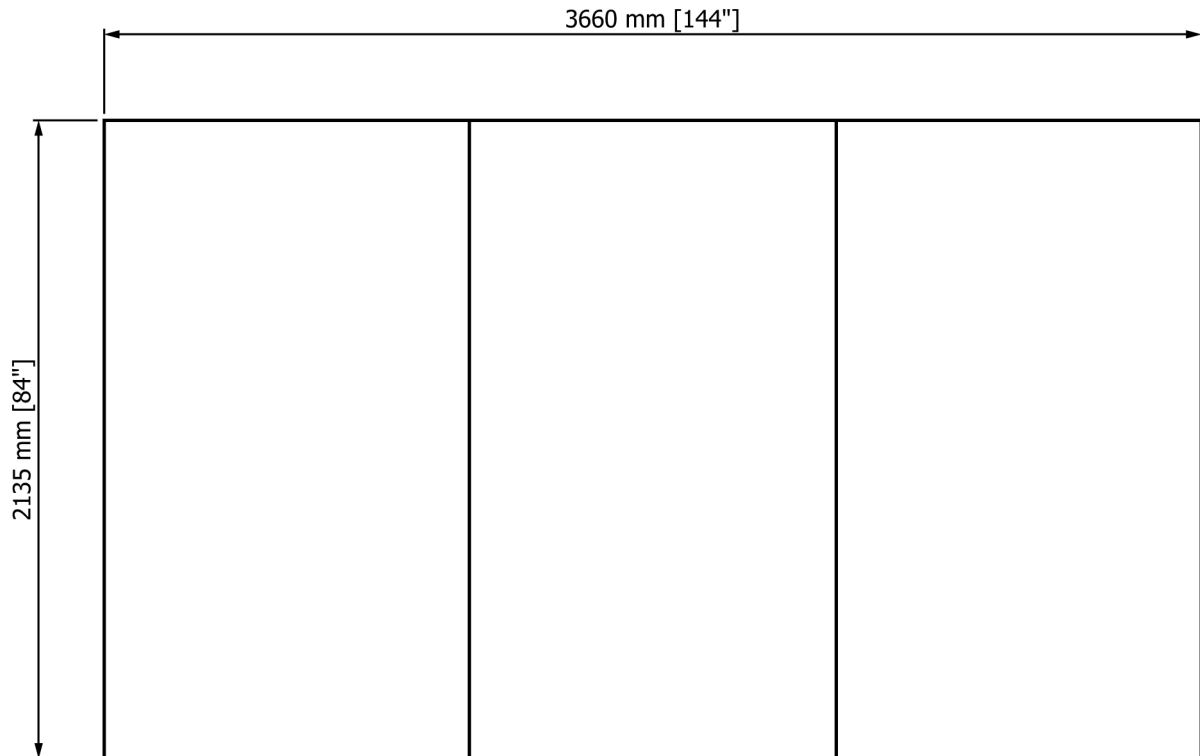


FIG. 3 Bulkhead System

the panel as shown in Fig. 1, set up to measure deflection. Set each indicator to read zero.

7.4 Attach the Loading Bracket on the front of test specimen at the centerline of the center panel with the loading bracket installed midway between the top and bottom of the panel. Use four M16 × 2 [5/16-18] bolts with nominal size 8 mm [7/16 in., 1 1/4 in. O.D.] flat washers, bushings and hex nuts, on 305 mm ± 3 mm [12 in.] centers. A minimum 12 +1/-0 mm [1/2 in.] spacer is to be installed between the bulkhead and Loading Bracket to prevent the Loading Bracket back plate from contacting the panel face. See Fig. 4 Setup. Each of four bolts are to be torque 1/4 turn past finger tight.

7.5 Position the hook 305 mm ± 3 mm [12 in.] from the panel surface and record deflection values.

7.6 Add load plates to bracket one at a time for each hook position, record weight and deflection values and note any failure of the panel system. Typical failures are visible cracking of the panel, delamination of the panel, and pull through of the fasteners holding the load bracket in place.

7.7 If panel does not fracture at maximum weight, move the hook position outward at 305 mm ± 3 mm [12 in.] increments and repeat 7.6. The maximum distance (*d*) is 915 mm ± 3 mm [36 in.] from the panel face.

7.8 Photograph the test specimen at the maximum load applied, record any failure type, and location and maximum load applied.

## 8. Calculation or Interpretation of Results

8.1 Determine weight and center of gravity of the loading bracket without a load applied to calculate its moment.

8.2 Calculate the moment applied for each static load recorded.

8.3 Plot deflection versus moment for each of the three dial indicators.

## 9. Report

9.1 Report the following information;

9.1.1 Complete identification of the bulkhead panel system tested, including type, source, code numbers, technical data sheets, MSDS, and manufacturer's installation instructions.

9.1.2 Weight per length of the bulkhead panel system.

9.1.3 Number of specimens tested and sketch of the test specimen.

9.1.4 Full deflection versus moment curves for each specimen.

9.1.5 All failures and failure modes with photographic documentation.

9.1.6 Date, location, and witnesses of the test.

## 10. Precision and Bias

10.1 The precision and bias of these test methods have not yet been determined.

## 11. Keywords

11.1 bending moment; marine non-structural; static loading