

**Coast Guard, DHS**

**§ 154.1325**

§ 154.1035(b)(3)(iv) are available for a worst case discharge.

[USCG-1999-5149, 65 FR 40827, June 30, 2000]

**Subpart I—Response Plans for Other Non-Petroleum Oil Facilities**

SOURCE: CGD 91-036, 61 FR 7932, Feb. 29, 1996, unless otherwise noted.

**§ 154.1310 Purpose and applicability.**

This subpart establishes oil spill response planning requirements for an owner or operator of a facility that handles, stores, or transports other non-petroleum oils. The requirements of this subpart are intended for use in developing response plans and identifying response resources during the planning process. They are not performance standards.

**§ 154.1320 Response plan submission requirements.**

An owner or operator of a facility that handles, stores, or transports other non-petroleum oils shall submit a response plan in accordance with the requirements of this subpart, and with all sections of subpart F of this part, except §§ 154.1045 and 154.1047, which apply to petroleum oils.

**§ 154.1325 Response plan development and evaluation criteria for facilities that handle, store, or transport other non-petroleum oils.**

(a) An owner or operator of a facility that handles, stores, or transports other non-petroleum oils must provide information in his or her plan that identifies—

(1) Procedures and strategies for responding to a worst case discharge of other non-petroleum oils to the maximum extent practicable; and

(2) Sources of the equipment and supplies necessary to locate, recover, and mitigate such a discharge.

(b) An owner or operator of a facility that handles, stores, or transports other non-petroleum oils must ensure that any equipment identified in a response plan is capable of operating in the conditions expected in the geographic area(s) in which the facility operates using the criteria in Table 1 of appendix C of this part. When evalu-

ating the operability of equipment, the facility owner or operator must consider limitations that are identified in the ACPs for the COTP zone in which the facility is located, including—

- (1) Ice conditions;
- (2) Debris;
- (3) Temperature ranges; and
- (4) Weather-related visibility.

(c) The owner or operator of a facility that handles, stores, or transports other non-petroleum oils must identify the response resources that are available by contract or other approved means as described in § 154.1028(a). The equipment identified in a response plan must include—

(1) Containment boom, sorbent boom, or other methods for containing oil floating on the surface or to protect shorelines from impact;

(2) Oil recovery devices appropriate for the type of other non-petroleum oils handled; and

(3) Other appropriate equipment necessary to respond to a discharge involving the type of oil handled.

(d) Response resources identified in a response plan under paragraph (c) of this section must be capable of commencing an effective on-scene response within the times specified in this paragraph for the applicable operating area:

	Tier 1 (hrs.)	Tier 2	Tier 3
Higher volume port area .....	6	N/A	N/A
Great Lakes .....	12	N/A	N/A
All other river and canal, inland, near-shore, and offshore areas .....	12	N/A	N/A

(e) A response plan for a facility that handles, stores, or transports other non-petroleum oils must identify response resources with firefighting capability. The owner or operator of a facility that does not have adequate firefighting resources located at the facility or that cannot rely on sufficient local firefighting resources must identify and ensure, by contract or other approved means as described in § 154.1028(a), the availability of adequate firefighting resources. The response plan must also identify an individual located at the facility to work with the fire department on other non-petroleum oil fires. This individual shall also verify that sufficient well-

trained firefighting resources are available within a reasonable response time to a worst case scenario. The individual may be the qualified individual as defined in §154.1020 and identified in the response plan or another appropriate individual located at the facility.

(f) The response plan for a facility that is located in any environment with year-round preapproval for use of dispersants and that handles, stores, or transports other non-petroleum oils may request a credit for up to 25 percent of the worst case planning volume set forth by subpart F of this part. To receive this credit, the facility owner or operator must identify in the plan and ensure, by contract or other approved means as described in §154.1028(a), the availability of specified resources to apply the dispersants and to monitor their effectiveness. The extent of the credit will be based on the volumes of the dispersant available to sustain operations at the manufacturers' recommended dosage rates. Identification of these resources does not imply that they will be authorized for use. Actual authorization for use during a spill response will be governed by the provisions of the NCP and the applicable ACP.

#### APPENDIX A TO PART 154—GUIDELINES FOR DETONATION FLAME ARRESTERS

This appendix contains the draft ASTM standard for detonation flame arresters. Devices meeting this standard will be accepted by the Commandant (G-MSO).

##### 1. Scope

1.1 This standard provides the minimum requirements for design, construction, performance and testing of detonation flame arresters.

##### 2. Intent

2.1 This standard is intended for detonation flame arresters protecting systems containing vapors of flammable or combustible liquids where vapor temperatures do not exceed 60 °C. For all tests, the test media defined in 14.1.1 can be used except where detonation flame arresters protect systems handling vapors with a maximum experimental safe gap (MESG) below 0.9 millimeters. Detonation flame arresters protecting such systems must be tested with appropriate media (the same vapor or a media having a MESG no greater than the vapor). Various gases and their respective MESG are listed in attachment 1.

2.2 The tests in this standard are intended to qualify detonation flame arresters for all in-line applications independent of piping configuration provided the operating pressure is equal to or less than the maximum operating pressure limit specified in the manufacturer's certification and the diameter of the piping system in which the detonation arrester is to be installed is equal to or less than the piping diameter used in the testing.

NOTE: Detonation flame arresters meeting this standard as Type I devices, which are certified to be effective below 0 °C and which can sustain three stable detonations without being damaged or permanently deformed, also comply with the minimum requirements of the International Maritime Organization, Maritime Safety Committee Circular No. 373 (MSC/Circ. 373/Rev.1).

##### 3. Applicable Documents

###### 3.1 ASTM Standards<sup>1</sup>

A395 Ferritic Ductile Iron Pressure-Retaining Castings For Use At Elevated Temperatures.

F722 Welded Joints for Shipboard Piping Systems

F1155 Standard Practice for Selection and Application of Piping System Materials

###### 3.2 ANSI Standards<sup>2</sup>

B16.5 Pipe Flanges and Flanged Fittings.

###### 3.3 Other Documents

3.3.1 ASME Boiler and Pressure Vessel Code<sup>2</sup>

Section VIII, Division 1, Pressure Vessels

Section IX, Welding and Brazing Qualifications.

3.3.2 International Maritime Organization, Maritime Safety Committee<sup>3</sup>

MSC/Circ. 373/Rev. 1—Revised Standards for the Design, Testing and Locating of Devices to Prevent the Passage of Flame into Cargo Tanks in Tankers.

3.3.3 International Electrotechnical Commission<sup>4</sup>

Publication 79-1—Electrical Apparatus for Explosive Gas Atmospheres.

##### 4. Terminology

4.1  $\Delta P/P_o$ —The dimensionless ratio, for any deflagration and detonation test of 14.3, of the maximum pressure increase (the maximum pressure minus the initial pressure), as measured in the piping system on the side of the arrester where ignition begins by the device described in paragraph 14.3.3, to the initial absolute pressure in the piping system. The initial pressure should be greater than or equal to the maximum operating pressure specified in paragraph 11.1.7.

4.2 Deflagration—A combustion wave that propagates subsonically (as measured at the

<sup>1</sup>Footnotes appear at the end of this article.

pressure and temperature of the flame front) by the transfer of heat and active chemical species to the unburned gas ahead of the flame front.

4.3 Detonation—A reaction in a combustion wave propagating at sonic or supersonic (as measured at the pressure and temperature of the flame front) velocity. A detonation is stable when it has a velocity equal to the speed of sound in the burnt gas or may be unstable (overdriven) with a higher velocity and pressure.

4.4 Detonation flame arrester—A device which prevents the transmission of a detonation and a deflagration.

4.5 Flame speed—The speed at which a flame propagates along a pipe or other system.

4.6 Flame Passage—The transmission of a flame through a device.

4.7 Gasoline Vapors—A non-leaded petroleum distillate consisting essentially of aliphatic hydrocarbon compounds with a boiling range approximating 65 °C/75 °C.

#### 5. Classification

5.1 The two types of detonation flame arresters covered in this specification are classified as follows:

5.1.1 Type I—Detonation flame arresters acceptable for applications where stationary flames may rest on the device.

5.1.2 Type II—Detonation flame arresters acceptable for applications where stationary flames are unlikely to rest on the device, and further methods are provided to prevent flame passage when a stationary flame occurs. One example of "further methods" is a temperature monitor and an automatic shut-off valve.

#### 6. Ordering Information

6.1 Orders for detonation flame arresters under this specification shall include the following information as applicable:

6.1.1 Type (I or II).

6.1.2 Nominal pipe size.

6.1.3 Each gas or vapor in the system and the corresponding MESH.

6.1.4 Inspection and tests other than specified by this standard.

6.1.5 Anticipated ambient air temperature range.

6.1.6 Purchaser's inspection requirements (see section 10.1).

6.1.7 Description of installation.

6.1.8 Materials of construction (see section 7).

6.1.9 Maximum flow rate and the maximum design pressure drop for that maximum flow rate.

6.1.10 Maximum operating pressure.

#### 7. Materials

7.1 The detonation flame arrester housing, and other parts or bolting used for pressure retention, shall be constructed of materials listed in ASTM F 1155 (incorporated by reference, see §154.106), or section VIII, Division 1 of the ASME Boiler and Pressure Ves-

sel Code. Cast and malleable iron shall not be used; however, ductile cast iron in accordance with ASTM A395 may be used.

7.1.1 Arresters, elements, gaskets, and seals must be made of materials resistant to attack by seawater and the liquids and vapors contained in the system being protected (see section 6.1.3).

7.2 Nonmetallic materials, other than gaskets and seals, shall not be used in the construction of pressure retaining components of the detonation flame arrester.

7.2.1 Nonmetallic gaskets and seals shall be non-combustible and suitable for the service intended.

7.3 Bolting materials, other than that of section 7.1, shall be at least equal to those listed in Table 1 of ANSI B16.5.

7.4 The possibility of galvanic corrosion shall be considered in the selection of materials.

7.5 All other parts shall be constructed of materials suitable for the service intended.

#### 8. Other Requirements

8.1 Detonation flame arrester housings shall be gas tight to prevent the escape of vapors.

8.2 Detonation flame arrester elements shall fit in the housing in a manner that will insure tightness of metal-to-metal contacts in such a way that flame cannot pass between the element and the housing.

8.2.1 The net free area through detonation flame arrester elements shall be at least 1.5 times the cross-sectional area of the arrester inlet.

8.3 Housings, elements, and seal gasket materials shall be capable of withstanding the maximum and minimum pressures and temperatures to which the device may be exposed under both normal and the specified fire test conditions in section 14, and shall be capable of withstanding the hydrostatic pressure test of section 9.2.3.

8.4 Threaded or flanged pipe connections shall comply with the applicable B16 standards in ASTM F 1155 (incorporated by reference, see §154.106). Welded joints shall comply with ASTM F 722 (incorporated by reference, see §154.106).

8.5 All flat joints of the housing shall be machined true and shall provide for a joint having adequate metal-to-metal contact.

8.6 Where welded construction is used for pressure retaining components, welded joint design details, welding and non-destructive testing shall be in accordance with Section VIII, Division 1, of the ASME Code and ASTM F 722 (incorporated by reference, see §154.106). Welders and weld procedures shall be qualified in accordance with section IX of the ASME Code.

8.7 The design of detonation flame arresters shall allow for ease of inspection and removal of internal elements for replacement, cleaning or repair without removal of the entire device from the system.

8.8 Detonation flame arresters shall allow for efficient drainage of condensate without impairing their efficiency to prevent the passage of flame. The housing may be fitted with one or more drain plugs for this purpose. The design of a drain plug should be such so that by cursory visual inspection it is obvious whether the drain has been left open.

8.9 All fastenings shall be protected against loosening.

8.10 Detonation flame arresters shall be designed and constructed to minimize the effect of fouling under normal operating conditions.

8.11 Detonation flame arresters shall be capable of operating over the full range of ambient air temperatures anticipated.

8.12 Detonation flame arresters shall be of first class workmanship and free from imperfections which may affect their intended purpose.

8.13 Detonation flame arresters shall be tested in accordance with section 9.

#### 9. Tests

9.1 Tests shall be conducted by an independent laboratory capable of performing the tests. The manufacturer, in choosing a laboratory, accepts that it is a qualified independent laboratory by determining that it has (or has access to) the apparatus, facilities, personnel, and calibrated instruments that are necessary to test detonation flame arresters in accordance with this standard.

9.1.1 A test report shall be prepared by the laboratory which shall include:

9.1.1.1 Detailed drawings of the detonation flame arrester and its components (including a parts list identifying the materials of construction).

9.1.1.2 Types of tests conducted and results obtained. This shall include the maximum temperature reached and the length of testing time in section 14.2 in the case of Type II detonation flame arresters.

9.1.1.3 Description of approved attachments (reference 9.2.6).

9.1.1.4 Types of gases or vapors for which the detonation flame arrester is approved.

9.1.1.5 Drawings of the test rig.

9.1.1.6 Record of all markings found on the tested detonation flame arrester.

9.1.1.7 A report number.

9.2 One of each model Type I and Type II detonation flame arrester shall be tested. Where approval of more than one size of a detonation flame arrester model is desired, only the largest and smallest sizes need be tested provided it is demonstrated by calculation and/or other testing that intermediate size devices have equal or greater strength to withstand the force of a detonation and have equivalent detonation arresting characteristics. A change of design, material, or construction which may affect the corrosion resistance, or ability to resist endurance burning, deflagrations or detona-

tions shall be considered a change of model for the purpose of this paragraph.

9.2.1 The detonation flame arrester shall have the same dimensions, configuration, and most unfavorable clearances expected in production units.

9.2.2 A corrosion test shall be conducted. In this test, a complete detonation flame arrester, including a section of pipe similar to that to which it will be fitted, shall be exposed to a 20% sodium chloride solution spray at a temperature of 25 °C for a period of 240 hours, and allowed to dry for 48 hours. Following this exposure, all movable parts shall operate properly and there shall be no corrosion deposits which cannot be washed off.

9.2.3 The detonation flame arrester shall be subjected to a hydrostatic pressure test of at least 350 psig for ten minutes without rupturing, leaking, or showing permanent distortion.

9.2.4 Flow characteristics as declared by the manufacturer, shall be demonstrated by appropriate tests.

9.2.5 Detonation flame arresters shall be tested for endurance burn and deflagration/detonation in accordance with the test procedures in section 14. Type I detonation flame arresters shall show no flame passage when subjected to both tests. Type II detonation flame arresters shall show no evidence of flame passage during the detonation/deflagration tests in section 14.3. Type II detonation flame arresters shall be tested for endurance burn in accordance with section 14.2. From the endurance burn test of a Type II detonation flame arresters, the maximum temperature reached and the test duration shall be recorded and provided as part of the laboratory test report.

9.2.6 Where a detonation flame arrester is provided with cowls, weather hoods and deflectors, etc., it shall be tested in each configuration in which it is provided.

9.2.7 Detonation flame arresters which are provided with a heating arrangement designed to maintain the surface temperature of the device above 85 °C shall pass the required tests at the maximum heated operating temperature.

9.2.8 Each finished detonation arrester shall be pneumatically tested at 10 psig to ensure there are no defects or leakage.

#### 10. Inspection

10.1 The manufacturer shall afford the purchaser's inspector all reasonable access necessary to assure that the device is being furnished in accordance with this standard. All examinations and inspections shall be made at the place of manufacture, unless otherwise agreed upon.

10.2 Each finished detonation arrester shall be visually and dimensionally checked to ensure that the device corresponds to this

standard, is certified in accordance with section 11 and is marked in accordance with section 12. Special attention shall be given to the checking of welds and the proper fit-ups of joints (see sections 8.5 and 8.6).

#### 11. Certification

11.1 Manufacturer's certification that a detonation flame arrester meets this standard shall be provided in an instruction manual. The manual shall include as applicable:

11.1.1 Installation instructions and a description of all configurations tested (reference paragraph 9.2.6). Installation instructions to include the device's limitations.

11.1.2 Operating instructions.

11.1.3 Maintenance requirements.

11.1.3.1 Instructions on how to determine when arrester cleaning is required and the method of cleaning.

11.1.4 Copy of test report (see section 9.1.1).

11.1.5 Flow test data, maximum temperature and time tested (Type II).

11.1.6 The ambient air temperature range over which the device will effectively prevent the passage of flame.

NOTE: Other factors such as condensation and freezing of vapors should be evaluated at the time of equipment specification.

11.1.7 The maximum operating pressure for which the device is suitable.

#### 12. Marking

12.1 Each detonation flame arrester shall be permanently marked indicating:

12.1.1 Manufacturer's name or trademark.

12.1.2 Style, type, model or other manufacturer's designation for the detonation flame arrester.

12.1.3 Size of the inlet and outlet.

12.1.4 Type of device (Type I or II).

12.1.5 Direction of flow through the detonation flame arrester.

12.1.6 Test laboratory and report number.

12.1.7 Lowest MESG of gases that the detonation flame arrester is suitable for.

12.1.8 ASTM designation of this standard.

12.1.9 Ambient air operating temperature range.

12.1.10 Maximum operating pressure.

#### 13. Quality Assurance

13.1 Detonation flame arresters shall be designed, manufactured and tested in a manner that ensures they meet the characteristics of the unit tested in accordance with this standard.

13.2 The detonation flame arrester manufacturer shall maintain the quality of the arresters that are designed, tested and marked in accordance with this standard. At no time shall a detonation flame arrester be sold with this standard designation that does not meet the requirements herein.

#### 14. Test Procedures for Detonation Arresters

##### 14.1 Media/Air Mixtures

14.1.1 For vapors from flammable or combustible liquids with a MESG greater than or

equal to 0.9 mm, technical grade hexane or gasoline vapors shall be used for all tests in this section except technical grade propane may be used for the deflagration/detonation tests in section 14.3. For vapors with a MESG less than 0.9 mm, the specific vapor (or alternatively, a media with a MESG less than or equal to the MESG of the vapor) must be used as the test medium in all Section 14 tests.

14.1.2 Hexane, propane, gasoline and other test vapors shall be mixed with air to form the most easily ignitable mixture.<sup>5</sup>

##### 14.2 Endurance Burn Test Procedure

14.2.1 An endurance burning test shall be carried out as follows:

14.2.1.1 The test rig shall consist of an apparatus producing an explosive mixture, a small tank with a diaphragm, a prototype of the detonation flame arrester and a firing source in close proximity to the test device (see Figure 1). The detonation flame arrester shall be installed so that the mixture emission is vertically upwards, or installed in the position for which it is designed and which will cause the most severe heating of the device under the prescribed endurance burn conditions. In this position the mixture shall be ignited.

14.2.1.2 Endurance burn test shall start by using the most easily ignitable test vapor/air mixture with the aid of a pilot flame or a spark igniter at the outlet. The flammable mixture may be reignited as necessary in the course of the endurance burn.

14.2.1.3 Temperature measurement will be performed on the surface of the arrester element half way between the center and its edge.

14.2.1.4 By varying the proportions of the flammable mixture and the flow rate, the detonation flame arrester shall be heated by a stable flame on the surface of the arrester until the highest obtainable temperature is reached on the ignited side or until the temperature on the side which was not ignited (protected side) rises 100 °C.

14.2.1.5 The flammable mixture proportions will then be varied again until the conditions which result in the highest temperature on the protected side are achieved. This temperature shall be maintained for a period of ten minutes, after which the flow shall be stopped and the conditions observed. The highest attainable temperature is considered to have been reached when any subsequent rise of temperature does not exceed 0.5 °C per minute over a ten minute period.

14.2.1.6 If difficulty arises in establishing the highest attainable temperature on the protected side, the following criteria shall apply. When the increase in temperature on the protected side occurs so slowly that its temperature does not rise 100 °C, the conditions which produced the highest temperature on the ignited side of the arrester will

be maintained for two hours. For the condition in which the temperature on the protected side continues to rise at a rate in excess of 0.5 °C per minute for a 10 minute period, endurance burning shall be continued, using the most severe conditions of flammable mixtures and flow rate, for a period of two hours. In either of these cases, at the end of the two hour period, the flow shall be stopped and the conditions observed. The two hour interval shall be measured commencing with the setting of the conditions which produced the most severe conditions of mixture and flow rate. For Type I detonation flame arresters, flame passage shall not occur during this test. For Type II detonation flame arresters, the maximum temperature obtained, and the time elapsed from the time when the most severe conditions are set to when flame passage occurs, shall be recorded. However, for Type II detonation flame arresters the test may be terminated 15 minutes after setting the most severe conditions on the protected side.

14.3 *Deflagration/Detonation Test Procedure*

14.3.1 A detonation flame arrester shall be installed at one end of a pipe of the same diameter as the inlet of the detonation flame arrester (see Figure 2). The length and configuration of the test pipe shall develop a stable detonation<sup>6</sup> at the device and shall be capable, by change in its length or configuration, of developing deflagrations and unstable (overdriven) detonations as measured on the side of the pipe where ignition occurs (run-up side). For deflagration testing, two test piping arrangements shall be used on the outlet side of the detonation flame arrester (the side which is not ignited). In both of the following end arrangements, the outlet side pipe diameter shall be equal to that on the run-up side. In one arrangement, the outlet side pipe shall be at least 10 pipe diameters long with a plastic bag over the free end. (Alternate end of pipe closures are also acceptable provided they easily give way during the course of the test, and the closure allows the required gas concentration to be maintained throughout the test piping arrangement.) In the other arrangement the outlet side pipe shall be fitted with a restriction located 0.6 meters from the outlet side arrester flange. The size of the restriction for each nominal size detonation flame arrester shall be as follows:

Nominal pipe diameter (inches)	Restriction diameter (inches)
3	1/2
4	1/2
6	1
8	1 1/2
10	1 1/2
12	2
18	2
24	2

The entire pipe shall be filled with the most easily ignitable vapor/air mixture to a test pressure corresponding to or greater than the upper limit of the device's maximum operating pressure (see 11.1.7). In order to obtain this test pressure, a device such as a bursting disc may be fitted on the open end of the device in place of the plastic bag. The concentration of the mixture should be verified by appropriate testing of the gas composition. The vapor/air mixture shall then be ignited.

14.3.2 Flame speeds shall be measured by optical devices capable of providing accuracy of ±5%. These devices shall be situated no more than a distance equal to 3% of the length of the run-up pipe apart with one device no more than 8 inches from the end of the test pipe to which the detonation flame arrester is attached. In addition, each outlet arrangement described in paragraph 14.3.1 shall be fitted with an optical device located no more than 8 inches from the detonation flame arrester outlet.<sup>7</sup>

14.3.3 Explosion pressures within the pipe shall be measured by a high frequency transducer situated in the test pipe no more than 8 inches from the run-up side of the housing of the detonation flame arrester.

14.3.4 Using the first end arrangement (10 pipe diameter outlet) described in paragraph 14.3.1, a series of tests shall be conducted to determine the test pipe length and configuration that results in the maximum unstable (overdriven) detonation having the maximum measured flame speed at the detonation flame arrester. (These tests may also be carried out using a single length of pipe with igniters spaced at varying distances from the arrester.) The flame speeds, explosion pressures and test pipe configurations shall be recorded for each of these tests. The piping configuration that resulted in the highest recorded unstable (overdriven) detonation flame speed shall be used, and the device shall be subjected to at least four additional unstable (overdriven) detonations. In the course of testing, the device shall also demonstrate its ability to withstand five stable detonations, five deflagrations (as determined by flame speed) where  $\Delta P/P_0$  was less than 1 and five deflagrations (as determined by flame speed) where  $\Delta P/P_0$  was greater than 1 but less than 10. Initiation of deflagrations shall be at several locations to generate a range for  $\Delta P/P_0$ . Deflagration tests using the restricted outlet arrangement described in paragraph 14.3.1 shall then be conducted. In these tests the device shall demonstrate its ability to stop five deflagrations (as determined by flame speed) generated by the same configurations which resulted in  $\Delta P/P_0$  being less than 1 during the deflagration tests which were conducted without the restricted end arrangements, and five deflagrations (as determined by

flame speed) generated by the same configurations which resulted in  $\Delta P/P_0$  being greater than 1 but less than 10 during the deflagration tests which were conducted without the restricted end arrangements. No evidence of flame passage shall occur during these tests. The flame speeds and explosion pressures for each of these tests shall be recorded.

14.3.5 A device that successfully passes the tests of 14.3.4 shall be considered to be directional (suitable for arresting a detonation advancing only from the direction as tested) except;

14.3.5.1 A device may be tested according to 14.3.4 for detonations approaching from either direction, or

14.3.5.2 The design of the device is symmetrical where each end may be considered to be identical when approached by a detonation from either direction.

<sup>1</sup>Available from the American Society for Testing and Materials (ASTM), 100 Barr Harbor Dr., West Conshohocken, PA 19428-2959.

<sup>2</sup>Available from the American Society of Mechanical Engineers International, Three Park Avenue, New York, NY 10016-5990.

<sup>3</sup>Available from the International Maritime Organization, 4 Albert Embankment, London SE1 7SR, England.

<sup>4</sup>Available from the International Electrotechnical Commission, 1 rue de Varembe, Geneva, Switzerland.

<sup>5</sup>See IEC Publication 79-1.

<sup>6</sup>Some data are available for the estimation of flame speeds in horizontal pipes without detonation flame arresters. Some data indicate that the presence of small obstacles, fittings or bends in the test pipe can accelerate the flame speeds appreciably.

<sup>7</sup>Other pressure and/or flame speed measuring techniques may be used if effective.

FIGURE 1

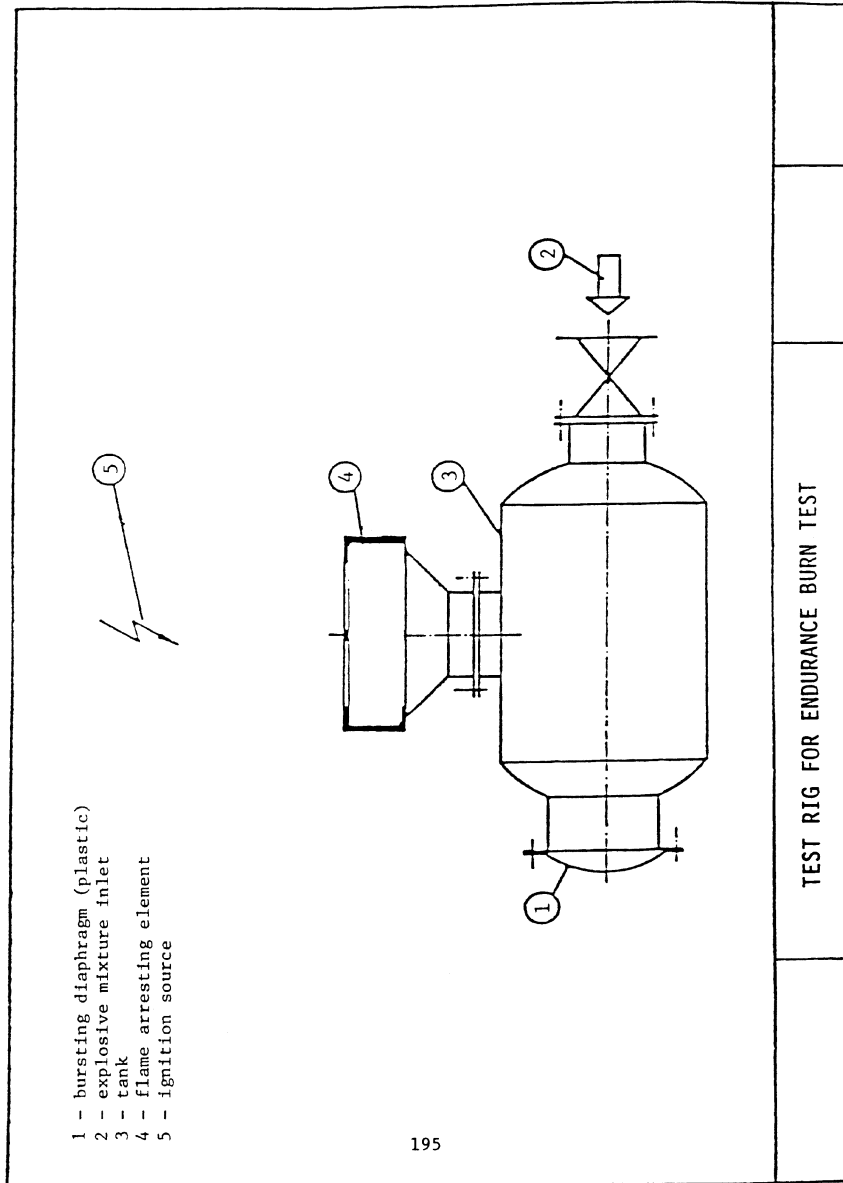
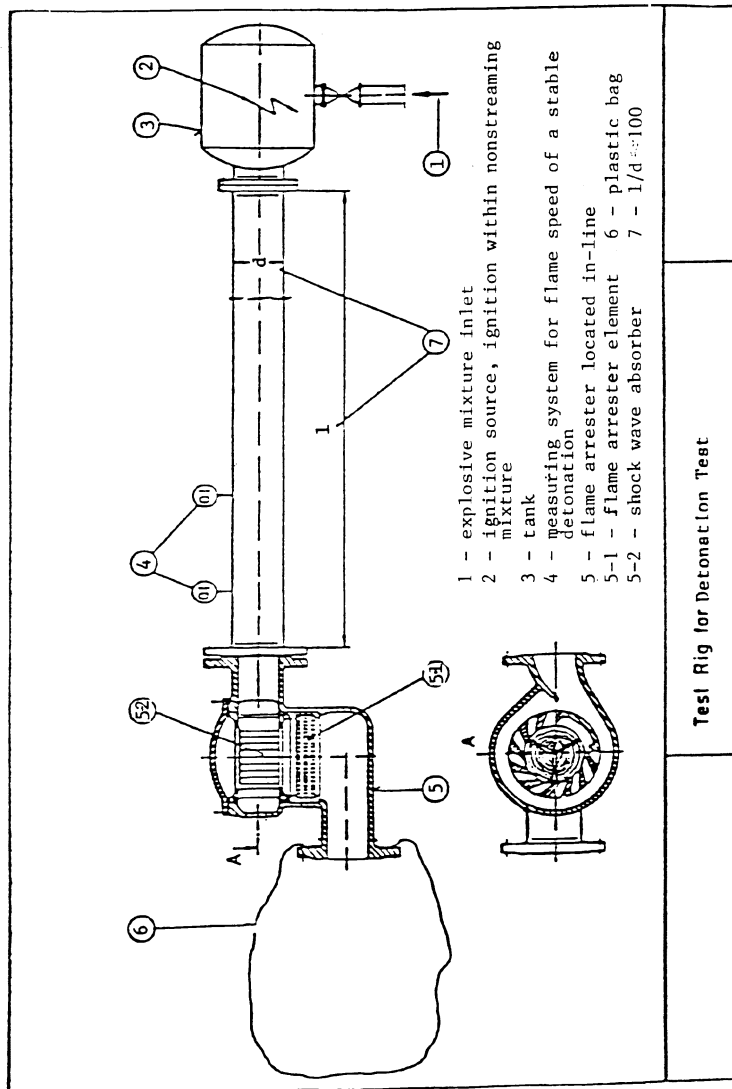




Figure 2



ATTACHMENT 1

Inflammable gas or vapour	Experimental maximum safe gap	
	mm	in.
Methane .....	1.170	0.046
Blast furnace gas .....	1.193	0.047
Propane .....	0.965	0.038
Butane .....	1.066	0.042
Pentane .....	1.016	0.040
Hexane .....	0.965	0.038
Heptane .....	0.965	0.038
Iso-octane .....	1.040	0.041
Decane .....	1.016	0.040
Benzene .....	0.99	0.039
Xylene .....	1.066	0.042
Cyclohexane .....	0.94	0.037
Acetone .....	1.016	0.040
Ethylene .....	0.71	0.028
Methyl-ethyl-ketone .....	1.016	0.040
Carbon monoxide .....	0.915	0.036
Methyl-acetate .....	0.990	0.039
Ethyl-acetate .....	1.04	0.041
Propyl-acetate .....	1.04	0.041
Butyl-acetate .....	1.016	0.040
Amyl-acetate .....	0.99	0.039
Methyl alcohol .....	0.915	0.036
Ethyl alcohol .....	1.016	0.040
Iso-butyl-alcohol .....	0.965	0.038
Butyl-alcohol (Normal) .....	0.94	0.037
Amyl-alcohol .....	0.99	0.039
Ethyl-ether .....	0.864	0.034
Coal gas (H <sub>2</sub> 57%) .....	0.482	0.019
Acetylene .....	≤0.025	≤0.001
Carbon disulphide .....	0.203	0.008
Hydrogen .....	0.102	0.004
Blue water gas (H <sub>2</sub> 53% CO 47%) .....	0.203	0.008
Ethyl nitrate .....	≤0.025	≤0.001
Ammonia .....	<sup>1</sup> 3.33	<sup>1</sup> 0.133
Ethylene oxide .....	0.65	0.026
Ethyl nitrite .....	0.922	0.038

<sup>1</sup> Approximately.

[CGD 88-102, 55 FR 25435, June 21, 1990; 55 FR 39270, Sept. 26, 1990, as amended by CGD 96-026, 61 FR 33666, June 28, 1996; USCG-1999-5832, 64 FR 34715, June 29, 1999; USCG-2000-7223, 65 FR 40058, June 29, 2000]

#### APPENDIX B TO PART 154—STANDARD SPECIFICATION FOR TANK VENT FLAME ARRESTERS

##### 1. Scope

1.1 This standard provides the minimum requirements for design, construction, performance and testing of tank vent flame arresters.

##### 2. Intent

2.1 This standard is intended for flame arresters protecting systems containing vapors of flammable or combustible liquids with a flashpoint that does not exceed 60 °C. The test media defined in 14.1.1 can be used except where arresters protect systems handling vapors with a maximum experimental safe gap (MESG) below 0.9 millimeters. Flame arresters protecting such systems must be tested with appropriate media (the same vapor or a media having a MESG no

greater than the vapor). Various gases and their respective MESG are listed in Attachment 1.

NOTE: Flame arresters meeting this standard also comply with the minimum requirements of the International Maritime Organization, Maritime Safety Committee Circular No. 373 (MSC/Circ. 373/Rev. 1).

##### 3. Applicable Documents

3.1 ASTM Standards<sup>1</sup> F722 Welded Joints for Shipboard Piping Systems; F1155 Standard Practice for Selection and Application of Piping System Materials

3.2 ANSI Standards<sup>2</sup> B16.5 Pipe Flanges and Flanged Fittings.

##### 3.3 Other Documents

3.3.1 ASME Boiler and Pressure Vessel Code<sup>2</sup> section VIII, Division 1, Pressure Vessels; section IX, Welding and Brazing Qualifications.

3.3.2 International Maritime Organization, Maritime Safety Committee<sup>3</sup> MSC/Circ. 373/Rev. 1—Revised Standards for the Design, Testing and Locating of Devices to Prevent the Passage of Flame into Cargo Tanks in Tankers.

3.3.3 International Electrotechnical Commission<sup>4</sup> Publication 79.1—Electrical Apparatus for Explosive Gas Atmospheres.

##### 4. Terminology

4.1 Flame arrester—A device to prevent the passage of flame in accordance with a specified performance standard. Its flame arresting element is based on the principle of quenching.

4.2 Flame speed—The speed at which a flame propagates along a pipe or other system.

4.3 Flame Passage—The transmission of a flame through a flame arrester.

4.4 Gasoline Vapors—A non-leaded petroleum distillate consisting essentially of aliphatic hydrocarbon compounds with a boiling range approximating 65 °C/75 °C.

##### 5. Classification

5.1 The two types of flame arresters covered in this specification are classified as follows:

5.1.1 Type I—Flame arresters acceptable for end-of-line applications.

5.1.2 Type II—Flame arresters acceptable for in-line applications.

##### 6. Ordering Information

6.1 Orders for flame arresters under this specification shall include the following information as applicable:

6.1.1 Type (I or II).

6.1.2 Nominal pipe size.

6.1.3 Each gas or vapor in the tank being protected by the flame arrester, and the corresponding MESG.

6.1.4 Inspection and tests other than specified by this standard.

<sup>1</sup>Footnotes appear at the end of this article.

6.1.5 Anticipated ambient air temperature range.

6.1.6 Purchaser's inspection requirements (see section 10.1).

6.1.7 Description of installation (distance and configuration of pipe between the arrester, and the atmosphere or potential ignition source) (see section 9.2.4.2).

6.1.8 Materials of construction (see section 7).

6.1.9 Maximum flow rate and the design pressure drop for that maximum flow rate.

#### 7. Materials

7.1 The flame arrester housing, and other parts or bolting used for pressure retention, shall be constructed of materials listed in ASTM F 1155 (incorporated by reference, see §154.106), or section VIII, Division 1 of the ASME Boiler and Pressure Vessel Code.

7.1.1 Arresters, elements, gaskets, and seals must be of materials resistant to attack by seawater and the liquids and vapors contained in the tank being protected (see section 6.1.3).

7.2 Nonmetallic materials, other than gaskets and seals, shall not be used in the construction of pressure retaining components of the flame arrester.

7.2.1 Nonmetallic gaskets and seals shall be non-combustible and suitable for the service intended.

7.3 Bolting materials, other than that of Section 7.1, shall be at least equal to those listed in Table I of ANSI B16.5.

7.4 The possibility of galvanic corrosion shall be considered in the selection of materials.

7.5 All other parts shall be constructed of materials suitable for the service intended.

#### 8. Other Requirements

8.1 Flame arrester housings shall be gas tight to prevent the escape of vapors.

8.2 Flame arrester elements shall fit in the housing in a manner that will insure tightness of metal-to-metal contacts in such a way that flame cannot pass between the element and the housing.

8.2.1 The net free area through flame arrester elements shall be at least 1.5 times the cross-sectional area of the arrester inlet.

8.3 Housings and elements shall be of substantial construction and designed for the mechanical and other loads intended during service. In addition, they shall be capable of withstanding the maximum and minimum pressures and temperatures to which the device may be exposed under both normal and the specified fire test conditions in section 14.

8.4 Threaded or flanged pipe connections shall comply with the applicable B16 standards in ASTM F 1155 (incorporated by reference, see §154.106). Welded joints shall comply with ASTM F 722 (incorporated by reference, see §154.106).

8.5 All flat joints of the housing shall be machined true and shall provide for a joint having adequate metal-to-metal contact.

8.6 Where welded construction is used for pressure retaining components, welded joint design details, welding and non-destructive testing shall be in accordance with section VIII, Division 1, of the ASME Code and ASTM F 722 (incorporated by reference, see §154.106). Welders and weld procedures shall be qualified in accordance with section IX of the ASME Code.

8.7 The design of flame arresters shall allow for ease of inspection and removal of internal elements for replacement, cleaning or repair without removal of the entire device from the system.

8.8 Flame arresters shall allow for efficient drainage of condensate without impairing their efficiency to prevent the passage of flame.

8.9 All fastenings shall be protected against loosening.

8.10 Flame arresters shall be designed and constructed to minimize the effect of fouling under normal operating conditions.

8.11 Flame arresters shall be capable of operating over the full range of ambient air temperatures anticipated.

8.12 End-of-line flame arresters shall be so constructed as to direct the efflux vertically upward.

8.13 Flame arresters shall be of first class workmanship and free from imperfections which may affect their intended purpose.

8.14 Tank vent flame arresters shall show no flame passage when subjected to the tests in 9.2.4.

#### 9. Prototype Tests

9.1 Tests shall be conducted by an independent laboratory capable of performing the tests. The manufacturer, in choosing a laboratory, accepts that it is a qualified independent laboratory by determining that it has (or has access to) the apparatus, facilities, personnel, and calibrated instruments that are necessary to test flame arresters in accordance with this standard.

9.1.1 A test report shall be prepared by the laboratory which shall include:

9.1.1.1 Detailed drawings of the flame arrester and its components (including a parts list identifying the materials of construction).

9.1.1.2 Types of tests conducted and results obtained.

9.1.1.3 Specific advice on approved attachments (see section 9.2.4.1).

9.1.1.4 Types of gases or vapors for which the flame arrester is approved (see section 6.1.3).

9.1.1.5 Drawings of the test rig.

9.1.1.6 Record of all markings found on the tested flame arrester.

9.1.1.7 A report number.

9.2 One of each model Type I and Type II flame arrester shall be tested. Where approval of more than one size of a flame arrester model is desired, the largest and smallest sizes shall be tested. A change of design, material, or construction which may affect the corrosion resistance, endurance burn, or flashback capabilities of the flame arrester shall be considered a change of model for the purpose of this paragraph.

9.2.1 The flame arrester shall have the same dimensions, configuration, and the most unfavorable clearances expected in production units.

9.2.2 A corrosion test shall be conducted. In this test, a complete arrester, including a section of pipe similar to that to which it will be fitted, shall be exposed to a 20% sodium chloride solution spray at a temperature of 25 degrees C for a period of 240 hours, and allowed to dry for 48 hours. Following this exposure, all movable parts shall operate properly and there shall be no corrosion deposits which cannot be washed off.

9.2.3 Performance characteristics as declared by the manufacturer, such as flow rates under both positive and negative pressure, operating sensitivity, flow resistance, and velocity, shall be demonstrated by appropriate tests.

9.2.4 Tank vent flame arresters shall be tested for endurance burn and flashback in accordance with the test procedures in section 14. The following constraints apply:

9.2.4.1 Where a Type I flame arrester is provided with cowls, weather hoods and deflectors, etc., it shall be tested in each configuration in which it is provided.

9.2.4.2 Type II arresters shall be specifically tested with the inclusion of all pipes, tees, bends, cowls, weather hoods, etc., which may be fitted between the arrester and the atmosphere.

9.2.5 Devices which are provided with a heating arrangement shall pass the required tests at the heated temperature.

9.2.6 After all tests are completed, the device shall be disassembled and examined, and no part of the device shall be damaged or show permanent deformation.

#### 10. Inspection

10.1 The manufacturer shall afford the purchaser's inspector all reasonable facilities necessary to assure that the material is being furnished in accordance with this standard. All examinations and inspections shall be made at the place of manufacture, unless otherwise agreed upon.

10.2 Each finished flame arrester shall be visually and dimensionally checked to ensure that the device corresponds to this standard, is certified in accordance with section 11 and is marked in accordance with section 12. Special attention shall be given to checking the proper fit-up of joints (see sections 8.5 and 8.6)

#### 11. Certification

11.1 Manufacturer's certification that a flame arrester has been constructed in accordance with this standard shall be provided in an instruction manual. The manual shall include as applicable:

11.1.1 Installation instructions and a description of all configurations tested (reference paragraph 9.2.4.1 and 9.2.4.2). Installation instructions to include manufacturer's recommended limitations based on all configurations tested.

11.1.2 Operating instructions.

11.1.3 Maintenance requirements.

11.1.3.1 Instructions on how to determine when flame arrester cleaning is required and the method of cleaning.

11.1.4 Copy of test report (see section 9.1.1).

11.1.5 Flow test data, including flow rates under both positive and negative pressures, operating sensitivity, flow resistance, and velocity.

11.1.6 The ambient air temperature range over which the device will effectively prevent the passage of flame. (NOTE: Other factors such as condensation and freezing of vapors should be evaluated at the time of equipment specification.)

#### 12. Marking

12.1 Each flame arrester shall be permanently marked indicating:

12.1.1 Manufacturer's name or trademark.

12.1.2 Style, type, model or other manufacturer's designation for the flame arrester.

12.1.3 Size of the inlet and outlet.

12.1.4 Type of device (Type I or II).

12.1.5 Direction of flow through the flame arrester.

12.1.6 Test laboratory and report number.

12.1.7 Lowest MESH of gases for which the flame arrester is suitable for.

12.1.8 Ambient air operating temperature range.

12.1.9 ASTM designation of this standard.

#### 13. Quality Assurance

13.1 Flame arresters shall be designed, manufactured and tested in a manner that ensures they meet the characteristics of the unit tested in accordance with this standard.

13.2 The flame arrester manufacturer shall maintain the quality of the flame arresters that are designed, tested and marked in accordance with this standard. At no time shall a flame arrester be sold with this standard designation that does not meet the requirements herein.

#### 14. Test Procedures for Flame Arresters

##### 14.1 Media/Air Mixtures

14.1.1 For vapors from flammable or combustible liquids with a MESH greater than or equal to 0.9 mm, technical grade hexane or gasoline vapors shall be used for all tests in this section except technical grade propane may be used for the flashback test in Section 14.2. For vapors with a MESH less than 0.9 mm, the specific vapor (or alternatively, a media with a MESH less than or equal to the

MESG of the vapor) must be used as the test medium in all section 14 tests.

14.1.2 Hexane, propane, gasoline and chemical vapors shall be mixed with air to form the most easily ignitable mixture.<sup>5</sup>

#### 14.2 Flashback Test

14.2.1 A flashback test shall be carried out as follows:

14.2.1.1 The test rig shall consist of an apparatus producing an explosive mixture, a small tank with a diaphragm, a prototype of the flame arrester, a plastic bag<sup>6</sup> and a firing source in three positions (see Figure 1).<sup>7</sup>

14.2.1.2 The tank, flame arrester assembly and the plastic bag enveloping the prototype flame arrester shall be filled so that this volume contains the most easily ignitable vapor/air mixture.<sup>8</sup> The concentration of the mixture should be verified by appropriate testing of the gas composition in the plastic bag. Three ignition sources shall be installed along the axis of the bag, one close to the flame arrester, another as far away as possible therefrom, and the third at the midpoint between these two. These three sources shall be fired in succession, one during each of the three tests. Flame passage shall not occur during this test.

14.2.1.3 If flame passage occurs, the tank diaphragm will burst and this will be audible and visible to the operator by the emission of a flame. Flame, heat and pressure sensors may be used as an alternative to a bursting diaphragm.

#### 14.3 Endurance Burn Test

14.3.1 An endurance burning test shall be carried out as follows:

14.3.1.1 The test rig as referred to in 14.2 may be used, without the plastic bag. The flame arrester shall be so installed that the mixture emission is vertical. In this position the mixture shall be ignited.

14.3.1.2 Endurance burning shall be achieved by using the most easily ignitable test vapor/air mixture with the aid of a pilot flame or a spark igniter at the outlet. By varying the proportions of the flammable mixture and the flow rate, the arrester shall be heated until the highest obtainable tem-

perature on the cargo tank side of the arrester is reached. The highest attainable temperature may be considered to have been reached when the rate of rise of temperature does not exceed 0.5 °C per minute over a ten minute period. This temperature shall be maintained for a period of ten minutes, after which the flow shall be stopped and the conditions observed. If difficulty arises in establishing the highest attainable temperature, the following criteria shall apply. When the temperature appears to be approaching the maximum temperature, using the most severe conditions of flammable mixtures and flow rate, but increases at a rate in excess of 0.5 °C per minute over a ten minute period, endurance burning shall be continued for a period of two hours after which the flow shall be stopped and the conditions observed. Flame passage shall not occur during this test.

<sup>1</sup>American Society for Testing and Materials (ASTM), 100 Barr Harbor Dr., West Conshohocken, PA 19428-2959.

<sup>2</sup>Available from the American Society of Mechanical Engineers International, Three Park Avenue, New York, NY 10016-5990.

<sup>3</sup>Available from the International Maritime Organization, 4 Albert Embankment, London SE1 7SR, England.

<sup>4</sup>Available from the International Electrotechnical Commission, 1 rue de Varembe, Geneva, Switzerland

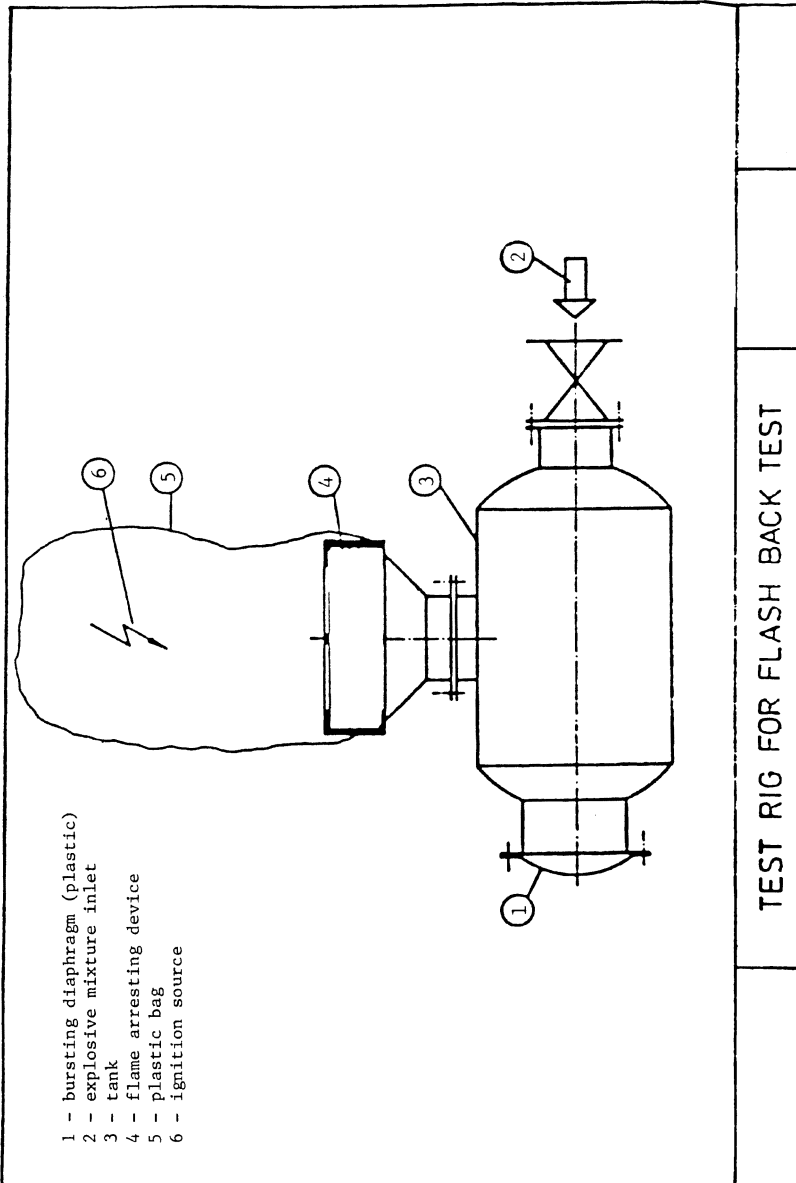
<sup>5</sup>See IEC Publication 79-1.

<sup>6</sup>The dimensions of the plastic bag are dependent on those of the flame arrester. The plastic bag may have a circumference of 2 m, a length of 2.5 m and a wall thickness of .05 m.

<sup>7</sup>In order to avoid remnants of the plastic bag from falling back on to the flame arrester being tested after ignition of the fuel/air mixture, it may be useful to mount a coarse wire frame across the flame arrester within the plastic bag. The frame should be constructed so as not to interfere with the test result.

<sup>8</sup>See IEC Publication 79-1.

FIGURE 1



## ATTACHMENT 1

Inflammable gas or vapor	Experimental maximum safe gap	
	mm	in.
Methane .....	1.170	0.046
Blast furnace gas .....	1.193	0.047
Propane .....	0.965	0.038
Butane .....	1.066	0.042
Pentane .....	1.016	0.040
Hexane .....	0.965	0.038
Heptane .....	0.965	0.038
Iso-octane .....	1.040	0.041
Decane .....	1.016	0.040
Benzene .....	0.99	0.039
Xylene .....	1.066	0.042
Cyclohexane .....	0.94	0.037
Acetone .....	1.016	0.040
Ethylene .....	0.71	0.028
Methyl-ethyl-ketone .....	1.016	0.040
Carbon monoxide .....	0.915	0.036
Methyl-acetate .....	0.990	0.039
Ethyl-acetate .....	1.04	0.041
Propyl-acetate .....	1.04	0.041
Butyl-acetate .....	1.016	0.040
Amyl-acetate .....	0.99	0.039
Methyl alcohol .....	0.915	0.036
Ethyl alcohol .....	1.016	0.040
Iso-butyl-alcohol .....	0.965	0.038
Butyl-alcohol (Normal) .....	0.94	0.037
Amyl-alcohol .....	0.99	0.039
Ethyl-ether .....	0.864	0.034
Coal gas (H <sub>2</sub> 57%) .....	0.482	0.019
Acetylene .....	<0.025	<0.001
Carbon disulphide .....	0.203	0.008
Hydrogen .....	0.102	0.004
Blue water gas (H <sub>2</sub> 53% CO 47%) .....	0.203	0.008
Ethyl nitrate .....	<0.025	<0.001
Ammonia .....	13.33	10.133
Ethylene oxide .....	0.65	0.026
Ethyl nitrite .....	0.922	0.038

<sup>1</sup>Approximately.

[CGD 88-102, 55 FR 25441, June 21, 1990, as amended by USCG-1999-5832, 64 FR 34715, June 29, 1999; USCG-2000-7223, 65 FR 40058, June 29, 2000]

APPENDIX C TO PART 154—GUIDELINES FOR DETERMINING AND EVALUATING REQUIRED RESPONSE RESOURCES FOR FACILITY RESPONSE PLANS

1. Purpose

1.1 The purpose of this appendix is to describe the procedures for identifying response resources to meet the requirements of subpart F of this part. These guidelines will be used by the facility owner or operator in preparing the response plan and by the Captain of the Port (COTP) when reviewing them. Response resources identified in subparts H and I of this part should be selected using the guidelines in section 2 and Table 1 of this appendix.

2. Equipment Operability and Readiness

2.1 All equipment identified in a response plan must be designed to operate in the con-

ditions expected in the facility's geographic area. These conditions vary widely based on location and season. Therefore, it is difficult to identify a single stockpile of response equipment that will function effectively in each geographic location.

2.2 Facilities handling, storing, or transporting oil in more than one operating environment as indicated in Table 1 of this appendix must identify equipment capable of successfully functioning in each operating environment.

2.3 When identifying equipment for response plan credit, a facility owner or operator must consider the inherent limitations in the operability of equipment components and response systems. The criteria in Table 1 of this appendix should be used for evaluating the operability in a given environment. These criteria reflect the general conditions in certain operating areas.

2.3.1 The Coast Guard may require documentation that the boom identified in a response plan meets the criteria in Table 1. Absent acceptable documentation, the Coast Guard may require that the boom be tested to demonstrate that it meets the criteria in Table 1. Testing must be in accordance with ASTM F 715 (incorporated by reference, see §154.106), or other tests approved by the Coast Guard.

2.4 Table 1 of this appendix lists criteria for oil recovery devices and boom. All other equipment necessary to sustain or support response operations in the specified operating environment must be designed to function in the same conditions. For example, boats which deploy or support skimmers or boom must be capable of being safely operated in the significant wave heights listed for the applicable operating environment.

2.5 A facility owner or operator must refer to the applicable local contingency plan or ACP, as appropriate, to determine if ice, debris, and weather-related visibility are significant factors in evaluating the operability of equipment. The local contingency plan or ACP will also identify the average temperature ranges expected in the facility's operating area. All equipment identified in a response plan must be designed to operate within those conditions or ranges.

2.6 The requirements of subparts F, G, H and I of this part establish response resource mobilization and response times. The distance of the facility from the storage location of the response resources must be used to determine whether the resources can arrive on scene within the stated time. A facility owner or operator shall include the time for notification, mobilization, and travel time of response resources identified to meet the maximum most probable discharge and Tier 1 worst case discharge response time requirements. For subparts F and G, tier 2 and 3 response resources must be notified and

mobilized as necessary to meet the requirements for arrival on scene in accordance with §§154.1045 or 154.1047 of subpart F, or §154.1135 of subpart G, as appropriate. An on water speed of 5 knots and a land speed of 35 miles per hour is assumed unless the facility owner or operator can demonstrate otherwise.

2.7 For subparts F and G, in identifying equipment, the facility owner or operator shall list the storage location, quantity, and manufacturer's make and model. For oil recovery devices, the effective daily recovery capacity, as determined using section 6 of this appendix must be included. For boom, the overall boom height (draft plus freeboard) should be included. A facility owner or operator is responsible for ensuring that identified boom has compatible connectors.

2.8 For subparts H and I, in identifying equipment, the facility owner or operator shall list the storage location, quantity, and manufacturer's make and model. For boom, the overall boom height (draft plus freeboard) should be included. A facility owner or operator is responsible for ensuring that identified boom has compatible connectors.

### *3. Determining Response Resources Required for the Average Most Probable Discharge*

3.1 A facility owner or operator shall identify sufficient response resources available, through contract or other approved means as described in §154.1028(a), to respond to the average most probable discharge. The equipment must be designed to function in the operating environment at the point of expected use.

3.2 The response resources must include:

3.2.1 1,000 feet of containment boom or two times the length of the largest vessel that regularly conducts oil transfers to or from the facility, whichever is greater, and a means deploying it available at the spill site within 1 hour of the discovery of a spill.

3.2.2 Oil recovery devices with an effective daily recovery capacity equal to the amount of oil discharged in an average most probable discharge or greater available at the facility within 2 hours of the detection of an oil discharge.

3.2.3 Oil storage capacity for recovered oily material indicated in section 9.2 of this appendix.

### *4. Determining Response Resources Required for the Maximum Most Probable Discharge*

4.1 A facility owner or operator shall identify sufficient response resources available, by contract or other approved means as described in §154.1028(a), to respond to discharges up to the maximum most probable discharge volume for that facility. This will require response resources capable of con-

taining and collecting up to 1,200 barrels of oil or 10 percent of the worst case discharge, whichever is less. All equipment identified must be designed to operate in the applicable operating environment specified in Table 1 of this appendix.

4.2 Oil recovery devices identified to meet the applicable maximum most probable discharge volume planning criteria must be located such that they arrive on scene within 6 hours in higher volume port areas (as defined in 154.1020) and the Great Lakes and within 12 hours in all other areas.

4.3 Because rapid control, containment, and removal of oil is critical to reduce spill impact, the effective daily recovery capacity for oil recovery devices must equal 50 percent of the planning volume applicable for the facility as determined in section 4.1 of this appendix. The effective daily recovery capacity for oil recovery devices identified in the plan must be determined using the criteria in section 6 of this appendix.

4.4 In addition to oil recovery capacity, the plan must identify sufficient quantities of containment boom available, by contract or other approved means as described in §154.1028(a), to arrive within the required response times for oil collection and containment and for protection of fish and wildlife and sensitive environments. While the regulation does not set required quantities of boom for oil collection and containment, the response plan must identify and ensure, by contract or other approved means as described in §154.1028(a), the availability of the boom identified in the plan for this purpose.

4.5 The plan must indicate the availability of temporary storage capacity to meet the guidelines of section 9.2 of this appendix. If available storage capacity is insufficient to meet this level, then the effective daily recovery capacity must be derated to the limits of the available storage capacity.

4.6 The following is an example of a maximum most probable discharge volume planning calculation for equipment identification in a higher volume port area: The facility's worst case discharge volume is 20,000 barrels. Ten percent of this is 2,000 barrels. Since this is greater than 1,200 barrels, 1,200 barrels is used as the planning volume. The effective daily recovery capacity must be 50 percent of this, or 600 barrels per day. The ability of oil recovery devices to meet this capacity will be calculated using the procedures in section 6 of this appendix. Temporary storage capacity available on scene must equal twice the daily recovery rate as indicated in section 9 of this appendix, or 1,200 barrels per day. This is the information the facility owner or operator will use to identify and ensure the availability of, through contract or other approved means as described in §154.1028(a), the required response resources. The facility owner will also



need to identify how much boom is available for use.

*5. Determining Response Resources Required for the Worst Case Discharge to the Maximum Extent Practicable*

5.1 A facility owner or operator shall identify and ensure availability of, by contract or other approved means, as described in §154.1028(a), sufficient response resources to respond to the worst case discharge of oil to the maximum extent practicable. Section 7 of this appendix describes the method to determine the required response resources.

5.2 Oil spill response resources identified in the response plan and available through contract or other approved means, as described in §154.1028(a), to meet the applicable worst case discharge planning volume must be located such that they can arrive at the scene of a discharge within the times specified for the applicable response tiers listed in §154.1045.

5.3 The effective daily recovery capacity for oil recovery devices identified in a response plan must be determined using the criteria in section 6 of this appendix. A facility owner or operator shall identify the storage locations of all response resources that must be used to fulfill the requirements for each tier. The owner or operator of a facility whose required daily recovery capacity exceeds the applicable response capability caps in Table 5 of this appendix shall identify sources of additional equipment, their locations, and the arrangements made to obtain this equipment during a response. The owner or operator of a facility whose calculated planning volume exceeds the applicable contracting caps in Table 5 shall identify sources of additional equipment equal to twice the cap listed in Tiers 1, 2, and 3 or the amount necessary to reach the calculated planning volume, whichever is lower. The resources identified above the cap must be capable of arriving on scene not later than the Tiers 1, 2, and 3 response times in §154.1045. No contract is required. While general listings of available response equipment may be used to identify additional sources, a response plan must identify the specific sources, locations, and quantities of equipment that a facility owner or operator has considered in his or her planning. When listing Coast Guard classified oil spill removal organization(s) which have sufficient removal capacity to recover the volume above the response capability cap for the specific facility, as specified in Table 5 of this appendix, it is not necessary to list specific quantities of equipment.

5.4 A facility owner or operator shall identify the availability of temporary storage capacity to meet the requirements of section 9.2 of this appendix. If available storage capacity is insufficient to meet this requirement, then the effective daily recovery

capacity must be derated to the limits of the available storage capacity.

5.5 When selecting response resources necessary to meet the response plan requirements, the facility owner or operator must ensure that a portion of those resources are capable of being used in close-to-shore response activities in shallow water. The following percentages of the on-water response equipment identified for the applicable geographic area must be capable of operating in waters of 6 feet or less depth:

- (i) Offshore—10 percent
- (ii) Nearshore/inland/Great Lakes/ivers and canals—20 percent.

5.6 In addition to oil spill recovery devices, a facility owner or operator shall identify sufficient quantities of boom that are available, by contract or other approved means as described in §154.1028(a), to arrive on scene within the required response times for oil containment and collection. The specific quantity of boom required for collection and containment will depend on the specific recovery equipment and strategies employed. A facility owner or operator shall also identify sufficient quantities of oil containment boom to protect fish and wildlife and sensitive environments for the number of days and geographic areas specified in Table 2. Sections 154.1035(b)(4)(iii) and 154.1040(a), as appropriate, shall be used to determine the amount of containment boom required, through contract or other approved means as described in §154.1028(a), to protect fish and wildlife and sensitive environments.

5.7 A facility owner or operator must also identify, through contract or other approved means as described in §154.1028(a), the availability of an oil spill removal organization capable of responding to a shoreline cleanup operation involving the calculated volume of oil and emulsified oil that might impact the affected shoreline. The volume of oil that must be planned for is calculated through the application of factors contained in Tables 2 and 3. The volume calculated from these tables is intended to assist the facility owner or operator in identifying a contractor with sufficient resources and expertise. This planning volume is not used explicitly to determine a required amount of equipment and personnel.

*6. Determining Effective Daily Recovery Capacity for Oil Recovery Devices*

6.1 Oil recovery devices identified by a facility owner or operator must be identified by manufacturer, model, and effective daily recovery capacity. These rates must be used to determine whether there is sufficient capacity to meet the applicable planning criteria for the average most probable discharge, maximum most probable discharge, and worst case discharge to the maximum extent practicable.

6.2 For the purpose of determining the effective daily recovery capacity of oil recovery devices, the formula listed in section 6.2.1 of this appendix will be used. This method considers potential limitations due to available daylight, weather, sea state, and percentage of emulsified oil in the recovered material. The Coast Guard may assign a lower efficiency factor to equipment listed in a response plan if it determines that such a reduction is warranted.

6.2.1 The following formula must be used to calculate the effective daily recovery capacity:

$$R=T \times 24 \text{ hours} \times E$$

R=Effective daily recovery capacity

T=Throughput rate in barrels per hour (nameplate capacity)

E=20 percent Efficiency factor (or lower factor as determined by Coast Guard)

6.2.2 For those devices in which the pump limits the throughput of liquid, throughput rate will be calculated using the pump capacity.

6.2.3 For belt or mop type devices, the throughput rate will be calculated using the speed of the belt or mop through the device, assumed thickness of oil adhering to or collected by the device, and surface area of the belt or mop. For purposes of this calculation, the assumed thickness of oil will be 1/4 inch.

6.2.4 Facility owners or operators including oil recovery devices whose throughput is not measurable using a pump capacity or belt/mop speed may provide information to support an alternative method of calculation. This information must be submitted following the procedures in paragraph 6.3.2 of this appendix.

6.3 As an alternative to 6.2, a facility owner or operator may submit adequate evidence that a different effective daily recovery capacity should be applied for a specific oil recovery device. Adequate evidence is actual verified performance data in spill conditions or tests using ASTM F 631 (incorporated by reference, see §154.106), or an equivalent test approved by the Coast Guard.

6.3.1 The following formula must be used to calculate the effective daily recovery capacity under this alternative:

$$R=D \times U$$

R=Effective daily recovery capacity

D=Average Oil Recovery Rate in barrels per hour (Item 26 in ASTM F 808; Item 13.2.16 in ASTM F 631; or actual performance data)

U=Hours per day that a facility owner or operator can document capability to operate equipment under spill conditions. Ten hours per day must be used unless a facility owner or operator can demonstrate that the recovery operation can be sustained for longer periods.

6.3.2 A facility owner or operator proposing a different effective daily recovery

rate for use in a response plan shall provide data for the oil recovery devices listed. The following is an example of these calculations:

A weir skimmer identified in a response plan has a manufacturer's rated throughput at the pump of 267 gallons per minute (gpm).

$$267 \text{ gpm} = 381 \text{ barrels per hour}$$

$$R = 381 \times 24 \times .2 = 1829 \text{ barrels per day}$$

After testing using ASTM procedures, the skimmer's oil recovery rate is determined to be 220 gpm. The facility owner or operator identifies sufficient response resources available to support operations 12 hours per day.

$$220 \text{ gpm} = 314 \text{ barrels per hour}$$

$$R = 314 \times 12 = 3768 \text{ barrels per day}$$

The facility owner or operator will be able to use the higher rate if sufficient temporary oil storage capacity is available. Determinations of alternative efficiency factors under paragraph 6.2 or alternative effective daily recovery capacities under paragraph 6.3 of this appendix will be made by Commandant, (G-MOR), Coast Guard Headquarters, 2100 Second Street SW., Washington, DC 20593. Response contractors or equipment manufacturers may submit required information on behalf of multiple facility owners or operators directly in lieu of including the request with the response plan submission.

#### 7. Calculating the Worst Case Discharge Planning Volumes

7.1 The facility owner or operator shall plan for a response to a facility's worst case discharge. The planning for on-water recovery must take into account a loss of some oil to the environment due to evaporative and natural dissipation, potential increases in volume due to emulsification, and the potential for deposit of some oil on the shoreline.

7.2 The following procedures must be used to calculate the planning volume used by a facility owner or operator for determining required on water recovery capacity:

7.2.1 The following must be determined: The worst case discharge volume of oil in the facility; the appropriate group(s) for the type of oil handled, stored, or transported at the facility (non-persistent (Group I) or persistent (Groups II, III, or IV)); and the facility's specific operating area. Facilities which handle, store, or transport oil from different petroleum oil groups must calculate each group separately. This information is to be used with Table 2 of this appendix to determine the percentages of the total volume to be used for removal capacity planning. This table divides the volume into three categories: Oil lost to the environment; oil deposited on the shoreline; and oil available for on-water recovery.

7.2.2 The on-water oil recovery volume must be adjusted using the appropriate emulsification factor found in Table 3 of this appendix. Facilities which handle, store, or

transport oil from different petroleum groups must assume that the oil group resulting in the largest on-water recovery volume will be stored in the tank or tanks identified as constituting the worst case discharge.

7.2.3 The adjusted volume is multiplied by the on-water oil recovery resource mobilization factor found in Table 4 of this appendix from the appropriate operating area and response tier to determine the total on-water oil recovery capacity in barrels per day that must be identified or contracted for to arrive on-scene with the applicable time for each response tier. Three tiers are specified. For higher volume port areas, the contracted tiers of resources must be located such that they can arrive on scene within 6, 30, and 54 hours of the discovery of an oil discharge. For all other river, inland, nearshore, offshore areas, and the Great Lakes, these tiers are 12, 36, and 60 hours.

7.2.4 The resulting on-water recovery capacity in barrels per day for each tier must be used to identify response resources necessary to sustain operations in the applicable operating area. The equipment must be capable of sustaining operations for the time period specified in Table 2 of this appendix. The facility owner or operator must identify and ensure the availability, through contract or other approved means as described in §154.1028(a), of sufficient oil spill recovery devices to provide the effective daily recovery oil recovery capacity required. If the required capacity exceeds the applicable cap specified in Table 5 of this appendix, then a facility owner or operator shall ensure, by contract or other approved means as described in §154.1028(a), only for the quantity of resources required to meet the cap, but shall identify sources of additional resources as indicated in §154.1045(m). The owner or operator of a facility whose planning volume exceeds the cap for 1993 must make arrangements to identify and ensure the availability, through contract or other approved means as described in §154.1028(a), of the additional capacity in 1998 or 2003, as appropriate. For a facility that handles, stores, or transports multiple groups of oil, the required effective daily recovery capacity for each group is calculated before applying the cap.

7.3 The following procedures must be used to calculate the planning volume for identifying shoreline cleanup capacity:

7.3.1 The following must be determined: The worst case discharge volume of oil for the facility; the appropriate group(s) for the type of oil handled, stored, or transported at the facility (non-persistent (Group I) or persistent (Groups II, III, or IV)); and the operating area(s) in which the facility operates. For a facility storing oil from different groups, each group must be calculated separately. Using this information, Table 2 of

this appendix must be used to determine the percentages of the total planning volume to be used for shoreline cleanup resource planning.

7.3.2 The shoreline cleanup planning volume must be adjusted to reflect an emulsification factor using the same procedure as described in section 7.2.2.

7.3.3 The resulting volume will be used to identify an oil spill removal organization with the appropriate shoreline cleanup capability.

7.3.4 The following is an example of the procedure described above: A facility receives oil from barges via a dock located on a bay and transported by piping to storage tanks. The facility handles Number 6 oil (specific gravity .96) and stores the oil in tanks where it is held prior to being burned in an electric generating plant. The MTR segment of the facility has six 18-inch diameter pipelines running one mile from the dock-side manifold to several storage tanks which are located in the non-transportation-related portion of the facility. Although the facility piping has a normal working pressure of 100 pounds per square inch, the piping has a maximum allowable working pressure (MAWP) of 150 pounds per square inch. At MAWP, the pumping system can move 10,000 barrels (bbls) of Number 6 oil every hour through each pipeline. The facility has a roving watchman who is required to drive the length of the piping every 2 hours when the facility is receiving oil from a barge. The facility operator estimates that it will take approximately 10 minutes to secure pumping operations when a discharge is discovered. Using the definition of worst case discharge provided in §154.1029(b)(ii), the following calculation is provided:

	bbls.
2 hrs + 0.17 hour × 10,000 bbls per hour .....	21,700
Piping volume = 37,322 ft <sup>3</sup> + 5.6 ft <sup>3</sup> /bbl .....	+6,664
	<hr/>
Discharge volume per pipe .....	28,364
Number of pipelines .....	×6
	<hr/>
Worst case discharge from MTR facility .....	170,184

To calculate the planning volumes for on-shore recovery:

Worst case discharge: 170,184 bbls. Group IV oil

Emulsification factor (from Table 3): 1.4

Operating Area impacted: Inland

Planned percent oil onshore recovery (from Table 2): Inland 70%

Planning volumes for onshore recovery: Inland 170,184 × .7 × 1.4 = 166,780 bbls.

Conclusion: The facility owner or operator must contract with a response resource capable of managing a 166,780 barrel shoreline cleanup.

To calculate the planning volumes for on-water recovery:

Worst case discharge: 170,184 bbls. Group IV oil  
 Emulsification factor (from Table 3): 1.4  
 Operating Area impacted: Inland  
 Planned percent oil on-water recovery (from Table 2): Inland 50%  
 Planning volumes for on-water recovery: Inland  $170,184 \times .5 \times 1.4 = 119,128$  bbls.

To determine the required resources for on-water recovery for each tier, use the mobilization factors from Table 4:

	Tier 1	Tier 2	Tier 3
Inland = 119,128 bbls. ....	× .15	× .25	× .40
Barrels per day (bpd) .....	17,869	29,782	47,652

Conclusion: Since the requirements for all tiers for inland exceed the caps, the facility owner will only need to contract for 10,000 bpd for Tier 1, 20,000 bpd for Tier 2, and 40,000 bpd for Tier 3. Sources for the bpd on-water recovery resources above the caps for all three Tiers need only be identified in the response plan.

Twenty percent of the capability for Inland, for all tiers, must be capable of operating in water with a depth of 6 feet or less.

The facility owner or operator will also be required to identify or ensure, by contract or other approved means as described in §154.1028(a), sufficient response resources required under §§ 154.1035(b)(4) and 154.1045(k) to protect fish and wildlife and sensitive environments identified in the response plan for the worst case discharge from the facility.

The COTP has the discretion to accept that a facility can operate only a limited number of the total pipelines at a dock at a time. In those circumstances, the worst case discharge must include the drainage volume from the piping normally not in use in addition to the drainage volume and volume of oil discharged during discovery and shut down of the oil discharge from the operating piping.

*8. Determining the Availability of Alternative Response Methods*

8.1 Response plans for facilities that handle, store, or transport Groups II or III persistent oils that operate in an area with year-round preapproval for dispersant use may receive credit for up to 25 percent of their required on-water recovery capacity for 1993 if the availability of these resources is ensured by contract or other approved means as described in §154.1028(a). For response plan credit, these resources must be capable of being on-scene within 12 hours of a discharge.

8.2 To receive credit against any required on-water recover capacity a response plan must identify the locations of dispersant stockpiles, methods of shipping to a staging area, and appropriate aircraft, vessels, or fa-

cilities to apply the dispersant and monitor its effectiveness at the scene of an oil discharge.

8.2.1 Sufficient volumes of dispersants must be available to treat the oil at the dosage rate recommended by the dispersant manufacturer. Dispersants identified in a response plan must be on the NCP Product Schedule that is maintained by the Environmental Protection Agency. (Some states have a list of approved dispersants and within state waters only they can be used.)

8.2.2 Dispersant application equipment identified in a response plan for credit must be located where it can be mobilized to shoreside staging areas to meet the time requirements in section 8.1 of this appendix. Sufficient equipment capacity and sources of appropriate dispersants should be identified to sustain dispersant application operations for at least 3 days.

8.2.3 Credit against on-water recovery capacity in preapproved areas will be based on the ability to treat oil at a rate equivalent to this credit. For example, a 2,500 barrel credit against the Tier 1 10,000 barrel on-water cap would require the facility owner or operator to demonstrate the ability to treat 2,500 barrel/day of oil at the manufacturers recommended dosage rate. Assuming a dosage rate of 10:1, the plan would need to show stockpiles and sources of 250 barrels of dispersants at a rate of 250 barrels per day and the ability to apply the dispersant at that daily rate for 3 days in the geographic area in which the facility is located. Similar data would need to be provided for any additional credit against Tier 2 and 3 resources.

8.3 In addition to the equipment and supplies required, a facility owner or operator shall identify a source of support to conduct the monitoring and post-use effectiveness evaluation required by applicable regional plans and ACPs.

8.4 Identification of the response resources for dispersant application does not imply that the use of this technique will be authorized. Actual authorization for use during a spill response will be governed by the provisions of the NCP and the applicable regional plan or ACP. A facility owner or operator who operates a facility in areas with year-round preapproval of dispersant can reduce the required on-water recovery capacity for 1993 up to 25 percent. A facility owner or operator may reduce the required on water recovery cap increase for 1998 and 2003 up to 50 percent by identifying pre-approved alternative response methods.

8.5 In addition to the credit identified above, a facility owner or operator that operates in a year-round area pre-approved for dispersant use may reduce their required on water recovery cap increase for 1998 and 2003 by up to 50 percent by identifying non-mechanical methods.

8.6 The use of in-situ burning as a non-mechanical response method is still being studied. Because limitations and uncertainties remain for the use of this method, it may not be used to reduce required oil recovery capacity in 1993.

9. Additional Equipment Necessary to Sustain Response Operations

9.1 A facility owner or operator is responsible for ensuring that sufficient numbers of trained personnel and boats, aerial spotting aircraft, containment boom, sorbent materials, boom anchoring materials, and other supplies are available to sustain response operations to completion. All such equipment must be suitable for use with the primary equipment identified in the response plan. A facility owner or operator is not required to list these response resources, but shall certify their availability.

9.2 A facility owner or operator shall evaluate the availability of adequate temporary storage capacity to sustain the effective daily recovery capacities from equipment identified in the plan. Because of the inefficiencies of oil spill recovery devices, response plans must identify daily storage capacity equivalent to twice the effective daily recovery rate required on scene. This temporary storage capacity may be reduced if a facility owner or operator can demonstrate by waste stream analysis that the efficiencies of the oil recovery devices, ability to decant waste, or the availability of alternative temporary storage or disposal locations will reduce the overall volume of oily material storage requirement.

9.3 A facility owner or operator shall ensure that his or her planning includes the capability to arrange for disposal of recovered oil products. Specific disposal procedures will be addressed in the applicable ACP.

TABLE 1—RESPONSE RESOURCE OPERATING CRITERIA OIL RECOVERY DEVICES

Operating environment	Significant wave height <sup>1</sup>	Sea State
Rivers and Canals .....	≤1 Foot .....	1
Inland .....	≤3 feet .....	2
Great Lakes .....	≤4 feet .....	2-3
Ocean .....	≤6 feet .....	3-4

**BOOM**

Boom property	Use			
	Rivers and canals	Inland	Great Lakes	Ocean
Significant Wave Height <sup>1</sup> .....	≤1	≤3	≤4	≤6
Sea State .....	1	2	2-3	3-4
Boom height—in. (draft plus freeboard) .....	6-18	18-42	18-42	≤42
Reserve Buoyancy to Weight Ratio .....	2:1	2:1	2:1	3:1 to 4:1
Total Tensile Strength—lbs. ....	4,500	15-20,000	15-20,000	≤20,000
Skirt Fabric Tensile Strength—lbs .....	200	300	300	500
Skirt Fabric Tear Strength—lbs .....	100	100	100	125

<sup>1</sup> Oil recovery devices and boom must be at least capable of operating in wave heights up to and including the values listed in Table 1 for each operating environment.

TABLE 2—REMOVAL CAPACITY PLANNING TABLE

Spill location	Rivers and canals			Nearshore/inland Great Lakes			Offshore		
	3 Days			4 Days			6 Days		
	% Natural dissipation	% Recovered floating oil	% Oil on shore	% Natural dissipation	% Recovered floating oil	% Oil on shore	% Natural dissipation	% Recovered floating oil	% Oil on shore
1 Non-persistent oils .....	80	10	10	80	20	10	95	5	/
2 Light crudes .....	40	15	45	50	50	30	75	25	5
3 Medium crudes and fuels .....	20	15	65	30	50	50	60	40	20
4 Heavy crudes and fuels .....	5	20	75	10	50	70	50	40	30

TABLE 3—EMULSIFICATION FACTORS FOR PETROLEUM OIL GROUPS

Non-Persistent Oil:	1.0
Group I .....	
Persistent Oil:	

TABLE 3—EMULSIFICATION FACTORS FOR PETROLEUM OIL GROUPS—Continued

Group II .....	1.8
Group III .....	2.0
Group IV .....	1.4

TABLE 4—ON WATER OIL RECOVERY RESOURCE MOBILIZATION FACTORS

Operating Area	Tier 1	Tier 2	Tier 3
Rivers & Canals .....	.30	.40	.60
Inland/Nearshore/Great Lakes .....	.15	.25	.40

TABLE 4—ON WATER OIL RECOVERY RESOURCE MOBILIZATION FACTORS—Continued

Operating Area	Tier 1	Tier 2	Tier 3
Offshore .....	.10	.165	.21

Note: These mobilization factors are for total response resources mobilized, not incremental response resources.

TABLE 5—RESPONSE CAPABILITY CAPS BY OPERATING AREA

	Tier 1	Tier 2	Tier 3
February 18, 1993:			
All except rivers and canals, Great Lakes.	10K bbls/day .....	20K bbls/day .....	40K bbls/day/
Great Lakes .....	5K bbls/day .....	10K bbls/day .....	20K bbls/day.
Rivers and canals .....	1,500 bbls/day .....	3,000 bbls/day .....	6,000 bbls/day.
February 18, 1998:			
All except rivers and canals, Great Lakes.	12.5K bbls/day .....	25K bbls/day .....	50K bbls/day.
Great Lakes .....	6.25K bbls/day .....	12.3K bbls/day .....	25K bbls/day.
Rivers and canals .....	1,875 bbls/day .....	3,750 bbls/day .....	7,500 bbls/day.
February 18, 2003:			
All except rivers and canals, Great Lakes.	TBD .....	TBD .....	TBD.
Great Lakes .....	TBD .....	TBD .....	TBD.
Rivers and canals .....	TBD .....	TBD .....	TBD.

Note: The caps show cumulative overall effective daily recovery capacity, not incremental increases. TBD=To be determined.

[CGD 91-036, 61 FR 7933, Feb. 29, 1996, as amended by CGD 96-026, 61 FR 33666, June 28, 1996; USCG-1999-5151, 64 FR 67175, Dec. 1, 1999; USCG-2000-7223, 65 FR 40058, June 29, 2000; USCG-2005-21531, 70 FR 36349, June 23, 2005]

APPENDIX D TO PART 154—TRAINING ELEMENTS FOR OIL SPILL RESPONSE PLANS

1. General

1.1 The portion of the plan dealing with training is one of the key elements of a response plan. This concept is clearly expressed by the fact that Congress, in writing OPA 90, specifically included training as one of the sections required in a vessel or facility response plan. In reviewing submitted response plans, it has been noted that the plans often do not provide sufficient information in the training section of the plan for either the user or the reviewer of the plan. In some cases, plans simply state that the crew and others will be trained in their duties and responsibilities, with no other information being provided. In other plans, information is simply given that required parties will receive the necessary worker safety training (HAZWOPER).

1.2 The training section of the plan need not be a detailed course syllabus, but it must contain sufficient information to allow the user and reviewer (or evaluator) to have an understanding of those areas that are believed to be critical. Plans should identify key skill areas and the training that is required to ensure that the individual identi-

fied will be capable of performing the duties prescribed to them. It should also describe how the training will be delivered to the various personnel. Further, this section of the plan must work in harmony with those sections of the plan dealing with exercises, the spill management team, and the qualified individual.

1.3 The material in this appendix D is not all-inclusive and is provided for guidance only.

2. Elements To Be Addressed

2.1 To assist in the preparation of the training section of a facility response plan, some of the key elements that should be addressed are indicated in the following sections. Again, while it is not necessary that the comprehensive training program for the company be included in the response plan, it is necessary for the plan to convey the elements that define the program as appropriate.

2.2 An effective spill response training program should consider and address the following:

2.2.1 Notification requirements and procedures.

2.2.2 Communication system(s) used for the notifications.

2.2.3 Procedures to mitigate or prevent any discharge or a substantial threat of a

discharge of oil resulting from failure of manifold, mechanical loading arm, or other transfer equipment or hoses, as appropriate;

2.2.3.1 Tank overfill;

2.2.3.2 Tank rupture;

2.2.3.3 Piping rupture;

2.2.3.4 Piping leak, both under pressure and not under pressure, if applicable;

2.2.3.5 Explosion or fire;

2.2.3.6 Equipment failure (e.g., pumping system failure, relief valve failure, or other general equipment relevant to operational activities associated with internal or external facility transfers).

2.2.4 Procedures for transferring responsibility for direction of response activities from facility personnel to the spill management team.

2.2.5 Familiarity with the operational capabilities of the contracted oil spill removal organizations and the procedures to notify the activate such organizations.

2.2.6 Familiarity with the contracting and ordering procedures to acquire oil spill removal organization resources.

2.2.7 Familiarity with the ACP(s).

2.2.8 Familiarity with the organizational structures that will be used to manage the response actions.

2.2.9 Responsibilities and duties of the spill management team members in accordance with designated job responsibilities.

2.2.10 Responsibilities and authority of the qualified individual as described in the facility response plan and company response organization.

2.2.11 Responsibilities of designated individuals to initiate a response and supervise response resources.

2.2.12 Actions to take, in accordance with designated job responsibilities, in the event of a transfer system leak, tank overflow, or suspected cargo tank or hull leak.

2.2.13 Information on the cargoes handled by the vessel or facility, including familiarity with—

2.2.13.1 Cargo material safety data sheets;

2.2.13.2 Chemical characteristic of the cargo;

2.2.13.3 Special handling procedures for the cargo;

2.2.13.4 Health and safety hazards associated with the cargo; and

2.2.13.5 Spill and firefighting procedures for cargo.

2.2.14 Occupational Safety and Health Administration requirements for worker health and safety (29 CFR 1910.120).

### 3. Further Considerations

In drafting the training section of the facility response plan, some further considerations are noted below (these points are raised simply as a reminder):

3.1 The training program should focus on training provided to facility personnel.

3.2 An organization is comprised of individuals, and a training program should be structured to recognize this fact by ensuring that training is tailored to the needs of the individuals involved in the program.

3.3 An owner or operator may identify equivalent work experience which fulfills specific training requirements.

3.4 The training program should include participation in periodic announced and unannounced exercises. This participation should approximate the actual roles and responsibilities of individual specified in the plan.

3.5 Training should be conducted periodically to reinforce the required knowledge and to ensure an adequate degree of preparedness by individuals with responsibilities under the facility response plan.

3.6 Training may be delivered via a number of different means; including classroom sessions, group discussions, video tapes, self-study workbooks, resident training courses, on-the-job training, or other means as deemed appropriate to ensure proper instruction.

3.7 New employees should complete the training program prior to being assigned job responsibilities which require participation in emergency response situations.

### 4. Conclusion

The information in this appendix is only intended to assist response plan preparers in reviewing the content of and in modifying the training section of their response plans. It may be more comprehensive than is needed for some facilities and not comprehensive enough for others. The Coast Guard expects that plan preparers have determined the training needs of their organizations created by the development of the response plans and the actions identified as necessary to increase the preparedness of the company and its personnel to respond to actual or threatened discharges of oil from their facilities.

[CGD 91-036, 61 FR 7938, Feb. 29, 1996]

## PART 155—OIL OR HAZARDOUS MATERIAL POLLUTION PREVENTION REGULATIONS FOR VESSELS

### Subpart A—General

Sec.

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