- SMALL PASSENGER VESSELS -
SIMPLIFIED STABILITY PROOF TEST (SST) PROCEDURE INSTRUCTIONS

(In accordance with 46 CFR 178.330)

U.S. DEPARTMENT OF HOMELAND SECURITY
U.S. COAST GUARD
SST JOB AID- EX CG-4006 (Rev. 12-18)

Print double-sided

Overview:

This document is a guide for the performance of a Simplified Stability Proof Test (SST) in accordance with 46 CFR 178.330 and reflects current best practices for performing a SST. Where regulations and the guidance of this form conflict, the regulations govern. 46 CFR 178.310(c) provides demonstration of compliance with the SST as an alternative to compliance with the stability requirements of 46 CFR Subchapter S. Other stability requirements must be met if the SST requirements are not met.

This document has two parts: Part 1 contains the instructions and guidance for the user performing a SST and its pages are numbered "1-[N]", where [N] is the page number. Part 2 contains the form where information from the SST should be documented and its pages are numbered "2-[N]". The instructions for a given form page (e.g., page 2-2) are given on the corresponding instruction page (e.g., page 1-2). The use of the instructions or the form contained in this document is not mandatory. However, satisfactory completion of a SST using this document will result in a reliable outcome.

Applicability:

The SST only applies to a monohull or non-sailing flush deck catamaran vessel that must meet certain requirements that are set out in the instructions for completing Section 1 (see page 1-1).

> This SST procedure was designed for monohull and catamaran vessels of traditional proportions and form. The SST is not recommended for vessels of unusual proportions and form; and may not be appropriate for a vessel for which a reference freeboard may not be reliably measured. Contact the Marine Safety Center Small Vessel Branch (Hull Division) for questions on the suitability of the SST for a vessel.

Regulatory Reminders:

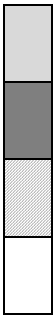
Subdivision Requirements: If a vessel either carries more than 49 passengers or is constructed of wood, certificated on or after March 11, 2001 and operates in cold water, the vessel may comply with 46 CFR 179.220, simplified subdivision outlined in form CG-4005, as an alternative to complying with Type II subdivision and damage stability requirements in 46 CFR 171.070 through 171.080.

Drainage Requirements: The drainage of all cockpit and well deck vessels must be checked by the attending Marine Inspector to ensure minimum drainage requirements are met per 46 CFR 178.450.

Vessel Weight/Wind Profile Changes: Since this procedure is a proof test, any changes made which change the total weight of the vessel, or increase its wind profile, may require a new SST to be conducted. To assess the degree of future weight changes, baseline vessel freeboard measurements should be recorded at the bow and stern and port and starboard at the reference location with the vessel in the loaded condition but without any passenger or crew weight and without any cargo or variable weight onboard (e.g., no dive equipment). See Section 16 of Part 1 for details.

Test/Form Overview:
The form contained in Part 2 is organized to document the performance of a SST and the sequential steps that should be taken during a SST. In the form, data is entered in cells, each of which is uniquely identified with a bold section number (e.g., **3.**), a row letter (e.g., A), and a column number (e.g., 1). For example, the number of passengers is entered at **2.**(B)(1).

Also, the type of data to be entered into each cell is identified by how the cell is shaded:



- A lightly grey shaded cell means that numerical measured or given data (e.g., weight and location of solid ballast) is to be entered;
- A dark grey shaded cell means a calculated value is to be entered;
- A diagonal cross hatched cell means that a value is to be entered that is derived from or copied from another cell in the form; and
- A clear cell means that information (e.g., description of solid ballast material) is to be entered.

Not all cells will be entered, but the instructions for each section identifies those cells that will be filled in.

The guidance for completing Part 2 - the form – is given in the specific instructions in Part 1 – pages 1-1 through 1-17. Part 1 should be reviewed prior to performing a SST and referred to whenever specific questions arise.

Guidance for Performing the Simplified Stability Test (SST) and Filling Out the SST Form

General Information:

Vessel Condition: The vessel must be *complete* at the time of the SST. This means that:

- □ any unnecessary items not normally carried onboard the vessel such as tools, welding equipment, staging, etc. must be removed from the vessel prior to testing;
- □ any ballast, if needed, is on board, in place, and stowed in compliance with 46 CFR 178.510;
- □ all awnings and canopies must be installed; and
- □ the weight of primary lifesaving equipment must be simulated at its normal position if not aboard during the SST.

The SST must be performed with the vessel in the loaded condition as described below:

- □ full crew complement;
- □ all fuel and water tanks ¾ full;
- □ sewage tanks either empty or full;
- □ all cargo/variable loads onboard including any dive equipment;
- □ all stores, luggage, coolers, ice, fish, and other supplies onboard in their normal location; and
- □ passenger weight is onboard in the anticipated normal location.

Baseline Vessel Freeboard Measurements to Assess the Degree of Future Weight Changes, section 16, may be completed either prior to placing the passenger and crew weight and cargo/variable loads onboard (i.e., before the SST) or after the SST is completed and the passenger/crew weight and cargo/variable loads are removed. Completion of section 16 is optional and is not part of the SST. These measurements are recommended so that future vessel weight changes can be more easily assessed.

The weight of passengers and crew and of cargo/variable loads, if carried, is simulated by bringing aboard known weights, such as sandbags, concrete blocks, or filling containers of known volume with fresh water. The SST must be performed in the type of water (fresh or salt) in which the vessel will operate. If the vessel's intended operation includes both fresh and salt water, the SST must be performed in fresh water.

The average location of the weight of an object and a single point about which an object balances is the Center of Gravity (CG) and its vertical location is the Vertical Center of Gravity (VCG). A high VCG is generally less safe (more conservative) than a low VCG because application of a constant heeling moment to a vessel with high VCG will cause more heel than the vessel with low VCG.

The weight used to represent equipment, crew, cargo/variable loads, and stores must be considered part of the loaded condition, onboard, and distributed to reflect the anticipated loading during operation of the vessel. That weight can be moved transversely also if shifting of the passenger test weight alone does not achieve the minimum total heeling moment (HM_T). In some cases, the total weight of passengers and equipment, crew, cargo/variable loads, and stores is insufficient to achieve the HM_T and additional weight needs to be placed aboard to do so.

Crew weight is not part of the passenger test weight but is part of the loaded condition. Crew weight must have a 39 inch vertical center of gravity (VCG) for standing crew and a 30 inch VCG for seated crew. Crew weight must also be distributed to reflect normal vessel operation.

All non-return closures on cockpit scuppers or weather deck drains must be open during the SST. Mooring lines must be slack and the depth of water sufficient to allow the vessel to heel without bottom contact.

Stability Test Procedure for *a* Vessel Carrying *Both* Passengers and Cargo/Variable Loads:

Many vessels carry cargo/variable loads in addition to passengers. Although the cargo/variable loads are not shifted during a SST, they can have a significant effect on vessel stability. Certain vessels may require cargo/variable loads onboard to pass a SST.

If the judgment of the Officer in Charge, Marine Inspection (OCMI) determines that the cargo/variable loads are unlikely to affect the results of the SST, the SST may be conducted once with all cargo/variable loads onboard. However, if the judgment of the OCMI determines that the cargo/variable loads may affect the results of the SST, the SST must be performed twice. The first test must be performed conducted with no cargo/variable loads onboard the vessel (i.e., with passengers only). The second test must be performed with the maximum cargo/variable loads onboard and arranged to simulate the most unfavorable VCG likely to occur in service.

If a vessel does not pass with passengers only, alterations to the vessel or allowable passenger count need to be made; otherwise the vessel may choose to pursue stability calculations via 46 CFR Subchapter S as provided in 46 CFR 178.310. If a vessel only passes a SST without the maximum cargo/variable loads onboard, the cargo/variable loads must be reduced until the vessel can pass. If a vessel cannot pass an SST with any cargo/variable loads onboard, then that vessel will not be authorized to carry cargo/variable loads.

Part 1 – Specific Instructions for completing the SST form:

1. Vessel, Builder, Representative Identification and Applicability Verification:

In this section, clearly identify the vessel being tested, the builder, and the representatives attending the test. This includes:

1.(A)(1) Enter the vessel name.
1.(A)(2) Enter the vessel's official or state identification number
1.(B)(1) Enter the builder's name.
1.(B)(2) Enter the builder's hull or other identification number.
1.(C)(1) and **1.**(C)(2) Enter the the builder's street address and city and state.
1.(D)(1) Enter the legible name of the owner or owner's representative responsible for performing the SST.
1.(D)(2) Enter the name of the Coast Guard marine inspector (MI) who witnesses the SST.
1.(E)(1) Enter the owner's contact phone number and email address.
1.(E)(2) Enter the MI's contact information.

The regulations in 46 CFR 178.310(c), 178.320(a), and 178.325(a) and (b) allow vessels to demonstrate compliance using the SST if certain criteria and requirements are satisfied. In rows (F) through (M), the user positively verifies that the SST is applicable to the vessel by checking the box in column (1):

- To confirm that the criteria in 46 CFR 178.310(c)(1) through (4) are satisfied, check the following:
  1.(F)(1) The vessel's length, as defined by 46 CFR 175.400, is not more than 65 feet in length;
  1.(G)(1) The vessel does not carry more than 12 passengers on an international voyage;
  1.(H)(1) The vessel does not have more than one deck above either the bulkhead deck or, if without a bulkhead deck, above the deck from which freeboard is measured, excluding a pilot house;
  1.(I)(1) The vessel's stability has not been questioned by the OCMI.
- 1.(J)(1) To confirm that the criteria in 46 CFR 178.320(a) or 178.325(b), as applicable, are satisfied, check that the tumblehome of the deck, if any, measured amidships, does not exceed 2 percent of the beam.
- To confirm that the criteria in 46 CFR 178.320(a)(1) and (2) are satisfied, check that:
  1.(K)(1) The vessel is a monohull or a flush deck catamaran which is not a pontoon vessel; and
  1.(L)(1) If the vessel is a catamaran, the vessel does not carry more than 49 passengers.
- **1.**(M)(1) To confirm that the criteria in either 46 CFR 178.420(b) or 178.430(d) pertaining to a cockpit or well deck type vessel, respectively, is satisfied, check that the vessel operates only on protected waters if the cockpit deck or well deck is less than 10 inches above the waterline.
- **1.**(N)(1) If the vessel is a monohull sailing vessel, to confirm that the requirements in 46 CFR 178.325(a)(1) through (8) are satisfied, check the following:
  The vessel does not operate on exposed waters or beyond daylight hours;
  The vessel is of usual type, rig and hull form, and has a weathertight deck;
  The vessel does not carry more than 49 passengers or is not a sailing school vessel that carries a combined total of 6 or more sailing school students and instructors;
  The vessel has a minimum downflooding angle greater than 60 degrees (the distance from centerline of any opening that cannot be rapidly closed watertight must not be greater than 0.577 times the height of that opening above the waterline in calm water– 46 CFR 171.055(f));
  The vessel does not have a cockpit length greater than 20% of the Length Over Deck; and
  If operating on Partially Protected Waters and equipped with a cockpit, the vessel has a self-bailing cockpit.

1.(O)(1) When the verification of applicability is completed, check the appropriate box as to whether or not the SST is determined to be applicable to the vessel

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(In accordance with 46 CFR 178.330)

U.S. DEPARTMENT OF
HOMELAND SECURITY
U.S. COAST GUARD
SST JOB AID- EX CG-4006 (Rev. 12-18)

1. Vessel, Builder, Representative Identification, and Applicability Verification:

	(1)	(2)
Vessel:	Name	Official No.
(A)		
Builder:	Name	Hull No.
(B)		
Builder:	Address	City, State
(C)		
Representatives:	For Owner	Marine Inspector
(D)		
Contact Info (phone/email):	Owner/Representative	Marine Inspector
(E)		

	Applicability Verification	(1)
(F)	The vessel's length, defined by 46 CFR 175.400	□ - is not more than 65 feet
(G)	The number of passengers carried on an international voyage	□ - does not exceed 12
(H)	Above the bulkhead deck or the deck from which freeboard is measured, excluding a pilothouse	□ - the vessel has not more than 1 deck
(I)	The Officer in Charge, Marine Inspection	□ - has not questioned the vessel's stability
(J)	The tumblehome, if any, measured at amidship	□ - $\leq$ 2% of the beam
(K)	This vessel is either a:	□ - monohull, or a non-sailing, flush deck catamaran
(L)	If this vessel is a catamaran, the number of passengers carried	□ - does not exceed 49
(M)	If this vessel is either a cockpit or well deck type with deck < 10 inches above the waterline, it operates on	□ - protected waters
(N)	If the vessel is a monohull sailing vessel, ● the vessel operates on waters that are ● operation is restricted to ● the vessel is of usual ● the vessel is fitted with a ● the number of passengers carried ● the combined total number of sailing school students and instructors ● the vessel's downflooding angle ● the ratio of cockpit length to Length Over Deck ● if the vessel is equipped with a cockpit and operates on Partially Protected Waters	 □ - not exposed waters □ - daylight hours □ - type, rig, and hull form □ - weathertight deck □ - does not exceed 49 □ - does not exceed 6 □ - is greater than 60° □ - does not exceed 20% □ - cockpit is self-bailing
(O)	The SST is determined to be	□ - applicable □ - not applicable

2. Test Information:

Complete this section to record critical information, much of which is included in a stability letter issued to the vessel:

2.(A)(1) Enter the location where the SST is performed (Dock, Address, City, State).

2.(A)(2) Enter the date that the SST is performed.

2.(B)(1) Enter the intended number of passengers (Np) [Note: 46 CFR 176.113 provides the process by which the OCMI determines the *maximum* number of passengers permitted and may be the greatest number permitted by the length of rail criterion (30 inches per person), the deck area criterion (10 square feet per person), or the fixed seating criterion (18 inches of fixed seating width per person). Of course, fewer numbers of passengers may be carried to meet other requirements or at the option of the owner.]

2.(B)(2) Enter the average assumed weight per person (for passengers and crew) = 185 pounds (except if the OCMI requires or permits a different weight per person – see 46 CFR 170.090).

2.(C)(1) Check that the mooring arrangements of the vessel are proper, sheltered from wind, tide, waves, and currents; and can float free from pier contact or restriction from mooring lines.

2.(C)(2) Check that the depth of the water is sufficient to ensure no bottom contact during the SST and, if the vessel has natural list, the vessel should be moored on the side with less freeboard.

2.(D)(1) Check the route (this will be either “oceans,” “coastwise,” “limited coastwise,” “great lakes,” “lakes, bays, sounds,” or “rivers” as recorded on the Certificate of Inspection– see 46 CFR 176.110).

2.(D)(2) Check the stability route: exposed waters, partially protected waters, or protected waters: these terms are defined in 46 CFR 175.400).

2.(E)(1) Check the sewage tank status: verified as either empty or full.

2.(E)(1) Check the status of fuel and water tanks: verified at ¾ full.

2.(F)(1) Enter the number of crew.

2.(F)(2) Enter the calculated crew weight.

In **2.**(G)(1) through **2.**(L)(4), enter the material (column (1)), weight (column (2)), and centers of gravity (columns (3) and (4)) of each location of solid ballast, if installed (46 CFR 178.510). “Forward of Transom” means the longitudinal distance of the solid ballast from the aft end of the vessel. “Above the Top of Keel” means the vertical distance above the baseline – an imaginary horizontal reference line at the upper surface of the keel at centerline.

Note: The Stability Letter should record all solid ballast (including material, weight, and center of gravity location).

2. Test Information:

	(1)	(2)
Test:	Location (Dock, Address, City, State)	Date
(A)		
Passengers:	Number of Passengers (Np)	Weight Per Person (Wt/Person)
(B)		□ - 185 lbs □ - Other value: _____ lbs
Mooring Arrangement:	Verified that vessel movement is not restricted	Sufficient water depth verified
(C)	□ - Yes; □ - No	□ - Yes; □ - No
Route:	For Certificate of Inspection	Stability (check one):
(D)	□ - Oceans □ - Coastwise □ - Rivers □ - Limited Coastwise □ - Lakes, Bays, and Sounds	□ - Exposed □ - Partially Protected □ - Protected
Tank Status:	Sewage tanks verified to be:	All fuel and water tanks ¾ full
(E)	□ - Full; □ - Empty	□ - Yes; □ - No
Crew:	Number of Crew (N_C)	Crew Weight = (F)(1) x 185 (lbs)
(F)		

Solid Ballast (Include each item, weight and location. To be listed in the stability letter):

	(1)	(2)	(3)	(4)
	Material	Weight (lbs)	Approximate Location of Center of Gravity: Forward of Transom (feet)	Above Top of Keel (feet)
(G)				
(H)				
(I)				
(J)				
(K)				
(L)				

To complete section 2., the type, weight, and center of gravity of each allowable cargo/variable load, if carried needs to be recorded in the table **2.**(M)(1) through (**2.**(Q)(4):

Column (1) Identify the item of variable load or cargo.

Column (2) Enter the weight of the item of variable load or cargo (pounds).

Columns (3) and (4) Enter the approximate location of the longitudinal center of gravity forward of transom (feet) and the vertical center of gravity above the top of keel (feet).

Notes regarding cargo/variable loads:

- The maximum cargo and variable load weight should be onboard at the highest anticipated VCG during the SST.
- The cargo/variable load weight includes all dive gear, vehicles, luggage, or other deck cargo the vessel carries.
- Dive gear must be at least 80 pounds per diver and located in its stowed position.
- Follow the stability test procedure for vessels carrying both passengers and cargo/variable loads described on page iii.

Construction particulars are checked in row (R):

2.(R)(1) Check the appropriate propulsion machinery type.

2.(R)(2) Check the type of construction material used for the hull.

3. Passenger Test Weight Required:

Complete this section to determine the passenger test weight (W) required:

3.(A)(1) Enter the maximum number of passengers (Np) the vessel is intended to carry from **2.**(B)(1).

3.(A)(2) Enter the weight per person from **2.**(B)(2) (in most cases, 185 pounds).

3.(A)(3) Enter the result of the multiplication of Np (**3.**(A)(1)) by the weight per person (**3.**(A)(2)) which is the passenger test weight (W).

W simulates only the weight of passengers and does not include crew weight.

4. Required VCG (VCG_R) of the Passenger Test Weight:

Complete this section to calculate the VCG_R for the passenger test weight. The number of standing passengers is determined by “deck area” or “length of rail” criteria in 46 CFR 176.113(b)(1) or 46 CFR 176.113(b)(2). The number of seated passengers is determined by “fixed seating” criterion of 46 CFR 176.113(b)(3) and are assumed to be seated during a normal voyage.

4.(A)(3) and **4.**(B)(3) Enter the number of passengers that are considered to be standing and/or seated, respectively;

4.(A)(4) and **4.**(B)(4), respectively: Enter the product of the multiplication of the number of standing and of seated passengers (column (3)) by the VCG for standing and seated passengers (column (2)), respectively;

4.(C)(3) Enter the sum of the numbers of standing and seated passengers, which must equal the No. of Passenger (Np) entered in **3.**(A)(1);

4.(C)(4) Enter the sum of the products entered in **4.**(A)(4) and **4.**(B)(4);

4.(D)(1) Enter the sum of the products from **4.**(C)(4);

4.(D)(2) Enter the No. of Passenger (Np) from **4.**(C)(3);

4.(D)(3) Enter the result of the division of the sum of products (**4.**(D)(1)) by the No. of Passenger (Np) (**4.**(D)(2)), which is the VCG_R.

2. Test Information (continued):

Variable Loads/Cargo:

	(1)	(2)	(3)	(4)
	Variable Load or Cargo Type	Weight (lbs)	Approximate Location of Center of Gravity: Forward of Transom (feet)	Approximate Location of Center of Gravity: Above Top of Keel (feet)
(M)				
(N)				
(O)				
(P)				
(Q)				

Construction	Propulsion Machinery	Hull
(R)	□ - Steam □ - Internal Combustion - Diesel □ - Internal Combustion - Gasoline □ - Outboard Engine □ - Electric Motor □ - Other: _____	□ - Steel □ - Aluminum □ - FRP □ - Wood □ - Other: _____

3. Passenger Test Weight Required:

	(1) = **2.**(B)(1)	(2) = **2.**(B)(2)	(3) = (1) x (2)
	No. of Passengers (Np)	Weight Per Person (Wt./Person) (lbs)	Passenger Test Weight (W) (lbs)
(A)			

4. Required Vertical Center of Gravity of Test Weight (VCG_R):

	(1)	(2)	(3)	(4) = (2) x (3)
	Passenger who are:	VCG (inches)	Number of Passengers	VCG x N
(A)	Standing	39		
(B)	Seated/Sitting	30		
(C)	Standing and Seated	Sums of (3) and (4):		

Note: (C)(3) must equal Np given in **3.**(A)(1).

	(1) = (C)(4)	(2) = (C)(3)	(3) = (1) ÷ (2)
	VCG x N	Number of Passengers (Np)	VCG_R (inches)
(D)			

5. Actual Test Weight Vertical Center of Gravity (VCG_A):

The correct VCG of all passenger test weight is extremely important. The information entered in this section is used to calculate the VCG_A referenced from the deck on which the passenger test weight is located. The passenger test weight can be comprised of many different objects. The VCG_A of the test weight should be equal to or greater than the VCG_R (**4.**(D)(3)). However, there are cases when, for safety reasons, the test weights need to be arranged in a way that the VCG_A is less than the VCG_R, and, in such a case, a heeling moment correction to account for the difference is applied as specified in Section 12.

The VCG of any solid and symmetrical item is generally half the height of the item. If the item is not solid or of unusual shape, a conservative (high) estimate of the item's VCG should be made.

To obtain a VCG_A that is greater than or equal to the VCG_R and to obtain the needed total test weight, multiple test weights that are the same are often used (e.g., containers filled with water, purchased sand bags, concrete blocks) and stacked. The table in section 5 has been set up to provide for a quantity of the same item located at the VCG.

To facilitate all the test weights, their VCG and quantity, section 5 consists of two tables: The first table consists of 6 columns in which information about individual weight items, their VCG and their quantity are listed and intermediate calculation results are documented. In general:

Column (1) is where each item of the test weight is listed/described.
Column (2) is where, for each item, the weight of the item is entered.
Column (3) is where, for each item, the VCG above the deck on which the item is located is entered.
Column (4) is where, for each similar item, the quantity of the item at the given VCG is entered.
Column (5) is where the result of the multiplication of the weight and quantity of the item is entered.
Column (6) is where the result of the multiplication of the VCG and the weight times quantity of the item is entered.

In Rows (A) through (P) (i.e., the first table in section 5), the information about the weight items are to be entered.

5.(Q)(3) Enter the sum of all products of weights times quantities, which is the total test weight.

5.(Q)(4) Enter the sum of all products of VCG multiplied by product of all weights and quantities.

In the last table:

5.(R)(1) Enter the sum of all weights multiplied by their quantity from **5.**(Q)(5).

5.(R)(2) Enter the sum of all products of VCG multiplied by weight and by quantity from **5.**(Q)(6).

5.(R)(3) Enter the result of dividing the sum of all products **5.**(R)(2) by the sum of all weight 5.(R)(1) to obtain the VCG_A.

5. Actual Test Weight Vertical Center of Gravity (VCG_A):

	(1)	(2)	(3)	(4)	(5) = (2) x (4)	(6) = (5) x (3)
	Item	Weight of Item (We) (lbs)	VCG Above Deck (inches)	Quantity (#)	We x # (lbs)	We x # x VCG (inch-lbs)
(A)						
(B)						
(C)						
(D)						
(E)						
(F)						
(G)						
(H)						
(I)						
(J)						
(K)						
(L)						
(M)						
(N)						
(O)						
(P)						
(Q)				Sums of (5) and (6)		

	(1) = (Q)(5)	(2) = (Q)(6)	(3) = (2) ÷ (1)
	Sum of We x #	Sum of VCG x We x #	VCG_A (inches)
(R)			

6. Distribution of Test Weight on Upper Deck and Main Deck:

This section identifies the amount of passenger test weight to be placed on each deck.

For **a vessel with only one passenger deck available to passengers**, only rows (A) and (E) of this section should to be completed. In this case, the value entered in **6.**(A)(1) should be "0"; the value entered in **6.**(E)(2) should be "0" (whether an upper deck exists or not); the entire passenger test weight, W, should be placed on the single passenger main deck and this value entered in **6.**(E)(3).

For **a vessel with one upper deck also available to passengers**, the test weight must be distributed so that the maximum number of passengers allowed on the upper deck in service is simulated. For this vessel, the passenger test weight distributed on the upper deck must not be less than that calculated in **6.**(E)(2).

For a vessel with one upper deck:

6.(A)(1) Indicate whether there is an upper deck also available to passengers in addition to the main deck by entering the number of decks. If this number is more than 1, STOP – the SST is not applicable.

6.(A)(2) Check the box for "(A)(1) = 1".

6.(B)(1) Enter the number of passengers, Np, from **2.**(B)(1).

6.(B)(3) Enter the result of multiplying Np (6.(B)(1)) by 0.75, rounded to the nearest whole number.

6.(C)(1) Enter the maximum number of passengers that are permitted to be carried on the Upper Deck per deck area, rail length, and/or fixed seating criteria (see **2.**(B)(1), page 1-2).

6.(C)(2) Enter the value for ¾Np from **6.**(B)(3).

6.(C)(3) Enter the result of subtracting **6.**(C)(2) from **6.**(C)(1).

6.(C)(4) Check the appropriate box with respect to the result in **6.**(C)(3). If **6.**(C)(3) is greater than or equal to zero, go directly to Row (E) (i.e., the Total Test Weight is put on the upper deck for the test.)

6.(D)(1) Enter the number of passengers that are to be carried on the Upper Deck from **6.**(C)(1).

6.(D)(2) Enter the Weight per Person from **2.**(B)(2).

6.(D)(4) Enter the result of multiplying the values in **6.**(D)(1), **6.**(D)(2), and **6.**(D)(3); this value is the weight to be placed on the Upper Deck. Note: the value in **6.**(D)(3), "1.33", is a safety factor.

6.(E)(1) Enter the Passenger Test Weight (W) from **3.**(A)(3).

6.(E)(2) Enter the Weight on Upper Deck. This value will be: ● zero if **6.**(A)(1) equals zero,
- ● the Passenger Test Weight (W) if **6.**(C)(3) ≥ 0, or
- ● the value of the Weight on Upper Deck calculated in **6.**(D)(4).

6.(E)(3) Subtract the Weight on Upper Deck **6.**(E)(2) from the Passenger Test Weight (W) **6.**(E)(1) and enter the result.

The passenger test weight should be longitudinally and transversely distributed onboard the vessel to simulate the normal passenger location and should ensure that normal operating trim and list of the vessel is obtained. When the arrangement of the vessel prohibits placement of the passenger test weight in the expected normal location of passengers, the passenger test weight should be distributed such that the center of gravity of the test weight matches the center of gravity of the normal passenger load. Some vessels may have a natural list that should *not* be corrected with the test weights.

6. Distribution of Test Weight:

	(1)	(2)
	No. of Decks above the Deck from which freeboard is measured (D), excluding pilothouse	□ - If (A)(1) = 0, then complete Row (E) with Weight on Upper Deck = 0; □ - If (A)(1) = 1, then complete Rows (B) through (E)
(A)		

	(1) = **2.**(B)(1)	(2)	(3) = (1) x (2)
	No. of Passengers (Np)		¾ Np (round to nearest whole number)
(B)		0.75	

	(1)	(2) = (B)(3)	(3) = (1) – (2)	(4)
	No. of Passengers On Upper Deck	¾ Np	No. of Passengers on Upper Deck minus ¾ Np	□ - If (C)(3) ≥ 0, then Passenger Test Weight (W) = Weight on Upper Deck Go to Row (E); □ - If (C)(3) < 0, then go to Row (D)
(C)				

	(1) = (C)(1)	(2) = **(2)**(B)(2)	(3)	(4) = (1) x (2) x (3)
	No. of Passengers On Upper Deck	Weight Per Person (lbs)		Weight on Upper Deck (lbs)
(D)			1.33	

	(1) = **3.**(A)(3)	(2)	(3)

	Passenger Test Weight (W) (lbs)	Weight on Upper Deck (lbs)
		If (A)(1) = 0, then (2) = 0;
		If (C)(3) ≥ 0, then (2) = (1);
		Otherwise (2) = (D)(4)
			Weight on Main Deck (lbs)
			If (A)(1) = 0, then (3) = (1);
			Otherwise (3) = (1) – (2)

(E)			

7. Vessel Measurements with Vessel in Loaded Condition with Weight Onboard:

This section should be completed only after all the passenger test weight (W) is onboard the vessel at the proper VCG and the vessel is in the loaded condition with all crew, cargo, dive gear, outfitting, and other variable loads onboard. Vessel measurements may then be taken. Measurements for Length Overall (LOA), Maximum Beam (B), and Maximum Beam in way of the Reference Station (B_f) are to exclude rub rails. *Be careful to enter the measured value in the proper units (feet or inches)!*

7.(A)(1) Enter the length overall (LOA). The LOA should exclude bowsprits, rudders, outboard motor brackets and other similar fittings, attachments, and extensions.
On a cockpit type vessel, the LOA is taken as the length of the weather deck.

7.(B)(1) Enter the distance of the reference mark from the bow (L_R). The reference station must be measured at the point of minimum freeboard or at a point ¾ of the vessel's length from the bow if the point of minimum freeboard is aft of this point.

7.(C)(1) and **7.**(D)(1) Enter the freeboards at the bow and stern (F_B and F_S, respectively) on the appropriate lines. These measurements should be taken at the centerline.

7.(E)(1) Enter the maximum beam (B_F) on the deck in way of the Reference Station. On vessels where the main deck extends outboard of the hull, B_F should be measured as the breadth of the hull and exclude any rubrails or deck extension beyond the hull.

7.(F)(1) Enter the maximum beam to the outside of the shell (B) – this value must be equal to or greater than B_F.

7.(G)(1) Enter the maximum beam (B_P) accessible to passengers. This value may be greater than B_F if there is a deck extension beyond the hull; this value may also be less than B_F if passengers are restricted from accessing space close to be full beam of the hull.

7.(H)(1) Enter the Reference freeboard measurement (f) at the reference station on the side with the least freeboard. The Reference Freeboard (f) is measured from the waterline (WL) to the top of the weather deck at the side of the vessel for a flush deck or well deck vessel and from the WL to the top of the gunwale for a cockpit vessel or open boat. Downflooding points must not exist below the gunwale. Great care should be taken with this measurement because it is critical.

If a vessel operates on other than protected waters and either is a well deck vessel with Reference Freeboard (f) less than 10 inches or is a cockpit vessel with the cockpit deck less than 10 inches above the waterline, then **STOP**: The vessel must comply with intact and damage stability and subdivision requirements in Subchapter S per 46 CFR 178.420(b); the SST is not applicable – see **1.**(M)(1).

If the vessel is a cockpit vessel or a well deck vessel with an exposed recess in the weather deck, show these features by adding dotted lines on the sketches in this section and indicate cockpit length L_C (entered at **8**.(D)(1)) or the length of the exposed recess in the weather deck for a well deck vessel.

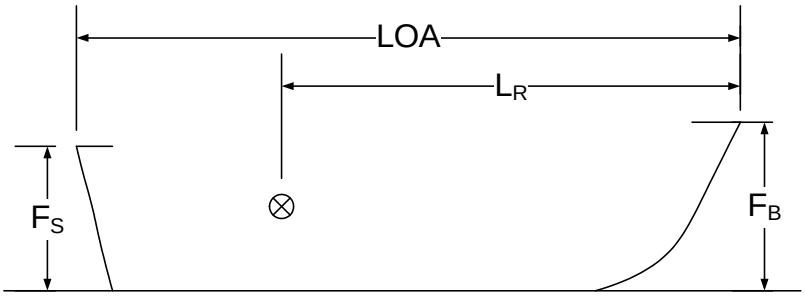
7.(I)(1) Enter the height of the gunwale above the waterline (f_G) for a well deck vessel that operates on protected waters. If the vessel is neither a well-deck vessel nor operates on protected waters, make no entry.

7.(J)(1) If the vessel is a catamaran, enter the draft at amidships.

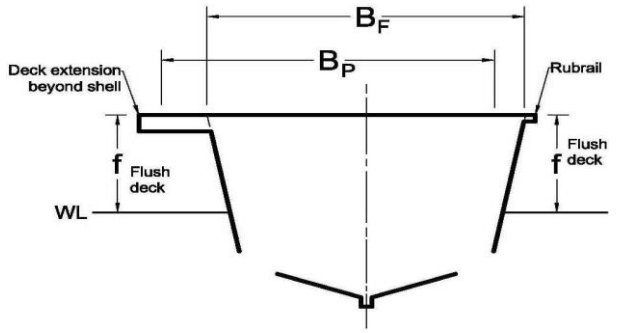
7.(K)(1) On the section view most similar to the vessel to which the SST is applied, complete the sketch to show whether the vessel has a round or hard-chined hull form and check the box corresponding to the bottom configuration. This needs to be identified since chine-emergence during the test can alter the SST outcome (see page 1-15).

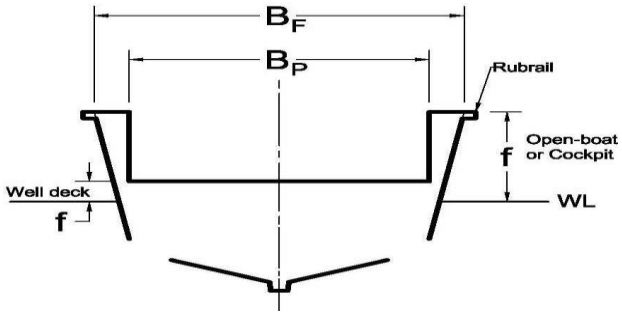
7. Vessel Measurements with Vessel in Loaded Condition with Weight Onboard:

All vessels:

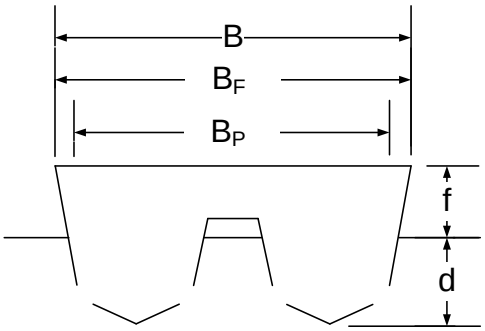


Monohulls:





Catamarans:



		(1)	
	Length Over All; (if Cockpit type vessel, LOA = Length on Weather Deck)		
(A)	LOA =		feet
	Distance of reference station from the bow		
(B)	L_R =		feet
	Freeboard at the bow		
(C)	F_B =		inches
	Freeboard at the stern		
(D)	F_S =		inches
	Maximum beam on deck in way of Reference Station		
(E)	B_F =		feet
	Maximum beam to outside of shell; ≥ B_F		
(F)	B =		feet
	Maximum beam accessible to passengers		
(G)	B_P =		feet
	Reference freeboard height		
(H)	f =		Inches
	Gunwale height above waterline (Well Deck Vessel on protected waters)		
(I)	f_G =		Inches
	Amidships Draft (catamarans)		
(J)	d =		Inches
	Bottom configuration (show on sketch)		
(K)	□ - Round; □ - Hard Chine		

IMPORTANT

With weight onboard, the Reference Freeboard (f) is measured at the reference station from the waterline (WL) to the top of the weather deck at the side of the vessel with least freeboard for a flush deck or well deck vessel and from the WL to the top of the gunwale for a cockpit vessel or open boat. This is a critical measurement and should be taken with great care.

8. Location of Immersion Mark (i) Above Load Waterline Prior to Applying Heeling Moment:

This section is used to calculate the location of the immersion mark (i) above the load waterline from which the Reference freeboard (f) was measured **7.**(H)(1). This mark shows the limit of heel the vessel may heel during the SST (see 46 CFR 178.330(d)). All but one immersion mark (i) calculation is based on the Reference Freeboard (f) recorded in Section 7.

8.(A)(1) Check the box corresponding to the vessel type since the calculation for the immersion mark (i) location is based on this. Definitions for cockpit vessel, flush deck vessel, open boat, sailing vessel, and well deck vessel are given in 46 CFR 175.400. A catamaran type vessel is not defined in regulation but is understood to mean a vessel with two parallel, geometrically similar hulls that are connected by a cross-structure that is at least partially buoyant (distinguished from a pontoon vessel).

8.(A)(2) This gives the instructions about which Rows in Section 8 are to be completed.

8.(A)(3) This directs the user to complete Row (M) to determine the location of (i).

Sub-section 8.1 – Each vessel: Row (B) – The maximum height of the immersion mark (i) to limit the final angle of list to 14° must be calculated for each vessel (46 CFR 178.330(d)(7)):

8.(B)(1) Enter the maximum beam of the hull in feet at the Reference Station from **7.**(E)(1).

8.(B)(3) Enter the result of the multiplication of **8.**(B)(1) by 1.5 to obtain the maximum height of (i) above the WL in inches. To check that the height of the immersion mark (i) does not exceed this value, this value is entered in **8.**(M)(1), regardless of vessel type.

Sub-section 8.2 – Cockpit Type Vessel: – Rows (C) and (E) or Rows (C) through (E) – must be calculated for each cockpit type vessel.

8.(C)(1) Check the box to answer whether the height of the cockpit deck is less than 10 inches above the waterline.

8.(C)(2) If the answer to **8.**(C)(1) is "**Yes**" and the vessel operates on protected waters, then – Go to **8.**(E)(1); **do not complete Row (D)**. If the answer to **8.**(C)(1) is "**Yes**" and the vessel operates on either exposed or partially protected waters, then **STOP**: the SST is not applicable – see **1.**(M)(1) and instructions for **7.**(H)(1).
If the answer to **8.**(C)(1) is "**No**", then – Go to Row (D).

8.(D)(1) Enter the length of the cockpit, L_C, in feet.

8.(D)(2) Enter the length of the weather deck in feet, LOA, which is taken from **7.**(A)(1).

8.(D)(3) Enter the result of dividing L_C (**8.**(D)(1)) by the LOA (**8.**(D)(2)). This result must be less than or equal to 0.5 in order for the vessel to meet the definition of a *cockpit vessel*.

8.(D)(4) Refer to **2.**(D)(2) to determine which box to check to determine the value "K": check "1.5" if the vessel operates on exposed waters; check "1.0" if the vessel operates on partially protected or protected waters.

8.(D)(5) Enter the result of multiplying Lc/LOA (**8.**(D)(3)) by the value K that is checked in **8.**(D)(4) (either 1.5 or 1.0).

8.(D)(7) Enter the result of subtracting K(L_C/LOA) from 2 to obtain "C".

8.(E)(1) Enter the value "1" if "**Yes**" is checked in **8.**(C)(1); otherwise, enter the value of C calculated and entered in **8.**(D)(7).

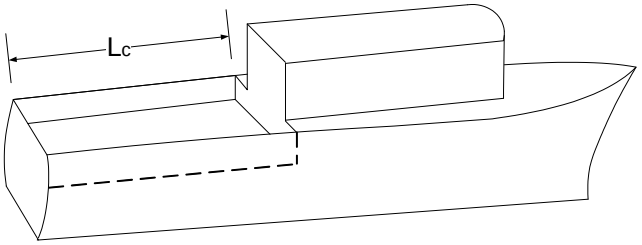
8.(E)(2) Enter the Reference Freeboard recorded in **7.**(H)(1).

8.(E)(4) Enter the result of multiplying C (**8.**(E)(1)) by the Reference Freeboard (**8.**(E)(2)) and dividing that product by 4 (**8.**(E)(3)). Enter this value, which is the height of (i) above the waterline, in **8.**(M)(2).

8. Location of Immersion Mark (i) Above Load Waterline Prior to Applying Heeling Moment:

	(1)	(2)	(3)
(A)	If Vessel is a -	Then -	Then complete Row (M) with results.
	□ - Cockpit Type Vessel,	complete Row (B) and Rows (C) through (E);	
	□ - Well Deck Type Vessel,	complete Row (B) and Rows (F) through (H);	
	□ - Flush Deck Type Vessel,	complete Row (B) and Row (H);	
	□ - Flush Deck Type Sailing,	complete Row (B) and Row (I);	
	□ - Open Boat Type Vessel,	complete Row (B) and Row (J);	
	□ - Catamaran Type Vessel,	complete Row (B) and Rows (K) and (L);	

8.1	**Each Vessel:**	(1) = **7.**(E)(1)	(2)	(3) = (1) x (2)	Check if least (i)
(B)	Height of immersion mark (i) must not exceed value in (B)(3) to limit heel to 14°	Maximum beam (B_F) on deck in way of Reference Station (feet)		Max Height of (i) above WL (inches)	
			1.5		□

8.2	**Cockpit Type Vessel:**	(1)	(2)
(C)	Reference freeboard (f) measured to top of gunwale  Cockpit	Height of cockpit deck above WL Less than 10 inches?	C
		□ - Yes; □ - No*	If (C)(1) = "Yes", then C = 1; Go to (E)(1) If (C)(1) = "No", then Go to Row (D)

* Note: Check **1.**(M)(1) – The SST cannot be used if a cockpit vessel both operates on either exposed or partially protected waters and has a cockpit deck less than 10 inches above the waterline.

	(1)	(2) = **7.**(A)(1)	(3) = (1) ÷ (2)	(4) see **2.**(D)(2)	(5) = (3) x (4)	(6)	(7) = (6) - (5)
(D)	Length of Cockpit L_C (feet)	LOA (feet)	L_C / LOA**	K	K(L_C/LOA)		C = 2 - K(L_C/LOA)
				□ - 1.5, if exposed route □ - 1.0, otherwise		2	

** Note: L_C / LOA, (D)(3), must not be greater than 0.5 (*Cockpit vessel* definition in 46 CFR 175.400).

	(1) = "1" if (C)(1) = "Yes"; Otherwise, (1) = (D)(7) - see (C)(2)	(2) = **7.**(H)(1)	(3)	(4) = (1) x (2) ÷ (3)	Check if least (i)
(E)	C	Reference Freeboard (f) (inches)		Height of (i) above WL (inches)	
			4		□

Sub-section 8.3 – Well Deck Type Vessel: Rows (F) and (G) or Rows (F) and (H) must be completed for all well deck vessels:

For the SST to be applicable (see **1.**(M)(1)), 46 CFR 178.430(d) requires the deck of a well deck vessel operating on either exposed or partially protected waters to be at least 10 inches above the waterline. Otherwise, the vessel must comply with intact and damage stability and subdivision requirements in Subchapter S.

8.(F)(1) Check the box corresponding to "Yes" or "No" to answer if the vessel is fitted with non-return scuppers or non-return freeing ports.

8.(F)(2) Check the box corresponding to "Yes" or "No" after confirming the status of **2.**(D)(2) that the stability route is protected waters.

If the answer to either **8.**(F)(1) or **8.**(F)(2) is "No", go to **8.**(F)(6).

8.(F)(3) Enter the height of the gunwale above the waterline (f_G) in inches from **7.**(I)(1).

8.(F)(4) Enter the reference freeboard (f) in inches from **7.**(H)(1).

8.(F)(5) Enter the result of the division of f_G (**8.**(F)(3)) by f (**8.**(F)(4)).

8.(F)(6) Check the box "STOP- SST not applicable" if:
8.(F)(2) = "No"; and **8.**(F)(4) < 10, as stated above;
Check the box "Go to (G)(1) if:
8.(F)(1) = "Yes"; and **8.**(F)(2) = "Yes"; and **8.**(F)(5) ≥ 4, then go to Row (G);
If any one of these three conditions is not satisfied,
go to Row (H) – (applicable to both flush deck type vessels and well deck type vessels that do not satisfy **8.**(F)(1) = "Yes"; and **8.**(F)(2) = "Yes"; and **8.**(F)(5) ≥ 4 conditions)

8.(G)(1) Enter the reference freeboard (f) in inches from **8.**(F)(4). Then, go to Row (M) and enter this value, the height of (i) above the waterline, in **8.**(M)(2).

Sub-section 8.4 – Flush Deck Type Vessel, including Well Deck Vessel from 8.(F)(6):

8.(H)(1) Enter the reference freeboard (f) in inches from **7.**(H)(1).

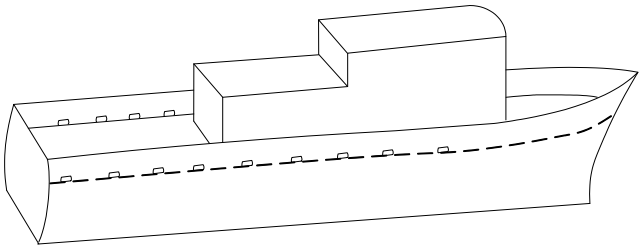
8.(H)(3) Enter the result of the division of the reference freeboard (f) **8.**(H)(1) by 2. Then, go to Row (M) and enter this value, the height of (i) above the waterline, in **8.**(M)(2).

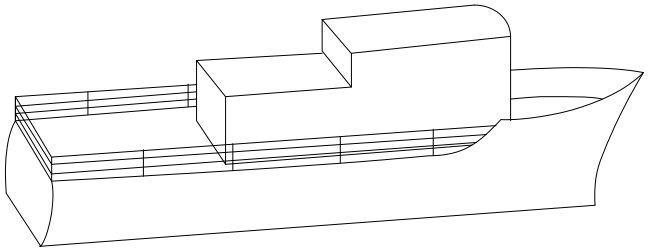
8. Location of Immersion Mark (i) Above Load Waterline Prior to Application of Heeling Moment (continued):

8.3	**Well Deck Type Vessel**					
	(1)	(2)	(3) = **7.**(I)(1)	(4) = **7.**(H)(1)	(5) = (3) ÷ (4)	(6)

(F)	Fitted with non-return scuppers or non-return freeing ports	Stability route = protected waters (See **2.**(D)(2)	f_G (inches)	f (inches)	f_G / f	If (F)(2) = "No" and (F)(4) < 10, then **STOP**;
						If (F)(1) = "Yes" and (F)(2) = "Yes"and (F)(5) ≥ 4, then Go to (G)(1);
						Otherwise, Go to Row (H)

	□ - Yes □ - No	□ - Yes □ - No				□ - STOP–SST not applicable □ - Go To (G)(1) □ - Go To Row (H)

		(1) = (F)(4)	Check if least (i)
(G)	 Well Deck	Height of (i) above Waterline (inches)	
			□

8.4	**Flush Deck Type Vessel, including Well Deck Type Vessel from (F)(6)**	(1) = **7.**(H)(1)	(2)	(3) = (1) ÷ (2)	Check if least (i)
(H)	 Flush Deck	Reference Freeboard (f)		Height of (i) above WL (inches)	
			2		□

Sub-section 8.5 – Flush Deck Type Sailing Vessel:

8.(I)(1) Enter the reference freeboard (f) in inches from **7.**(H)(1).

8.(I)(2) Enter the value in **8.**(I)(1). Then, go to Row (M) and enter this value, the height of (i) above the waterline, in **8.**(M)(2).

Sub-section 8.6 – Open Boat Type Vessel:

8.(J)(1) Enter the reference freeboard (f) in inches from **7.**(H)(1).

8.(J)(3) Enter the result of the division of the reference freeboard (f) **8.**(J)(1) by 4. Then, go to Row (M) and enter this value, the height of (i) above the waterline, in **8.**(M)(2).

Sub-section 8.7 – Catamaran Type Vessel: Rows (K) and (L) must be completed for all catamarans:

8.(K)(1) Enter the reference freeboard (f) in inches from **7.**(H)(1).

8.(K)(2) Enter the draft amidships (d) in inches from **7.**(J)(1).

8.(K)(3) Enter the value that is least of the values in **8.**(K)(1) and **8.**(K)(2).

8.(L)(2) Enter the result of the division of the value in **8.**(K)(3) by 3. Then, go to Row (M) and enter this value, the height of (i) above the waterline, in **8.**(M)(2).

Sub-section 8.8 – Each Vessel: Row (M) - The height of the immersion mark (i) must be the lesser of the following two values: the maximum height determined in Sub-section 8.1 and the height of (i) determined for the type vessel:

8.(M)(1) Enter the maximum height of (i) in inches above the waterline from **8.**(B)(3).

8.(M)(2) Enter the height of (i) in inches for the type vessel from:

8.(E)(4), if the vessel is a cockpit type vessel;

8.(G)(1), if the vessel is a well deck type vessel with non-return scuppers, ample height of gunwale and operating on protected waters;

8.(H)(3), if the vessel is a flush deck type vessel or a well deck type vessel without non-return scuppers or ample height of gunwale or not operating on protected waters;

8.(I)(2), if the vessel is flush deck type sailing vessel;

8.(J)(3), if the vessel is an open boat type vessel;

8.(L)(2), if the vessel is a catamaran type vessel.

8.(M)(3) Enter the value in inches that is least of the values in **8.**(M)(1) and **8.**(M)(2). This value is the height of the immersion mark above the waterline.

The immersion mark (i) should be fixed on the hull above the WL at the Reference station on the side with the least freeboard. Since subsequent sections require actual measurement of the vertical distance of (i) to the WL, some means of doing so should be provided, either by measuring from a small boat, or by fastening to the hull along with the (i) mark a vertical length of waterproof measuring tape whereby the (i)-WL distance can be read directly. Although not required, the mark for (i) is often conveniently made using a large piece of tape, with the bottom edge marking (i).

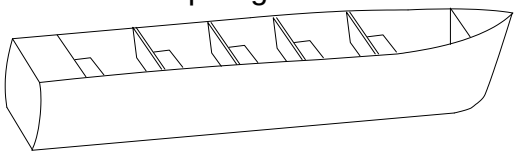
Row (N): This row assesses the allowable heel angle so that the person performing the SST (**1.**(D)(1)) can determine the potential for tipping and/or sliding of unsecured objects, including weights.

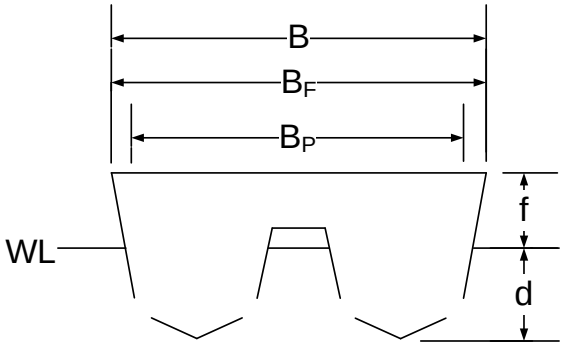
8.(N)(1) Enter the result of the division of the value in **8.**(M)(3) by the value in **8.**(M)(1).

8.(N)(2) If the value in **8.**(N)(1) is greater than 0.7, the immersion limit given by the height of (i) means that the heel angle could exceed 10 degrees and still be acceptable. However, the potential for tipping and even sliding of unsecured objects (e.g., the test weights) exists that might be a hazard to personnel (e.g., a tall weight with a narrow base might tip over if the maximum heel were to occur). So, consideration should be given to re-distributing weight to avoid such hazards.

8. Location of Immersion Mark (i) Above Load Waterline Prior to Applying Heeling Moment:

8.5		(1) = **7.**(H)(1)	(2) = (1)	Check if least (i)
(I)	**Flush Deck Type Sailing Vessel**	Reference Freeboard (f)	Height of (i) above WL (inches)	
				□

8.6	**Open Boat Type Vessel:**	(1) = **7.**(H)(1)	(2)	(3) = (1) ÷ (2)	Check if least (i)
(J)	Reference freeboard (f) measured to top of gunwale  Open-boat	Reference Freeboard (f)		Height of (i) above WL (inches)	
			4		□

8.7	**Catamaran Type Vessel:**	(1) = **7.**(H)(1)	(2) = **7.**(J)(1)	(3) = min ((1), (2))
(K)	**M**ust be non-sailing, flush deck, and propelled by mechanical means only	Reference Freeboard (f) (inches)	Amidships Draft (d) (inches)	Least of freeboard (f) or draft (d)
(L)		(1)	(2) = (K)(3) ÷ (1)	Check if least (i)
			Height of (i) above WL (inches)	
		3		□

8.8	**Each Vessel**		
	(1) = (B)(3)	(2) = (E)(4); or (G)(1); or (H)(3); or (I)(2); or (J)(3); or (L)(2)	(3) = min ((1), (2))
(M)	Max Height of (i) above WL (inches)	Height of (i) for Type Vessel (inches)	Least Height of (i) above WL (inches)

	(1) = (M)(3) ÷ (M)(1)	(2)
(N)		If (N)(1) > 0.7, the heel angle may exceed 10 degrees → employ safety measures (see instructions). □ - (N)(1) > 0.7; safety measures employed.

9. Wind Heel Calculations for 46 CFR 178.330(b):

Complete this section to identify the wind profile of the vessel for the test. With the vessel in the loaded condition, block off the profile of the vessel into lettered rectangles using vertical lines starting at the waterline in the loaded condition, as shown in the example diagram at the top of this section. Include all passenger railings, canopies, cargo, vehicles, and spotting towers. For sailing vessels, this includes the area of all bare poles including masts, booms, gaffs and, boomkins. For sailing vessels without auxiliary propulsion, include the area of storm sails.

Measure the length (L) and height (V) of each rectangle and enter into the table in this section.
For rectangle section (A):

- **9.**(A)(1) Enter the length (L) in feet of rectangle section (A) of the wind profile diagram.
- **9.**(A)(2) Enter the height (V) in feet of rectangle section (A) of the wind profile diagram.
- **9.**(A)(3) Enter the result of the multiplication of L (**9.**(A)(1)) times V (**9.**(A)(2)) to obtain the area A of rectangle section (A).
- **9.**(A)(4) Enter the result of the multiplication of V (**9.**(A)(2)) times 0.5 to obtain the vertical center (H) of rectangle section (A).
- **9.**(A)(5) Enter the result of the multiplication of A (**9.**(A)(3)) times H (**9.**(A)(4)) to obtain the vertical moment of area (M_A) of rectangle section (A).

For each remaining rectangle section in the wind profile diagram, repeat the process of entries in columns (1) through (5) as performed for rectangle section (A).

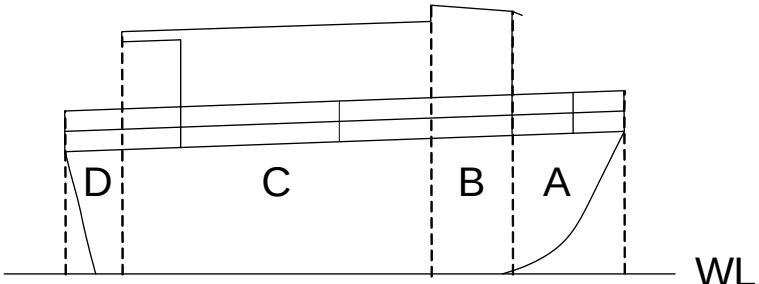
Eight rows, lettered (A) through (H), are provided to record the entries for the rectangle sections, however, in many cases, fewer rectangle sections are needed to complete a wind profile for the vessel.

Row (I): Sums of the lengths (column (1)) and the moments of area (column (5)) of the rectangle sections are recorded in this row:

- **9.**(I)(1) Enter the sum of all lengths of the rectangle sections recorded in rows (A) through (H). This value, in feet, should equal the LOA recorded in **7.**(A)(1). If it does not, re-check the validity of the wind profile diagram, the values of L and V recorded as well as the value of LOA recorded in **7.**(A)(1) and correct any errors found.
- **9.**(I)(5) Enter the sum of all moments of area (M_A) of the rectangle sections recorded in rows (A) through (H). If corrections are made to the values of rectangle section lengths, the values of the moments of area entered in rows (A) through (H) in column (5) should also be checked and/corrected if necessary.
- **9.**(J)(1) Enter the scale used in the wind profile diagram as the length of one side of a single square equal to [scale] in feet.

9. Wind Heel Calculations:

Notes:
L = Length of section in feet
V = Height of section in feet



Record the scale of the profile sketch in **9.**(J)(1).

-Profile-

-Calculations-

	(1)	(2)	(3) = (1) x (2)	(4) = (2) x 0.5	(5) = (3) x (4)
Section	L (feet)	V (feet)	A (L x V) (ft^2)	H (0.5 x V) (ft)	A x H ($ft\text{-}ft^2$)
(A)					
(B)					
(C)					
(D)					
(E)					
(F)					
(G)					
(H)					
(I)				Sum (A x H)= M_A	

Note: Sum (I)(1) should equal LOA, **7.**(A)(1).

		(1)	
(J)	Scale: 1 square =		feet

10. Sailing Vessel Wind Heel Calculations for 46 CFR 178.330(c)(3):

Complete this section to identify the wind heel profile of a sailing vessel with sails set and trimmed flat for largest sail area configuration desired in accordance with sail plan. If the vessel is not a sailing vessel, skip this section and go to section 11. This section is intended for vessels with fore and aft rigs. Contact the Marine Safety Center if the vessel has another rigging arrangement.

With the vessel in the loaded condition, block off the profile of the sails into lettered rectangles and triangles. Measure the length of the foot of the sail (L), the vertical height of the sail (V), and height of the foot (H_F) of each sail. The height of the foot (H_F) is the vertical distance from the waterline to the foot of the sail.

Enter the length of the foot of the sail (L) and vertical height of the sail (V) into the table in this section and perform related calculations:

Measure the length (L) and height (V) of each sail and enter into the table in this section. For the calculations of area (A) and height of the center of sail (H) in columns (5) and (7), use the formulas in the note table below.

Type of Sail:	Area:	Height of Vertical Center:
Gaff Sails:	A = L x V	H = 0.5 x V + H_F
Triangular Sails:	A = 0.5 x L x V	H = 0.33 x V + H_F

For sail section (A):

- **10.**(A)(1) Enter the name of the sail corresponding to sail section (A) of the wind profile diagram.
- **10.**(A)(2) Enter the type of sail, either “Gaff” or “Triangular,” of sail section (A).
- **10.**(A)(3) Enter the length (L) in feet of the foot of sail section (A) of the wind profile diagram.
- **10.**(A)(4) Enter the height (V) in feet of sail section (A) of the wind profile diagram.
- **10.**(A)(5) Enter the result of the calculation for area according to the formula corresponding to the sail type for sail section (A).
- **10.**(A)(6) Enter the height of the foot of the sail (H_F) in feet above the waterline.
- **10.**(A)(7) Enter the result of the calculation for height of the center of the sail according to the formula corresponding to the sail type for sail section (A).
- **10.**(A)(8) Enter the result of the multiplication of A (**10.**(A)(5)) times H (**10.**(A)(7)) to obtain the vertical moment of area of sail section (A).

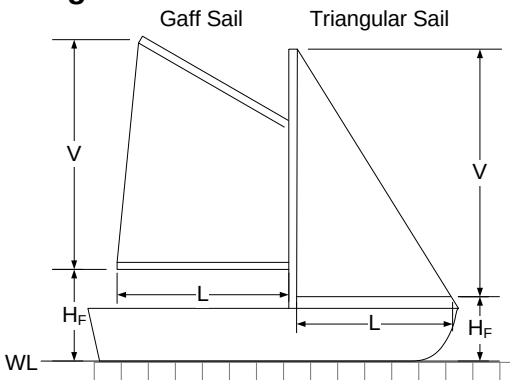
For each remaining sail section in the wind profile diagram, repeat the process of entries in columns (1) through (8) as performed for sail section (A).

Three rows, lettered (A) through (C), are provided to record the entries for the sail sections. If there are more than three sails, divide the existing rows into two using a horizontal line to do so and proceed in making the entries.

Row (D): The sum of the moments of area (column (8)) of the sail sections are recorded in this row:

- **10.**(D)(8) Enter the sum of all moments of area of the sail sections (M_{AS}) recorded in rows (A) through (C).
- **10.**(E)(1) Enter the scale used in the wind profile diagram as the length of one side of a single square equal to [scale] in feet.

10. Sailing Vessel Sail Wind Area Calculations for 46 CFR 178.330(c)(3):



L = Length of foot of sail in feet
V = Vertical height of sail in feet
H_F = Height of foot of sail in feet
H = Height of center of sail in feet
A = Area of sail in square feet

Note. Record the scale of the profile sketch in **10.**(E)(1).

-Profile-

-Calculations-

	(1)	(2)	(3)	(4)	(5) see Notes below	(6)	(7) see Notes below	(8) = (5) x (7)
	Sail Name	Sail Type	L (ft)	V (ft)	A (ft^2)	H_F (ft)	H (ft)	A x H (ft-ft^2)
(A)								
(B)								
(C)								
(D)							Sum (A x H) (M_{AS})=	

Notes:

	Calculation for (5)	Calculation for (7)
Gaff Sails:	A = L x V = (3) x (4)	H = V ÷ 2 + H_F = (4) ÷ 2 + (6)
Triangular Sails:	A = L x V ÷ 2 = (3) x (4) ÷ 2	H = V ÷ 3 + H_F = (4) ÷ 3 + (6)

		(1)	
(E)	Scale: 1 square =		feet

11. Required Heeling Moment (HM_R):

Complete this section to calculate the minimum required heeling moment (HM_R) to be applied to the vessel during the SST. The HM_R is the maximum of the Passenger heeling moment (M_P), the Wind heeling moment (M_W), and the Sailing vessel wind heeling moment (M_{WS}) determined in this section:

11.(A)(1) Enter the Passenger test weight (W) in pounds from **3.**(A)(3).

11.(A)(2) Enter the Maximum beam accessible to passengers (B_P) in feet from **7.**(G)(1).

11.(A)(4) Enter the result of multiplying W (**11.**(A)(1)) with B_P (**11.**(A)(2)) and dividing that product by 6. This value is the Passenger heeling moment in foot-pounds (M_P).

11.(B)(1) Check the box corresponding to the stability route of the vessel from **2.**(D)(2).

11.(B)(3) Enter the sum of the moments of area (M_A) in feet-feet^2 from **9.**(I)(5).

11.(B)(4) Enter the result of multiplying the wind pressure (P) (**11.**(B)(2)) that corresponds to the stability route of the vessel checked (**11.**(B)(1)) by M_A (**11.**(B)(3)). This value is the Wind heeling moment in foot-pounds (M_W).

Note: Complete Row (C) only if the vessel is a sailing vessel as defined in 46 CFR 175.400.

11.(C)(1) Enter the sum of the moments of area (M_A) in feet-feet^2 from **9.**(I)(5).

11.(C)(2) Enter the sum of the moments of sail area (M_{AS}) in feet-feet^2 from **10.**(D)(8).

11.(C)(3) Enter the combined sum of the moments of area in feet-feet^2, which is the addition of the values in **11.**(C)(1) and **11.**(C)(2).

11.(C)(5) Enter the result of multiplying the wind pressure (P) (**11.**(C)(4) = 1.0 lbs/ft^2) by the combined sum of the moments of area (**11.**(B)(3)). This value is the Sailing vessel wind heeling moment in foot-pounds (M_{WS}).

11.(D)(1) Enter the maximum of the Passenger heeling moment (M_P) (**11.**(A)(3)), the Wind heeling moment (M_W) (**11.**(B)(4)), and, if applicable, the Sailing vessel wind heeling moment (M_{WS}) (**11.**(C)(5)). This value is the Required heeling moment in foot-pounds (HM_R).

11.(D)(2) Check the box corresponding to the heeling moment that is the maximum of the Passenger heeling moment (M_P), the Wind heeling moment (M_W), and the Sailing vessel wind heeling moment (M_{WS}) recorded in **11.**(D)(1).

11. Required Heeling Moment (HM_R):

Passenger Heeling Moment (M_P)				
	(1) = **3.**(A)(3)	(2) = **7.**(G)(1)	(3)	(4) = (1) x (2) ÷ (3)
	Passenger Test Weight (W) (lbs)	Maximum Beam Accessible to Passengers (B_P) (feet)		Passenger Heeling Moment (M_P) (ft-lbs)
(A)			6	

Wind Heeling Moment (M_W)				
	(1) = **2.**(D)(2)	(2)	(3) = **9.**(I)(5)	(4) = (2) x (3)
	Stability Route	Wind Pressure (P) (lbs/ft^2)	Sum (A x H) (M_A) (ft-ft^2)	Wind Heeling Moment (M_W) (ft-lbs)
(B)	□ - Exposed → □ - Partially Protected→ □ - Protected →	15.0 10.0 7.5		

Sailing Vessel Wind Heel Moment (M_{WS})					
	(1) = **9.**(I)(5)	(2) = **10.**(D)(8)	(3) = (1) + (2)	(4)	(5) = (3) x (4)
	M_A = Sum (A x H) (Hull) (ft-ft^2)	M_{AS} = Sum (A x H) (Sails) (ft-ft^2)	Combined Sum (A x H) (ft-ft^2)	Wind Pressure (P) (lbs/ft^2)	Sailing Vessel Wind Heeling Moment (M_{WS}) (ft-lbs)
(C)				1.0	

	(1) = max ((A)(4), (B)(4), (C)(5))	(2)
(D)	Required Heeling Moment (HM_R) = maximum value of Passenger Heeling Moment, Wind Heeling Moment, and Sailing Vessel Wind Heeling Moment (if applicable) (ft-lbs)	Maximum Heeling Moment: □ - Passenger Heeling Moment □ - Wind Heeling Moment □ - Sailing Vessel Wind Heeling Moment

12. Heeling Moment Correction (HM_C) for Insufficient Test Weight VCG:

Complete this section to calculate an additional heeling moment that should be applied during a SST when the passenger test weight (W) VCG_A from Section (5) is less than the VCG_R from Section (4). The heeling moment correction (HM_C) is only applied when the VCG_A is less than the VCG_R. When the VCG_A is equal to or greater than the VCG_R, there is no heeling moment correction (HM_C).

IMPORTANT: The HM_C cannot be applied for vessels that either:

1. experience chine emergence during the SST; or
2. that have passenger decks that extend beyond the buoyant sideshell of the vessel.

In either of these cases, the VCG_A must not be less than the VCG_R.

12.(A)(1) Enter the Required VCG (VCG_R) in inches from **4.**(D)(3).

12.(A)(2) Enter the Actual VCG (VCG_A) in inches from **5.**(R)(3).

12.(A)(1) Enter the result of subtracting the VCG_A (**12.**(A)(2)) from the VCG_R (**12.**(A)(1)), which is the VCG difference (VCG_D) in inches.

12.(A)(4) Check the box that corresponds to whether VCG_D is greater than zero or less than or equal to zero.

If $VCG_D > 0$, then complete all of Row (B).

If $VCG_D \leq 0$ (i.e., the $VCG_R \leq VCG_A$), then go to **12.**(B)(6) and enter "0" for the HM_C.

12.(B)(1) Enter the Height of the immersion mark above the waterline (i) in inches from **8.**(M)(3).

12.(B)(2) Enter the VCGD in inches from **12.**(A)(3).

12.(B)(3) Enter the Passenger test weight (W) in pounds from **3.**(A)(3).

12.(B)(4) Enter the Maximum beam on deck in way of the reference station (B_F) in feet from 7.(E)(1).

12.(B)(6) Enter the result of the calculation of the Heeling moment correction (HM_C) in foot-pounds:

HM_C = (i) x (VCGD) x (W) ÷ (BF) ÷ 65.5 = **12.**(B)(1) x **12.**(B)(2) x **12.**(B)(3) ÷ **12.**(B)(4) ÷ 65.5

13. Heeling Moment for Test (HM_T):

Complete this section to calculate the heeling moment for the test (HM_T). The HM_T calculated in this section is to be applied to the vessel in Section (14). Remember when the VCG_A is equal to or greater than the VCG_R, the heeling moment correction (HM_C) is zero.

13.(A)(1) Enter the Required Heeling Moment (HM_R) in foot-pounds from **11.**(D)(1).

13.(A)(2) Enter the Heeling Moment Correction (HM_C) in foot-pounds from **12.**(B)(6).

13.(A)(3) Enter the result of the addition of HM_R (**13.**(A)(1)) and HM_C (**13.**(A)(2)), which is the Heeling Moment for Test (HM_T) in foot-pounds.

12. Heeling Moment Correction (HM_C) for Insufficient Test Weight VCG (VCG_A):

	(1) = **4.**(D)(3)	(2) = **5.**(R)(3)	(3) = (1) – (2)	(4)
	Required VCG (VCG_R) (inches)	Actual VCG (VCG_A) (inches)	VCG Difference (VCG_D) (inches)	If (3) VCG Difference (VCG_D) > 0, then a Heeling Moment Correction, HM_C, should be applied (Row B); Otherwise, HM_C = 0
(A)				□ - VCG_D > 0 → Row B □ - $VCG_D \leq 0$; HM_C = 0 → enter "0" in (B)(6)

	(1) = **8.**(M)(3)	(2) = (A)(3)	(3) = **3.**(A)(3)	(4) = **7.**(E)(1)	(5)	(6) = (1) x (2) x (3) ÷ (4) ÷ (5)
	Height of immersion mark above WL (i) (inches)	VCG Difference (VCG_D) (inches)	Passenger Test Weight (W) (lbs)	Maximum beam on deck in way of Reference Station (B_F) (ft)		Heeling Moment Correction (HM_C) (ft-lbs)
(B)					65.5	

13. Heeling Moment for Test (HM_T):

	(1) = **11.**(D)(1)	(2) = **12.**(B)(6);	(3) = (1) + (2)
(A)	Required Heeling Moment (HM_R) (ft-lbs)	Heeling Moment Correction (HM_C) (ft-lbs)	Heeling Moment for Test (HM_T) (ft-lbs)

14. Weight Movement:

Complete this section to indicate the total heeling moment applied to the vessel. The heeling moment for the test (HM_T) calculated in Section (13) must be obtained by a transverse movement of the test weights to produce an applied heeling moment (HM_A) that is equal to or exceeds HM_T.

Rows (A) through (V) are provided to record the weights and the distance that they are moved. Weights recorded in Section (5) can be entered in Rows (A) through (V). All passenger test weight should be listed in this section, even if it is not moved to achieve the Required Heeling Moment for the Test (HM_T).

14.(A)(1) Enter the description of the weight unit under consideration.

14.(A)(2) Enter the weight in pounds of each unit in this described weight unit.

14.(A)(3) Enter the quantity of similar weight items included for this described weight unit.

14.(A)(4) Enter the distance moved in feet for this described weight unit.

14.(A)(5) Enter the result of the multiplication of the quantity of weights (**14.**(A)(2)) times the weight per unit (**14.**(A)(3)) times the distance moved (**14.**(A)(4)). This value is the applied moment for this described weight unit.

For each remaining described weight unit, repeat the process of entries in columns (1) through (5) as performed for the described weight unit entered in Row (A).

14.(W)(5) Enter the sum of the applied moments entered in column (5). This value is the total heeling moment applied (HM_A).

The last row in section 14 is a verification that the total heeling moment applied (HM_A) is at least as great as the heeling moment for the test (HM_T).

14.(X)(1) Enter the total heeling moment applied (HM_A) from **14.**(W)(5).

14.(X)(2) Enter the heeling moment for test (HM_T) from **13.**(A)(3).

14.(X)(3) If HM_A is greater than or equal to HM_T, then check the box for “Yes”. If not, check “No”.

In case the answer to **14.**(X)(3) is “No”, additional heeling moment must be obtained in order to proceed with the test and the sections 5, 6, 7, 8, and 14 must be revised to reflect the new total weight aboard and the new total heeling moment applied (HM_A).

14. Weight Movement (actual):

(actual documented weight movement)

	(1)	(2)	(3)	(4)	(5) = (2) x (3) x (4)
	Unit Description	Weight per Unit (lbs)	Quantity (#)	Distance Moved (ft)	Applied Heeling Moment (ft-lbs)
(A)					
(B)					
(C)					
(D)					
(E)					
(F)					
(G)					
(J)					
(K)					
(L)					
(M)					
(N)					
(O)					
(P)					
(Q)					
(R)					
(S)					
(T)					
(U)					
(V)					
(W)	Sum of Column (5) = Total Moment Applied (HM_A) =				

	(1) = (W)(5)	(2) = **13.**(A)(3)	(3)
	Total Applied Moment (HM_A) (ft-lbs)	Heeling Moment for Test (HM_T) (ft-lbs)	Verification - $HM_A \geq HM_T$
(X)			□ - Yes; □ - No

If the vessel has a natural list, all weight movements are to be made to the listing (lower) side.

If the vessel heels and submerges the immersion mark (i) before the full heeling moment for the test (HM_T) is applied, the test must be stopped and the vessel is determined not to satisfy SST requirements.

At any time during the SST, if the inspector feels the stability of the vessel is questionable, then the inspector should stop the test and fail the vessel regardless of whether the immersion mark has been submerged. If this occurs, the box in **14.**(Z)(4) should be checked to note this outcome.

Care is to be exercised to prevent excessive heel either due to weight movement or external forces (wind and waves), causing the test weights to topple or ship's gear to become adrift.

During the loading and moving of test weights, care should be taken if there is evidence of low stability. This may be assumed whenever the effect of any weight movement is noted to be more than that of the preceding weight movement of the same size, or when the chine or bilge amidships comes out of the water as a result of the heel. Chine emergence itself does not mean a vessel fails the SST however; the inspector should be extremely cautious if the test is continued.

Before the vessel is heeled, check for open seams, loose hull fittings, etc., which are not normally immersed and which could cause flooding of the vessel.

The placement/movement of weights at the start and conclusion of the test must be documented by creating a diagram in this section. The grid provided in Section (14) is provided to facilitate creating this weight-moment diagram.

On the left side of the grid, create a diagram to show the arrangement of the weight units at the beginning of the test – that is, their initial locations.

On the right side of the grid, create a diagram that shows the arrangement of the weight units at the end of the test.

14.(Y)(1) Enter the scale used in the weight moment diagram as the length of one side of a single square equal to [scale] in feet.

14.(Z)(1) Enter the height of the immersion mark above the waterline (i) in inches BEFORE weight movement from **8.**(M)(3).

14.(Z)(2) Enter the height of the immersion mark above the waterline (i) in inches measured AFTER weight movement.

14.(Z)(3) Check the box that corresponds to the test outcome:
If **14.**(Z)(2) is greater than or equal to zero, the SST requirements are satisfied (i.e., PASS).
If **14.**(Z)(2) is less than zero, the SST requirements are not satisfied (i.e., FAIL).

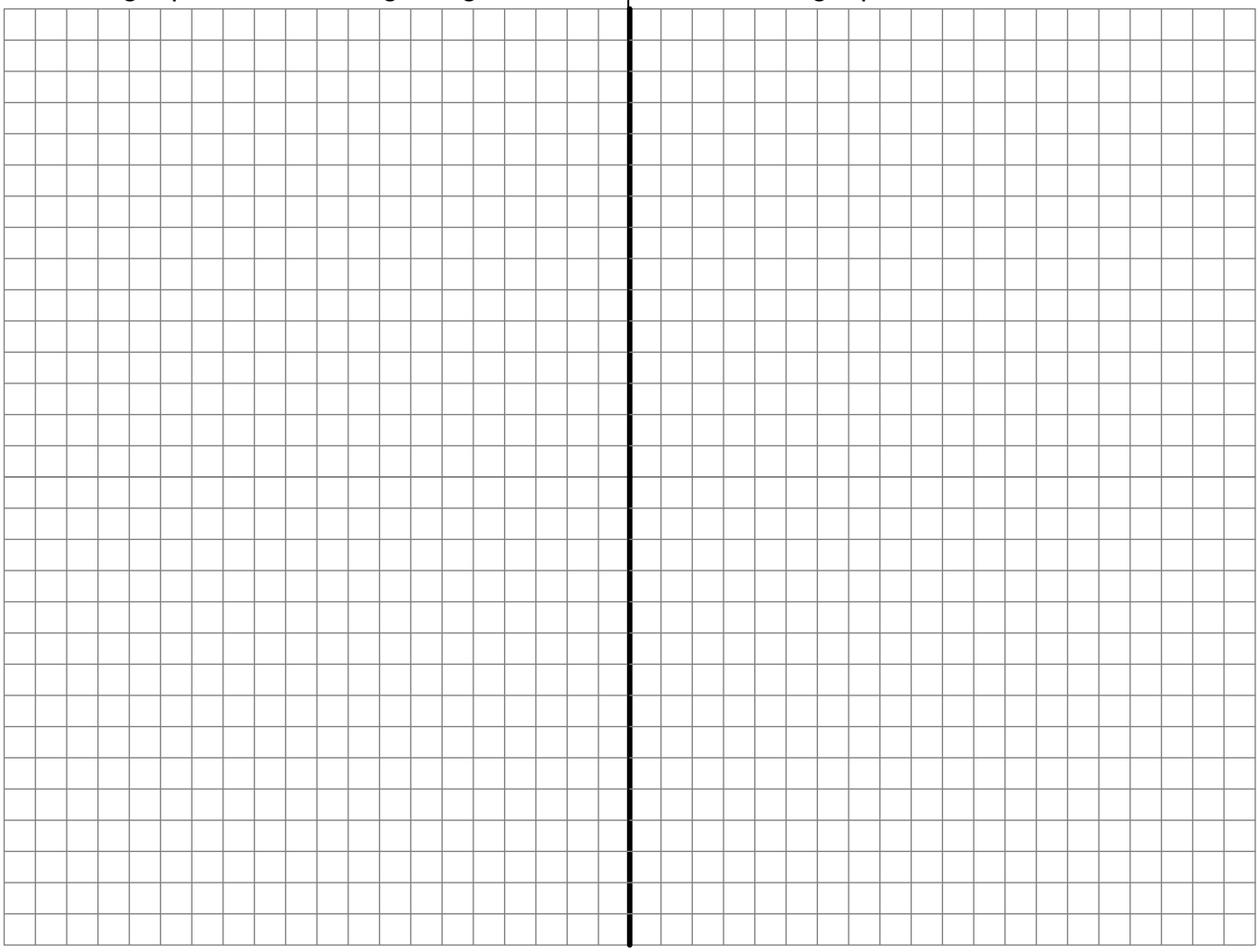
14.(Z)(4) If the outcome checked in **14.**(Z)(2) is “Fail”, then check the box that indicates the reason for that outcome.

14. Weight Movement (continued):

Weight Moment Diagram - Overhead view

Note. Record the scale of the profile sketch in **14.**(Y)(1) below.

-Weight placement at beginning of test- | -Weight placement at end of test-



		(1)	
(Y)	Scale: 1 square =		feet

	(1) = **8.**(M)(3)	(2)	(3)
(Z)	Height of (i) above WL BEFORE Weight Movement (inches)	Height of (i) above WL AFTER Weight Movement (inches)	Test Outcome: If (Z)(2) ≥ 0, Outcome = Pass; If (Z)(2) < 0, Outcome = Fail
			□ - Pass; □ - Fail
	(4) If the test outcome is "Fail", provide reason: □ - (Z)(3) = "Fail"; □ - Vessel's stability is questionable.		

15. Simplified Stability Test Summary:

Complete this section to summarize the SST. This section is intended to be used by the reviewing officer to check the results of the SST. This section also provides key information about the vessel's stability that may be used to identify the degree to which the vessel's stability may be questioned in the case of future weight changes (e.g., the Excess Heeling Moment and the Immersion Mark Height Difference (δi)). The Moment to Heel One Degree is a key characteristic of the vessel's stability and, when related to factors of the length and beam, allow SST outcomes to be compared with other vessels of similar construction and arrangement.

15.(A)(1) Enter the vessel type from **8.**(A)(1).

15.(A)(2) Enter the number of passengers (N_P) from **2.**(B)(1).

15.(A)(3) Enter the number of crew (N_C) from **2.**(F)(1).

15.(B)(1) Enter the Passenger Test Weight (W) in pounds from **3.**(A)(3).

15.(B)(2) Check the box corresponding to the stability route of the vessel from **2.**(D)(2).

15.(B)(3) Check the box corresponding to source of the maximum heeling moment for which the Heeling Moment for the Test (HM_T) was determined, from **11.**(D)(2).

15.(C)(1) Enter the Applied Heeling Moment (HM_A) in foot-pounds from **14.**(W)(5).

15.(C)(2) Enter the Total Required Heeling Moment (HM_T) in foot-pounds from **13.**(A)(3).

15.(C)(3) Enter the result of subtracting Total Required Heeling Moment (HM_T) in foot-pounds from **13.**(A)(3).

15.(D)(1) Enter the Height of the Immersion Mark BEFORE Weight movement in inches from **8.**(M)(3).

15.(D)(2) Enter the Height of the Immersion Mark AFTER Weight movement in inches from **14.**(Z)(2).

15.(D)(3) Enter the result in inches of subtracting the Height of the Immersion Mark BEFORE Weight movement (**15.**(D)(1)) from the Height of the Immersion Mark AFTER Weight movement (**15.**(D)(2)). This is the immersion mark height difference (δi) in inches.

15.(D)(4) Check the box corresponding to the test outcome, i.e. "Pass" = satisfy the SST requirement; "Fail" = do not satisfy the SST requirement.

15.(E)(1) Enter the Length of the Vessel in feet from **7.**(A)(1).

15.(E)(2) Enter the Beam of the Vessel at the Reference Station (B_F) in feet from **7.**(E)(1).

15.(E)(3) Enter the Reference freeboard of the Vessel in inches from **7.**(H)(1).

15.(E)(4) Enter the result of the calculation of the Moment to Heel One Degree in foot-pounds per degree = $HM_A \times B_F \times 30 \div \delta i \div \pi$ = **15.**(C)(1) x **15.**(E)(2) x π ÷ **15.**(D)(3) ÷ 30 (Recall that π, "Pi" = 3.1416). This value is a stability characteristic of the vessel; higher values correspond to greater stability and lower values correspond to lesser stability. The vessel undergoing the SST should have a value of Moment to Heel One Degree that is about the same as that of a similar vessel. If these values differ significantly, a reason for the difference should be identified.

To understand this value more completely, the Moment to Heel One Degree is equal to the metacentric height multiplied by the displacement ($GM \times \Delta$) and multiplied by the tangent of one degree (tan (1°) is numerically equal to the value of one degree in radians). This quantity is equal to the applied heeling moment (HM_A) divided by the tangent of the heel angle (tan (φ)) times π divided by 180). When considering a triangle as given in the diagram below, the tangent of the heel angle (tan (φ)) is equal to the immersion mark height difference (δi) divided by one-half the Beam at the Reference station (B_F):

tan (φ) = δi (inches) x (1 foot / 12 inches) ÷ (B_F (feet) ÷ 2) = δi ÷ (B_F x 6)

Therefore, HM_A times tan (1°) divided by tan (φ) = $HM_A \times B_F \times \pi \div \delta i \div 30$.

15. Simplified Stability Test Summary:

	(1) = **8.**(A)(1)	(2) = **2.**(B)(1)	(3) = **2.**(F)(1)
(A)	Vessel Type	No. of Passengers (N_P)	No. of Crew (N_C)

	(1) = **3.**(A)(3)	(2) = **2.**(D)(2)	(3) = **11.**(D)(2)
(B)	Passenger Test Weight (W) (lbs)	Stability Route	Maximum Heeling Moment
		□ - Exposed □ - Partially Protected □ - Protected	□ - Passenger Heeling Moment □ - Wind Heeling Moment □ - Sailing Vessel Wind Heeling Moment

	(1) = **14.**(W)(5)	(2) = **13.**(A)(3)	(3) = (1) – (2)
(C)	Applied Heeling Moment (HM_A) (ft-lbs)	Heeling Moment for Test (HM_T) (ft-lbs)	Excess Heeling Moment $HM_E = HM_A – HM_T$ (ft-lbs)

	(1) = **8.**(M)(3)	(2) = **14.**(Z)(2)	(3) = (1) – (2)	(4) = **14.**(Z)(3)
(D)	Height of Immersion Mark (i) BEFORE Weight Moved (inches)	Height of Immersion Mark (i) AFTER Weight Moved (inches)	Immersion Mark Height Difference (δi) (inches)	Test Outcome:
				□ - Pass; □ - Fail

	(1) = **7.**(A)(1)	(2) = **7.**(E)(1)	(3) = **7.**(H)(1)	(4) = $\frac{(C)(1) \times (2) \times \pi}{(D)(3) \times 30}$
(E)	Length (feet)	Beam at Reference Station (B_F) (feet)	Reference freeboard (f) (inches)	Moment to Heel One Degree (ft-lbs per degree)

16. Baseline Vessel Freeboard Measurements to Assess the Degree of Future Weight Changes:

This optional section may be completed either prior to placing the passenger and crew weight and cargo/variable loads onboard (i.e., before the SST) or after the SST is completed and the passenger/crew weight and cargo/variable loads are removed; it is not part of the SST. These measurements are recorded to establish a baseline vessel condition without passenger and crew weight or cargo/variable loads onboard to allow an assessment of the degree of future weight changes.

Reference vessel freeboard measurements should be recorded:

- **16.**(A)(1) Enter the measurement of the freeboard at the bow (F_{Bow}) in inches at the centerline.
- **16.**(A)(2) Enter the measurement of the freeboard at the stern (F_{Stern}) in inches at the centerline.
- **16.**(B)(1) Enter the measurement of the freeboard at the reference station (F_{Port}) in inches at the port side.
- **16.**(B)(2) Enter the measurement of the freeboard at the reference station (F_{Stbd}) in inches at the starboard side.

The condition of tanks and the status other loads in the condition when the reference vessel freeboard measurements were taken should be checked:

- **16.**(C)(1) Check the box corresponding to the status of fuel tanks. If the tanks are not 75% full, check the box corresponding to “Other” and enter an estimate of the actual filling level (± 5%).
- **16.**(C)(2) Check the box corresponding to the status of water tanks. If the tanks are not 75% full, check the box corresponding to “Other” and enter an estimate of the actual filling level (± 5%).
- **16.**(C)(3) Check the box corresponding to the status of sewage tanks. If the tanks are 100% full, check that box. If the tanks are empty, check that box. If the tanks are neither 100% full nor empty, check the box corresponding to “Other” and enter an estimate of the actual filling level (± 5%).
- **16.**(D)(1) Check the box corresponding to the status of passenger weight aboard. If there is no passengers aboard, check the box corresponding to “None Aboard.” If there passengers aboard, check the box corresponding to “Other” and enter an estimate of the weight of those passengers.
- **16.**(D)(2) Check the box corresponding to the status of crew weight aboard. If there is no crew aboard, check the box corresponding to “None Aboard.” If there is crew aboard, check the box corresponding to “Other” and enter an estimate of the weight of those crew.
- **16.**(E)(1) Check the box corresponding to the status of cargo / variable loads aboard. If there is no cargo or variable loads aboard, check the box corresponding to “None Aboard.” If there is cargo / variable loads aboard, check the box corresponding to “Other” and enter an estimate of the weight of those loads.
- **16.**(E)(2) Check the box corresponding to the status of dive equipment aboard. If there is no dive equipment aboard, check the box corresponding to “None Aboard.” If there is dive equipment aboard, check the box corresponding to “Other” and enter an estimate of the weight of that dive equipment.

Reference Information:

Density of saltwater = 8.5555 pounds per gallon

Density of freshwater = 8.33 pounds per gallon

16. Baseline Vessel Freeboard Measurements to Assess Degree of Future Weight Changes:

This optional section may be completed either before or after the SST is performed. This documents the vessel condition without passengers, crew, variable loads, or cargo but with tanks at appropriate levels.

	(1)	(2)
	Freeboard at the bow (F_{Bow}) (inches)	Freeboard at the stern (F_{Stern}) (inches)
(A)		
	Freeboards at the reference station	
	port (F_{Port}) (inches)	starboard (F_{Stbd})
(B)		

	Tank Status:		
	(1)	(2)	(3)
	Fuel Tanks (should be 75% full)	Water Tanks (should be 75% full)	Sewage Tanks (should be 0 or 100% full)
(C)	□ - 75% Full □ - Other: _____ % Notes:	□ - 75% Full □ - Other: _____ % Notes:	□ - 0% Full □ - 100% Full □ - Other: _____ % Notes:

Weight and Load Status:		
	(1)	(2)
	Passenger Weight (none should be aboard)	Crew Weight (none should be aboard)
(D)	□ - None Aboard □ - Other: _____ lbs Notes:	□ - None Aboard □ - Other: _____ lbs Notes:
	Cargo / Variable Loads (none should be aboard)	Dive Equipment Loads (none should be aboard)
(E)	□ - None Aboard □ - Other: _____ lbs Notes:	□ - None Aboard □ - Other: _____ lbs Notes: