BOATBUILDERÕS HANDBOOK

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SUBPART C

SAFE LOADING

Revised November, 2003

Title 33 CFR, Sections 183.21–183.27

SUBPART B

DISPLAY OF CAPACITY INFORMATION

Revised November, 2003

Title 33 CFR, Sections 183.31–183.43

WARNING:
This guide only addresses provisions of the Federal Regulations.
It is NOT a complete engineering manual for the design of boat systems.
It is the manufacturer's responsibility to ensure Federal Regulations
cited in this guide have not been updated or revised.

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USCG TABLE 4 **Weights (Pounds) Of Outboard Motors And Related Equipment For Various Boat Horsepower Ratings** **45**

Introduction

This Compliance Guideline is intended to help boat manufacturers learn and understand the requirements for certain boats, specifically with regulations concerning the safe loading of a boat contained in 33 CFR Subpart B: Display of Capacity Information and Subpart C: Safe Loading. Compliance with these requirements is the responsibility of the boat manufacturer. The Guideline shows the regulation as it is published, a discussion of the subject, and the methods used to perform the calculations necessary for design and production considerations. It also describes the test methods used to arrive at persons capacity for some specific boats.

The methods for calculating the safe loading or capacity of a boat, as explained herein, normally have "safety factors" included in them. In other words, the manufacturer will be encouraged to use data that may be slightly different from what the regulation actually requires, because experience indicates that it is better to err on the conservative side in order to avoid production variances causing a potential for non-compliance. Using the formulae indicated in this Guideline will always meet the requirements of the regulations, and will often exceed them.

CAUTION:

This guideline only addresses provisions of the Federal Regulations. It is not a complete engineering manual for the design of electrical systems on boats. There are other manuals and standards available for this purpose.

NOTE:

The formulae and methods contained in this Guideline do not alter, modify, supersede or otherwise replace the requirements of the regulations now in effect. Since the language in the Federal Regulations is sometimes difficult to understand, this Guideline is written in fairly simple terms to guide you through the regulations' compliance steps. At the beginning of each section, we state the requirements of the law, and follow with an explanation of the requirements of the law so as to make it easier to read.

NOTE:

The regulations use the words "motor" and "engine" interchangeably. This Guideline will refer to "engine" or "engines" only, except when quoting the Federal Regulations. Additionally, the regulations use the term "inboard-outdrive." Except when quoting the Federal Regulations the term "sterndrive" will be used.

For ease of reading and following the requirements, the definitions of the main terms used are contained in the subparts where the terms appear, and consequently may differ slightly from one requirement to another. For example, maximum displacement for outboard boats considers the three-inch opening for steering and other cables in the engine well, while in the case of an inboard or sterndrive, the definition of the same term will not have that condition specified.

Subpart C — Safe Loading

Title 33 CFR, Sections 183.31–183.43

Revised as of July 1, 2000

Subpart C divides boats that must comply with this regulation into three categories:

1. Inboard and sterndrive boats;
2. Outboard boats;
3. Boats rated for manual propulsion and boats rated for engines of two horsepower or less.

Each one of these categories must comply with two distinct capacity regulations, namely: maximum weight capacity and persons capacity. The Guideline shows the calculations necessary for design and production considerations and describes the test methods used. It will lead you through a step-by-step method to complete the calculations required.

Two of the concepts that are part of the requirements and calculations in this subpart are common to all three categories of boats. These two terms are static float-plane and maximum displacement. In order not to repeat the methods of determining these in each category, we discuss them under separate sections 3.0 and 4.0. Read these sections first, and become familiar with the concept and the method you will follow to determine both static float-plane and maximum displacement on your boats. It will help to simplify working with the requirements once you know where the float-plane is located and what the displacement of the boat is, relative to this float-plane.

Starting in section 5.0 we follow the regulation as it is written. We discuss its meaning and various details that need clarification, and then we offer an actual example of its calculations.

1.0 Applicability

FEDERAL LAW:

183.31 Applicability.

This subpart applies to monohull boats less than 20 feet in length except sailboats, canoes, kayaks, and inflatable boats.

For the purpose of this subpart, a monohull is defined as: a boat on which the line of intersection of the water surface and the boat at any operating draft forms a single closed curve or "footprint." A pontoon boat is not a monohull, but a catamaran would be if the top of the "tunnel" between the two hulls touches the water aft when in a static position and loaded with water, fuel and passengers. The footprint, in this case, will be a continuous line.

A canoe or kayak or similar watercraft is defined as: a watercraft designed to be manually propelled or equipped with a low horsepower motor whose ends do not have a transverse dimension greater than 45% of the maximum beam and whose length to beam ratio is as specified below:

Length	Length / Beam Ratio
14 Feet or Less	3:1 to 5:1
Over 14 Feet to 16 Feet	4:1 to 6:1
Over 16 Feet	5:1 to 8:1

An inflatable boat is defined as: any craft that achieves and maintains its intended shape and buoyancy through the medium of inflation. This includes RIBs.

A sailboat is defined as: a boat designed or intended to use sails as the primary means of propulsion.

Discussion:

This regulation applies only to monohull boats of less than 20 feet, the size range where the Coast Guard has found the largest number of accidents.

2.0 Definitions of Terms Used in This Guidline

It is important to emphasize here that the definitions included herein are strictly for the purpose of this Guideline and regulation, and not necessarily the same as the technical definition of a term that, in another application, may mean something entirely different. For example, in naval architecture the term displacement means: the weight of the water displaced by a vessel. Consequently, maximum displacement will be considered as the maximum load a ship may carry. However, for the purpose of this regulation, maximum displacement means the total weight of the water displaced by the vessel immersed to the point just before it will sink. This is done so that we may calculate the allowable load as a percentage of the boat's total capacity. Every definition contained herein shall be assumed to be preceded by the following statement:

For the purpose of this regulation, we will use the following definitions.

Monohull boat: A boat on which the line of intersection of the water surface and the boat at any operating draft forms a single closed curve. For example, a catamaran, trimaran, or a pontoon boat is not a monohull boat.

Some boats, e.g., power catamarans, may be considered to be monohull boats for the purpose of this regulation if the line of intersection of the surface of the water with the hull forms a single closed curve, or "footprint", when the boat is carrying its maximum rated horsepower and maximum weight capacity.

Maximum Displacement: The weight of the volume of water displaced by the boat at its maximum level of immersion in calm water without water coming aboard.

Static Float-Plane: The plane below all points of major leakage, and the most forward point of the boat below which the maximum displacement of the boat exists (See Figure 1 below). It is important to understand this term. Determination of the static float-plane is the heart of the method for calculating capacity. The easiest way to understand it is by visualizing the description called "Boat Immersion" (see section 4.0), and considering that all points of minor leaks have been sealed, while points of major leaks remain above this plane.

Calculation Length: The horizontal length from the most forward part of the boat below the static float-plane to the vertical midpoint of the transom below the static float-plane (See Figure 1.1 below and Figure 3 in section 4.0). The reason for figuring the length to the vertical midpoint is that, since the transom is at an angle, the mid-point intersection (as opposed to the intersection at the top of the float plane) will eliminate the need to add the volume of any space aft of that intersection, and also to subtract the volume forward of the intersection. The volumes of these two triangular spaces are equal, and they will cancel each other out.

Calculation Beam: The broadest part of the boat at each station measured below the static float-plane. This distance is in inches between the outer sides of the hull, excluding rub rails, fenders, or other extensions. In the majority of cases, this beam will be the widest when measured at the static float-plane, since most hulls have a "flair" between the chine and the sheer. However, in the case of a boat with a "tumblehome" section aft, the broadest point, where the beam must be measured, will be below the static float-plane. Figure 3-A in section 4.0 shows only half of a hull mold (for the sake of simplicity). Do not make the mistake, when figuring the calculation beam, of considering only half of the beam, as shown in the example. The full width of the boat must be taken into consideration when using the formula.

Level Boat: A boat is level when it is transversely level and when either of the two following conditions is met:

(i) The forward point where the sheer intersects the vertical centerline plane and the aft point where the sheer intersects the upper boundary of the transom (stern) are equidistant above the water surface, or are equidistant below the water surface.

(ii) The forward most point of the boat is level with or above the lowest point of water ingress.

Horizontal Boat: A boat is horizontal when it is transversely level and when the lowest points at 40 % and 75% of the boat's length behind the forward most point of the boat are level (See Figure 1 and Figure 2).

FIGURE 1 Static Float Plane

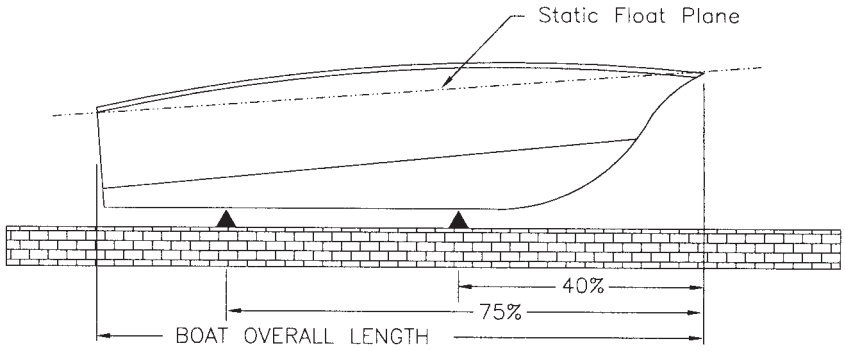


FIGURE 1.1 Static Float Plane — Alternate

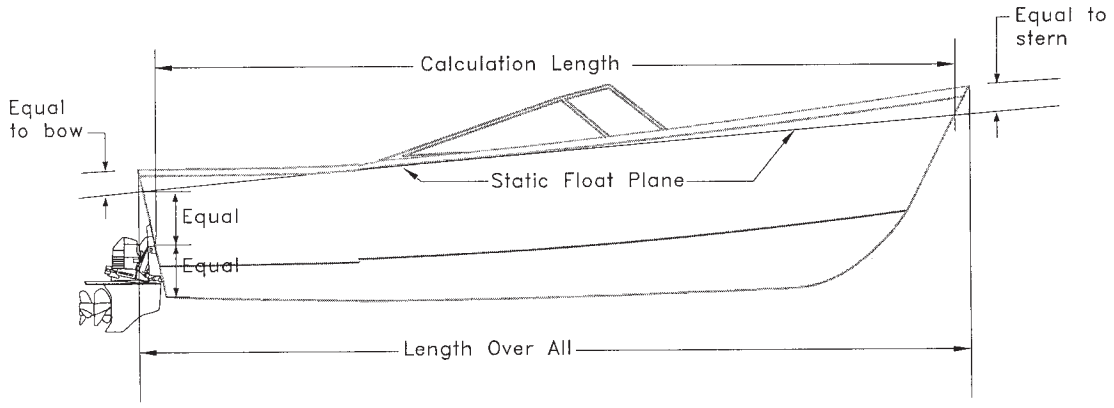
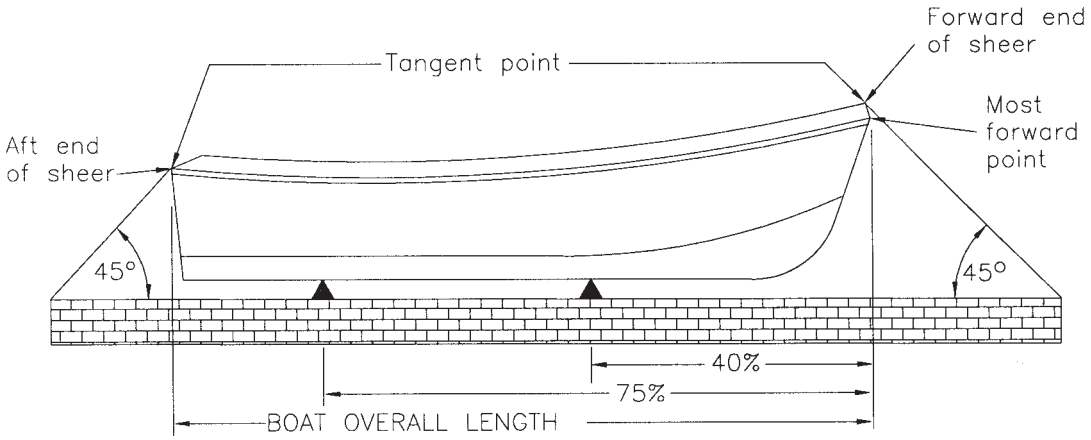


FIGURE 2 Intersections Determination and Horizontal Boat



3.0 Determination of the Static Float-Plane

To determine the static float-plane we must understand its purpose in the regulation. The maximum weight capacity we are searching for is based on the gross displaced volume of the boat to the point where down-flooding will sink the vessel. This point of down-flooding is a matter of interpretation of point of leakage. Is it minor or major? Since the Coast Guard must test boats already on the market, this interpretation is part of the testing procedures.

For the purpose of this Guideline, when determining the static float-plane, the user must consider the following features to be sealed:

1) All scuppers or freeing ports, with or without flaps or back-flow devices and regardless of size;

2) Drain holes in the bow;

3) Bait, fish and anchor-well fill/drain holes;

4) Holes in the engine well with boots, in addition to the 3-inch hole already allowed by the regulations;

5) The hull-to-deck joint;

6) Hull doors if able to be closed.

NOTE:

Some transom openings, drain holes or scuppers that may flood the boat during operation must be reviewed by the Coast Guard, and may be considered major down-flooding or water-ingress points. When in doubt about what may or may not be allowed, always consult the Coast Guard.

The static float-plane may be established, following its definition, by either of two methods:

1) Starting on the most forward point of the boat below which the maximum displacement exists. This may be above the deck-to-hull joint, on deck, or established on the deck-to-hull joint if the displacement is to ignore the superstructure. The plane intersects the upper boundary of the stern at or below the points of down-flooding (See Figure 1 in section 2).

2) In some instances, and to maximize the capacity or maximum displacement, the static float-plane may be established as follows:

A line in contact with the lowest point of the sheer that intersects the stem and stern below the intersection of the sheer and the stem at the bow and the intersection of the sheer and the transom at the stern. This line must be located so that the distance between this line and those two intersection points is the same. (See Figure 1.1 in section 2). In both cases, the plane shall be below the lowest point of downflooding.

4.0 Calculation of the Maximum Displacement

It is important to note that all three categories of boats in 33 CFR Subpart C covered by this regulation require that the maximum displacement be found (by any of the methods described here). Once the maximum displacement is determined, the maximum weight capacity and the persons capacity are found by simple calculations unique to each category of boat.

The large majority of boats under 20 feet in length covered by this regulation will calculate to more than sufficient displacement for the maximum weight capacity generally desired. It is possible that a designer or manufacturer might arbitrarily "de-rate" the maximum weight capacity to a level considered a more reasonable, lower figure. This weight capacity affects the amount of costly foam buoyancy required under the flotation regulation, so there is no need to rate a boat for excessive capacities. This is not true for all boats, and particularly for boats with low freeboard; it is merely something to keep in mind.

Consider a 19-ft. cuddy cabin sterndrive with a deck that rises to 20 inches above the deck-to-hull junction. This portion (the superstructure above the hull sheer) will certainly add considerable displacement and thus maximum weight capacity to the boat, because the static float-plane will be high above the hull sheer. However, if the manufacturer does not have a need to rate this vessel for 12 or 14 passengers and a great deal of gear, the easiest way to calculate the maximum displacement is to ignore the deck and measure the hull mold below the hull sheer and the static float-plane, as described above. On the other hand, consider a low-freeboard open fishing boat such as a Jon boat. In this case, it will be important to carefully locate the static float-plane at its maximum possible height, in order to use all of the displacement allowed.

Calculating the maximum displacement may be done by several methods. Selection of a method depends on what is available to the person working out the calculations. There are commercial enterprises that offer this service, but we recommend that the manufacturer be familiar with these methods so that decisions unique to each manufacturer may be made with a good understanding of the calculations.

First and foremost, we must understand displacement. Archimedes (a Greek scientist of 287–212 BC) discovered that, "*any body completely or partially submerged in a fluid is buoyed up by a force equal to the weight of the fluid displaced by the body.*" Consequently, if we push a boat down into the water to the point before water enters the boat while the bow and the stern are at the same distance from the water's surface, the weight of the volume of water displaced by the boat will represent the force keeping the boat buoyant and afloat. The weight of this water represents the "displacement" of this boat to the particular level it was "pushed" down to the static float-plane, because the magnitude of the buoyant force always equals the weight of the fluid displaced by the object — in this case a boat. There are other considerations, such as mass and density, which will determine if the object will sink or float. However, the importance of what we learn from this principle may be visualized by the example below.

Consider a cigar box with these dimensions:

Height = 3 in.
Length = 6 in.
Width = 4 in.
Its volume will be: V= 3 X 6 X 4 = 72 cubic inches.

Now place the box in the water and slowly add known weights until the water is about to enter the box. If you could measure the water displaced, it would be 72 cubic inches, and its weight will be the displacement of the cigar box, in that particular configuration.

The most practical methods used to calculate displacement are:

CAD System (Computer Aided Design): If CAD software is available and the hull lines are in the computer, it is easy to establish the float-plane and figure the volume below this plane. Any program with hydrostatic capabilities can compute this.

Boat Immersion: Although this method requires some infrastructure, such as a pool, an overhead crane or other lifting system, plenty of weights, and labor, it is the method followed by professionals who do this work under contract for others.

The system, as its name implies, consists of placing the boat in a tank or pool while it is suspended level from above by a pair of hoists that permit lowering it into the water, and then adding weights distributed evenly so the boat immerses with the float-plane parallel to the surface of the water. All points of minor leaks are sealed, such as deck-to-hull joints, bilge pump discharges, other scuppers or drains, and a three inch hole in the engine well as described in CFR 183.35 (b) (1) in the case of an outboard. When the water begins to come into the boat, which is at the lowest point of immersion, the weights are computed and give us the maximum displacement.

It is important to understand that the maximum displacement is the weight added to immerse the boat to its static float-plane, plus the weight of the boat, propulsion machinery and full fuel tank. This method is a hands-on procedure as opposed to a calculated one. When the boat is placed in the water, its weight already displaces water and consequently this weight must be added to the weights being placed on the boat in order to submerge it to the static float-plane.

All other methods shall consider the weights of the boat and machinery as the formulae indicate in sections 5.0, 6.0 and 7.0.

Simpson's Rule: This is a method used to calculate the volume of odd-shaped objects. It is based on dividing the object into stations, finding some specific dimensions, and then applying a series of multiplier factors to come up with the volume of the object. Later in this section we will discuss this system and include blank forms for the calculations, as well as including an example.

The actual dimensions used in this formula can be obtained from either:

Hull lines drawings;
Measuring a hull mold; or
Measuring a boat.

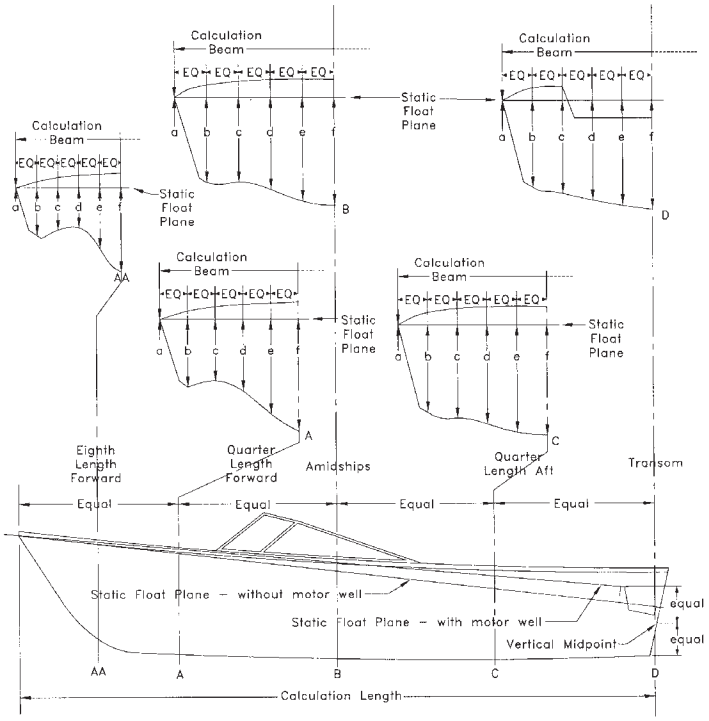
Hull Lines Drawings: You can establish the static float-plane and all the sections as required by Simpson's Rule on the hull lines drawings, and then figure the section areas with a planimeter; or you can measure the vertical dimensions at the proper stations directly from the drawings, and compute the volume as per the worksheet below.

Measuring a Hull Mold: You can also measure a hull mold by establishing the float-plane. Install a string along the centerline, establish all the sections, and enter all measurements on the work sheet. This is the easiest method if you do not have boat drawings or a CAD system. Measurements must be taken to the inside of the mold surface (outside of the boat's surface). Do not consider rub-rails or any hardware when establishing beam and length dimensions.

Measuring the Boat: There may be cases in which it is impractical to measure a mold, so an alternative method is to measure an existing boat. The figures needed for using Simpson's Rule are the same as in Figure 3 below, except that the method used is the reverse of measuring the mold. In other words, after establishing a float-plane, establishing the calculation length, and establishing the stations (or sections), the measurements are taken by drawing a line on the floor as the projection of each station, from the centerline to the projected calculation beam at each station location. Then divide the half-beam line into five equal spaces and measure from the floor to the projected points a, b, c, d, e, and f, where these intersect with the bottom of the boat. Subtract these measurements from the calculated distance between the float-plane and the floor. This will result in the values to be entered on the work sheet.

The method to calculate the displacement by measuring the mold is adapted so the same procedure may be used with all three categories of boats. The specific differences will be clearly noted for the technician to include in the calculations. For example, in the case of an outboard boat, the volume of the engine-well below the float-plane must be deducted, while an inboard boat does not have this feature. This method simplifies the calculation by making the displacement calculations equal for all boat categories.

FIGURE 3 Determination of Boat Displacement



Mold Preparation: Set the hull mold on the floor so that the keel line is level as described under the definition of "Horizontal Boat" in section 2.0.

Determine where the float-plane will intersect the transom. Look for the lowest point of water ingress on the boat (possibly the external engine vents on an inboard or the coaming of the engine well on an outboard). If the boat does not need to be rated for the largest capacity possible, ignore the deck or other superstructure. Remember that drains, scuppers, bilge-pump discharge fittings, deck-to-hull joint, and other sources of minor leaks *may* be below the float-plane.

Attach a string to the bow of the mold on the centerline, and to the point on the transom or transom plane where all points of major leaks are now above the string. This is the static float-plane.

Look at Figure 3 and notice that the calculation length (L) dimension we will use for Simpson's Rule is not the same as the LOA, or length-over-all, of the boat. Rather, it is the dimension taken from the most forward point of the interior of the mold below the static float-plane to a point on the transom (or transom plane for those boats with odd-shaped sterns) which is the mid-point between the static float-plane and the keel line or its projection. Mark, with a piece of tape on the string, the vertical projection of this mid-point on the transom. The calculation length (L) will be the horizontal distance from this tape to the most forward point on the interior of the mold.

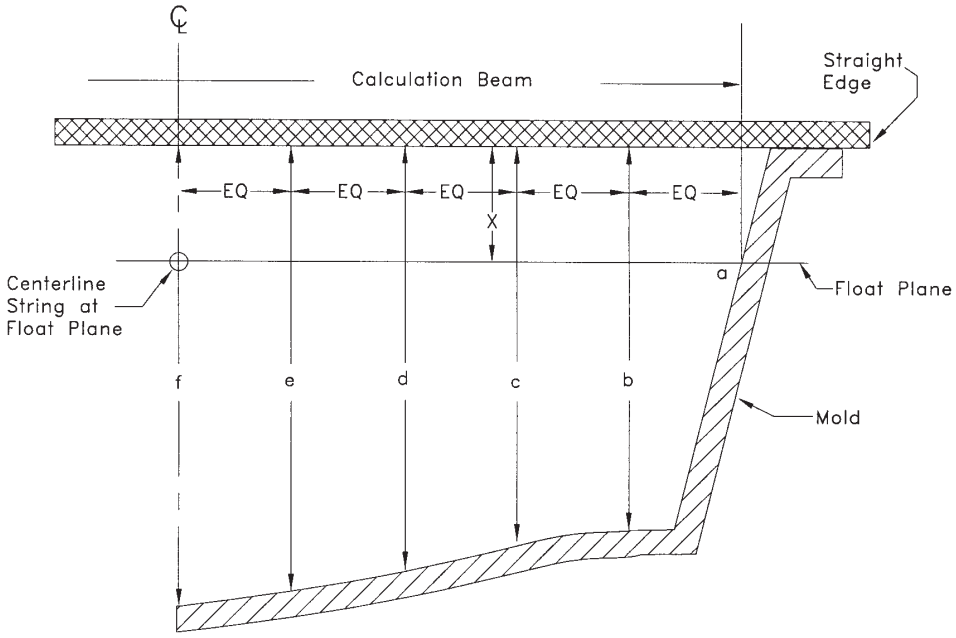
Divide the length of the string into four equal spaces, and then divide the most forward of these into two equal spaces. Look again at the hull in Figure 3. You now have established Sections: AA, A, B, C, and D.

The next step is to mark, on the topside flange of the mold, the places where the beam of each section will intersect the hull sheer or perimeter of the mold. The easiest method is to attach a piece of masking tape to the top of the mold approximately in the area where this intersection will be, and then, with a straight edge across the top of the mold, mark the outboard point of intersection when both ends of the straight edge are equidistant from the transom (or perpendicular to the centerline string). Now you have marked the place where the calculation beam used in the formula will be measured. The float-plane may very well be below the top flange of the mold where the straight edge has been placed, so if you measure the distance between the straight edge and the string marking the float-plane and call it dimension x (see figure 3A), this number must be subtracted from the measurements in the next step.

Divide the half-beam distance on each station (or section) into five equal spaces. Measure the vertical distance from the straight edge to the bottom of the mold at each of the points marked a, b, c, etc. Then subtract dimension x from these measurements to arrive at the net dimension between the static float-plane and the mold bottom (outside skin of the boat), to be entered on the blank spaces provided in Figure 4, for a, b, c, etc.

Look carefully at Figure 3-A. You have measured the net dimension between the float-plane and the boat on each of the vertical lines at each station; now enter them in the blank form located in section 4.1. Then enter the beam at each station. Remember this is the full calculation beam and not the half-beam. Enter the calculation length (L). Figure 4 shows a detailed look at the manner in which the stations A-A, A, B, C and D are laid out and measured.

FIGURE 3-A Determination of Boat Displacement — Detailed



Note: The "X" dimension could be 0 if the float plane coincides with the hull sheer or top of the mold.

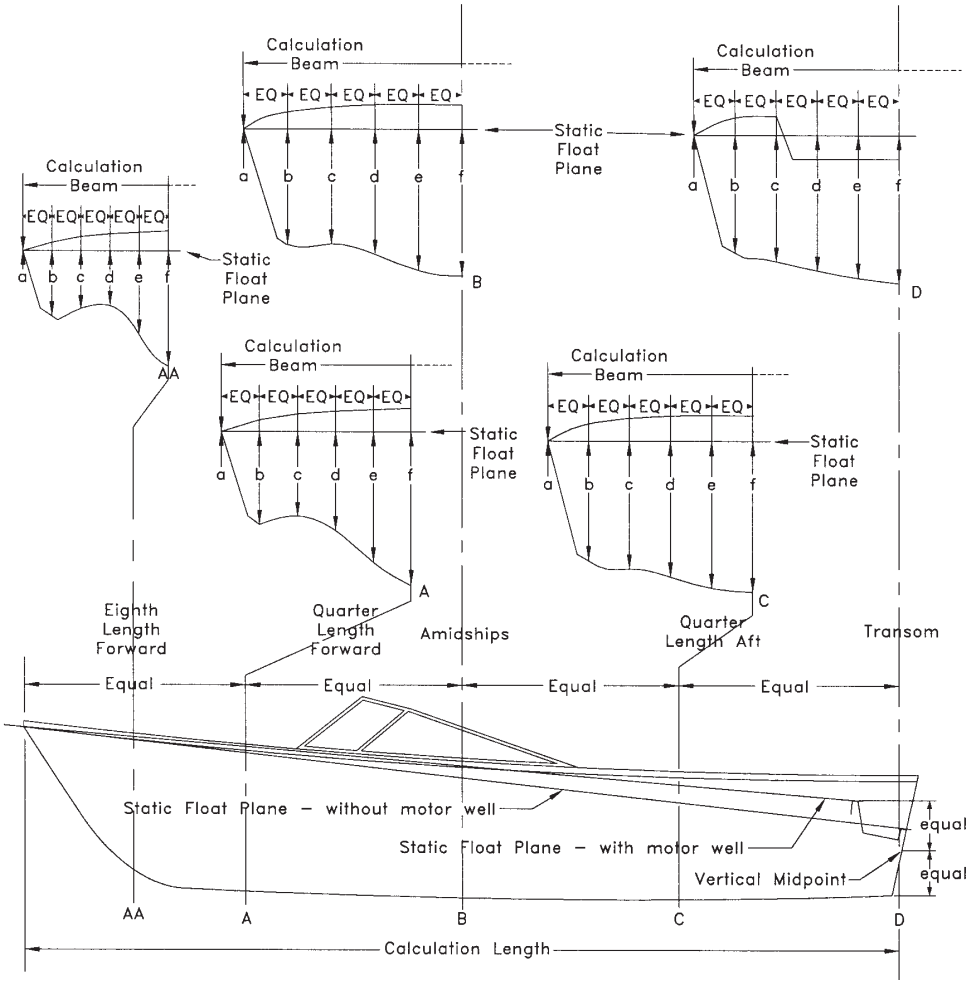
We are now ready to calculate the displacement in pounds. In Figure 4 we have a worksheet to compute the Simpson's Rule formula and arrive at the cubic capacity which, when multiplied by the weight of a cubic foot of water, will give us the boat's displacement below the float-plane. It's a good idea to make extra copies of these blank forms. Fill in the values measured and run the equations to get cubic capacity.

When you finish the calculations on these forms, the displacement of the boat measured inside a mold has been determined. This figure, known as the maximum displacement, is used to calculate the maximum weight capacity.

4.1 BLANK FORM FOR THE CALCULATION OF MAXIMUM DISPLACEMENT

It may be useful to make copies of the following form to keep for future use. The instructions for the use of this form have been explained above.

FIGURE 4 Boat Displacement Worksheet For Any Boat Category



L = _____ inches

STATION	a	b	c	d	e	f	Beam
AA	_____	_____	_____	_____	_____	_____	_____
B	_____	_____	_____	_____	_____	_____	_____
C	_____	_____	_____	_____	_____	_____	_____
D	_____	_____	_____	_____	_____	_____	_____
E	_____	_____	_____	_____	_____	_____	_____
F	_____	_____	_____	_____	_____	_____	_____

Enter on the form below, the dimensions noted in Figure 4 for the vertical dimensions a, b, c, d, e and f, on each of the sections (stations), enter the calculation beam for each section, and enter the calculation length (L).

Step 1: Compute area.

Formula: $\text{Area} = \frac{\text{beam}}{15}(a + 4b + 2c + 4d + 2e + 2f)$

Area AA:

AA = _____ [( ) + 4 ( ) + 2 ( ) + 4 ( ) + 2 ( ) + 2 ( )]
15 a b c d e f

AA = _____ square inches (two decimal places)

Area A:

AA = _____ [( ) + 4 ( ) + 2 ( ) + 4 ( ) + 2 ( ) + 2 ( )]
15 a b c d e f

A = _____ square inches (two decimal places)

Area B:

AA = _____ [( ) + 4 ( ) + 2 ( ) + 4 ( ) + 2 ( ) + 2 ( )]
15 a b c d e f

B = _____ square inches (two decimal places)

Area C:

C = _____ [( ) + 4 ( ) + 2 ( ) + 4 ( ) + 2 ( ) + 2 ( )]
15 a b c d e f

C = _____ square inches (two decimal places)

Area D:

D = _____ [( ) + 4 ( ) + 2 ( ) + 4 ( ) + 2 ( ) + 2 ( )]
15 a b c d e f

D = _____ square inches (two decimal places)

Step 2: Compute cubic capacity.

Formula: Cubic capacity of hull = $\frac{L}{174{,}600}$ [16AA + 13A + 27B + 27C + 9D] +/– Note 1

Cubic cap. = _____ [16 ( ) + 13 ( ) + 27 ( ) + 27 ( ) + 9 ( )] +/– _____
174,600 AA A B C D

Cubic cap. = _____ cubic feet (one decimal place)

See Note 2.

Step 3: Compute the maximum displacement below the static float-plane.

Formula: Displacement = cubic capacity X 62.4 lb.

Displacement = _____ X 62.4 lb.

Displacement = _____ pounds

NOTES

1. *Volume in cubic inches of the integral structure aft of the transom and below the static float-plane may be added to the cubic capacity. To determine this, figure the volume of any bustles, integral swim platforms or other structures below float-plane and add this volume to the formula where it says +/- Note 1. On the other hand, any volume of an engine well below the float-plane must be calculated and subtracted from the cubic capacity.*
2. *The factor 174,600 includes a 5% margin for measurement error.*
3. *Boat weight includes engine, stern drive, fuel system, fuel and battery weight.*
4. *The figures used in these examples are taken from the boat dimension drawings in Figure 4. The letters (a, b, c, d, e, and f) have been placed under the dimensions taken from Figure 3 as a further help for the user of this Guideline. All dimensions should be converted to decimal numbers before insertion in the formula. That number in cubic inches divided by 1,728 gives the volume in cubic feet.*

4.2 EXAMPLE OF MAXIMUM DISPLACEMENT CALCULATION

On the next two pages we present an example showing the calculations explained above. The boat in question may be described as:

Boat type	Outboard runabout
Length over all (LOA)	16.5 ft.
Calculation length (L)	16.2 ft. (194.2 in.)
Beam	6.75 ft.
Calculation beam	6.5 ft. (78.75 in.)
Horsepower rating	120. HP (maximum by calculations)
Boat weight (no engine)	700 lb.
Displacement	188 cubic feet minus 1 cubic foot for the outboard well = 187 cubic feet or 11,668.8 lb.

The values on the forms have been taken from measuring a boat or a hull mold as described in section 4.0 and entered on the blank form from Figure 4. Note that the calculation length, as well as the calculation beam, are less than the overall dimensions of the boat. The reasons for this were previously explained; refer to the definition of calculation length and calculation beam if you are unsure why.

Now look at Note 1 in Figure 4. It explains that the volume of any feature aft of the transom and below the float-plane contributing to the displacement of the boat must be added to the formula, in cubic inches. At the same time, if there is any volume not contributing to the displacement, such as the engine-well volume below the float-plane, it must be subtracted. Look at the boat drawing in Figure 4; you will note that there is an area of the engine well that is below the float-plane. Assume this volume to be one cubic foot, or 1,728 cubic inches. It goes in the formula as shown in Figure 5 below.

The purpose of these calculations is to ascertain a measured cubic capacity of the boat, while the immersion method measures the pounds of water displaced. In both instances, the result is the same, namely: the boat's displacement. The former is expressed in cubic inches and translated to weight; the latter is measured and expressed in pounds.

Look at Figure 5. All the values were established and entered on the blank worksheet (Fig. 4), the cubic capacity or maximum displacement of the boat when immersed to its static float-plane having been calculated to 187 cubic feet. This represents the volume. To calculate the displacement in pounds, multiply by 62.4 lb, the weight of a cubic foot of fresh water.

Our boat displacement is: 11,668.8 lb. (See example in Figure 5 below)

FIGURE 5 EXAMPLE OF DISPLACEMENT CALCULATIONS

Below is an example of the calculations for displacement below the static-float plane for any boat category, following the formulae of the worksheet on Figure 4. In an actual case, all dimensions would be the ones measured off the mold and entered in the form given in Figure 4.

Step 1: Compute area.

Formula: $\text{Area} = \frac{\text{beam}}{15}(a + 4b + 2c + 4d + 2e + 2f)$

Area AA _______ **Section eighth-length forward:**

$$AA = \frac{47.50}{15}[\underset{a}{0} + 4(\underset{b}{6.62}) + 2(\underset{c}{11.25}) + 4(\underset{d}{16.50}) + 2(\underset{e}{19.00}) + 2(\underset{f}{25.62})]$$

AA = 646.70 square inches (two decimal places)

Area A ________ **Section quarter-length forward:**

$$A = \frac{70.00}{15}[\underset{a}{0} + 4(\underset{b}{8.50}) + 2(\underset{c}{18.87}) + 4(\underset{d}{25.75}) + 2(\underset{e}{29.62}) + 2(\underset{f}{36.62})]$$

A = 1433.69 square inches (two decimal places)

Area B ________ **Section amidships:**

$$B = \frac{78.75}{15}[\underset{a}{0} + 4(\underset{b}{26.25}) + 2(\underset{c}{29.00}) + 4(\underset{d}{32.06}) + 2(\underset{e}{35.50}) + 2(\underset{f}{38.38})]$$

B = 2304.75 square inches (two decimal places)

Area C ________ **Section quarter-length aft:**

$$C = \frac{77.50}{15}[\underset{a}{0} + 4(\underset{b}{26.00}) + 2(\underset{c}{28.35}) + 4(\underset{d}{30.75}) + 2(\underset{e}{35.38}) + 2(\underset{f}{35.62})]$$

C = 2199.45 square inches (two decimal places)

Area D ________ **Section aft:**

$$D = \frac{76.25}{15}[\underset{a}{0} + 4(\underset{b}{24.94}) + 2(\underset{c}{27.44}) + 4(\underset{d}{29.56}) + 2(\underset{e}{32.12}) + 2(\underset{f}{33.19})]$$

D = 2051.13 square inches (two decimal places)

Step 2: Compute cubic capacity.

Formula: Cubic capacity of hull = $\frac{L}{174600}$ [I6AA + 13A + 27B – 27C – 9D]+/– Note 1

Cubic capacity $\frac{194.20}{174,600}$ [16(646.70)+13(1433.69)+27(2304.75)+27(2199.45)+9(2051.13)] – $\frac{1728}{1728}$

Cubic capacity = 187.0 cubic feet (one decimal place)

Step 3: Compute maximum displacement below static float-plane.

Formula: Displacement = cubic capacity X 62.4 lb.

Displacement = 187.0 X 62.4 lb.

Displacement = 11,668.8 pounds

NOTES:

1. *Volume in cubic inches of the integral structures aft of the transom and below the static float-plane may be added to the cubic capacity. To determine this, figure the volume of any bustles, integral swim platforms or other structures below the float-plane and add to formula where it says +/– Note 1. On the other hand, any volume of an engine well below the float-plane must be calculated and subtracted from the cubic capacity in the same place. That number in cubic inches divided by 1728 gives the volume in cubic feet.*
2. *The factor 174600 includes a 5% margin for measurement error.*
3. *Boat weight includes engine, stern drive, fuel system, fuel and battery weight.*
4. *The figures used in these examples are taken from the boat dimension drawings in Figure 3. The letters (a, b, c, d, e, and f) have been placed under the dimensions taken from Figure 3 as a further help for the user of this Guideline. All dimensions should be converted to decimal numbers before insertion in the formula.*

5.0 Category One: Inboard and Sterndrive Boats

33 CFR Subpart C: Safe Loading makes a distinction between three categories of boats. Some of the terms in this section have already been defined in section 2.0. Others, which are specific to this category, are defined below.

We know that in all three categories we must establish a static float-plane and calculate the boat's displacement below this float-plane. We have done this in sections 3.0 and 4.0. We are now ready to apply the formulae and find the amount of weight we can load in the boat.

5.1 MAXIMUM WEIGHT CAPACITY: INBOARD AND STERNDRIVE BOATS (CATEGORY ONE)

FEDERAL LAW:

183.33 Maximum weight capacity: Inboard and inboard-outdrive boats.

(a) The maximum weight capacity (W) marked on a boat that has one or more inboard or inboard-outdrive units for propulsion must not exceed the greater value of W obtained from either of the following formulas:

$$W = \frac{\text{maximum displacement}}{5} - \frac{\text{boat weight}}{5} - \frac{4\ (\text{machinery weight})}{5}$$

or

$$W = \frac{(\text{maximum displacement} - \text{boat weight})}{7}$$

(b) For the purpose of paragraph (a) of this section:

(1) "Maximum displacement" is the weight of the volume of water displaced by the boat at its maximum level immersion in calm water without water coming aboard. For the purpose of this paragraph, a boat is level when it is transversely level and when either of the two following conditions are met:

(i) The forward point where the sheer intersects the vertical centerline plane and the aft point where the sheer intersects the upper boundary of the transom (stern) are equidistant above the water surface or are equidistant below the water surface.

(ii) The most forward point of the boat is level with or above the lowest point of water ingress.

(2) Boat weight is the combination of:

(i) Hull weight;
(ii) Deck and superstructure weight;
(iii) Weight of permanent appurtenances; and
(iv) Weight of full permanent fuel tanks.

(3) Machinery weight is the combined weight of installed engines or motors, control equipment, drive units, and batteries.

NOTE:

Inboard-outdrive and stern drive are synonymous words and are used here to describe a propulsion machinery system consisting of an inboard engine installed in conjunction with an outside drive unit connected to the engine through the transom. An inboard boat is described as an inboard engine coupled to propulsion machinery such as a drive shaft and propeller, a jet pump etc.

Discussion:

The maximum weight capacity rating for a boat under this category may not be any greater than W in either one of the formulae above.

Let's look at the definitions of the terms in the formulae.

Maximum Displacement: We have discussed it in section 4.0, we ran through calculations in section 4.1, and we included an example in section 4.2. We know it means maximum displacement below the static float-plane. It is the number in pounds from Figure 5 (Example of Displacement Calculations).

Boat Weight: The combination of hull weight, deck and superstructure weight, weight of permanent appurtenances, and weight of the full permanent fuel tank.

Machinery Weight: The combination weight of installed engines, control equipment, drive units, and batteries.

NOTES:

1. *The boat weight includes the factory's heaviest production tolerances. Hull and deck weights may vary; use the heaviest ones and be conservative.*
2. *Permanent appurtenances means any factory-installed, non-portable, permanently attached equipment, furniture or other feature such as canopy tops, camper tops, coolers, cushions, etc.*
3. *Fuel tanks must be permanently installed; any other portable or removable tank shall not be included.*

The Coast Guard, when testing a boat of this category, will use the immersion method for finding the maximum displacement and then use the second formula: displacement minus boat weight, divided by seven.

We have gone through all the required calculations to figure this weight. We will, after discussing persons capacity, work out an example of both requirements.

5.2 PERSONS CAPACITY: INBOARD AND STERNDRIVE BOATS (CATEGORY ONE)

FEDERAL LAW

183.39 Persons capacity: Inboard and inboard-outdrive boats.

(a) The persons capacity in pounds marked on a boat that is designed or intended to use one or more inboard engines or inboard-outdrive units for propulsion must not exceed the lesser of:

(1) The maximum weight capacity determined under Sec. 183.33 for the boat; or

(2) For boats with a maximum persons capacity of less than 550 pounds, the maximum persons capacity is determined in the following manner:

(i) Float the boat in calm water with all its permanent appurtenances, including installed engines, full fuel system and tanks, control equipment, drive units, and batteries.

(ii) Gradually add weights along one outboard extremity of each passenger carrying area, at the height of the seat nearest the center of that area, but no higher than the height of the gunwale and distributed equally forward and aft of that center in a plane parallel to the floorboards, until the boat assumes the maximum list or trim or both, without water coming aboard.

(iii) Compute the persons capacity in pounds in the following formula: Persons capacity = A/0.6 where A is the total of the weights added in paragraph (a) (2) (ii) of this section.

(b) The maximum persons capacity in whole numbers of persons marked on a boat that is designed or intended to use one or more inboard engines or inboard-outboard units must not exceed the value obtained by adding 32 pounds to the value determined in paragraph (a) (2) (iii), dividing the sum by 141 and rounding off the result to the nearest whole number. If the fraction is less than one-half, round down to the next whole integer and if the fraction is equal to or greater than one-half, round up to the next higher whole integer.

Discussion:

As in all three boat categories, the persons capacity must be displayed in total pounds and whole numbers of persons.

In the real world, the probability of an inboard or sterndrive boat calculating to less than 550 lb. is small. It is possible though that a small jet-boat could fall in this bracket, in which case the persons capacity in pounds shall be the lesser of: maximum weight capacity or the result of the equation in (a)(2)(iii). Since this equation calls for dividing the weights added by .60, the resultant will certainly be a number higher than 550 lb. The number to adopt as persons capacity in pounds will be, as the law states, the maximum weight capacity [see 183.39(a)(1) above].

5.3 EXAMPLE OF CALCULATIONS FOR MAXIMUM WEIGHT CAPACITY AND PERSONS CAPACITY OF INBOARD AND STERNDRIVE BOATS (CATEGORY ONE)

Let's use the hypothetical outboard boat described in section 4.2 above, but converting the boat to a sterndrive. The specifications will read as follows:

Boat type	Sterndrive runabout
Length over all (LOA)	16.5 ft.
Calculation length	16.2 ft. (194.2 in.)
Beam	6.75 ft.
Calculation beam	6.5 ft. (78.75 in.)
Horsepower engine	120 HP (factory-installed)
Boat weight (dry)	700 lb.
Full, permanent fuel tank	150 lb.
Boat weight (per regulation)	850 lb. (See definition of boat weight above)
Engine & drive weight	845 lb.
Battery weight	45 lb.
Machinery weight	890 lb. (See definition of machinery weight)
Displacement:	188 cubic feet or 11,731.2 lb.

We measured the hull mold, we applied Simpson's Rule, and we came up with the displacement shown at the end of Figure 5 in section 4.2. The displacement above 11,731.2 lb., was a calculated one as opposed to one measured by immersion. (For this calculation we use the formulae as stated above in section 5.1.) The displacement is slightly different from the one in the example for the maximum displacement calculation. The boat in the present example, being a sterndrive, does not have an outboard well and therefore no volume needs to be added or subtracted. The cubic capacity would be 188 cubic feet.

Step 1: Compute maximum displacement as done in previous example. (See Figure 5 in section 4.2).

Step 2: Compute maximum weight capacity.

$$W = \frac{\text{maximum displacement}}{5} - \frac{\text{boat weight}}{5} - \frac{4(\text{machinery weight})}{5}$$

$$W = \frac{11{,}731.2}{5} - \frac{850}{5} - \frac{4(890)}{5}$$

$$W = 2{,}346.2 - 170 - 712$$

$$W = 1{,}464.2 \text{ rounded down to } 1{,}464 \text{ lb.}$$

We may also use the following formula (the regulation offers two formulae):

$$W = \frac{(\text{maximum displacement} - \text{boat weight})}{7}$$

$$W = \frac{11{,}731.2 - 850}{7}$$

$$W = 1{,}554.4 \text{ lb. rounded down to } 1{,}554 \text{ lb.}$$

The maximum allowable weight capacity is 1,554 lb., since it is the greater of the two results. The manufacturer will be allowed to certify this boat for:
1,554 lb. persons and gear.

Step 3: Compute persons capacity in pounds.

The manufacturer will be allowed to certify this boat for [see 183.39 (a) (1) above]:
1,554 lb. of persons.

NOTE:

The regulation in 33 CFR 183.39 describes a test that must be performed if the maximum weight capacity computes to less than 550 lb. This test is also known as the "Dry Stability Test".

Step 4: Compute persons capacity in whole numbers [see 183.39 (b) above].

$$\text{Persons} = \frac{32 + \text{persons capacity (lb.)}}{141}$$

$$\text{Persons} = \frac{32 + 1{,}554}{141} = 11.2 \text{ rounded down to 11 persons}$$

The manufacturer may have a capacity label on this boat as follows:
11 persons or 1,554 lb.
1,554 lb. persons and gear.

Comments on rating a boat in this category:

Obviously the manufacturer will not want to exercise his right to use these high numbers on the capacity label. It is unreasonable to rate a 16 ft. boat for 11 people, and it will be expensive to "float" the excess weight.

If the manufacturer "de-rates" the boat to a more reasonable number, such as the number of seats in the boat (say 6 persons), let's calculate how many of the allowed 1,554 pounds of maximum capacity will be used.

The formula is:

$$\text{Persons (in numbers)} = \frac{32 + \text{persons (in lb.)}}{141}$$

We want to know persons (in pounds) so:

Persons (in lb.) = (persons in no. x 141) – 32

Since we want 6 persons, substituting:

Pounds of persons = (6 X 141) –32

Pounds of persons = 814 pounds

The maximum weight capacity is expressed as XXXX lb. for persons and gear. Consequently, if the maximum weight capacity is 1,554 lb. and the persons in pounds is 814 lb., the difference will be allowed as gear.

1,554 pounds – 814 lb. of persons = 740 lb. allowed for gear, which may still be too large.

The manufacturer must now select among the options to use on the certification label, which are:

Option 1: 11 PERSONS or 1,554 lb.
1,554 lb. persons and gear

Option 2: 6 PERSONS or 814 lb.
1,554 lb. persons and gear

Option 3: 6 PERSONS or 814 lb.
Between 814 and 1,554 lb. persons and gear

A manufacturer has ample freedom to rate the boat as he sees fit, as long as it does not exceed the maximum weight capacity. The parameters to be considered in the decision-making process are:

- How many intended occupant positions does the boat have?
- What is a reasonable number of persons to load in this boat?
- How much gear should we consider?
- How much added flotation will be required?
- Has the boat been performance-tested with heavy loads?

The manufacturer probably will want to allow some weight for gear. Consequently, after taking into account all these considerations, the final label would look something like this:

6 persons or 814 lb.
1014 lb. persons and gear

This will allow the boat to carry 6 persons and 200 lb. of gear.

6.0 Category Two: Outboard Boats

Since many outboard boats leave the manufacturing plant without engines (these are installed by others), the method of calculating weight and persons capacity varies slightly from the inboard category. Weights for engines, controls, batteries, etc., must be worked into the formulae. However, basically the process is the same: figure the location of the static float-plane, calculate the maximum displacement, and then apply the formulae to arrive at capacity.

The other difference is in the calculation of the displacement, where we acknowledge that a 3-inch diameter hole is permitted in the engine-well area to provide access for the control cables and fuel lines. This hole will be sealed during immersion tests, or considered acceptable if displacement is calculated by another method.

The Coast Guard has been given authority to randomly check boats for compliance with the flotation requirements. When this check is conducted, simulated outboard engine weights are used rather than an actual outboard engine. The weight used during this check is obtained from the outboard engine weight table included in Subpart H (Flotation) of the CFR (see Table 4). Due to changing technology, outboard engines heavier than those listed in Table 4 are available. This is particularly true in the case of 4 stroke engines. The reader is encouraged to refer to ABYC Standard S-30, Outboard Engines and Related Equipment Weights, for the latest outboard engine weight table.

6.1 MAXIMUM WEIGHT CAPACITY: OUTBOARD BOATS (CATEGORY TWO)

FEDERAL LAW:

183.35 Maximum weight capacity: Outboard boats.

(a) The maximum weight capacity marked on a boat that is designed or intended to use one or more outboard motors for propulsion must be a number that does not exceed one-fifth of the difference between its maximum displacement and the boat weight.

(b) For the purpose of paragraph (a) of this section:

(1) Maximum displacement is the weight of the volume of water displaced by the boat at its maximum level of immersion in calm water without water coming aboard except for water coming through one opening in the motor well with its greatest dimension not over 3 inches for outboard motor controls or fuel lines. For the purpose of this paragraph, a boat is level when it is transversely level and when either of the two following conditions are met:

(i) The forward point where the sheer intersects the vertical centerline plane and the aft point where the sheer intersects the upper boundary of the transom (stern) are equidistant above the water surface or are equidistant below the water surface.

(ii) The most forward point of the boat is level with or above the lowest point of water ingress.

(2) Boat weight is the combination of:

(i) Hull weight;

(ii) Deck and superstructure weight;

(iii) Weight of permanent appurtenances; and

(iv) Weight of permanent fuel tanks.

Discussion:

To calculate the requirements of this section, the procedure is very similar to that of the preceding section. We must calculate maximum displacement (see section 4.0) in pounds, subtract the boat weight as defined above, and divide this weight by five.

An important point while figuring maximum displacement is to be sure the calculations under Simpson's Rule do follow the notes located at the bottom of the blank forms, so that any volume aft of the transom and below the float-plane is added in the proper place, while any volume forward of the transom and below the float-plane is deducted properly. Also, remember that outboard boats are allowed a three-inch-diameter hole in the engine well for the passage of controls and fuel lines.

NOTES:

1. *The boat weight includes the factory's heaviest production tolerances. Hull and deck weights may vary; use the heaviest ones and be conservative.*
2. *Permanent appurtenances mean any factory-installed, non-portable, permanently attached equipment, furniture or other features such as canopy tops, camper tops, coolers, cushions, etc.*
3. *Fuel tanks must be permanently installed; any other portable or removable tanks shall not be included.*

6.2 PERSONS CAPACITY: OUTBOARD BOATS (CATEGORY TWO)

FEDERAL LAW:

183.41 Persons Capacity: Outboard boats.

(a) The persons capacity in pounds marked on a boat that is designed to use one or more outboard motors for propulsion must not exceed the lesser of:

(1) The maximum weight capacity determined under Sec. 183.35 for the boat minus the motor and control weight, battery weight (dry), and full portable fuel tank weight from Table 4 of Subpart H of this part; or

(2) For boats with a maximum persons capacity of less than 550 pounds, the maximum persons capacity determined in the following manner:

(i) Float the boat with all its permanent appurtenances;

(ii) Add, in normal operating positions, the dry motor and control weight, battery weight, and full portable fuel tank weight, if any, shown in table 4 of Subpart H of this part for the maximum horsepower capacity marked on the boat. Permanently installed fuel tanks shall be full of fuel;

(iii) Gradually add weights along one outboard extremity of each passenger area, at the height of the seat nearest the center of that area, but no higher than the height of the gunwale, and distributed equally forward and aft of that center in a plane parallel to the floorboards until the boat assumes the maximum list or trim, or both without water coming aboard;

(iv) Compute the persons capacity in pounds using the following formula: Persons capacity = A/0.6 where A is the total of the weights added in paragraph (a) (2) (iii) of this section.

(b) The maximum persons capacity in whole numbers of persons marked on a boat designed or intended to use one or more outboard motors for propulsion must not exceed the value obtained by adding 32 pounds to the lesser of the values determined in paragraph (a) (1) or (a) (2) (iv), dividing the sum by 141, and rounding off the result to the nearest whole number. If the fraction is less than one-half, round down to the next lower whole integer and if the fraction is equal to or greater than one-half, round up to the next higher whole integer.

Discussion:

As in all of the three boat categories, the persons capacity for outboard boats must be displayed in total pounds and whole numbers of persons. The difference in the formulae between category one and category two makes these calculations slightly more complex.

In the outboard category, from the maximum weight capacity in pounds, calculated as in section 6.1 above, we must deduct the weight of the engine and controls, the battery weight (dry) and the weight of a full portable fuel tank. These weights are taken from Table 4 of Subpart H of the regulation, but some explanation is needed.

Although an outboard boat may be in compliance with the Federal Regulations at the time of construction, the same boat can be adversely affected by repowering with a heavier outboard engine. Manufacturers are encouraged to refer to the latest ABYC outboard engine weight table. Additionally, manufacturers are encouraged to review current engine weights available at the time of construction.

These capacity and flotation regulations are interrelated in different ways, and it is entirely possible that a small outboard boat, certified through calculations for a certain persons capacity, may very well fail the flotation regulation for which tests are done in the water. For this reason it may be beneficial to crosscheck the weights and calculations for both capacity and flotation.

The method to calculate the persons capacity in pounds for outboard boats (category two) is as follows:

Persons capacity (lb.) = maximum weight capacity – value in Column 6, Table 4 (U.S.C.G.),

Where:

Maximum weight capacity is as calculated in section 6.1 (33 CFR 183.35).

The value in Column 6 of Table 4 (USCG table) will be found in Appendix B. This number represents the sum of the weights of engines with controls, batteries, and full portable fuel tanks for the engine size on the U.S. Coast Guard Maximum Capacity Label. The result of this calculation is the number to display on the capacity label. If this number (persons capacity in lb.) is less than 550 pounds, it will be necessary to confirm it by conducting a dry stability test on the boat. We include this test here because many small outboard boats will fall under this requirement.

DRY STABILITY TEST:

Float the boat with all permanent appurtenances. Add, in their normal operating positions, the weight of engine, controls and battery. Weights are found in Table 4. Fill the permanent fuel tank, or add weight of portable tank in Table 4. Gradually add weights along one outboard side, at the height of the seats and distributed evenly on each passenger-carrying area. Continue adding weights until the boat assumes maximum list without taking on water. Repeat this procedure on the opposite side of the boat.

The weight added on each side to simulate passenger weight (not engine, controls, etc.) is called (A) in the calculations. If the weight added on one side is different from that on the other side, use the lesser of the two figures as (A) in the formula.

The method to calculate the persons capacity in whole numbers in the category of outboard boats will be the lesser of:

a. – Persons capacity (no.) = $\frac{32 + \text{persons capacity (lb.)}}{141}$

Or, if (a) above is less than 550 lb.,

b. – Persons capacity (no.) = $\frac{32 + (A/\ .60)}{141}$

Where (A) is the weight added as persons capacity during the dry stability test described above.

A SPECIAL DISCUSSION OF 33 CFR 183.41, SUBPART C — SAFE LOADING

Paragraph (a) of part 183.41 above states that the persons capacity of an outboard boat must not exceed the lesser of two options:

1. The maximum weight capacity minus weight in column 6 of Table 4; or

2. If this number is less than 550 pounds, you must test the boat and compute its persons capacity.

Now assume that the calculation in (1) results in 550 lb. persons capacity. This is the number to be used as persons capacity in pounds, while the computation for number of persons is:

$\frac{32+550}{141}$ = 4.12, or 4 persons.

However, assume the calculation in (1) results in 547 lb. Since this is less than 550 lb. you must conduct the dry stability test on this boat. The dry stability test gives us a total of 545 lb. The calculation for persons capacity in pounds [see 183.41 (a) (2) (iv) above] will be:

Persons capacity (lb.) = A/.60 where A is the weight added during test
Persons capacity (lb.) = 545 /.60 = 908 lb.

Choose the lesser of the two options: 547 lb. or 908 lb., which is obviously 547 lb.

Then the computation for persons capacity in number will be:

Persons capacity (No.) = $\frac{32+547}{141}$ = 4.10 or 4 persons.

The problem here occurs if, in the example above, only 328 lb. were added before the boat's inclination allowed water to come in. In this case, the computation for persons capacity in pounds is = 328 / .60 = 546 lb.

Choose the lesser of the two methods: 547 lb. or 546 lb. Obviously you will pick 546 lb.

Then persons in numbers is $\frac{32 + 546}{141}$ = 4.09 or 4 persons.

The intent here is to show that whenever you start finding very low values of capacities, the decision on how to certify the boat becomes difficult, and the recommendation is to discuss it with the Coast Guard. Look at the figures above again.

In one instance, the boat tested during the dry stability test withstood 545 lb. before taking on water, while in the other instance the boat withstood only 328 lb. Yet both certify for the same number of persons (four), and both are very close in persons capacity measured in pounds.

6.3 EXAMPLE OF CALCULATIONS FOR MAXIMUM WEIGHT CAPACITY AND PERSONS CAPACITY: OUTBOARD BOATS (CATEGORY TWO)

In section 4.2 we have an example of the calculations for maximum displacement using a form for the Simpson's Rule formula. In that example we arbitrarily assumed it was an outboard boat, simply because Figure 3 in section 4.0 pictures an outboard boat. The only difference from the sterndrive boat noted in example in section 5.3 as an example for the capacity calculations is that the outboard boat has a small volume of the engine well, below the float-plane and forward of the transom, which must be deducted when figuring cubic capacity; hence the displacement for the sterndrive boat was 11,731.2 lb. For the present example of an outboard boat we will use the displacement shown in Figure 5, or 11,668.8 lb.

Following are the specifications for our hypothetical outboard boat:

Length overall:	16.5 ft.
Calculation length:	16 ft., 2 in.
Beam:	6.75 ft.
Calculation beam:	6 ft., 6 in.
Boat weight:	1353 lb.
Displacement:	11,668.8 lb. (from Fig. 5, Sec. 4.2)
Outboard engine:	100 HP
Engine weight:	405 lb. (from Table 4, USCG)
Fuel:	Portable fuel tank

We measured the hull, applying Simpson's Rule, and we came up with the displacement (shown in Figure 5, section 4.2) of 11,668.8 lb. Now we will follow the steps of the regulation's formulae.

Step 1: Compute maximum displacement.

Done in Figure 5 = 11,668.8 lb.

Step 2: Compute maximum weight capacity.

$$W = \frac{\text{maximum displacement} - \text{boat weight}}{5}$$

$$W = \frac{11{,}668.8 \text{ lb.} - 1353 \text{ lb.}}{5}$$

W = 2,063.16 lb., rounded down to 2,063 lb.

This is the figure that may be used on the capacity label to certify the boat:

2,063 pounds, persons, motor, gear

Step 3: Compute persons capacity in pounds.

Following the regulation above, we note that the persons capacity in pounds is found by subtracting engine and controls weight, dry battery weight, and weight of portable fuel tank from the maximum weight capacity calculated above. We now go to Table 4, where column 6 shows 550 lb. as the sum of the weights listed above.

Persons capacity = maximum weight capacity – value in Column 6 Table 4
Persons capacity = 2,063 lb. – 550 lb.
*Persons capacity = 1,513 lb.

Step 4: Compute persons capacity in whole numbers.

Follow the regulation formula

$$\text{Persons capacity (no.)} = \frac{32 + \text{persons capacity in lb.}}{141}$$

$$\text{Persons capacity (no.)} = \frac{32 + 1{,}513}{141}$$

Persons capacity (no.) = 10.9, rounded up to 11 persons

* The regulation also states that if the figure above (persons capacity in pounds) computes to less than 550 lb., a dry stability test must be performed, and the figure to use for certification will be the lesser of the two results: the value in Step 3 above or the computation below.

For boats with a maximum persons capacity of less than 550 pounds, the persons capacity in pounds will be determined by the following dry stability test. Proceed as follows:

1. Float the boat in calm water with all its permanent appurtenances.

2. Add, in normal operating positions, the dry motor and controls weight, battery weight, and full portable fuel tank weight, if any, for the maximum horsepower capacity marked on the boat. Permanently installed fuel tanks shall be full of fuel.

3. Gradually add weights along one outboard extremity of each passenger area, at the height of the seat nearest the center of that area, but no higher than the height of the gunwale, and distributed equally forward and aft of that center in a plane parallel to the floorboards until the boat assumes the maximum list or trim, or both, without water coming aboard. Then repeat this test on the other side of the boat.

4. Compute the persons capacity in pounds using the following formula:
   Persons capacity = A/0.6 where A is the weight added in paragraph 3 above to obtain maximum listing without water coming in. (If there is a difference between one side and the other, use the greater of the two weight figures obtained when the test was performed.)

Let's assume that the maximum persons capacity above in Step 3 came to 545 lb. According to the regulation, the boat must be subjected to the dry stability test. Let's also assume that during the test, and after locating the dry weights of the engine, controls, battery and fuel tank, we added a total of 500 lb. on one side of the boat, and then on the other side, to obtain maximum inclination (or list) before water ingress. You now must compute as per the regulation:

Persons capacity in pounds = 500 / .60
Persons capacity in pounds = 833 lb.

The law states that we must use the lesser of the two values found:
1. Persons capacity (lb.) in Step 3: (as assumed above) 545 lb. or
2. Persons capacity (lb.) in dry stability test: 833 lb.

Using 545 lb., because it is the lesser of the two figures, we may then calculate the persons capacity in whole numbers as above:

$$\text{Persons capacity (no.)} = \frac{32 + \text{persons capacity (lb.) in test}}{141}$$

$$\text{Persons capacity (no.)} = \frac{32 + 550 \text{ lb.}}{141}$$

Persons capacity (no.) = 4.12, rounded down to 4 persons.

The manufacturer now has the information to certify the boat, and the label may read:

11 persons or 1,513 lb.
2,063 lb. persons, motor, gear
100 horsepower motor

Comments on rating a boat in this category:

Obviously the manufacturer will not want to exercise his right to use these high numbers on the capacity label. It is unreasonable to rate a 16 ft. boat for 11 people, and it will be expensive to "float" the excess weight.

If the manufacturer "de-rates" the boat to a more reasonable number, such as the number of seats in the boat (say 6 persons), let's calculate how many of the allowed 1,513 pounds of maximum capacity will be used.

We use the regulation formula but reversed:

Pounds of persons (desired rating) = (6 X 141) –32
Pounds of persons (desired rating) = 814 lb.

And the difference to the maximum weight capacity will be:

1,513 pounds – 814 pound of persons = 699 pounds allowed for gear, which may still be too large.

The manufacturer must now select among the options, which are (as they must be displayed on label):

Option 1: 11 persons or 1,513 lb. (allowed but unreasonable)
1,401 lb. of persons, motor and gear (reasonable--see * below)

Option 2: 6 persons or 814 lb. (reasonable persons load)
1,401 lb. of persons, motor and gear

* Remember that in outboards the maximum weight capacity is in persons, motor, and gear, which will allow:

814 lb. of persons
550 lb. for motor, controls, battery, and fuel tank
37 lb. of gear
1401 lb. total for persons, motor and gear.

A manufacturer has ample freedom to rate the boat as he sees fit, as long as it does not exceed the maximum weight capacity. The parameters to be considered in the decision-making process are:

- How many intended occupant positions does the boat have?
- What is a reasonable number of persons to load this boat with?
- How much gear we should consider?
- How much added flotation will be required?
- Has the boat been performance-tested with heavy loads?

After all these considerations, the manufacturer may decide for something like this:

6 persons or 814 lb.
1,401 lb. persons, motor, gear
100 horsepower motor.

7.0 Category Three: Boats Rated for Manual Propulsion and Boats Rated for Outboard Motors of 2 Horsepower or Less

Do not be misled into thinking that this classification covers only dinghies. There are many rowboats of up to 20 feet in length, and these can have many different configurations. Since most of these boats will fall into a "limited production" classification, it is likely that some manufacturers may have overlooked these regulations. They do apply, and the Coast Guard does test such boats.

The procedure to certify them is very similar to the procedure in the other two categories studied above. We must locate the static float-plane, and we must calculate the displacement. Since these boats do not operate at high speeds, the law allows more of their displacement to be used as maximum weight capacity. Notice that the law states that weight capacity is 3/10 of displacement, as opposed to 1/5 for outboards of over 2 horsepower.

Another point worth mentioning is that there are small "tunnel-hulled" boats sold as catamarans that will fall into this category, because their water-line or foot-print is a single line when loaded. These are most often used as dinghies or tenders. Many people do not consider them to fall under the applicability of this subpart of the law, but in reality they do.

7.1 MAXIMUM WEIGHT CAPACITY: BOATS RATED FOR MANUAL PROPULSION AND BOATS RATED FOR OUTBOARD MOTORS OF 2 HORSEPOWER OR LESS (CATEGORY THREE)

FEDERAL LAW:

183.37 Maximum weight capacity: Boats rated for manual propulsion and boats rated for motors of two horsepower or less.

(a) The maximum weight capacity marked on a boat that is rated for manual propulsion or for motors of two horsepower or less must not exceed 3/10 of the difference between the boat's maximum displacement and the boat's weight in pounds.

(b) For the purposes of paragraph (a) of this section:

(1) "Maximum displacement" is the weight of the volume of water displaced by the boat at its maximum level immersion in calm water without water coming aboard. For the purpose of this paragraph, a boat is level when it is transversely level and when either of the two following conditions are met:

(i) The forward point where the sheer intersects the vertical centerline plane and the aft point where the sheer intersects the upper boundary of the transom (stern) are equidistant above the water surface or are equidistant below the water surface.

(ii) The most forward point of the boat is level with or above the lowest point of water ingress.

(2) "Boat weight" is the combination of:

(i) Hull weight;
(ii) Deck and superstructure weight; and
(iii) Weight of permanent appurtenances.

Discussion:

The calculations for weight capacity on boats of this category are simple and straightforward. The regulation is clear and easy to follow. Boats in this category usually do not have engine wells or other features that may have to be observed when calculating displacement. It is easy to figure this displacement by the immersion method described in section 4.0.

The float-plane is also easy to establish. Some boats in this category have an "up-curve" sheer, or a sweeping sheer with the bow and the stern higher than amidships. Be sure to either immerse the boat, or calculate the float-plane by the alternate method explained in section 3.0. The distance from the most forward point of the boat to the waterline must be equidistant with the distance from the top of the transom to the waterline when the boat is about to down-flood.

There are other cases where the bow rise is so high (a pronounced sheer) that establishing the float-plane by this method may penalize the boat. Contact the Coast Guard for an interpretation or a waiver.

7.2 PERSONS CAPACITY: BOATS RATED FOR MANUAL PROPULSION AND BOATS RATED FOR OUTBOARD MOTORS OF 2 HORSEPOWER OR LESS (CATEGORY THREE)

FEDERAL LAW:

183.43 Persons Capacity: Boats rated for manual propulsion and boats rated for motors of two horsepower or less.

(a) The persons capacity in pounds marked on a boat that is rated for manual propulsion or for motors of 2 horsepower or less must not exceed:

(1) For boats rated for manual propulsion, 90 percent of the maximum weight capacity in pounds; and

(2) For boats rated for motors of two horsepower or less, 90 percent of the maximum weight capacity in pounds, less 25 pounds.

(b) The maximum persons capacity, in whole numbers of persons marked on a boat that is rated for manual propulsion must not exceed the value obtained by adding 32 pounds to the value determined in paragraph (a) (1), dividing the sum by 141, and rounding off the result to the nearest whole number. If the fraction is less than one-half, round down to the next lower integer and if the fraction is equal to or greater than one-half, round up to the next higher whole integer.

(c) The maximum persons capacity in whole numbers of persons marked on a boat rated for motors of 2 horsepower or less must not exceed the value obtained by adding 32 pounds to the value determined in paragraph (a) (2), dividing the sum by 141, and rounding off the result to the nearest whole number. If the fraction is less than one-half, round down to the next lower whole integer and if the fraction is equal to or greater than one-half, round up to the next higher whole integer.

Discussion:

As in the other categories, persons capacity is calculated and stated in the capacity label in two forms; expressed in pounds whole numbers. These calculations are straightforward and easy to complete.

The static float plane and the maximum displacement have been calculated in section 7.1 to get the maximum weight capacity, so following the regulation is easy, and there are two options:

1. If the boat is strictly for manual propulsion, the persons capacity in pounds is 90% of its maximum weight capacity

2. If the boat is rated for 2 horsepower or less, the persons capacity in pounds is 90% of its maximum weight capacity minus 25 pounds (allowance for the engine)

Either one of these figures expressed as "pounds of persons" is the certified persons capacity figure to be displayed in the capacity label.

As mentioned above, the maximum persons capacity also must be expressed in a whole number of persons. Its calculation is straightforward and follows the two options above.

1. If the boat is strictly for manual propulsion, follow this formula

$$\text{Person Capacity (no.)} = \frac{32 + \text{persons capacity (lb.)}}{141}$$

2. If the boat is rated for 2 horsepower or less, the formula is

$$\text{Person capacity (no.)} = \frac{32 + [\text{persons capacity (lb.)} - 25]}{141}$$

Either one of the figures for persons capacity in whole numbers must be rounded in the usual manner; if the fraction is less than half, to the next lower number. If it is half or greater, it may be rounded to the next higher number. As in the other categories, the manufacturer is allowed to de-rate the capacity to be stated in the capacity label.

7.3 EXAMPLE OF CALCULATIONS FOR MAXIMUM WEIGHT CAPACITY AND PERSONS CAPACITY: BOATS RATED FOR MANUAL PROPULSION AND BOATS RATED FOR 2 HORSEPOWER OR LESS (CATEGORY THREE)

For the purpose of this example we will assume a 14.5 ft. rowboat that has a transom capable of receiving an engine. The manufacturer has certified the boat for 2 HP.

In section 4.0, we discussed the methods to calculate maximum displacement. The assumed boat has a classic up-turned sheer and is sold as a rowing or low power outboard engine boat. The preferred methods to use in figuring displacement would be the immersion method or measuring a hull or mold and following Simpson's Rule. We assume this has been done. Following are the specifications:

Length overall:	14.5 ft.
Calculation length:	14 ft., 2 in.
Beam:	5.75 ft.
Calculation beam:	5.5 ft.
Boat weight:	600 lb.
Outboard engine:	2 HP
Engine weight:	25 lb.
Fuel tank:	built-in the engine

We have established the static float plane as explained before. We have measured the hull either by the boat immersion method or by applying Simpson's Rule, and have calculated a cubic capacity of 45 cubic ft. We now follow the steps to calculate maximum weight capacity according to 33 CFR 183.37.

Step 1: Compute maximum displacement.

D = cubic capacity X 62.4 lb.
D = 45 X 62.4 = 2808 lb.

Step 2: Compute maximum weight capacity (W).

W = (maximum displacement (lb.) – boat weight) X 3/10
W = (2808 lb. – 600 lb.) 3/10
W = 662.4 rounded down to 662 lb.

This figure of 662 pounds is the maximum weight capacity that must be displayed in the capacity label. It can be less, but it cannot be any more.

Step 3: Compute the persons capacity in pounds (P lb.).

The boat may be used for rowing but it has a transom capable of carrying an outboard motor and the manufacturer has decided to rate the boat for 2 HP on the certification capacity label. Therefore the persons capacity numbers must be calculated following option 2 of the regulation 183.43 (a) (2) above.

P(lb.) = 90% W — 25 lb.

= (.90 X 662) — 25

= 595.8 — 25 = 570.8 rounded up to 571 lb

Step 4: Compute the persons capacity in whole numbers (P no.).

$$P(no.) = \frac{32 + P(lb.)}{141}$$

$$= \frac{32 + 571}{141} = 4.27 \text{ rounded down to 4 persons}$$

The capacity label of the boat in this example may display a label such as:

U. S. COAST GUARD
MAXIMUM CAPACITIES
4 PERSONS OR 571 LB
662 LB PERSONS, MOTOR AND GEAR
2 HORSEPOWER, MOTOR

NOTE:

See 33 CFR 183.25.

Subpart B — Display of Capacity Information

Title 33 CFR, Sections 183.21–183.27

Revised as of July 1, 2000

Subpart B deals with the manner in which the capacity information obtained in Subpart C must be displayed. We have discussed this information at length. The results of the calculations for maximum weight capacity and persons capacity are what must be displayed on the boat's label. The capacity information label also (in some cases) includes the maximum horsepower engine allowable on the vessel. However, the Safe Powering requirement is the subject of a separate guideline; here we simply explain the information to be included on the certification label.

The physical requirements of the label itself are contained in a different section of 33 CFR. We have included these (parts 181.5 to 183.19) in Appendix A at the end of this guideline for information on the label contents and physical properties. Parts 183.21–183.27 discuss the display of the information calculated, relative to maximum weight and number of persons allowed.

Applicability

FEDERAL LAW:

183.21 Applicability.

This subpart applies to monohull boats less than 20 feet in length, except sailboats, canoes, kayaks, and inflatable boats.

FEDERAL LAW:

183.23 Capacity marking required.

Each boat must be marked in the manner prescribed in Sec.s 183.25 and 183.27 with the maximum persons capacity in whole numbers of persons and in pounds, the maximum weight capacity in pounds, determined under Sec.s 183.33 through 183.43, and the maximum horsepower capacity determined under Sec. 183.53 or the statement "This Boat Not Rated for Propulsion by a Motor".

FEDERAL LAW:

183.25 Display of markings.

(a) Each marking required by Sec. 183.23 must be permanently displayed in a legible manner where it is clearly visible to the operator when getting the boat underway.

(b) The information required by Sec. 183.23 must be displayed in the following manner:

(1) For outboard boats:
U.S. Coast Guard Maximum Capacities
XX Persons or XXX Pounds
XXX Pounds, persons, motor, gear
XXX Horsepower, motor
or
U.S. Coast Guard Maximum Capacities
XX Persons or XXX Pounds
XXX Pounds, persons, motor, gear
XXX Horsepower, motor with remote steering
XXX Horsepower, motor without remote steering

(2) For inboard boats and inboard-outboard boats:
U.S. Coast Guard Maximum Capacities
XX Persons or XXX Pounds
XXX Pounds, persons, gear

(3) For boats rated for motors of 2 horsepower or less:
U.S. Coast Guard Maximum Capacities
XX Persons or XXX Pounds
XXX Pounds, persons, motor, gear
XXX Horsepower, motor

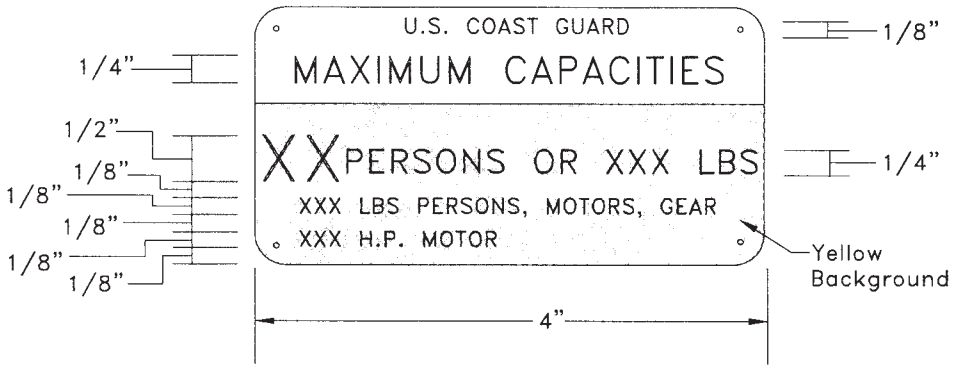
continued on page 42 . . .

FEDERAL LAW: *Sec. 183.25 continued . . .*

(4) For boats rated for manual propulsion:

U.S. Coast Guard Maximum Capacities
XX Persons or XXX Pounds
XXX Pounds, persons, gear
This boat not rated for propulsion by motor

(c) The capacity information displays required in paragraph (b) must meet the following as illustrated in Figure 183.25



All dimensions are minimum.

(1) The capacity information required in Sec. 183.23 must be displayed within a yellow area that —

(i) Is at least 4 inches wide; and

(ii) Is high enough that each line of print is separated by at least 1/8 inch from each other and from the borders of the yellow area;

(2) The persons capacity in whole numbers must be black print with the following dimensions:

(i) The height must not be smaller than one-half inch;

(ii) The width of the numbers must be three-fifths of the height except for the number "4", which shall be one stroke width wider, and the number "1" which shall be one stroke in width;

(iii) The stroke width shall be one-sixth of the height; and

(iv) The minimum space between the numbers shall be one stroke width.

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FEDERAL LAW: *Sec. 183.25 continued . . .*

(3) The words in the line "XX Persons or XXX Pounds" must be at least one-quarter inch in height but not larger than one-half the height of the persons capacity number and of a color contrasting with yellow. The number of pounds in this line must be at least one-eighth inch in height but no larger than one-half the height of the persons capacity number and of a color contrasting with yellow.

(4) All remaining words and numbers required to be within the yellow area required in paragraph (c) (1) must be at least one-eighth inch in height, but no larger than one-half the height of the persons capacity number.

(5) All other words and numbers on the displays must be located outside the yellow area on a background color which contrasts with yellow.

(6) The words "Maximum Capacities" must be at least one-quarter inch in height and of color contrasting with its background.

(7) The words "U. S. Coast Guard" must be at least one-eighth inch in height and of color contrasting with its background.

FEDERAL LAW:

183.27 Construction of markings.

Each marking required by Sec. 183.23 must be:

(a) Capable of withstanding the combined effects of exposure to water, oil, salt spray, direct sunlight, heat, cold, and wear expected in normal operation of the boat, without loss of legibility; and

(b) Resistant to efforts to remove or alter the information without leaving some obvious sign of such efforts.

Discussion:

The requirements in this subpart are simple and straightforward. The important section is 183.25 (b), which gives the arrangement options for the figures. The regulation follows the categories explained before, but breaks down category three so as to be more explicit. Following are some comments on this.

An outboard boat has two optional display forms: a regular outboard with a helm seat or steering station will simply display the information as shown in 183.25 (b) (1), but, if the vessel is a small boat on which the final owner may have the option of installing either a tiller-steered engine or a remote steering system, the regulation offers an option to certify a horsepower capacity for the tiller-steered engine, and a different horsepower capacity for a remotely steered engine.

The labels on inboard or sterndrive boats do not display a certification of the maximum horsepower capacity because the engine is already installed at the factory. Therefore, the display will only show the persons capacity in pounds and whole numbers and the maximum weight capacity. Remember that technically, the persons capacity in pounds can be the same as the maximum weight capacity.

Finally, category three is broken down into two groups: boats rated for 2 HP or less in which the manufacturer certifies identically to the regular outboard boats above; and boats rated for manual propulsion in which no horsepower capacity is given and a note is added at the bottom of the label stating, "This Boat Not Rated for Propulsion by Motor."

Part 183.27 deals with the requirements for the construction of the label, including the fact that the label must withstand environmental effects without loss of legibility. In reality, the manufacturer will probably procure these labels from a supplier that already complies with these requirements. It is not practical for boat manufacturers to make their own labels.

Appendix A

USCG TABLE 4 Weights (Pounds) Of Outboard Motors And Related Equipment For Various Boat Horsepower Ratings

Boat Horsepower Rating	Motor & control weight		Battery weight		Full portable fuel tank weight	1 + 3 + 5
	Dry	Swamped	Dry	Submerged		
			COLUMN NO.			
	1	2	3	4	5	6
0.1 to 2	25	20				25
2.1 to 3.9	40	34				40
4.0 to 7	60	52			25	35
7.1 to 15	90	82	20	11	50	160
15.1 to 25	125	105	45	25	50	220
25.1 to 45	170	143	45	25	100	315
45.1 to 60	235	195	45	25	100	380
60.1 to 80	280	235	45	25	100	425
80.1 to 145	405	352	45	25	100	550
145.1 to 275	430	380	45	25	100	575
275.1 and up	605	538	45	25	100	750
Transoms designed for twin motors:						
50.1 to 90	340	286	90	50	100	530
90.1 to 120	470	390	90	50	100	660
120.1 to 160	560	470	90	50	100	750
160.1 to 290	810	704	90	50	100	1000
290.1 to 550	860	760	90	50	100	1050
550.1 and up	1210	1076	90	50	100	1400

Appendix B

Title 33 CFR 181, Subpart B — Manufacturer Certification of Compliance

FEDERAL LAW:

Sec. 181.5 Purpose and applicability.

This subpart prescribes requirements for the certification of boats and associated equipment to which 46 U.S.C. Chapter 43 applies and to which a safety standard prescribed in Part 183 of this chapter applies.

FEDERAL LAW:

Sec. 181.7 Compliance certification label required.

Unless there is affixed to it a certification label that contains the information required by Sec. 181.15:

(a) No person who manufactures, constructs, or assembles a boat or associated equipment may deliver that boat or equipment for the purpose of sale;

(b) No person may import into the United States any boat or associated equipment; and

(c) No person engaged in the business of selling or distributing boats or associated equipment may sell or offer for sale any boat or associated equipment.

FEDERAL LAW:

Sec. 181.9 Affixing labels.

(a) Each manufacturer of a boat or item of associated equipment to which a standard or regulation prescribed in Part 183 of this chapter applies shall affix a certification label that contains the information required by Sec. 181.15 to that boat or equipment before it:

(1) Leaves the place of manufacture for the purpose of sale; or

(2) Is imported.

(b) The manufacturer of a boat or item of associated equipment that is sold to a private label merchandiser may, at the option of the private label merchandiser, affix a certification label identifying the private label merchandiser as the manufacturer before the boat or item of associated equipment leaves the place of manufacture.

FEDERAL LAW:

Sec. 181.11 Exceptions to labeling requirement.

(a) This part does not apply to boats or associated equipment intended solely for export, and so labeled, tagged, or marked on the boat or equipment and on the outside of the container, if any, which is exported.

(b) If an item of associated equipment is so small that a certification label that meets the requirements in Sec. 181.15 cannot be affixed to it, a certification label that contains the information required by Sec. 181.15 may be printed on the smallest container in which the item is packed or on a slip packed with the item.

(c) This subpart does not apply to any outboard motor or starting control to which Sec. 183.710 of this chapter applies.

FEDERAL LAW:

Sec. 181.13 Removal of labels.

No person may remove a label required by this part or remove or alter any information on a label required by this part, unless authorized by the Commandant.

FEDERAL LAW:

Sec. 181.15 Contents of labels.

(a) Each label required by Sec. 181.7 must contain:

(1) The name and address of the manufacturer or private label merchandiser who certifies that the boat or item of associated equipment complies with the standards prescribed in Part 183 of this subchapter; and

(2) Except as provided in paragraph (c) of this section, the words:
(i) "This (insert 'Boat' or 'Equipment') Complies With U.S. Coast Guard Safety Standards In Effect On (insert date of certification as prescribed in paragraph (b) of this section)"
or
(ii) If the item being certified is a boat the label may show the words, "This Boat Complies With U.S. Coast Guard Safety Standards In Effect On The Date of Certification."

(b) Date of certification must be no earlier than the date on which construction or assembly began and no later than the date on which the boat or item of associated equipment leaves the place of manufacture or assembly or import for the purposes of sale.

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FEDERAL LAW: *Sec. 181.15 continued . . .*

(c) {Reserved}

(d) Except as provided in paragraph (e) of this section, the manufacturer may, in addition to the information required by paragraphs (a) and (b) of this section, display on the certification label any or all of the following information:

(1) Model name or designation.

(2) Hull identification number (if a boat) or serial number (if an item of associated equipment).

(3) Model year.

(e) Display of the hull identification number on the certification label does not satisfy the display requirements of Sec. 181.29.

(f) Each boat which displays a maximum horsepower capacity determined in accordance with Sec. 183.53 (b) must, in addition to the information required by paragraphs (a), (b) and (d) of this section, display on the certification label, the following statement in letters no less than one-quarter of an inch in height: ".THIS BOAT IS INTENDED FOR RACING AND OTHER HIGH PERFORMANCE ACTIVITIES. THE SKILL REQUIRED MAY EXCEED THE ABILITIES OF SOME OPERATORS".

FEDERAL LAW:

Sec. 181.17 Label numbers and letters.

Letters and numbers on each label must:

(a) Be no less than one-eighth of an inch in height; and

(b) Contrast with the basic color of the label, except that the date of certification may be permanently stamped, engraved, or embossed on the label.

FEDERAL LAW:

Sec. 181.19 Construction of labels.

(a) Each label must be made of material that can withstand exposure to water, oil salt spray, direct sunlight, heat, cold, and wear expected in normal use of the boat or item of associated equipment without deterioration of legibility.

(b) Each label must be made of material that shows visible traces of the alteration or removal of information on the label.

References

U.S. Coast Guard regulations are available from the U.S. Government Printing Office, Superintendent of Documents, Washington, DC 20402-9328.