Designation: F1455 – 92 (Reapproved 2022)

An American National Standard

Standard Guide for Selection of Structural Details for Ship Construction[1]

This standard is issued under the fixed designation F1455; 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 (ε) indicates an editorial change since the last revision or reapproval.

INTRODUCTION

The principal aim of this guide is to depict recommended practices related to the design of ship structural details. The importance of structural details is clear:

(*1*) Their layout and fabrication represent a sizable fraction of hull construction costs.

(*2*) Details are often the source of cracks and other failures which, under certain circumstances, could lead to serious damage to the ship hull girder.

(*3*) The trend toward decreasing ship hull scantlings (that is, increasing average hull stresses) has the potential of increasing the damage to details.

(*4*) Researchers have largely neglected the analysis of structural details at least in part because the configuration and purpose of these details vary greatly and are not commonly described or discussed in the literature.

Due to lack of analytical and experimental effort devoted to structural details, their determination has been left up to draftsmen and designers, with very little engineering input.

In two comprehensive reviews[2,3] of the performance of structural details, 86 ships were surveyed. These included naval and commercial ship types. The commercial ships included both U.S. and foreign built. The vessels ranged from 428 to 847 feet in length, from 18 000 to 90 000 tons in displacement, and from five to twenty-six years in age. The details obtained were grouped into 12 typical families. Knife Edge Crossings (Family No. 6) and Structural Deck Cutout Details (Family No. 9) are shown but not covered in detail in this guide. The remaining ten detail families were further categorized into 53 groups comprising a total of 611 detail configurations. A number of these configurations are very similar to others in detail geometry and such duplicates have been excluded from this guide. A number of others were eliminated because of relatively infrequent observed use. As a result, a total of 414 details are included herein. However, all 611 details can be found in "Structural Details,"[4] if desired.

In total, 607 584 details were observed with a total of 6856 failures. Failures were attributed to one or a combination of five categories: design, fabrication, welding, maintenance, and operation (see 4.1 through 4.1.5). This extensive, well documented research, together with engineering judgement, provides the principal support for this guide.

1. Scope

1.1 This guide provides a recommended list of selected ship structure details for use in ship construction.

1.2 Structural details which have failed in service and are not recommended for use in ship construction are included as well.

1.3 This guide is intended to convey the lessons learned on different configurations of ship structure details, not the dimensions, thickness, or construction methods which would result from structural calculations.[4]

[1] This guide is under the jurisdiction of ASTM Committee F25 on Ships and Marine Technology and is the direct responsibility of Subcommittee F25.01 on Structures.

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[2] Jordan, C. R., and Cochran, C. S., "In-service Performance of Structural Details," SSC-272, *Ship Structure Committee Report*, March 1977, available through the National Technical Information Service, Springfield, VA 22161.

[3] Jordan, C. R., and Knight, L. T., "Further Survey of In-service Performance of Structural Details," SSC-294, *Ship Structure Committee Report*, May 1979, available through the National Technical Information Service, Springfield, VA 22161.

[4] Jordan, C. R., and Krumpen, P., Jr., "Structural Details," *American Welding Society Welding Journal*, Vol 63, No. 1, January 1984.

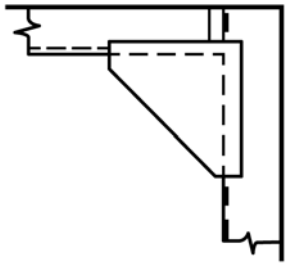

FIG. 1 Beam Brackets (Family No. 1)

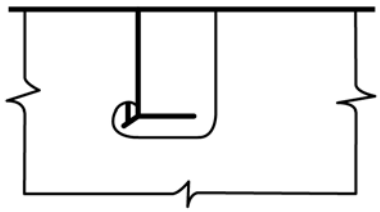

FIG. 2 Clearance Cut-Outs (Family No. 8)

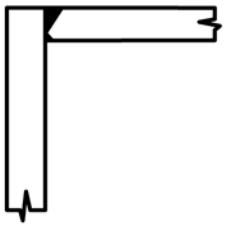

FIG. 3 Gunwale Connections (Family No. 5)

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. Terminology

2.1 *Definitions of Terms Specific to This Standard:*

2.1.1 *Terms:*

2.1.2 *beam bracket*—a bracket at the end of framing or stiffening members that is used for increased strength, continuity and end constraint.

2.1.2.1 *Discussion*—See Fig. 1.

2.1.3 *clearance cut-outs*—a hole or opening in a pierced member to allow passage of a piercing member.

2.1.3.1 *Discussion*—See Fig. 2.

2.1.4 *gunwale connection*—the connection of the sheer strake to the stringer strake of the uppermost deck of the hull.

2.1.4.1 *Discussion*—See Fig. 3.

2.1.5 *knife edge crossing*—the projected point intersection of members (plate members, stiffeners or bulkheads) on opposite sides of an intervening plate member. An undesirable condition to be avoided.

2.1.5.1 *Discussion*—Included for information only, see 3.1.

2.1.5.2 *Discussion*—See Fig. 4.

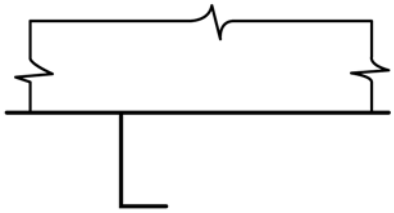

FIG. 4 Knife Edge Crossing (Family No. 6)

2.1.6 *miscellaneous cut-out*—small holes or openings of a variety of sizes and shapes used for access, drainage, ease of fabrication, stress relief, and so forth.

2.1.6.1 *Discussion*—See Fig. 5.

2.1.7 *non-tight collar*—a fitting at the cut-outs in way of the intersection of two continuous members that provides lateral support for the piercing member which does not fully fill the cut-out area of the pierced member. May be a lug.

2.1.7.1 *Discussion*—See Fig. 6.

2.1.8 *panel stiffeners*—intercostal, non-load-carrying members used to reduce the size of plate panels.

2.1.8.1 *Discussion*—See Fig. 7.

2.1.9 *stanchion ends*—structural fittings at the ends (top and bottom) of a stanchion to transfer loads from the supported member to the supporting member.

2.1.9.1 *Discussion*—See Fig. 8.

2.1.10 *stiffener ends*—the configuration of the end of an unbracketed, non-continuous stiffener.

2.1.10.1 *Discussion*—See Fig. 9.

2.1.11 *structural deck cuts*—allow passage through decks for access, tank cleaning, piping, cable, and so forth.

2.1.11.1 *Discussion*—Included for information only, see 3.1.

2.1.11.2 *Discussion*—See Fig. 10.

2.1.12 *tight collar*—as per non-tight collar but the cut-out in the pierced member is fully filled and is air-, oil-, or watertight as required. Tight collars may be lapped or flush fitted.

2.1.12.1 *Discussion*—See Fig. 11.

2.1.13 *tripping bracket*—a bracket or chock that provides lateral support to framing and stiffening members. Support may be provided to either the web or the flange, or to both.

2.1.13.1 *Discussion*—See Fig. 12.

2.2 *Symbols:*

2.2.1 Symbols are as indicated in Fig. 13. The detail identification symbol (Fig. 13, 1-J-1 for example) is the same as that assigned in the original research reports and is retained throughout for all details for ease in referring back to the reports if desired.

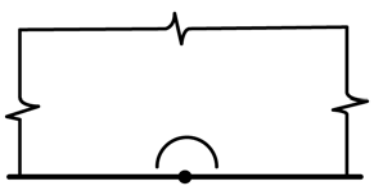

FIG. 5 Miscellaneous Cut-Outs (Family No. 7)