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INCH-POUND

MIL-HDBK-2189(SH)
SECTION 672-1
24 DECEMBER 1987

DEPARTMENT OF DEFENSE
MILITARY HANDBOOK

DESIGN METHODS FOR NAVAL SHIPBOARD SYSTEMS

SECTION 672-1

CALCULATION OF STOREROOM CAPACITIES



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MIL-STD-2189(SH)
SECTION 672-1
24 December 1987

DEPARTMENT OF THE NAVY
NAVAL SEA SYSTEMS COMMAND

Washington, DC 20362-5101

Design Methods for Naval Shipboard Systems Calculation of Storeroom Capacities

1. This Military Standard is approved for use by the Department of the Navy and is available for use by all Departments and Agencies of the Department of Defense.

2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Sea Systems Command, SEA 55Z3, Department of the Navy, Washington, DC 20362-5101 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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1. GENERAL AND SCOPE

1.1 General. The procedures established by MIL-STD-2189 are applicable. This section and the basic standard are to be considered as an integral single document.

1.2 Scope. This standard establishes the method of calculating storeroom data and provides the format for documenting the storeroom capacity table.

2. REFERENCED DOCUMENTS

2.1 Government documents.

2.1.1 Standard. Unless otherwise specified, the following standard of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation forms a part of this standard to the extent specified herein.

STANDARD

MILITARY

MIL-STD-2189 - Design Methods for Naval Shipboard Systems.

(Copies of standards required by contractors in connection with specified acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

2.2 Order of precedence. In the event of a conflict between the text of this standard and the references cited herein, the text of this standard shall take precedence,

3. DEFINITIONS

3.1 Deck area. Deck area is the area in square meters or square feet of the storeroom compartment within the boundaries of the bulkheads and bottom of shell plating. The area includes floor plates when these are installed.

3.2 Packing factor. Packing factor is the ratio of the net stowage capacity to the gross stowage capacity expressed as a percentage for the particular stowage aid. This is a standard percentage based on studies and analyses of past stowage aid utilization and is not to be modified or derived during the current calculations.

3.3 Percent of storeroom utilization. Percent of storeroom utilization is the ratio of the storeroom net volume to the storeroom gross volume expressed as a percentage.

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3.4 Storeroom gross volume. Storeroom gross volume is the volume of the compartment within the boundaries of the bulkheads and shell plating from the deck or deck grating to the stowage height. For refrigerated spaces it is the volume within the boundaries of the bulkhead insulation and sheathing from the top of the deck grating to the stowage height.

3.5 Storeroom net volume. Storeroom net volume is the volume of the compartment available for the material to be stowed. It equals the sum of the net stowage capacity of each stowage aid within the space, including bulk stowage.

3.6 Stowage aid. Stowage aid is any piece of equipment or fitting used for stowage, including bins, drawer shelf units, lockers, modular drawer stowage (MDS) cabinets, reels, shelving clips, jackrods, battens or gratings.

3.7 Gross stowage capacity. Gross stowage capacity is the total stowage volume provided by the individual stowage aids.

3.8 Net stowage capacity. Net stowage capacity is the usable stowage volume provided by individual stowage aids.

3.9 Stowage height. Stowage height is the clear height to which stores are to be stacked. For ship storerooms, it is defined as 6 feet 6 inches above the deck or deck gratings when provided. For refrigerated storerooms, it is defined as 6 feet above the deck gratings. However, a minimum of 6 inches of clear space is required above the bulk stowage material. Hence, the stowage height shall be reduced where necessary to meet the required clear space.

4. GENERAL REQUIREMENTS

4.1 Information factors. The following information shall be calculated and provided for each storeroom:

- (a) Deck area.
- (b) Storeroom gross volume.
- (c) Net stowage capacity and number of each type of stowage aid in the storeroom.
- (d) Storeroom net volume.
- (e) Percent of storeroom utilization.

4.2 Computations. Computations shall be as follows:

- (a) Deck area. To find the deck area, multiply length times width of deck within the boundaries of the storeroom bulkheads or the bottom of the shell plating. Measurements shall be as shown on figure 1.
- (b) Storeroom gross volume. To find the storeroom gross volume, multiply the deck area times the stowage height of 6 feet for refrigerated storerooms or 6 feet 6 inches for all other storerooms.

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4.2.1 Net stowage capacity of each type of stowage aid. Net stowage capacity for each type of stowage aid shall be calculated as follows:

- (a) Calculate the area of each unit of stowage.
- (1) Drawer, bin, shelf, or rack. Multiply the clear width times the clear depth. Measurements shall be as shown on figure 2. Ignore partitions or dividers within drawers since these are covered by the packing factor.
 - (2) Bulk. Multiply the clear width within the boundaries of bulkheads or battens times the clear depth. Bulk spaces shall be serviced by aisles according to the following guidelines:
 - a. Aisles shall have a clear width of 510 millimeters (mm) (24 inches). This requires an aisle width of 740 mm (29 inches) for telescopic tube battens, and 760 mm (30 inches) for portable battens.
 - b. The aisle shall extend from the door to within 915 mm (36 inches) of the bulkhead opposite the door.
 - c. No portion of the storeroom shall be more than 1.5 meters (5 feet) from an aisle.
 - d. Access shall be provided to all valves, damage control fittings, operating gear, and manholes.
- (b) Calculate the gross stowage capacity of each unit of stowage by multiplying the area determined above by the clear height. Height measurements shall be as shown on figure 3. Subtract any interferences such as pipes, vents, fans, light fixtures, and so forth which fall within the boundaries of the width, depth, or height measurements.
- (c) Determine the total gross stowage capacity for each type of stowage aid by adding the gross stowage capacity for each unit of the stowage aid within the storeroom.
- (d) Calculate the net stowage capacity of each type of stowage aid by multiplying the gross stowage capacity for each type of stowage aid times the packing factor provided below.

<u>Type stowage aid</u>	<u>Packing factor</u>
Drawer	70 percent
Bin	60 percent
Shelf	60 percent
Rack	75 percent
Bulk	90 percent

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4.2.2 Storeroom net volume. Net volume of the storeroom shall be determined by adding the net stowage capacity of each type of stowage aid within the storeroom.

4.2.3 Percent of storeroom utilization. Percent of storeroom utilization shall be calculated by dividing the storeroom net volume by the storeroom gross volume and multiplying the result times 100.

4.3 Storeroom capacity table. The information obtained in computing the storeroom utilization for each compartment shall be displayed on a storeroom capacity table similar to the sample shown on figure 4.

5. DETAILED REQUIREMENTS

Not applicable.

6. NOTES

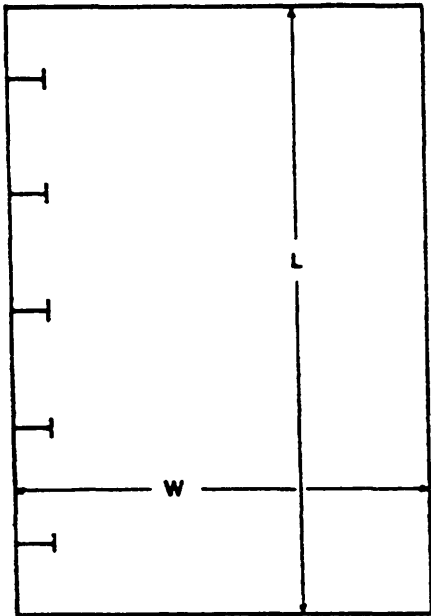
6.1 Intended use. This standard is intended to be used for calculating storeroom information including deck area, gross volume, quantities, types and capacity of stowage aids, net volume and percent utilization.

6.2 Subject term (key word) listing.

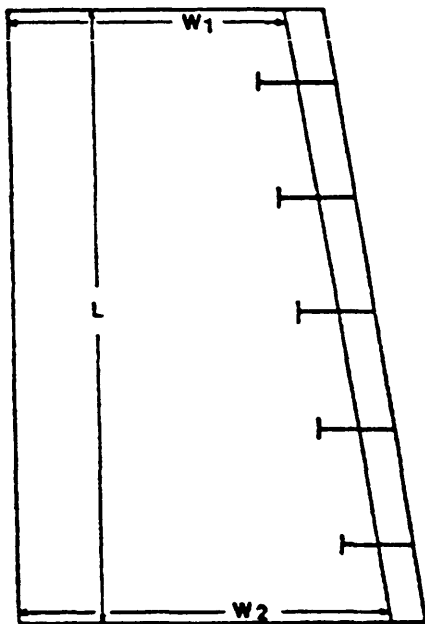
Deck area
Packing factor
Net stowage capacity
Stowage aid
Stowage height

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Measure the length or the width from bulkhead to bulkhead. Do not consider stiffeners along the bulkhead.

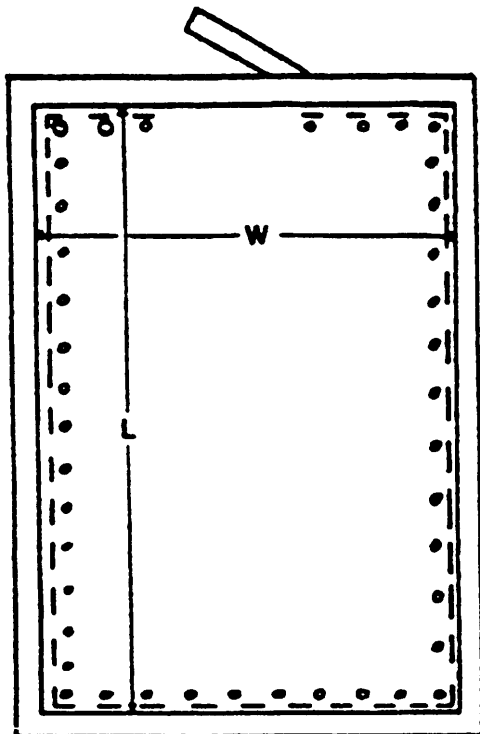


When the width varies at a fairly constant rate over the length of the storeroom, measure W1 and W2 from the bulkhead to the point where the shell plating meets the deck at the extremities of the storeroom. To determine the average width, add W1 and W2 and divide the result by two.

SH 132317431

FIGURE 1. Deck measurements for computing storeroom gross volume.

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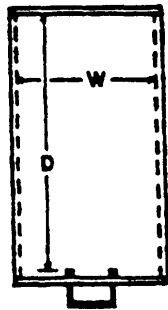


For refrigerated storerooms, the length and width measurements for computing the gross volume are taken from inside the insulation and sheathing. Cooling coils and battens are not considered for computation of gross volume.

SH 132317431

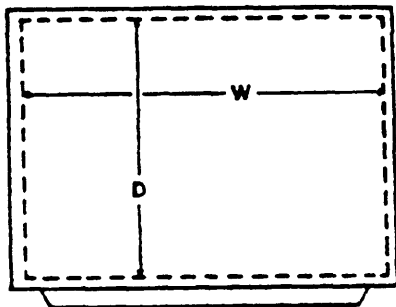
FIGURE 1. Deck measurements for computing storeroom gross volume. - Continued

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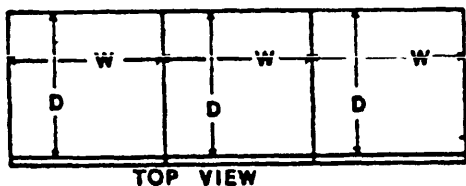
A or B DRAWER

The width measurement is taken from within the curved divider slots. The depth measurement is taken from the hardware holding the drawer handle to the back plate.



MDS or SVMDS DRAWERS

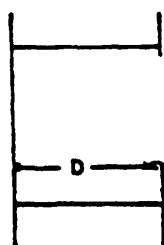
The width measurement is taken from within the curved divider slots. The depth measurement is taken from within the curved partition slots.



BINS

Measure each bin unit.

**SIDE
VIEW**

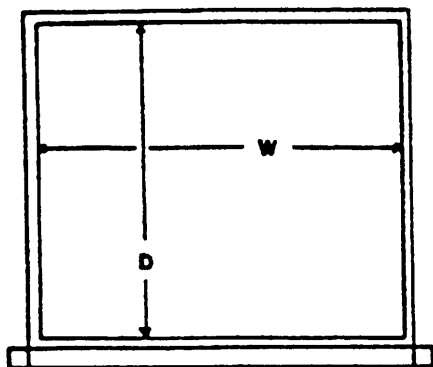


The depth measurement is taken from inside the front lip to the back plate.

SH 132317432

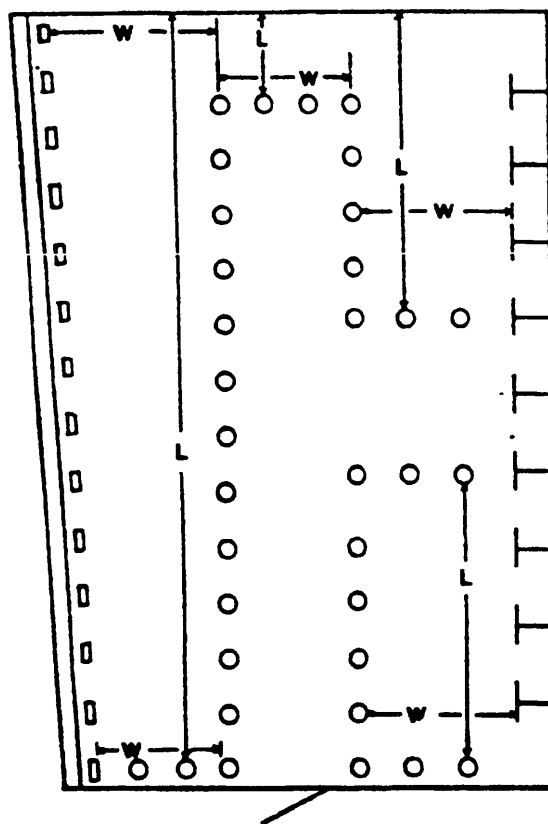
FIGURE 2. Net stowage capacity area measurements.

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PACKS

Measure the width and the depth within the shelf lip or the retaining bar, whichever is less.



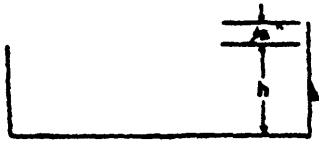
BULK

Measure the width and the depth within the batten and the bulkhead stiffeners. One storeroom may require computation of several bulk locations. Add the individual areas to obtain the total bulk area of the storeroom. For refrigerated storerooms, measurements are taken from within the battens which protect the cooling coils.

SH 132317432

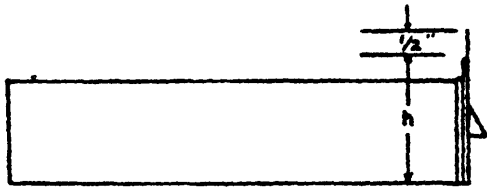
FIGURE 2. Net stowage capacity area measurements. - Continued

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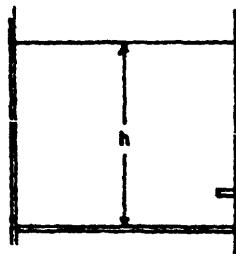


A and B DRAWERS

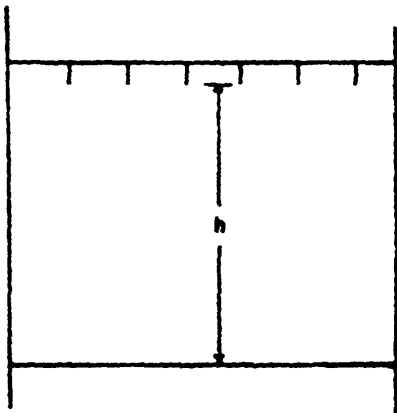
The height measurement for drawers is from the bottom of the drawer to 1/2 inch below the top of the drawer front.



MDS and SVMDS DRAWERS



BINS



RACKS

When rack shelves are strengthened by use of stiffeners, the height measurement is taken from the top of the lower shelf to the bottom of the stiffeners.

SH 132317433

FIGURE 3. Net stowage capacity height measurements.

