

container with a suitable outlet at the top for connection of a portable air hose, or must be placed directly beneath a suitable outlet at the top for connection of a portable air hose. The air hose must be permanently connected to an exhaust duct leading to the open deck and terminate in a gooseneck or other suitable weather head. If natural ventilation is not practicable or adequate, mechanical means of exhaust must be employed in conjunction with the duct. The air outlet on the battery container must be equipped with an interlock switch so arranged that the charging of the battery cannot take place unless the air hose is properly connected to the box.

(2) If mechanical ventilation is used, an additional interlock must be provided between the fan and the charging circuit so that the fan must be in operation in order to complete the charging circuit for operation. It is preferable that this interlock switch be of a centrifugal type driven by the fan shaft.

(3) The hold may not contain any hazardous materials.

(4) The charging facilities may be part of the truck equipment or may be separate from the truck and located inside or outside the cargo hold. The power supply or charging circuit (whichever method is used) must be connected to the truck by a portable plug connection of the break-away type. This portable plug must be so engaged with the truck battery charging outlet that any movement of the truck away from the charging station will break the connection between the plug and receptacle without exposing any live parts to contact with a conducting surface or object and without the plug falling to the deck where it may become subject to damage.

(5) All unmounted batteries must be suitably protected or removed from an area in the hold of the vessel before any truck is operated in that area.

(k) *Stowage of power-operated industrial trucks on board a vessel.* Trucks stowed on board a vessel must meet vessel stowage requirements in § 176.905.

(l) *Packaging and stowage of fuel on board a vessel.* Division 2.1 (flammable gas) materials and flammable liquids used as fuel for industrial trucks must

be packaged and stowed as authorized in 46 CFR 147.60 or 46 CFR 147.45, respectively.

[Amdt. 176-1, 41 FR 16110, Apr. 15, 1976, as amended by Amdt. 176-1A, 41 FR 40687, Sept. 20, 1976; Amdt. 176-30, 55 FR 52689, Dec. 21, 1990; Amdt. 176-39, 61 FR 18933, Apr. 29, 1996; Amdt. 176-43, 62 FR 24741, May 6, 1997; 65 FR 58630, Sept. 29, 2000]

EFFECTIVE DATE NOTE: At 68 FR 61942, Oct. 30, 2003, § 176.78 was amended in paragraph (f)(8) by revising the word "movement" to read "moving", effective Oct. 1, 2004. At 69 FR 30588, May 28, 2004, the effective date was delayed until Jan. 1, 2005.

### Subpart D—General Segregation Requirements

#### § 176.80 Applicability.

(a) This subpart sets forth segregation requirements in addition to any segregation requirements set forth elsewhere in this subchapter.

(b) Hazardous materials in limited quantities when loaded in transport vehicles and freight containers, are excepted from the segregation requirements of this subpart and any additional segregation specified in this subchapter for transportation by vessel.

[Amdt. 176-1, 41 FR 16110, Apr. 15, 1976, as amended by Amdt. 176-3, 42 FR 57967, Nov. 7, 1977]

#### § 176.83 Segregation.

(a) *General.* (1) The requirements of this section apply to all cargo spaces on deck or under deck of all types of vessels, and to all cargo transport units.

(2) Segregation is obtained by maintaining certain distances between incompatible hazardous materials or by requiring the presence of one or more steel bulkheads or decks between them or a combination thereof. Intervening spaces between such hazardous materials may be filled with other cargo which is not incompatible with the hazardous materials.

(3) The general requirements for segregation between the various classes of dangerous goods are shown in the segregation table. In addition to these general requirements, there may be a need to segregate a particular material from other materials which would contribute to its hazard. Such segregation

requirements are indicated by code numbers in Column 10B of the §172.101 Table.

(4) Segregation is not required between hazardous materials of different classes which comprise the same substance but vary only in their water content (e.g., sodium sulphide in Division 4.2 or Class 8).

(5) Whenever hazardous materials are stowed together, whether or not in a transport unit, the segregation of such hazardous materials from others must always be in accordance with the most restrictive requirements for any of the hazardous materials concerned.

(6) When the §172.101 Table or §172.402 requires packages to bear a subsidiary hazard label or labels, the segregation appropriate to the subsidiary hazards must be applied when that segregation is more restrictive than that required by the primary hazard. For the purposes of this paragraph, the segregation requirements corresponding to an explosive subsidiary hazard are—except for organic peroxides which are those corresponding to Division 1.3—those for Division 1.4 (explosive) materials.

(7) Where, for the purposes of segregation, terms such as “away from” a particular hazard class are used in the §172.101 Table, the segregation requirement applies to:

(i) All hazardous materials within the hazard class; and

(ii) All hazardous materials for which a secondary hazard label of that class is required.

(8) Notwithstanding the requirements of paragraphs (a)(6) and (a)(7) of this section, hazardous materials of the same class may be stowed together

without regard to segregation required by secondary hazards (subsidiary risk label(s)), provided the substances do not react dangerously with each other and cause:

(i) Combustion and/or evolution of considerable heat;

(ii) Evolution of flammable, toxic or asphyxiant gases;

(iii) The formation of corrosive substances; or

(iv) The formation of unstable substances.

(9) Stowage in a shelter-’tween deck cargo space is not considered to be “on deck” stowage.

(10) Where the code in column (10B) of the §172.101 Table specifies that “Segregation as for. . .” applies, the segregation requirements applicable to that class in the §176.83(b) General Segregation Table must be applied. However, for the purposes of paragraph (a)(8) of this section, which permits substances of the same class to be stowed together provided they do not react dangerously with each other, the segregation requirements of the class as represented by the primary hazard class in the §172.101 Table entry must be applied.

(b) *General Segregation Table.* The following table sets forth the general requirements for segregation between the various classes of hazardous materials. The properties of materials within each class may vary greatly and may require greater segregation than is reflected in this table. If the §172.101 Table sets forth particular requirements for segregation, they take precedence over these general requirements.

TABLE 176.83(b)—GENERAL SEGREGATION REQUIREMENTS FOR HAZARDOUS MATERIALS

[Segregation must also take account of a single secondary hazard label, as required by paragraph (a)(6) of this section.]

Class	1.1 1.2 1.5	1.3	1.4 1.6	2.1	2.2	2.3	3	4.1	4.2	4.3	5.1	5.2	6.1	6.2	7	8	9
Explosives, 1.1, 1.2, 1.5 .....	(*)	(*)	(*)	4	2	2	4	4	4	4	4	4	2	4	2	4	X
Explosives, 1.3 .....	(*)	(*)	(*)	4	2	2	4	3	3	4	4	4	2	4	2	2	X
Explosives, 1.4, 1.6 .....	(*)	(*)	(*)	2	1	1	2	2	2	2	2	2	X	4	2	2	X
Flammable gases 2.1	4	4	2	X	X	X	2	1	2	X	2	2	X	4	2	1	X
Non-toxic, non-flammable gases 2.2 .....	2	2	1	X	X	X	1	X	1	X	X	1	X	2	1	X	X
Poisonous gases 2.3 ..	2	2	1	X	X	X	2	X	2	X	X	2	X	2	1	X	X
Flammable liquids 3 ...	4	4	2	2	1	2	X	X	2	1	2	2	X	3	2	X	X
Flammable solids 4.1	4	3	2	1	X	X	X	X	1	X	1	2	X	3	2	1	X
Spontaneously combustible substances 4.2 .....	4	3	2	2	1	2	2	1	X	1	2	2	1	3	2	1	X

TABLE 176.83(b)—GENERAL SEGREGATION REQUIREMENTS FOR HAZARDOUS MATERIALS—  
Continued

[Segregation must also take account of a single secondary hazard label, as required by paragraph (a)(6) of this section.]

Class	1.1 1.2 1.5	1.3	1.4 1.6	2.1	2.2	2.3	3	4.1	4.2	4.3	5.1	5.2	6.1	6.2	7	8	9
Substances which are dangerous when wet 4.3	4	4	2	X	X	X	1	X	1	X	2	2	X	2	2	1	X
Oxidizing substances 5.1	4	4	2	2	X	X	2	1	2	2	X	2	1	3	1	2	X
Organic peroxides 5.2	4	4	2	2	1	2	2	2	2	2	2	X	1	3	2	2	X
Poisons 6.1	2	2	X	X	X	X	X	X	1	X	1	1	X	1	X	X	X
Infectious substances 6.2	4	4	4	4	2	2	3	3	3	2	3	3	1	X	3	3	X
Radioactive materials 7	2	2	2	2	1	1	2	2	2	2	1	2	X	3	X	2	X
Corrosives 8	4	2	2	1	X	X	X	1	1	1	2	2	X	3	2	X	X
Miscellaneous dangerous substances 9	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

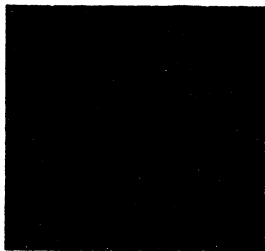
Numbers and symbols relate to the following terms as defined in this section:  
 1—"Away from."  
 2—"Separated from."  
 3—"Separated by a complete compartment or hold from."  
 4—"Separated longitudinally by an intervening complete compartment or hold from."  
 X—The segregation, if any, is shown in the § 172.101 table.  
 \*—See § 176.144 of this part for segregation within Class 1.

(c) Segregation requirements for breakbulk cargo. (1) The requirements of this paragraph apply to the segregation of packages containing hazardous materials and stowed as breakbulk cargo;

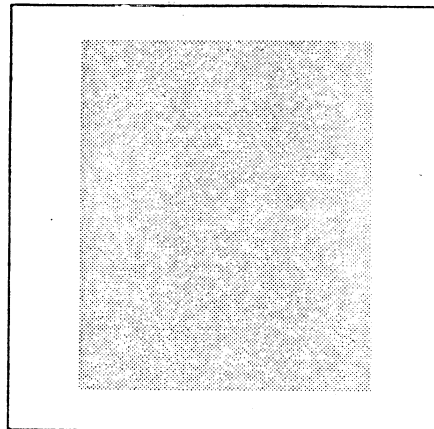
(2) Definition of the segregation terms:

(i) Legend:

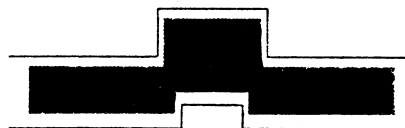
(A) Package containing incompatible goods.



(B) Reference package.



(C) Deck resistant to fire and liquid.



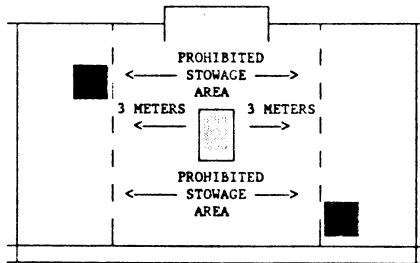
NOTE: Full vertical lines represent transverse bulkheads between compartments or holds resistant to fire and liquid.

(ii) "Away from": Effectively segregated so that the incompatible materials cannot interact dangerously in

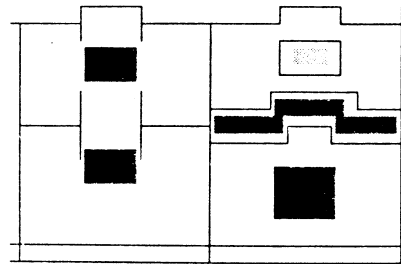
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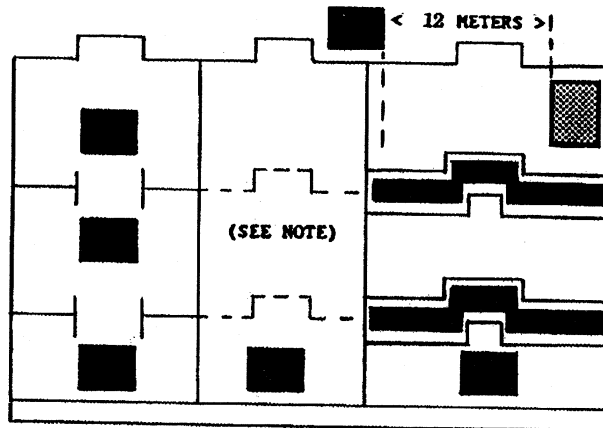
the event of an accident but may be carried in the same compartment or hold or on deck provided a minimum horizontal separation of 3 m (10 feet) projected vertically is obtained.



(iii) "Separated From": In different compartments or holds when stowed under deck. If the intervening deck is resistant to fire and liquid, a vertical separation (i.e., in different compartments) is acceptable as equivalent to this segregation. For "on deck" stowage, this segregation means a separation by a distance of at least 6 m (20 feet) horizontally.



(iv) "Separated by a complete compartment or hold from": Either a vertical or horizontal separation. If the intervening decks are not resistant to fire and liquid, then only a longitudinal separation (i.e., by an intervening complete compartment or hold) is acceptable. For "on deck" stowage, this segregation means a separation by a distance of at least 12 m (39 feet) horizontally. The same distance must be applied if one package is stowed "on deck", and the other one in an upper compartment.



NOTE: One of the two decks must be resistant to fire and liquid.

(v) "Separated longitudinally by an intervening complete compartment or hold from": Vertical separation alone does not meet this requirement. Between a package "under deck" and one "on deck"

a minimum distance of 24 m (79 feet) including a complete compartment must be maintained longitudinally. For "on deck" stowage, this segregation means a separation by a distance of at least 24 m (79 feet) longitudinally.



(d) *Segregation in transport units:* Two hazardous materials for which any segregation is required may not be stowed in the same transport unit.

(e) *Segregation of hazardous materials stowed as breakbulk cargo from those packed in transport units:* (1) Hazardous materials stowed as breakbulk cargo must be segregated from materials packed in open transport units in accordance with paragraph (c) of this section.

(2) Hazardous materials stowed as breakbulk cargo must be segregated from materials packed in closed transport units in accordance with paragraph (c) of this section, except that:

(i) Where “away from” is required, no segregation between packages and the closed transport units is required; and

(ii) Where “separated from” is required, the segregation between the packages and the closed transport units may be the same as for “away from”.

(f) *Segregation of containers on board container vessels:* (1) Except for hatchless container ships, this paragraph applies to the segregation of freight containers that are carried on board container vessels, or on other types of vessels, provided these cargo spaces are properly fitted for permanent stowage of freight containers during transport.

(2) For container vessels which have cargo spaces used for breakbulk cargo or any other method of stowage, the appropriate paragraph of this section applies to the relevant cargo space.

(3) *Segregation Table:* Table §176.83(f) sets forth the general requirements for segregation between freight containers on board container vessels.

(4) In table §176.83(f), a *container space* means a distance of not less than 6 m (20 feet) fore and aft or not less than 2.5 m (8 feet) athwartship.

TABLE 176.83(f)—SEGREGATION OF CONTAINERS ON BOARD CONTAINER SHIPS

Segregation requirement	Vertical			Horizontal							
	Closed versus closed	Closed versus open	Open versus open	Closed versus closed		Closed versus open		Open versus open			
				On deck	Under deck	On deck	Under deck	On deck	Under deck		
1. "Away from"	One on top of the other permitted.	Open on top of closed permitted.	Not in the same vertical line unless segregated by a deck.	No restriction	No restriction	No restriction	No restriction	One container space.	One container space.	One container space or one bulkhead.	One container space.
2. "Separated from".	Not in the same vertical line unless segregated by a deck.	As for open versus open.	Not in the same vertical line unless segregated by a deck.	One container space.	One container space.	One container space.	One container space.	One container space.	One container space.	One bulkhead.	One bulkhead.
3. "Separated by a complete compartment or hold from".	Not in the same vertical line unless segregated by a deck.	As for open versus open.	Not in the same vertical line unless segregated by a deck.	One container space.	One container space.	One container space.	One container space.	One container space.	One container space.	Two bulkheads.	Two bulkheads.
4. "Separated longitudinally by an intervening complete compartment or hold from".	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited

\* Containers not less than 6 m (20 feet) from intervening bulkhead.  
 Note: All bulkheads and decks must be resistant to fire and liquid.

(g) *Segregation of transport units on board trailerships:* (1) The requirements of this paragraph apply to the segregation of transport units which are carried on board trailerships or in “roll-on/roll-off” cargo spaces.

(2) For trailerships which have spaces suitable for breakbulk cargo, con-

tainers, or any other method of stowage, the appropriate paragraph of this section applies to the relevant cargo space.

(3) *Segregation Table.* Table §176.83(g) sets forth the general requirements for segregation between transport units on board trailerships.

TABLE 176.83(g)—SEGREGATION OF TRANSPORT UNITS ON BOARD TRAILERSHIPS AND TRAINSHIPS.

Segregation requirement		Closed versus closed		Closed versus open		Open versus open	
		On deck	Under deck	On deck	Under deck	On deck	Under deck
1. “Away From” .....	Fore and aft.	No restriction.	No restriction.	No restriction.	No restriction.	At least 3 m.	At least 3 m.
	Athwartships.	No restriction.	No restriction.	No restriction.	No restriction.	At least 3 m.	At least 3 m.
2. “Separated from” .....	Fore and aft.	At least 6 m.	At least 6 m or one bulk-head.	At least 6 m.	At least 6 m or one bulk-head.	At least 6 m.	At least 12 m or one bulk-head.
	Athwartships.	At least 3 m.	At least 3 m or one bulk-head.	At least 3 m.	At least 6 m or one bulk-head.	At least 6 m.	At least 12 m or one bulk-head.
3. “Separated by a complete compartment or hold from”.	Fore and aft.	At least 12 m.	At least 24 m + deck.	At least 24 m.	At least 24 m + deck.	At least 36 m.	Two decks or two bulk-heads.
	Athwartships.	At least 12 m.	At least 24 m + deck.	At least 24 m.	At least 24 m + deck.	At least 36 m.	Prohibited.
4. “Separated longitudinally by an intervening complete compartment or hold from”.	Fore and aft.	At least 36 m.	Two bulk-heads or at least 36 m + two decks.	At least 36 m.	At least 48 m including two bulk-heads.	At least 48 m.	Prohibited.
	Athwartships.	Prohibited.	Prohibited.	Prohibited.	Prohibited.	Prohibited.	Prohibited.

NOTE: All bulkheads and decks must be resistant to fire and liquid.

(h) *Segregation on board barge carrying vessels:* (1) The requirements of this section apply to the segregation in shipborne barges as well as to the segregation between shipborne barges carried on board vessels specially designed and equipped to carry such barges.

(2) On barge-carrying vessels which incorporate other stowage spaces or any other method of stowage, barges containing hazardous materials must be segregated from hazardous materials not stowed in barges as prescribed in paragraphs (b) and (j) of this section.

(i) *Segregation in shipborne barges:* Hazardous materials transported in shipborne barges must be segregated as prescribed in paragraphs (a), (b), and (c) of this section.

(j) *Segregation between shipborne barges on barge-carrying vessels:* (1) When a shipborne barge is loaded with two or more hazardous materials with different requirements for segregation, the most stringent applicable segregation requirement must be applied.

(2) “Away from” and “separated from” require no segregation between shipborne barges.

(3) For barge-carrying vessels with vertical holds, “Separated by a complete compartment or hold from” means that separate holds are required. On barge-carrying vessels having horizontal barge levels, separate barge levels are required and the barges may not be in the same vertical line.

(4) “Separated longitudinally by an intervening complete compartment or

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hold from” means, for barge-carrying vessels with vertical holds, that separation by an intervening hold or engine room is required. On barge-carrying vessels having horizontal barge levels, separate barge levels and a longitudinal separation by at least two intervening barge spaces are required.

(k) *Segregation requirements for ferry vessels:* A ferry vessel (when operating either as a passenger or cargo vessel) that cannot provide the separation required in this section may carry incompatible hazardous materials in separate transport vehicles if they are stowed to give the maximum possible separation.

(l) *Segregation of containers on board hatchless container ships:* (1) This paragraph applies to the segregation of containers that are transported on board

hatchless container ships provided that the cargo spaces are properly fitted to give permanent stowage of the cargo transport units during transport.

(2) For partly hatchless container ships that have spaces suitable for breakbulk cargo, conventional container stowage, or any other method of stowage, the appropriate requirements of this section apply to the relevant cargo space.

(3) *Segregation Table:* Table §176.83(l)(3) sets forth the general requirements for segregation of containers on board hatchless container vessels.

(4) In Table §176.83(l)(3), a container space means a distance of not less than 6 m (20 feet) fore and aft or not less than 2.5 m (8 feet) athwartship.

TABLE 176.83(i) - SEGREGATION OF CONTAINERS ON BOARD HATCHLESS CONTAINER SHIPS

SEGREGATION REQUIREMENT	VERTICAL		HORIZONTAL						
	CLOSED VERSUS CLOSED	CLOSED VERSUS OPEN OR OPEN ON TOP OF CLOSED PERMITTED AS FOR VERSUS OPEN	CLOSED VERSUS CLOSED		CLOSED VERSUS OPEN		OPEN VERSUS OPEN		
			ON DECK	UNDER DECK	ON DECK	UNDER DECK	ON DECK	UNDER DECK	
*AWAY FROM 1.	ONE ON TOP OF THE OTHER PERMITTED	OPEN ON TOP OF CLOSED PERMITTED AS FOR VERSUS OPEN	NO RESTRICTION	NO RESTRICTION	NO RESTRICTION	NO RESTRICTION	NO RESTRICTION	ONE CONTAINER SPACE	ONE CONTAINER SPACE OR ONE BULKHEAD
*SEPARATED FROM 2.	NOT IN THE SAME VERTICAL LINE	NOT IN THE SAME VERTICAL LINE	ONE CONTAINER SPACE	ONE CONTAINER SPACE OR ONE BULKHEAD	ONE CONTAINER SPACE	ONE CONTAINER SPACE OR ONE BULKHEAD	ONE CONTAINER SPACE AND ABOVE SAME HOLD	ONE CONTAINER SPACE	ONE BULKHEAD
*SEPARATED BY A COMPLETE COMPARTMENT OR HOLD FROM 3.	AS FOR "OPEN VERSUS OPEN"	AS FOR "OPEN VERSUS OPEN"	ONE CONTAINER SPACE AND ABOVE SAME HOLD	ONE BULKHEAD	ONE CONTAINER SPACE AND ABOVE SAME HOLD	ONE BULKHEAD	ONE BULKHEAD	TWO CONTAINER SPACES AND NOT IN OR ABOVE SAME HOLD	TWO BULKHEADS
*SEPARATED LONGITUDINALLY BY AN INTERVENING COMPARTMENT OR HOLD FROM 4.	PROHIBITED	PROHIBITED	TWO CONTAINER SPACES AND ABOVE SAME HOLD	ONE BULKHEAD	TWO CONTAINER SPACES AND ABOVE SAME HOLD	ONE BULKHEAD	ONE BULKHEAD	THREE CONTAINER SPACES AND ABOVE SAME HOLD	TWO BULKHEADS
			MINIMUM HORIZONTAL DISTANCE OF 24 M <sup>1</sup> AND 24 M <sup>2</sup> IN OR ABOVE SAME HOLD	ONE BULKHEAD AND MINIMUM HORIZONTAL DISTANCE OF 24 M <sup>1</sup>	MINIMUM HORIZONTAL DISTANCE OF 24 M <sup>1</sup> AND 24 M <sup>2</sup> IN OR ABOVE SAME HOLD	MINIMUM HORIZONTAL DISTANCE OF 24 M <sup>1</sup> AND 24 M <sup>2</sup> IN OR ABOVE SAME HOLD	MINIMUM HORIZONTAL DISTANCE OF 24 M <sup>1</sup> AND 24 M <sup>2</sup> IN OR ABOVE SAME HOLD	MINIMUM HORIZONTAL DISTANCE OF 24 M <sup>1</sup> AND 24 M <sup>2</sup> IN OR ABOVE SAME HOLD	TWO BULKHEADS
			PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED

<sup>1</sup>Containers not less than 6 m (20 feet) from intervening bulkhead.  
<sup>2</sup>Note: All bulkheads and decks must be resistant to fire and liquid.

[Amdt. 176-30, 55 FR 52690, Dec. 21, 1990, as amended at 56 FR 66282, Dec. 20, 1991; 57 FR 45465, Oct. 1, 1992; Amdt. 176-34, 58 FR 51533, Oct. 1, 1993; Amdt. 176-38, 60 FR 49111, Sept. 21, 1995; 64 FR 10781, 10782, Mar. 5, 1999; 66 FR 45184, 45384, Aug. 28, 2001; 68 FR 45039, July 31, 2003]