

(d) When demonstrating compliance with paragraph (c) of this section, credit may be given for the buoyancy of the immersed portion of cargo tanks if the tank securing devices are shown by design calculations to be strong enough to hold the tanks in place when they are subjected to the buoyant forces resulting from the water in the hopper.

(e) Each tank barge must be shown by design calculations to have at least 2 inches (50 mm) of positive GM in each condition of loading and operation after assuming the damage specified in paragraph (f) of this section is applied in the following locations:

(1) *Type I barge hull not in an integrated tow.* If a Type I hull is required and the barge is not a box barge designed for use in an integrated tow, design calculations must show that the barge hull can survive damage at any location including on the intersection of a transverse and longitudinal watertight bulkhead.

(2) *Type I barge hull in an integrated tow.* If a Type I hull is required and the barge is a box barge designed for operation in an integrated tow, design calculations must show that the barge can survive damage—

(i) To any location on the bottom of the tank barge except on a transverse watertight bulkhead; and

(ii) To any location on the side of the tank barge including on a transverse watertight bulkhead.

(3) *Type II hull.* If a Type II hull is required, design calculations must show that the barge can survive damage to any location except to a transverse watertight bulkhead.

(f) For the purpose of paragraph (e) of this section—

(1) Design calculations must include both side and bottom damage, applied separately; and

(2) Damage must consist of the most disabling penetration up to and including penetrations having the following dimensions:

(i) Side damage must be assumed to be as follows:

(A) Longitudinal extent—6 feet (183 centimeters).

(B) Transverse extent—30 inches (76 centimeters).

(C) Vertical extent—from the baseline upward without limit.

(ii) Bottom damage must be assumed to be 15 inches (38.1 centimeters) from the baseline upward.

### Subpart D—Special Rules Pertaining to a Vessel That Carries a Cargo Regulated Under 33 CFR Part 157

#### § 172.060 Specific applicability.

This subpart applies to each U.S. tank vessel that is required to comply with 33 CFR 157.21.

[CGD 90-051, 57 FR 36246, Aug. 12, 1992]

#### § 172.065 Damage stability.

(a) *Definitions.* As used in this section, *Length* or *L* means load line length (LLL).

(b) *Calculations.* Each tank vessel must be shown by design calculations to meet the survival conditions in paragraph (g) of this section in each condition of loading and operation except as specified in paragraph (c) of this section, assuming the damage specified in paragraph (d) of this section.

(c) *Conditions of loading and operation.* The design calculations required by paragraph (b) of this section need not be done for ballast conditions if the vessel is not carrying oil, other than oily residues, in cargo tanks.

(d) *Character of damage.* (1) If a tank vessel is longer than 738 feet (225 metes) in length, design calculations must show that it can survive damage at any location.

(2) If a tank vessel is longer than 492 feet (150 meters) in length, but not longer than 738 feet (225 meters), design calculations must show that it can survive damage at any location except the transverse bulkheads bounding an aft machinery space. The machinery space is calculated as a single floodable compartment.

(3) If a tank vessel is 492 feet (150 meters) or less in length, design calculations must show that it can survive damage—

(i) At any location between adjacent main transverse watertight bulkheads except to an aft machinery space;

(ii) To a main transverse watertight bulkhead spaced closer than the longitudinal extent of collision penetration

§ 172.065

46 CFR Ch. I (10-1-04 Edition)

specified in Table 172.065(a) from another main transverse watertight bulkhead; and

(iii) To a main transverse watertight bulkhead or a transverse watertight bulkhead bounding a side tank or double bottom tank if there is a step or a recess in the transverse bulkhead that is longer than 10 feet (3.05 meters) and that is located within the extent of penetration of assumed damage. The step formed by the after peak bulkhead and after peak tank top is not a step for the purpose of this regulation.

(e) *Extent of damage.* For the purpose of paragraph (b) of this section—

(1) Design calculations must include both side and bottom damage, applied separately; and

(2) Damage must consist of the penetrations having the dimensions given in Table 172.065(a) except that, if the most disabling penetrations would be less than the penetrations described in this paragraph, the smaller penetration must be assumed.

(f) *Permeability of spaces.* When doing the calculations required in paragraph (b) of this section—

(1) The permeability of a floodable space, other than a machinery space, must be as listed in Table 172.065(b);

(2) Calculations in which a machinery space is treated as a floodable space must be based on an assumed machinery space permeability of 85%, unless the use of an assumed permeability of less than 85% is justified in detail; and

(3) If a cargo tank would be penetrated under the assumed damage, the cargo tank must be assumed to lose all cargo and refill with salt water, or fresh water if the vessel operates solely on the Great Lakes, up to the level of the tank vessel's final equilibrium waterline.

(g) *Survival conditions.* A vessel is presumed to survive assumed damage if it meets the following conditions in the final stage of flooding:

(1) *Final waterline.* The final waterline, in the final condition of sinkage, heel, and trim, must be below the lower edge of an opening through which progressive flooding may take place, such as an air pipe, or an opening that is closed by means of a weathertight door

or hatch cover. This opening does not include an opening closed by a—

- (i) Watertight manhole cover;
- (ii) Flush scuttle;
- (iii) Small watertight cargo tank hatch cover that maintains the high integrity of the deck;
- (iv) Class 1 door in a watertight bulkhead within the superstructure;
- (v) Remotely operated sliding watertight door; or
- (vi) Side scuttle of the non-opening type.

(2) *Heel angle.* The maximum angle of heel must not exceed 25 degrees, except that this angle may be increased to 30 degrees if no deck edge immersion occurs.

(3) *Range of stability.* Through an angle of 20 degrees beyond its position of equilibrium after flooding, a tank vessel must meet the following conditions:

- (i) The righting arm curve must be positive.
- (ii) The maximum righting arm must be at least 3.94 inches (10 cm).
- (iii) Each submerged opening must be weathertight.

(4) *Progressive flooding.* Pipes, ducts or tunnels within the assumed extent of damage must be either—

- (i) Equipped with arrangements such as stop check valves to prevent progressive flooding to other spaces with which they connect; or
- (ii) Assumed in the design calculations required in paragraph (b) of this section to permit progressive flooding to the spaces with which they connect.

(h) *Buoyancy of superstructure.* For the purpose of paragraph (b) of this section, the buoyancy of any superstructure directly above the side damage is to be disregarded. The unflooded parts of superstructures beyond the extent of damage may be taken into consideration if they are separated from the damaged space by watertight bulkheads and no progressive flooding of these intact spaces takes place.

TABLE 172.065(a)—EXTENT OF DAMAGE

COLLISION PENETRATION	
Longitudinal extent .....	0.495L <sup>2/3</sup> or 47.6 feet ((1/3)L <sup>2/3</sup> or 14.5m) whichever is shorter.
Transverse extent <sup>1</sup> .....	B/5 or 37.74 feet (11.5m) which is shorter.

TABLE 172.065(a)—EXTENT OF DAMAGE—  
Continued

Vertical extent ..... From the baseline upward with-  
out limit.

GROUNDING PENETRATION AT THE FORWARD END BUT EXCLUD-  
ING ANY DAMAGE AFT OF A POINT 0.3L AFT OF THE FORWARD  
PERPENDICULAR

Longitudinal extent .....  $0.495L^{2/3}$  or 47.6 feet ( $(1/3)L^{2/3}$   
or 14.5m) whichever is shorter.  
Transverse extent ..... B/6 or 32.81 feet (10m) which-  
ever is shorter but not less  
than 16.41 feet (5m).  
Vertical extent from the ..... B/15 or 19.7 feet (6m) whichever  
baseline. is shorter.

GROUNDING PENETRATION AT ANY OTHER LONGITUDINAL  
POSITION

Longitudinal extent ..... L/10 or 16.41 feet (5m) which-  
ever is shorter.  
Transverse extent ..... 16.41 feet (5m).  
Vertical extent from the ..... B/15 or 19.7 feet (6m) whichever  
baseline. is shorter.

GROUNDING PENETRATION FOR RAKING DAMAGE

For tank vessels of  
20,000 DWT and  
above, the following as-  
sumed bottom raking  
damage must supple-  
ment the damage as-  
sumptions:

Longitudinal extent ..... For vessels of 75,000 DWT and  
above, 0.6L measured from the  
forward perpendicular.  
..... For vessels of less than 75,000  
DWT, 0.4L measured from the  
forward perpendicular.  
Transverse extent ..... B/3 anywhere in the bottom.  
Vertical extent ..... Breach of the outer hull.

<sup>1</sup> Damage applied inboard from the vessel's side at right an-  
gles to the centerline at the level of the summer load line as-  
signed under Subchapter E of this chapter.

TABLE 172.065(b)—PERMEABILITY

Spaces and tanks	Permeability (percent)
Storeroom spaces .....	60.
Accommodation spaces .....	95.
Voids .....	95.
Consumable liquid tanks .....	95 or 0. <sup>1</sup>
Other liquid tanks .....	95 or 0. <sup>2</sup>

<sup>1</sup> Whichever results in the more disabling condition.

<sup>2</sup> If tanks are partially filled, the permeability must be deter-  
mined from the actual density and amount of liquid carried.

[CGD 79-023, 48 FR 51040, Nov. 4, 1983, as  
amended by USCG-2000-7641, 66 FR 55574,  
Nov. 2, 2001]

**§ 172.070 Intact stability.**

All tank vessels of 5,000 DWT and  
above contracted after the effective  
date of this rulemaking must comply  
with the intact stability requirements  
of Regulation 25A, annex I of MARPOL  
73/78.

[USCG-2000-7641, 66 FR 55575, Nov. 2, 2001]

**Subpart E—Special Rules Per-  
taining to a Barge That Carries  
a Hazardous Liquid Regulated  
Under Subchapter O of This  
Chapter**

**§ 172.080 Specific applicability.**

This subpart applies to each tank  
barge that carries a cargo listed in  
Table 151.01-10(b) of this chapter.

**§ 172.085 Hull type.**

If a cargo listed in Table 151.05 of  
part 151 of this chapter is to be carried,  
the tank barge must be at least the  
hull type specified in Table 151.05 of  
this chapter for that cargo.

**§ 172.087 Cargo loading assumptions.**

(a) The calculations required in this  
subpart must be done for cargo weights  
and densities up to and including the  
maximum that is to be endorsed on the  
Certificate of Inspection in accordance  
with § 151.04-1(c) of this chapter.

(b) For each condition of loading and  
operation, each cargo tank must be as-  
sumed to have its maximum free sur-  
face.

**§ 172.090 Intact transverse stability.**

(a) Except as provided in paragraph  
(b) of this section, each tank barge  
must be shown by design calculations  
to have a righting arm curve with the  
following characteristics:

(1) If the tank barge is in river serv-  
ice, the area under the righting arm  
curve must be at least 5 foot-degrees  
(1.52 meter-degrees) up to the smallest  
of the following angles:

(i) The angle of maximum righting  
arm.

(ii) The downflooding angle.

(2) If the tank barge is in lakes, bays  
and sounds or Great Lakes summer  
service, the area under the righting  
arm curve must be at least 10 foot-de-  
grees (3.05 meter-degrees) up to the  
smallest of the following angles:

(i) The angle of maximum righting  
arm.

(ii) The downflooding angle.

(3) If the tank barge is in ocean or  
Great Lakes winter service, the area  
under the righting arm curve must be