

MSC Guidelines for Review of Structural Plans for Steel and Aluminum Vessels

Procedure Number: H1-10

Revision Date: 03/21/02

References

- a. Title 46 CFR Subchapter K, Subpart C - Hull Structure
- b. Title 46 CFR Subchapter H, Subpart 72.01 - Hull Structure
- c. Title 46 CFR Subchapter I, Subpart 92.01 - Hull Structure
- d. Title 46 CFR Subchapter R, Subpart 167.20 - Hull Requirements, Construction and Arrangement of Nautical School Ships, Subpart 168.05 - General Requirements, Subpart 169.300 - Construction and Arrangement
- e. Title 46 CFR Subchapter T, Subpart C - Hull Structure
- f. Title 46 CFR Subchapter U, Subpart 190.01 - Hull Structure
- g. 1998 ABS Guide for Building and Classing Steel Vessels
- h. 1997 ABS Guide for Building and Classing Steel Vessels Under 90 Meters (295 Feet) in Length
- i. 1997 ABS Guide for Building and Classing High-Speed Craft
- j. 1997 ABS Rules for Building and Classing Steel Vessels for Service on Rivers and Intracoastal Waterways
- k. 1983 ABS Rules for Building and Classing Steel Vessels Under 61 Meters (200 Feet) in Length
- l. 1983 ABS Rules for Building and Classing Steel Vessels Under 61 Meters (200 Feet) in Length with the appropriate conversions from the 1975 ABS Rules for Building and Classing Aluminum Vessels
- m. 1975 ABS Rules for Building and Classing Aluminum Vessels
- n. Lloyd's Register of Shipping Rules for the Classification of Yachts and Small Craft
- o. NVIC No. 11-80: Structural Plan Review Calculations for Aluminum Small Passenger Vessels
- p. MTN Note: 02-96: Plan Review Guidance for Hovercraft
- q. MTN Note: 05-94: Special Considerations Regarding Racking Loads in the Structural Analysis of Large Multi-level Superstructures on Passenger Vessels Operating on Protected or Partially Protected Waters

Disclaimer

These guidelines were developed by the Marine Safety Center staff as an aid in the preparation and review of vessel plans and submissions. They were developed to supplement existing guidance. They are not intended to substitute or replace laws, regulations, or other official Coast Guard policy documents. The responsibility to demonstrate compliance with all applicable laws and regulations still rests with the plan submitter. The Coast Guard and the U. S. Department of Homeland Security expressly disclaim liability resulting from the use of this document.

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Contact Information

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Structural Standards

Subchapters H and I

All vessels must be built to the current standards of the American Bureau of Shipping (ABS) in effect at the time of construction (§72.01-15 and §92.01-15). For vessels being built today, this eliminates references (k), (l), (n), and (o). When a vessel is of a design not contemplated by ABS, the MSC may accept either a systematic analysis based on engineering principles or an applicable design standard of another classification society as sufficient evidence that the vessel's structures have adequate safety and strength (§72.01-20 and §92.01-15).

Subchapters K and T

In general, all vessels must be built to one of the structural design standards referenced here within. However, the MSC may also accept either a systematic analysis based on engineering principles or an applicable design standard of another classification society as sufficient evidence that the vessel's structures have adequate safety and strength (§116.340 and §177.340).

Subchapter R

Public nautical school ships must be built to the current structural design standards of reference (g), or to the current Navy or Coast Guard Standard Construction Specifications (§167.20-1).

Civilian nautical school ships must be built to the same structural requirements as similar sized passenger vessels (§168.05-1).

Sailing school vessels must be built to the structural design standards established by a recognized classification society (§169.309).

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Subchapter U

All vessels must be built to one of the ABS structural design standards (§190.01-10). When a vessel is of a design not contemplated by ABS, the MSC may accept either a systematic analysis based on engineering principles or an applicable design standard of another classification society as sufficient evidence that the vessel's structures have adequate safety and strength (§190.01-15).

Classification Society Review

Vessels Reviewed for Classification

The MSC considers the structural plan approval by a recognized classification society for the purpose of classification as sufficient demonstration of compliance with the regulations. Any plans of a vessel classed by a recognized classification society and submitted to the MSC will be returned without action stating this policy.

Vessels Reviewed for Load Line Assignment

The MSC considers the structural plan approval by an assigning authority for the purpose of load line assignment as sufficient demonstration of compliance with the regulations. Any plans reviewed by an assigning authority for this purpose and submitted to the MSC will be returned without action stating this policy. Please note that a load line review is much less extensive than a classification review. In a load line review, the assigning authority reviews only the major external strength members and ignores many structural components such as internal bulkheads that are reviewed if a vessel is seeking classification. Plans of structural members not reviewed by the assigning authority must be submitted to the MSC for review and approval.

Vessels Reviewed By Class Societies for Other Purposes

The MSC considers the structural plan approval by a recognized classification society as sufficient demonstration that the vessel's hull structures have adequate safety and strength in accordance with Title 46 CFR 177.340, or 72.01-20, or 116.340, as appropriate.

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General
Review
Guidance

Check that the following items are included in the submittal package:

Documentation

- ❑ A detailed list of all plans noting what action is desired (approval, information only, etc.)
 - ❑ A general description of the vessel and its functions such as: length overall, length between perpendiculars, breadth, depth, block coefficient, estimated lightship and draft, load line draft, vessel speed, wave height vs. speed relationship (if applicable), service limitations, identification of novel designs and/or connection details requiring direct analyses, anticipated route, and types of cargo to be carried.
 - ❑ If the vessel is classed: Ensure that the MSC and the cognizant Officer in Charge, Marine Inspection (OCMI) receive copies of the classification society's approval letter(s). The OCMI must also receive copies of the classification society's approved drawings for their use in the inspection and certification process.
 - ❑ If the vessel is load-lined: Ensure that the MSC receives a copy of all structural plans not being reviewed by the classification society. In addition, ensure that MSC and the OCMI receive copies of the approval letter(s) for the plans reviewed by the classification society. The OCMI must also receive copies of the classification society's approved drawings for their use in the inspection and certification process.
 - ❑ If the vessel is not classed or load-lined but the hull structure has been reviewed and approved by a classification society for other reasons: Ensure that the MSC receives the class society's approval letter and approved drawings.
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Plans

Check that the following plans are included in the submittal package if applicable to the vessel (in triplicate). Representative sections must be submitted when scantling plans are not available.

- ❑ Bottom construction, floors, girders, inner bottom plating, etc.
- ❑ Deck plans
- ❑ Framing plan

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- ❑ Midship section - Identifying all cutouts, longitudinal stiffeners/girders that are not considered effective, and all local loadings (i.e. wheel loads, foundation loads, concentrated or distributed loads).
- ❑ Pillars and girders
- ❑ Scantling profile and decks
- ❑ Shell expansion
- ❑ Superstructure and deckhouses
- ❑ Watertight and deep-tank bulkheads
- ❑ Miscellaneous non-tight bulkheads which are used as structural supports
- ❑ Watertight doors and framing
- ❑ Window and framing details
- ❑ Structural details of panel stiffeners, brackets, openings in girders, structural intersections, tripping brackets, stanchion supports, stiffener endings, snipes, bulkhead penetrations, and cutouts
- ❑ Typical sections for areas of unusual structure
- ❑ General arrangement (for reference only)
- ❑ General material specifications
- ❑ A plan detailing the location and installation of special materials including the material's chemical and physical properties and weld procedures.
- ❑ Welding Schedule and details - Structural and welding details need not be itemized on each plan and can be referenced to the "Booklet of Standard Details" developed for each vessel. Shipyard standard details need to be submitted only if the Coast Guard does not have an approved copy on file, or if it contains revised details for the specific vessel under review.

Calculations

Ensure that the structural standard used to demonstrate compliance is:

- (1) a standard permitted by the vessel's specific subchapter, and
- (2) applicable to the vessel.

Check that the following structural calculations are included in the submittal package (in triplicate). If the standard chosen does not address some of the calculations, then calculations are not required for that particular aspect of the vessel's design:

- ❑ Keels, stems, and shaft struts
- ❑ Bottom shell plating and attached stiffeners
- ❑ Side shell plating and attached stiffeners
- ❑ Strength deck plating and attached stiffeners
- ❑ Longitudinal hull girder strength
- ❑ Hull transverse, torsional, and shear strength (multi-hull only)

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- ❑ Other deck plating and attached stiffeners
 - ❑ Watertight bulkheads and attached stiffeners
 - ❑ Deep-tank bulkhead plating and attached stiffeners
 - ❑ Non-tight structural bulkheads/tank boundaries and attached stiffeners
 - ❑ Shaft struts and tunnels
 - ❑ Superstructure and deckhouse plating and attached stiffeners
 - ❑ Stanchions
 - ❑ Windows and framing
 - ❑ Rudders
 - ❑ Unusual structure requiring direct analysis (novel designs and/or connection details, hydrofoil appendages, etc.)
 - ❑ Racking load calculations (large multi-level superstructures with few transverse bulkheads and/or supporting stanchions)
 - ❑ Fatigue analysis (hovercraft, ACV, SES, or any novel design using high strength aluminum alloys to achieve “flight or partial flight operations”)
 - ❑ Structural details of panel stiffeners, brackets, openings in girders, structural intersections, tripping brackets, stanchion supports, stiffener endings, snipes, bulkhead penetrations, and cutouts
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Structural Continuity

If longitudinally framed, check to ensure the following:

- ❑ Bulkheads, partial bulkheads or web frames are arranged to provide effective transverse rigidity and to support the ends of the superstructure or deckhouse.
- ❑ Longitudinal frames are supported by effective transverse structure.
- ❑ In general, longitudinals are continuous in way of transverse supporting members, except at transverse bulkheads where they may be intercostal provided continuity of strength and end fixity are maintained. If longitudinals are not continuous, ensure that they are not used in the longitudinal hull girder section modulus calculations.

If transversely framed, check to ensure the following:

- ❑ Deck and bottom girders are provided. Girders may be intercostal at transverse bulkheads provided continuity of strength and end fixity are maintained.
- ❑ Transverses are arranged as continuous web rings and girders are aligned with stiffeners at bulkheads. Alternatives will be specifically considered.

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For all vessels, check to ensure the following:

- ❑ The attachments of all internal structural members provide end fixity and effective load transmission.
- ❑ The webs of all members are effectively attached to the shell, deck or bulkhead plating, to their supporting members, and to face bars.
- ❑ Hard spots, notches, and other structural discontinuities are minimized.
- ❑ Openings in structural internal members are clear of concentrated loads and areas of high stresses.
- ❑ Openings in decks are framed to provide efficient support and attachment for the ends of deck beams.
- ❑ Portlights below the main weather deck are of substantial construction and capable of being closed and secured watertight.
- ❑ Engines are supported and secured by substantial girders, suitably stiffened, supported against tripping and supported at bulkheads.