

SMALL PASSENGER VESSEL INFORMATION PACKAGE

**Section F: Stability:**

- **Stability Tests**
- **Collision Bulkheads**
- **Subdivision Bulkheads**
- **Hatches**
- **Watertight Coaming**
- **Hull Penetrations**
- **Drainage of Weather Decks**

**Stability Tests - 46 CFR 178.310 & 178.330**

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| <p><b>Simplified Stability Test</b></p>    | <p>Prior to being certificated, a vessel must have undergone a stability test.</p> <p>The following vessels are allowed to undergo a <i>simplified stability test</i>.</p> <ul style="list-style-type: none"> <li>• Vessel <math>\leq</math> 65 feet; <u>and</u></li> <li>• Carries less than 150 passengers; <u>or</u></li> <li>• Carries less than 12 on an international voyage; <u>or</u></li> <li>• It has not more than one deck above the bulkhead deck.</li> </ul> <p>Upon completion of a satisfactory simplified stability test, our office will issue a stability letter.</p>   |
| <p><b>Inclining Experiment</b></p>         | <p>All other vessels are required to undergo a full <i>inclining experiment</i>. This will normally require the owner to employ the services of a Naval Architect. This test is not covered in this handout as it is beyond the ability of most owners to conduct themselves. The Coast Guard Inspector is only a witness to the experiment and all results must be submitted to the U.S. Coast Guard Marine Safety Center (MSC) for review. The results will be evaluated and, if satisfactory, the stability letter will be issued by the MSC. The MSC website at <a href="http://www.uscg.mil/hq/msc/">http://www.uscg.mil/hq/msc/</a> contains information and downloadable documents relating to vessel stability and other topics.</p> |
| <p><b>Posting the Stability Letter</b></p> | <p>All pages of the stability letter are required to be posted aboard the vessel behind glass or clear plastic in the pilothouse.</p>  |

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| <p><b>Conducting the Simplified Stability Test</b></p> | <p>A simplified stability test can normally be completed in a day, and is one of the last items to be completed prior to issuing a COI. All modifications to the vessel must have been completed and all required equipment and any fixed ballast must be aboard the vessel for this test.</p> <p>This is a pass-fail test. You are encouraged to maximize the number of persons to be carried on the vessel, as well as test for the most stringent and/or flexible routes envisioned for the vessel's operation.</p> <p>The following chart shows the steps of a simplified stability test. The vessel owner is responsible for providing all necessary weights and the manpower to move the weights.</p> |
| <p><b>1</b></p>  | <p>Prior to the Coast Guard Inspector's arrival:</p> <ul style="list-style-type: none"> <li>All fuel and water tanks must be approximately three quarters full. If tanks have cross connection valves, these valves must be open.</li> <li>The owner must have all weights used to simulate passengers at the vessel (e.g. sand bags, water barrels or other weights). A scale to prove weight must also be present.</li> <li>Vessel mooring lines must be slacked off so that they do not interfere with the vessels listing during the test.</li> </ul>   |
| <p><b>2</b></p>  | <p>Upon arrival, the Inspector will determine where the weights shall be distributed aboard the vessel so as to obtain the normal operating trim.</p> <ul style="list-style-type: none"> <li>The total weight placed aboard the vessel will be determined by multiplying the number of persons the vessel will carry times 160 pounds, except that on vessels with protected water routes, the number will be 140 pounds per person.</li> <li>All weights must be positioned so that the center of gravity of the weight is approximately 2.5 feet above the deck. If necessary, the owner will need to provide a means of elevating the weights to the proper height.</li> </ul>                           |
| <p><b>3</b></p>  | <p>Once all weights are distributed, the Inspector will take several measurements of the vessel and make a temporary mark on the hull. This mark is the maximum allowable immersion line.</p> <ul style="list-style-type: none"> <li>The Inspector will then calculate the maximum required healing moment and advise the owner of how much weight must be moved and how far.</li> </ul>  |
| <p><b>4</b></p>  | <p>Once all weights have been moved, the Inspector will examine the mark that was made on the hull. If the mark is not submerged, the vessel has passed the stability test. If the mark is submerged, the Inspector may do additional tests with less weight in an attempt to find where the vessel will pass.</p>  |
| <p><b>5</b></p>  | <p>After a satisfactory stability test, our office will issue a stability letter specifying the maximum number of persons allowed on board for each operational route.</p> <p><b>Note:</b> The actual number of persons allowed by the Certificate of Inspection may be less due to the amount of available of deck space, rail area or fixed seating.</p>  |

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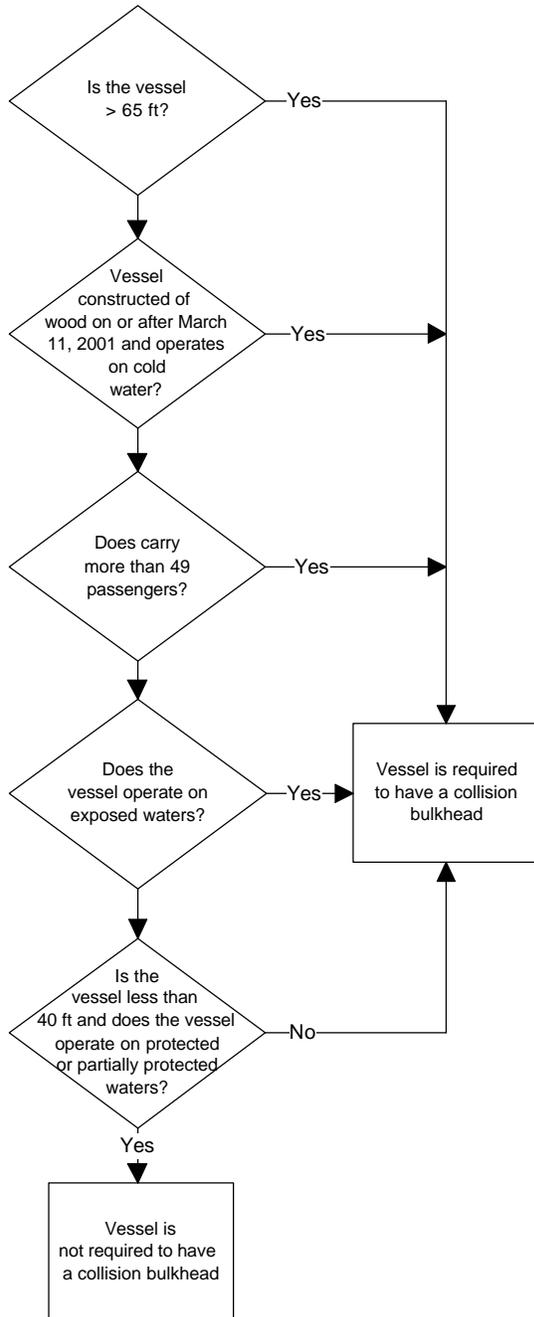
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**Collision Bulkheads - 46 CFR 179.210 & 179.310**

**General Requirements**

A collision bulkhead is a watertight bulkhead installed at the forward part of the vessel to protect the vessel from flooding in case of damage to the bow.

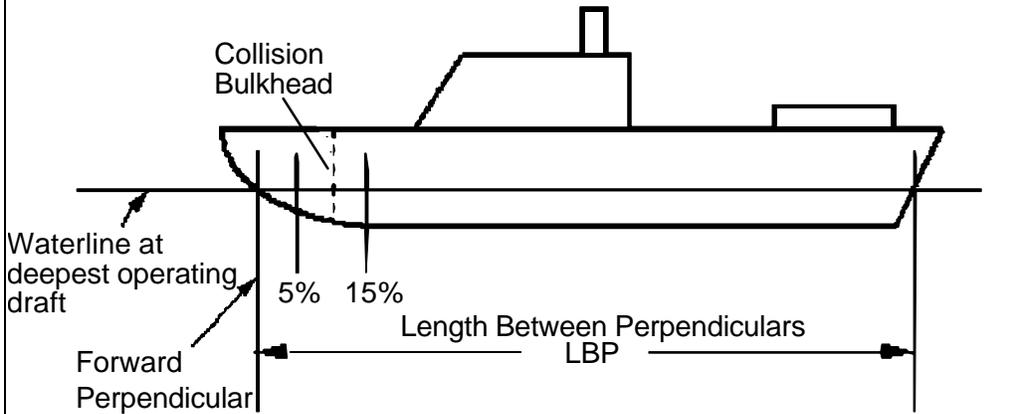
To determine if your vessel is required to have a collision bulkhead use the chart below.



Note: See Section A of this guide for definitions of vessel routes.

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| <p><b>Calculating the Location of the Collision Bulkhead</b></p> | <p>The location of the collision bulkhead is determined by first determining the Length Between Perpendiculars (LBP). LBP is the horizontal distance measured between perpendiculars taken at the forward most and after most points on the <u>waterline</u> corresponding to the deepest operating draft.</p> <p>The collision bulkhead must be located between 5% and 15% of LBP as measured aft of the forward perpendicular.</p> <p>Example:<br/>If LBP = 100 feet then collision bulkhead must be located between 5 and 15 feet aft of the forward perpendicular</p>  |
| <p><b>Construction Requirements</b></p>                          | <p>The collision bulkhead must</p> <ul style="list-style-type: none"> <li>• Be watertight and extend to the weather deck</li> <li>• May not have a watertight door in it</li> <li>• If not required to comply with one or two compartment standard of flooding, it may have an opening sized such that:             <ul style="list-style-type: none"> <li>- The lowest edge of the opening cannot be more than 12" down from the bulkhead deck; and</li> <li>- There must be at least 36 inches of intact collision bulkhead below the lower edge of the opening.</li> </ul> </li> </ul>   |

**Subdivision Bulkheads - 46 CFR 179.212 - 179.230 & 179.320**

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| <p><b>General Requirements</b></p> | <p>In addition to a collision bulkhead, vessels that carry more than 49 passengers must also have transverse watertight bulkheads that subdivide the vessel.</p> |
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|   | <p>Transverse watertight bulkheads are placed at strategic locations throughout the vessel, so flooding damage is minimized should the vessel become damaged below the waterline.</p> <p>A form called Simplified Subdivision is available from our office upon request. If your vessel requires subdivision bulkheads you can use this form with assistance from the Inspector assigned to your project. This form will be very useful in determining the placement of bulkheads below the main deck.</p> |
| <b>Watertight Door in Subdivision Bulkheads</b> | <p>The use of watertight doors in subdivision bulkheads is very restricted.</p> <p>Watertight doors are not allowed in subdivision bulkheads of vessels that proceed more than 20 nautical miles from shore.</p> <p>On all other vessels, watertight doors are only allowed in subdivision bulkheads that separate a machinery space from an accommodation space, <b>and only as allowed by the OCMI.</b></p>  |

**Hatches - 46 CFR 178.360**

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| <b>General Requirements</b>               | <p>All hatches exposed to the weather must be watertight, except the following hatches may be weathertight:</p> <ul style="list-style-type: none"> <li>• On a watertight trunk that extends a minimum of 12 inches above the weather deck.</li> <li>• On a cabin top.</li> <li>• Each hatch on a vessel that operates only on protected waters.</li> </ul>   |
| <b>Securing Devices and Keeper Chains</b> | <p>All hatch covers are required to:</p> <ul style="list-style-type: none"> <li>• Have securing devices</li> <li>• Be attached to the hatch frame or coaming by hinges, captive chains or other devices.</li> </ul>  |
| <b>Watertight Definition</b>              | <p>The term watertight means to effectively resist the passage of water when subjected to a hose test of 30 psi, with no leakage of water.</p> <p>Weathertight means that in any sea condition, water will not penetrate into the vessel in any appreciable amount.</p> <p>The test for weathertight consists of hose testing for several minutes and allowing no more than a slight seepage of water to pass.</p> |

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**Watertight Coaming - 46 CFR 179.360(d)**

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| <b>General Requirements</b>  | <p>Watertight coaming is required at the base of all weathertight doors located in a deckhouse or a companionway that give access into the hull, if it is located in:</p> <ul style="list-style-type: none"> <li>• A cockpit</li> <li>• A well</li> <li>• An exposed location on a flush deck vessel.</li> </ul> <p>If the door is a watertight door, the watertight coaming need only be sufficient to accommodate the door.</p> |                          |
| <b>Height of the Coaming</b> | <p>The coaming height requirement is based on the vessel's route.</p> <p><b>Note:</b> See Section A of this guide for definitions of vessel routes.</p>   |                          |
|                              | <b>Route</b>  | <b>Height of Coaming</b> |
|                              | Exposed or partially protected waters   | 6 inches                 |
|                              | Protected waters  | 3 inches                 |

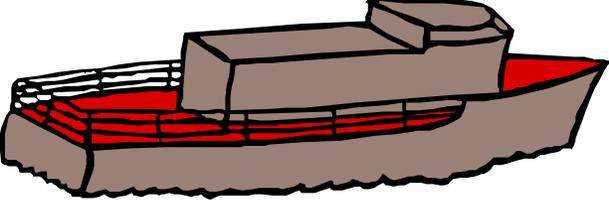
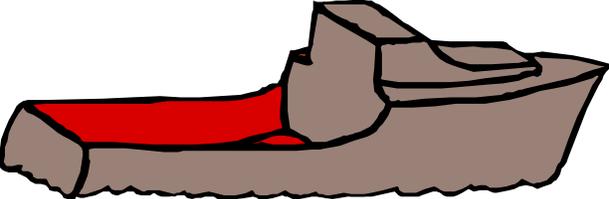
**Hull Penetrations - 46 CFR 179.350**

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| <b>General Requirements for Sea Valves</b> | <p>Except for engine exhausts, each inlet or discharge pipe that penetrates the hull within six inches of the waterline and below at the vessel's deepest operating draft must have a positive action valve or cock that is located as close to the hull as possible.</p> <p>This is required to prevent water from entering the vessel if the pipe fractures or otherwise fails.</p> <p>The valve must be constructed of metal or equivalent material. Cast iron is not allowed because of its brittleness.</p> <p>"Sea cocks" must be equipped with a positive means of locking the cock into the body; cotter pins may not be used to achieve this end.</p> <p>Valves that use resilient seats must meet the requirements above.</p> |
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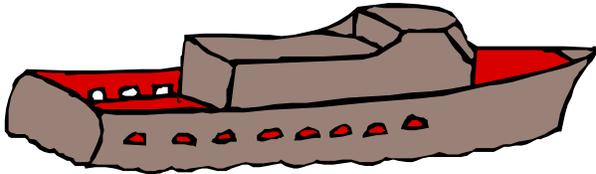
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**Drainage of Weather Decks - 46 CFR 178.410 - 178.450**

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| <p><b>General Requirements</b></p>          | <p>The regulations identify 4 types of vessels:</p> <ul style="list-style-type: none"> <li>• Flush deck • Open boat • Cockpit deck • Well deck</li> </ul> <p>The regulations require that a vessel be provided with a means for rapidly clearing water from the decks. This is accomplished by the natural design of the vessel or the installation of freeing ports or scuppers.</p> <p>The collection of a small quantity of water can drastically affect a vessel's stability.</p>  |
| <p><b>Drainage of a Flush Deck Boat</b></p> | <p>"Flush deck" means a continuous weather deck that is watertight and flush with the side shell of the hull.</p>  <p>The weather deck must be watertight.</p> <p>The forward 1/3rd may have solid bulwarks if there is sufficient sheer to ensure drainage of water aft and if bulwarks do not form a well on all sides to trap water.</p>  |
| <p><b>Drainage of a Cockpit</b></p>         | <p>"Cockpit" means an exposed recess in the weather deck extending no more than 1/2 of the length of the vessel measured over the weather deck.</p>  <p>The cockpit must be watertight, except that:</p> <ul style="list-style-type: none"> <li>• There may be a watertight door with coaming</li> <li>• There may be vent openings; <u>if</u>:             <ul style="list-style-type: none"> <li>- The vessel operates on protected or partially protected waters</li> <li>- The openings are located as high as possible in the side of the cockpit</li> <li>- The height of the opening does not exceed 2".</li> </ul> </li> </ul> |

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|   | <p>The cockpit must be designed to be self-bailing.</p> <p>Scuppers are drains located at the base of a cockpit. Scuppers with a minimum area must be located in a cockpit to allow rapid clearing of water in all probable conditions of list and trim. The minimum scupper area is calculated based on the area of the cockpit, and will be done using the formula listed in 46 CFR 178.450.</p>   |
| <p><b>Height of a Cockpit Deck</b></p>      | <p>The cockpit deck of a vessel that operates on exposed or partially protected waters must be at least 10" above the deepest subdivision load line, <u>unless</u> the vessel complies with:</p> <ul style="list-style-type: none"> <li>• Intact stability requirements (171.050);</li> <li>• Type II subdivision requirements (171.070, 171.072 &amp; 171.073); <u>and</u></li> <li>• Damage stability requirements (171.080)</li> </ul> <p>For vessels that do not operate on exposed or partially protected waters the cockpit deck must be located as high as practicable above the deepest subdivision load line.</p> |
| <p><b>Drainage of a Well Deck</b></p>       | <p>"Well deck" means a weather deck fitted with solid bulwarks that impede the drainage of water over the sides or an exposed recess in the weather deck extending 1/2 or more of the length of the vessel measure over the weather deck.</p> <div style="text-align: center;">  </div> <p>Each deck must be watertight.</p> <p>The bulwarks that form a well must be provided with freeing ports and will be determined by using the formula listed in 46 CFR 178.450.</p>  |
| <p><b>Drainage of an Open Boat Deck</b></p> | <p>"Open Boat" means open to the weather with little or no deck or superstructure to drain water overboard. The upper edge of an open boat's side is the gunwale and drainage is to the bilge. Vessels with gunwales are intended to have high freeboards to minimize the amount of seawater coming in.</p> <div style="text-align: center;">  </div>  |

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