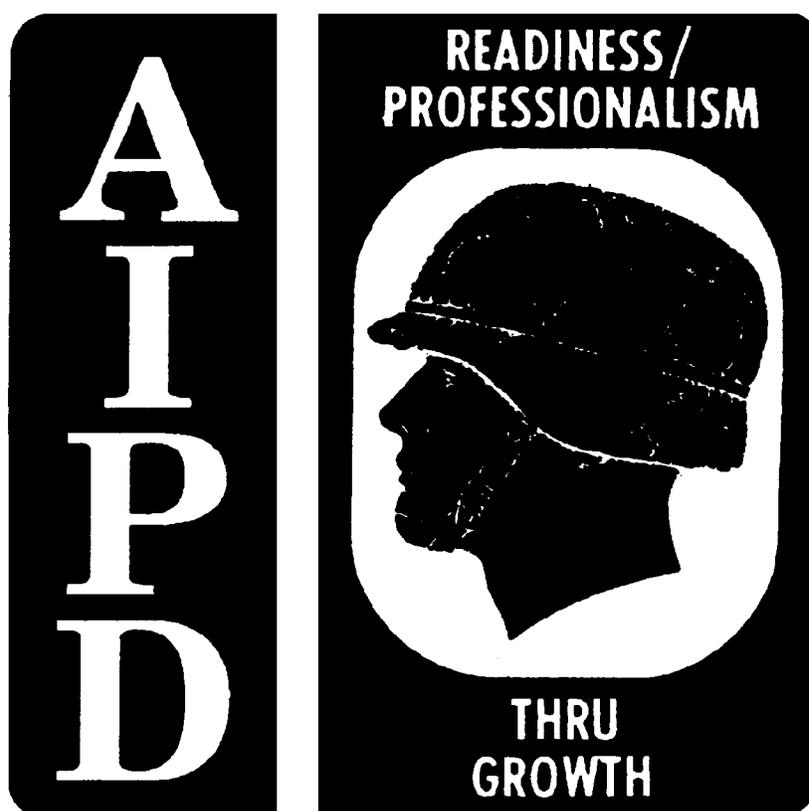

**SUPERVISE HAZARDOUS MATERIALS
HANDLING AND ESTABLISH A
NUCLEAR SURETY PROGRAM**



THE ARMY INSTITUTE FOR PROFESSIONAL DEVELOPMENT
ARMY CORRESPONDENCE COURSE PROGRAM

**SUPERVISE HAZARDOUS MATERIALS HANDLING AND
ESTABLISH A NUCLEAR SURETY PROGRAM**

Subcourse Number TR 1029

EDITION 8

United States Army Transportation School

EDITION 8

4 CREDIT HOURS

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SUBCOURSE OVERVIEW

This subcourse is designed to teach you how to supervise personnel in hazardous materials handling and how to establish a nuclear surety program. This subcourse contains instruction in identifying essential parts of CFR Title 49, supervising hazardous materials handling on ocean vessels, motor vehicles, and aircraft (mobilization only). This subcourse also contains training in preparing nuclear materials for shipment and using a reliability program to ensure personnel reliability.

There are no prerequisites for this subcourse.

This subcourse reflects the doctrine which was current at the time the subcourse was prepared. In your own work situation, always refer to the latest publications.

The words "he," "him," "his," and "men," when used in this publication, represent both the masculine and feminine genders unless otherwise stated.

TERMINAL LEARNING OBJECTIVE

TASK: You will identify procedures for supervising hazardous materials handling and establishing a nuclear surety program.

CONDITIONS: You will have access to information about identifying essential parts of Code of Federal Regulations.(CFR) Title 49 and supervising hazardous materials handling, information about establishing a nuclear surety program, and illustrations relating to this information.

STANDARDS Demonstrate competency of the task skills and knowledge by correctly responding to 75 percent of the multiple-choice test items which cover identifying procedures for supervising hazardous materials handling and establishing a nuclear surety program.

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LESSON ONE

SUPERVISE HAZARDOUS MATERIALS HANDLING

MQS Manual Task: 01-7320.15-0100

OVERVIEW

TASK DESCRIPTION:

In this lesson you will learn to supervise personnel in the handling of hazardous material.

LEARNING OBJECTIVE:

ACTIONS: Describe the procedures required to supervise hazardous materials handling.

CONDITIONS: You will be given access to information from various publications.

STANDARDS: Supervision of hazardous materials handling will be in accordance with CFR Title 49 and related hazardous materials publications.

REFERENCES: The material contained in this lesson was derived from the following publications:

CFR Title 46, Shipping.

CFR Title 49, Transportation.

DOD Reg 4500.32-R, Vol I.

AR 55-355.

AR 700-141.

FM 55-17.

FM 55-60.

AFR 71-41/TM 38-250/NAVSUP Pub 505/MCO P4030.19D/DLAM 4145.3.

TM 38-750.

INTRODUCTION

An important duty of a transportation officer is to supervise the handling of hazardous materials. Because numerous safety hazards are often involved in handling such materials, you need to know regulatory requirements for the handling, storage, certification, and loading of hazardous cargo. You also need to know specific

rules and regulations governing hazardous cargo handling on all modes of transport.

PART A - IDENTIFY ESSENTIAL PARTS OF CFR TITLE 49

Your job as a transportation officer requires being familiar with CFR 49. All transportation-related legislation is incorporated into this regulation, and, as new laws are passed, CFR 49 is updated in supplement form to stay as current as possible. Since laws may change frequently, ensure that you use a current version of CFR 49. The CFRs are kept up to date by individual issues of the Federal Register. Basically, you will need to use the CFR 49 together with the Federal Register to check the latest version of any given rule.

CIVIL AND CRIMINAL PENALTIES

You need to know as much as you can about CFR 49 because violations of its edicts will provide **prima facie** evidence against you in a court of law. If you knowingly violate the regulation, you can be charged with a civil penalty incurring a maximum \$25,000 fine or imprisonment for not more than five years or both. The only instance you may encounter to which CFR 49 does not apply is handling and moving hazardous goods on military installations. For all other cases, you will need to be acquainted with the regulation and to know certain parts of it extremely well.

PART 171

When you deal with hazardous materials on a daily basis, you will routinely use some parts of CFR 49. Chief among these is Part 171, which contains general information, requirements, references, and definitions.

Section 171.8 covers definitions and abbreviations. Section 171.9 covers the rules of construction as shown here:

- Words imparting the singular include the plural.
- Words imparting the plural include the singular.
- Words imparting the masculine include the feminine.
- "Shall" and "must" are used in an imperative sense.
- "Should" is used in a recommendatory sense.
- "May" is used in a permissive sense.

- "Includes" represents inclusion, not limitation.

These rules provide applicable definitions for interpreting CFR 49.

EXEMPTION POLICY

There may be situations in which you can find no rule for containerization in CFR 49. In this event, you must refer to Subpart B, Chapter 1, CFR 49. This will give the information you need to apply for certificates of equivalency (COEs). Before using this information, determine if a COE already exists for the particular situation, and use the existing COE.

TRANSPORTATION MODES

This course deals primarily with hazardous materials handling on vessels, motor vehicles traveling public highways, rail, and military aircraft (during mobilization). The CFR 49 also addresses commercial air. (Should you be transporting nuclear weapons by rail, you will also need to consult AR 50-5.)

HAZARDOUS MATERIALS CLASSES

To understand the references in CFR 49, you must know the Department of Transportation (DOT) hazardous classes contained in Part 173 of CFR 49. These nine classes include the following:

- Class 1 includes explosives (any chemical compound, mixture, or device, whose purpose is the substantially instantaneous release of gas or heat). Within Class 1 are three types of explosives:
 - "A" explosives are the most dangerous and explode with a minimum or no motion applied (dynamite).
 - "B" explosives function by rapid combustion rather than detonation (propellant explosives, railway torpedoes).
 - "C" explosives are minimally hazardous (toy caps).
- Class 2 includes gases that are compressed, liquefied, or dissolved under pressure.
- Class 3 includes flammable liquids such as gasoline, acetone, or benzine.
- Class 4 includes flammable solids such as metallic calcium or bulk cotton.

- Class 5 includes oxidizers (substances which yield oxygen to stimulate the burning of other materials [chlorate, nitrate, peroxides]).
- Class 6 includes irritants and poisons. As the name suggests, irritants are materials which give off irritating fumes. Poisons are divided into two groups:
 - "A" poisons are those which are dangerous to life in small amounts.
 - "B" poisons are toxic to man.
- Class 7 includes radioactive materials which may be any material or combination of materials that spontaneously emit ionizing radiation.
- Class 8 includes corrosives such as acids or other substances which will destroy human skin.
- Class 9 includes all the other miscellaneous dangerous substances which do not fall into the preceding categories.

In addition to the classes, the DOT system may be used as well to numerically list hazard classes. This system groups materials into 11 major hazard classes:

- (1) Explosives (as described earlier, Classes A, B, and C, plus blasting agents).
- (2) Compressed gases, both flammable and nonflammable.
- (3) Flammable and combustible liquids.
- (4) Flammable solids (further broken down into air-reactive, water-reactive, or spontaneously combustible).
- (5) Oxidizers.
- (6) Organic peroxides.
- (7) Etiologic agents, defined as viable microorganisms or toxins which cause or may cause human disease. (The chief etiologic agents found in transport are biological specimens and virus specimens used for testing and research. The latter include such agents as measles or rabies viruses.)
- (8) Radioactive materials.

- (9) Corrosive materials.
- (10) Other Regulated Materials (ORMs) (from A through E).
- (11) Class A and B poisons and irritating materials (listed under Class 6).

HAZARDOUS MATERIALS TABLE

The Hazardous Materials Table is located in Section 172.101 of CFR 49. You will use this table to determine the proper placard, label, and packaging for hazardous materials. This table lists, alphabetically, more than 1800 hazardous materials.

Table 1-1. Extract from CFR 49, Section 172.101

Hazardous Materials Table

(1) +/ E/ A/ W	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(3A) Identification number	(4) Labels required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water shipments			
					(a) Exceptions	(b) Specific requirements	(a) Passenger carrying aircraft or railcar	(b) Cargo aircraft only	(a) Cargo vessel	(b) Passenger vessel	(c) Other requirements	
	Acetyl cyclohexanesulfonyl peroxide, more than 82%, wetted with less than 12% water Acetyl cyclohexanesulphonyl peroxide, not more than 82%, wetted with not less than 12% water. See Organic peroxide, solid, n.o.s. Acetyl cyclohexanesulphonyl peroxide, not more than 12% in solution. See Organic peroxide, liquid or solution, n.o.s. Acetylene	Forbidden	UN2082 UN2083									
A	Acetylene (liquid) Acetylene silver nitrate Acetylene tetrabromide Acetyl iodide Acetyl peroxide, not more than 25% in solution. See Acetyl peroxide solution, not over 25% peroxide Acetyl peroxide, solid, or more than 25% in solution Acetyl peroxide solution, not over 25% peroxide Acid butyl phosphate Acid carboy, empty. See Carboy, empty. Acid, liquid, n.o.s. Acid, sludge	Flammable gas Forbidden ORM-A Corrosive material	UN1001 UN2504 UN1898 UN2084	Flammable gas None Corrosive	None 173.505 173.244	173.503 173.510 173.247	Forbidden 10 gallons 1 quart	300 pounds 55 gallons 1 gallon	1 1	1 1	Shade from radiant heat Keep dry. Glass carboys not permitted on passenger vessels	
+ E	Acrolein, inhibited (RQ-1/454)	Corrosive material	NA1780	Corrosive	173.244	173.245	1 quart 5 pints	1 4			Keep cool	
E	Acrylic acid	Corrosive material	UN1908	Corrosive	None	173.248	Forbidden	1 quart	1.2	1	Keep cool. Stow away from living quarters	
E	Acrylonitrile (RQ-100/45.4)	Flammable liquid	UN1082	Flammable liquid and Poison	None	173.122	Forbidden	1 quart	1.2	5	Keep cool	
	Actuating cartridge, explosive (fire extinguisher, or other)	Class C explosive	UN2218	Corrosive	173.244	173.245	1 quart 5 pints	1 1			Keep cool	
	Adhesive*	Combustible liquid	UN1188	None	173.118a	None	No limit	No limit	1.2	1.2		
	Adhesive*	Flammable liquid	UN1188	Flammable liquid	173.118	173.123	1 quart	10 gallons	1.2	1		
E	Adipic acid (RQ-3000/2270) Aerosol product. See Compressed gas, n.o.s. Air, compressed	ORM-E Nonflammable gas	NA8077 UN1002	None Nonflammable gas	None 173.306	173.302	No limit 150 pounds	No limit 300 pounds	1.2 1.2	1.2 1.2		
	Air conditioning machine. See Refrigerating machine											
	Aircraft rocket engine (Commercial)	Flammable solid	NA3791	Flammable solid	None	173.238	Forbidden	500 pounds	1.3	5		
	Aircraft rocket engine igniter (Commercial)	Flammable solid	UN2792	Flammable solid	None	173.238	Forbidden	25 pounds	1.3	6		
	Airplane flare. See Fireworks, special											
	Alcoholic beverage	Flammable liquid	UN1170	Flammable liquid	173.118	173.125	See 173.118(b)	10 gallons	1.2	1		
	Alcoholic beverage	Combustible liquid	UN1170	None	173.118a	None	No limit	No limit	1.2	1.2		

Table 1-1. Extract from CFR 49, Section 172.101 (continued)

Hazardous Materials Table—Continued

	Alcohol, n.o.s.	Flammable liquid	UN1987	Flammable liquid	173.118	173.125	1 quart	10 gallons	1,2	1	
	Alcohol, n.o.s.	Combustible liquid	UN1987	None	173.118a	None	No limit	No limit	1,2	1,2	
E	Aldrin (RQ-1/0.454)	Poison B	NA2781	Poison	173.364	173.376	50 pounds	200 pounds	1,2	1,2	
EA	Aldrin, cast solid (RQ-1/0.454)	ORM-A	NA2781	None	173.505	173.510	No limit	No limit	1,2	1,2	
E	Aldrin mixture, dry (with more than 65% aldrin) (RQ-1/0.454)	Poison B	NA2781	Poison	173.364	173.376	50 pounds	200 pounds	1,2	1,2	
EA	Aldrin mixture, dry, with 65% or less aldrin (RQ-1/0.454)	ORM-A	NA2781	None	173.505	173.510	No limit	No limit	1,2	1,2	
E	Aldrin mixture, liquid (with more than 60% aldrin) (RQ-1/0.454)	Poison B	NA2782	Poison	173.345	173.361	1 quart	55 gallons	1,2	1,2	If flash point less than 141 deg F, segregation same as for flammable liquids
EA	Aldrin mixture, liquid, with 60% or less aldrin (RQ-1/0.454)	ORM-A	NA2782	None	173.505	173.510	No limit	No limit	1,2	1,2	
	Alkaline (corrosive) liquid, n.o.s.	Corrosive material	NA1719	Corrosive	173.244	173.249	1 quart	5 gallons	1,2	1,2	
	Alkane-sulfonic acid	Corrosive material	UN2584	Corrosive	173.244	173.245	5 pints	1 gallon	1,2	1	
	Allyl aluminum halides. See Pyrophoric liquid, n.o.s.										
A	Allethrin	ORM-A	NA2802	None	173.505	173.510	No limit	No limit			
E	Allyl alcohol (RQ-100/45.4)	Flammable liquid	UN1068	Flammable liquid and Poison	None	173.119	1 quart	10 gallons	1,2	1	
	Allyl bromide	Flammable liquid	UN1069	Flammable liquid	173.118	173.119	Forbidden	10 gallons	1,2	1	
E	Allyl chloride (RQ-1000/454)	Flammable liquid	UN1100	Flammable liquid	None	173.119	Forbidden	10 gallons	1,3	5	
	Allyl chlorocarbonate	Flammable liquid	UN1792	Flammable liquid	None	173.288	Forbidden	5 pints	1	5	Keep dry. Separate longitudinally by an intervening complete hold or compartment from explosives. Segregation same as for corrosive materials
	Allyl chloroformate. See Allyl chlorocarbonate										
	Allyl trichlorosilane	Corrosive material	UN1724	Corrosive	None	173.280	Forbidden	10 gallons	1	1	Keep dry

*Effective April 1, 1984.

Column 1 contains one or more of these four symbols:

- The plus (+) fixes the proper shipping name and hazard class for an entry without regard to whether the material meets the definition of that class. An alternate proper shipping name and hazard class may be authorized by the Associate Director, Office of Hazardous Materials Regulation, Materials Transportation Bureau (MTB).
- The letter "E" (alone) identifies materials subject to the requirements of Subchapter C, CFR 49, regardless of mode of transportation or hazard class, if it is a hazardous substance.
- The letter "A" restricts the application of Subchapter C, CFR 49, to materials offered or intended for transportation by aircraft, unless a letter "E" also appears with it and the material is a hazardous substance or the material is a hazardous waste.
- The letter "W" restricts the application of Subchapter C, CFR 49, to materials offered or intended for transportation by vessel, unless a letter "E" also appears with it and the material is a hazardous substance or the material is a hazardous waste.

Column 2 lists the proper shipping name of materials designated as hazardous materials. Proper shipping names are limited to those shown in Roman (not italic) type. While not part of the proper shipping name, the words in italics may be used in

addition to the proper shipping name. The term "or in italics" indicates that any terms in the sequence may be used as the proper shipping name, when appropriate. Also as a general rule, the use of the prefix "mono" is optional (for example, "monoethanolamine" is the same as "ethanolamine"). The parenthetical designation of reportable quantity (RQ) followed by a fraction (for example, RQ-1000/454) indicates the minimum quantity of the material that is reportable, in both pounds and kilograms (per the example, 1000 pounds or 454 kilograms). The RQ designations are descriptive but not technically a part of the substance's proper name. You will need to apply the descriptive information later, in interpreting Column 5. Many other rules to apply in using Column 2 are in CFR 49. At some point, you will want to familiarize yourself with all of them.

Column 3 contains a designation of the DOT hazard class corresponding to each proper shipping name or the word "forbidden" (which means "prohibited from being offered or accepted for transportation"). If you obtain new data on a material indicating that you may be able to modify the "forbidden" designation or the hazard class specified for a material specifically identified in the table, you should submit the information to the Associate Director, Office of Hazardous Materials Regulation, MTB. Further details on how to interpret Column 3 are in Section 172.101, CFR 49.

Column 3A lists the identification (ID) numbers assigned to hazardous materials. The North American (NA) designations are descriptions that are not recognized for international shipments except those to and from Canada. Those ID numbers preceded by a UN designation are associated with descriptions considered appropriate for both international and domestic shipments. You will find more specific information on reading Column 3A in CFR 49.

Column 4 specifies labels required to be applied to each package, subject to additional labeling requirements found in Section 172.402, CFR 49. The shipper is ultimately responsible for all labeling and placarding; however, if you are initiating the movement, you will need to know the proper label or placard types.

Column 5 discusses the applicable packaging section of Part 173, Subchapter C, CFR 49. You will note numerous exceptions from some requirements of Subchapter C as you proceed to identify particular packaging instructions. You can find these exceptions by referencing **Column 5a**. By using both this column and **Column 5b** which lists specific subparagraphs that you may need to reference to link the parenthetical references listed by the proper shipping names with the correct packaging modes, you should be able to properly pack the materials you plan to transport.

Column 6 sets the maximum net quantity that can be carried in one package for transportation by passenger-carrying aircraft or passenger railcars. A "forbidden" notice in this column means the material may not be offered or carried; it is limited in applicability only to the transportation types noted above. Also, certain flammable liquids may be excepted (see Subpart B, Subchapter C, CFR 49). **Column 6a** actually sets the maximum net quantity allowed in one package for transportation via the listed modes. **Column 6b** sets the maximum net quantity permitted in one package for transportation by cargo-only aircraft. Subpart B, Subchapter C, CFR 49 provides more information on labeling and packaging requirements for goods to be moved on cargo-only aircraft.

Column 7 lists the authorized stowage locations on board cargo and passenger vessels, and certain additional requirements for shipments of each listed hazardous material. Section 176, Subchapter C, CFR 49 spells out physical requirements for authorized vessel locations noted in Column 7. (For bulk shipment by vessel and vessel shipment of explosives, you will also need to consult CFR 46; see Part B for more information on hazardous materials handling on vessels.) To use the information in Column 7 effectively, you must--

- Follow the instruction in Subpart B, Subchapter C, CFR 49 to find out what the numerical codes under **Column 7a** and **7b** mean.
- Refamiliarize yourself with the "Rules of Construction" subchapter (Part 171, CFR 49) since these rules could affect stowage compatibility.

Finally, **Column 7c** lists other requirements for water shipments of hazardous cargo as applicable to specific materials. These requirements are applicable to specific materials -- for activating cartridges and explosive (fire extinguishes or valve). The "other requirements" are to keep the shipment cool and dry.

HAZARDOUS MATERIALS LABELS

Labels must be affixed to hazardous material to identify the type of hazard concerned. Each type of label has an identifying color, such as orange for explosives. It also may have a symbol, such as a flame for flammable materials. Finally, the specific type of hazard appears in letters, such as POISON. They are meant to be easily identifiable. When two or more different labels are required, display them next to each other. The Hazardous Materials Tables of CFR 49 (discussed earlier) identify the proper labels for hazardous materials.



Figure 1-1. Hazardous Materials Labels



Figure 1-1. Hazardous Materials Labels (continued)

PART B - SUPERVISE HAZARDOUS MATERIALS HANDLING ON OCEAN VESSELS

In Part A, you learned most of the general rules of stowage pertaining to ocean vessels. Column 7, Hazardous Materials Table, CFR 49 relates directly to stowage compatibility.

You must also use CFR 46, part 146, which discusses--

- general stowage and compatibility rules.
- specific requirements for compatible handling and storage of hazardous materials.
- methods used to secure cargo (for example, effective use of dunnage).
- methods used to check secureness of stowage.
- safety precautions and considerations involved in hazardous cargo handling.
- procedures for inspecting cargo-handling gear and equipment.
- supervising hazardous cargo operations.

You must be able to use CFR 46 because it is the source for regulatory information on handling explosives that are shipped on seagoing vessels. Also, a great amount of ammunition is transported through ocean terminals; you will need to coordinate with the terminal operations planner to ensure that a separate, isolated terminal is available for both ammo shipments and other hazardous cargo. You also will want to be familiar with AR 50-5 which governs the waterborne movement of nuclear weapons.

INTERNATIONAL MARITIME DANGEROUS GOODS (IMDG) CODE

To properly classify, certify, mark, placard, and label hazardous cargo, you should know how to apply the IMDG code. This code, designed primarily for mariners, also contains provisions affecting industries and the handling and transport services of manufacturers down through consumers. If you do not have access to the IMDG code, then you can use the information given in Part A, along with CFR 46 to handle shipments.

The General Introduction part of the IMDG code addresses required marking, identification and consignment procedures, labeling and placarding, documentation, and packing of hazardous

goods to be transported by sea. The introduction includes a discussion of special requirements for freight containers, portable tanks, and road tank vehicles; stowage and segregation considerations; and safety issues (fire prevention and fire fighting). Other introductory sections cover the carriage of dangerous goods: on roll-on/roll-off (RORO) ships; in limited quantities; on shipborne barges or barge-carrying ships; and under controlled temperature conditions to maintain chemical stability.

Annex I to the General Introduction gives packing recommendations and also a glossary with illustrations on the construction and testing of packagings. Annex I also divides dangerous goods, other than those covered by Classes 1, 2, and 7, into three packaging groups according to the degree of danger they present. These groups include--

- **Packaging Group I:** Goods presenting great danger.
- **Packaging Group II:** Goods presenting medium danger.
- **Packaging Group III:** Goods presenting minor danger.

Each class is preceded by an introduction which describes the properties and definitions of the goods and gives details of stowage and segregation (that is, the degree to which goods should be kept separated from other dangerous substances or goods transported on a ship). The class introduction also gives information concerning recommended loading and unloading procedures.

Each class is identified by a distinctive label or placard, some of which will be familiar to road users since they appear on commercial vehicles which transport dangerous goods (see Part C). Where appropriate, each individual schedule in the code shows the label or labels (100 mm x 100 mm) which should be affixed to a package or placards (enlarged labels-250 mm x 250 mm) which should be affixed to portable tanks, freight containers, or other transport units.

Goods in this class are also assigned to various **stowage categories**. Stowage Category I (ordinary) covers goods which present relatively little hazard. Category II involves magazine stowage of such goods, and is divided into three groups. Stowage Category III is for pyrotechnics. Category IV is reserved for special items such as both explosive and chemical agents which can emit tear-producing or toxic gases.

Class 1 - Explosives

To ensure that hazardous goods are stowed as safely as possible, you should know how these goods are grouped. They are arranged in twelve compatibility groups and classification codes as shown in the following figure:

Description of explosive substance or article to be classified	Compatibility Group	Classification Code
Primary explosive substance	A	1.1A
Article containing a primary explosive substance and not containing two or more independent safety features	B	1.1B 1.2B 1.4B
Propellant explosive substance or other deflagrating burn or cause to burn with great heat and intense light explosive substance or article containing such explosive substance	C	1.1C 1.2C 1.3C 1.4C
Secondary detonating explosive substance or black powder or article containing a secondary denotating explosive substance, in each case without means of initiation and without a propelling charge. Articles containing a primary explosive substance and containing two or more independent safety features	D	1.1D 1.2D 1.4D 1.5D
Article containing a secondary denotating explosive substance, without means of initiation, with a propelling charge (other than one containing an inflammable or hypergolic [igniting spontaneously on contact with its components] liquid)	E	1.1E 1.2E 1.4E

Figure 1-2. Explosive Substance Compatibility and Classification

Article containing a secondary denotating explosive with its own means of initiation; with a propelling charge (other than one containing an inflammable or hypergolic liquid) or without a propelling charge	F	1.1F 1.2F 1.3F 1.4F
Pyrotechnic substance, or article containing a pyrotechnic substance, or article containing both an explosive substance and an illuminating incendiary, tear- or smoke-producing substance (other than a water-activated article or one containing white phosphorus, phosphide, or an inflammable liquid or gel)	G	1.1G 1.2G 1.3G 1.4G
Article containing both an explosive substance and white phosphorus	H	1.2H 1.3H
Article containing both an explosive substance and an inflammable liquid or gel	J	1.1J 1.2J 1.3J
Article containing both an explosive substance and a toxic chemical agent	K	1.2K 1.3K
Explosive substance or article containing an explosive substance and presenting a special risk needing isolation of each type	L	1.1L 1.2L 1.3L
Substance or article so packaged or designed that any hazardous affects arising from accidental functioning are confined within the package, unless the package has been degraded by fire (in the latter case, all blast or projection effects are limited to the extent that they do not significantly hinder or prohibit fire-fighting or other emergency response efforts in the immediate vicinity of the package)	S	1.4S

Figure 1-2. Explosive Substance Compatibility and Classification (Continued)

NOTES: The descriptions are intended to be mutually exclusive, except for a substance or article which qualifies for Compatibility Group S. Since the criterion of Compatibility S is an empirical one, assignment to this group is necessarily linked to the tests for assignment to Division 1.4.

Articles in Compatibility Group D or E may be packaged together with means of initiation, provided that the hazard causing an explosion of the article is virtually eliminated in the event of accidental operation of the means of initiation.

Articles in Compatibility Group D or E may be fitted with their means of initiation, provided that the means has a safety device to interrupt the initiation in the event of accidental operation.

Figure 1-2. Explosive Substance Compatibility and Classification
(Continued)

In addition to the proper shipping name (correct technical name) and the UN number, the individual schedules in Class 1 also give the substance's or article's division and compatibility group. If you are the shipper, you must show this information on the package label. The schedules also show the substance's or article's stowage category. You or the personnel you delegate must include this information in the shipping documentation.

Class 2 - Gases

Gases carried on board ships have varied properties and come in different forms. They may be compressed, liquified at ambient temperature under high pressure, dissolved under pressure in a solvent which is then absorbed in a porous material, or liquified by refrigeration. They may be nonflammable, inflammable, poisonous, corrosive, combustible, or a combination of all or some of these things. Some gases are lighter than air; some are heavier.

For the purpose of stowage and segregation on board ship, Class 2 is further subdivided according to the hazards presented by gases during stowage and transport:

- Class 2.1 - Inflammable* gases
- Class 2.2 - Nonflammable gases
- Class 2.3 - Poisonous gases

* Flammable has the same meaning.

To more accurately convey the hazards presented by gases, the classification required by Regulation 2, Chapter VII of the Convention for Safety of Life at Sea (SOLAS) 1974 must be supplemented by the additional description of the subclass.

The IMDG code gives general information concerning the properties of gases, plus guidelines on means of packing, stowing, and segregating them.

The schedules themselves include the UN number and the chemical formula of each gas. Also, if the gas is flammable, the range of its explosive limits (that is, the percentage of gas required in a gas air atmosphere to make the mixture explosive) is given. Thus, the schedule for acetylene, the first entry in Class 2, shows that a mixture of acetylene and air is explosive when it contains from 2.1 percent to 80 percent acetylene.

The schedules then describe properties of specific gases, including appropriate additional information and details on packing requirements, stowage, and segregation.

Class 3 - Inflammable* Liquids

Class 3 is divided into three subclasses according to the flashpoint (the lowest temperature at which the vapor of a combustible liquid can be made to ignite momentarily in air) of the liquid.

- Class 3.1 covers liquids with a low flashpoint (below -18°C (0°F)).
- Class 3.2 covers liquids with an intermediate flashpoint (-18°C and up to, but not including, 23°C) (73°F).
- Class 3.3 covers liquids with a high flashpoint (23°C and above, up to 61°C) (141°F).

NOTE: Transporting liquids with flashpoints up to 100°C (212°F) is regulated within Europe.

The IMDG code sets out the various methods which can be used to establish the flashpoint of inflammable liquids, an important factor as far as safety is concerned. Packing and stowage requirements for liquids with low flashpoints are stricter than for those with high flashpoints.

The introduction to Class 3 includes information on packing, stowage, and segregation. The individual schedules are arranged

*Flammable has the same meaning.

in the three subclasses referred to previously, starting with Class 3.1. Each schedule includes the substance's name, UN number, chemical formula, explosive limits, and flashpoint.

Added information is provided under the standard headings of properties, observations, packing, stowage, and segregation (as is the case with the other classes).

Liquids in this class are also assigned to a packaging group which is determined by the degree of danger these substances present. Packaging Group I includes liquids presenting great danger, Group II represents medium danger, and Group III means minor danger. A similar system of assigning dangerous goods to one of three packaging groups is used in other classes of the IMDG code with the exception of Classes 1*, 2, and 7.

Generally speaking, water is unsuitable in fighting a fire involving inflammable liquids particularly for liquids which cannot mix with water.

Class 4 - Other Inflammables

This class is divided into three subclasses, each of which has very different properties. The classes include some commonly known products, many of which seem harmless enough but which can be very dangerous unless properly packaged, handled, and transported.

Class 4.1 - Inflammable solids

Substances in this class are easily combustible and can be readily ignited by external sources, such as sparks or flames. The individual schedules give the product's name, UN number, and chemical formula. These schedules are often detailed since properties vary.

Some common products covered by this class are wetted explosives; camphor; vegetable fibers such as cotton, jute, and hemp; hay and straw; matches; rubber scrap; and sulphur.

Class 4.2 - Substances liable to spontaneous combustion

Substances in this class react to heat and are liable to ignite spontaneously. Some are more likely to do so when wetted by water or in contact with moist air. Some may also give off toxic

* Unless a specific provision to the contrary is made on individual schedules for goods of Class 1, the packaging used should comply with the requirements for the "medium danger" Packaging Group II.

gases when burned. Because of these properties, packing and stowage requirements are important. Although some general comments are made in the introduction to the class, more detailed information is given in the individual schedules.

Common products which appear in this class are charcoal; celluloid scrap, copra, wet or oily cotton, iron oxide, some plastics, fishmeal, and seed cakes.

Class 4.3 - Substances which, in contact with water, emit inflammable gases

Because the products in this class give off gases which are sometimes subject to spontaneous ignition and are also toxic, fire fighting is a particular problem.

The use of water, steam, or water-foam extinguishers may make matters worse. Even the use of carbon dioxide can do more harm than good in some situations.

Common products in this class include calcium carbide, powder derivatives of aluminum and calcium, ferrosilicon, lithium, magnesium-based products, potassium-based products, rubidium, sodium, and zinc.

Class 5 - Oxidizing Substances (Agents) and Organic Peroxides

This class is divided into two subclasses. Class 5.1 deals with oxidizing substances which, although not necessarily combustible themselves, may increase the risk and intensity of a fire by giving off oxygen. Class 5.2 includes organic peroxides most of which are combustible.

Class 5.1 - Oxidizing substances (agents)

The fact that all substances in this class give off oxygen when burned creates obvious fire-fighting difficulties. Some substances may also be sensitive to impact, friction, or a rise in temperature. Still others may react vigorously with moisture, thereby increasing the risk of fire.

Mixtures of these agents with organic and combustible materials are easily ignited. As such, they may burn with explosive force. Also, you can expect a violent reaction between most oxidizing substances and strong liquid acids, which in turn emit highly toxic gases.

One fire-fighting problem is caused by the fact that, since substances in this class give off oxygen when burned, the use of steam, carbon dioxide, or other inert gas extinguishers may be ineffective.

This class includes ammonium nitrate fertilizers, chlorates, chlorites, and calcium and potassium permanganate.

Class 5.2 - Organic peroxides

In addition to being oxidizing agents, most substances in this class are also liable to explosive decomposition. Most will burn rapidly and are sensitive to heat. Some are also sensitive to impact or friction. To reduce this sensitivity to a safe level, they are carried in a solution, as a paste, wetted with water, or as with an inert solid.

Even under "safe" conditions, some of these substances may react dangerously with other substances. Violent decomposition may result from traces of impurities such as acids, metallic oxides, or amines. Decomposition may give rise to toxic or inflammable gases.

Some organic peroxides can be particularly dangerous to the eyes, even after only momentary contact. You and your personnel should seek immediate medical attention if such contact occurs.

Some substances may begin to decompose when a certain temperature is exceeded. In some cases, this may lead to an explosion. To prevent this, certain organic peroxides have to be transported at a controlled temperature. The General Introduction to the IMDG code, the introduction to Class 5.2, and the individual schedules contain information on this aspect of hazardous materials handling.

Fire may result in an explosion as well. Move packages containing organic peroxides away from the seat of any fire. If this is not possible, have your personnel spray packages with large quantities of water from as far away as practical to cool them. Even when the fire has been extinguished, packages should be treated with great care, since organic peroxides which have been exposed to high temperatures may start a violent decomposition at any time.

In some cases, packages may require a second subsidiary risk label in addition to the Class 5.2 label (for example, a special Class 1 (explosive) or a Class 3 (inflammable liquid) label).

Class 6 - Poisonous (Toxic*) and Infectious Substances

This class is divided into two subclasses: Class 6.1 - Poisonous (toxic) substances and Class 6.2 - Infectious substances. Generally, substances in Class 6.1 may cause serious injury or

* Toxic has the same meaning as poisonous.

even death if swallowed, inhaled, or absorbed by contact through the skin. Class 6.1 materials are arranged in three packaging groups, in descending order of risk. The introduction to Class 6.1 sets the criteria for this grouping.

Fire-fighting measures are basically the same as those given for Class 3 (inflammable liquids). Because of the high risk of poisoning through fumes, the IMDG code requires that ships carrying poisonous substances always carry protective clothing and self-contained breathing apparatus.

If leakage or spillage occurs involving toxic substances, such as liquid pesticides, you should ensure decontamination is carried out by trained staff wearing suitable protective clothing and equipment.

Class 6.2 includes substances containing viable microorganisms (or their toxins) which are known, or suspected, to cause disease in animals or humans.

The danger labels required for the various substances in this class vary according to the substance's properties. Most are required to carry the "POISON" label. Some carry a label indicating that the substance is "HARMFUL" and should, therefore, be stowed away from foodstuffs. In addition, further subsidiary labels may be required, depending on the substance's properties.

Class 7 - Radioactive Substances (Materials)

The provisions of this class are based on the principles of the International Atomic Energy Agency's (IAEA) Regulations for the Safe Transport of Radioactive Materials, 1973 (as amended). The principles offer guidance to personnel involved in handling and transporting radioactive materials in ports and on ships. These personnel ordinarily will not have to consult the IAEA regulations.

Packing, labeling, and placarding; stowage; segregation; and other requirements vary according to the radioactivity of the material. Radioactive substances are divided into three categories, depending on radiation levels. Category I (white) is the least dangerous. The labels for Categories II and III (yellow) are printed in yellow and white for additional emphasis.

Class 8 - Corrosives

Substances in this class can damage living tissue and materials, in some cases very severely. Some of them give off irritating, poisonous, or harmful vapors; others are poisonous in and of themselves. Some are also inflammable or give off inflammable gases under certain conditions.

Substances in this class may be corrosive to metals such as aluminum, zinc, and tin but not to iron or steel, while others are corrosive to all metals. Some of these substances may even corrode glass.

Water can also affect some substances by making them more corrosive, by liberating gases, and in a few cases by generating heat.

In view of these different properties, the process of packing, stowage, and segregation is extremely important. Class 8 substances are divided into three packaging groups (with packaging group I being the most dangerous). The Introduction to Class 8 gives detailed information on the types of packaging to be used.

Most fires involving corrosive substances can be put out by any extinguisher, including water. Those substances which are also inflammable should be dealt with in the same way as substances in Class 3 of the IMDG code. Care must also be taken in view of the high risk of poisoning through breathing harmful fumes.

Class 9 - Miscellaneous Dangerous Substances

This class includes substances and articles which, for various reasons, do not fall within any of the other classes. Because of the varied properties and characteristics in this class, the individual schedules which usually include detailed information on stowage and segregation need not be labeled; therefore, no label is provided for Class 9. Products of this class include aerosols, some ammonium nitrate fertilizers, asbestos, safety matches, and pollutants.

IMDG CODE GENERAL INDEX

All substances and articles which appear in the IMDG code are listed in the general index of the IMDG code which gives the product's UN number; emergency schedule number (EmS no.); Medical First Aid Guide table number (MFAG table no.); and the IMDG code and page number of the individual schedule.

By looking up the substance or article in the General Index, you can readily find the appropriate emergency schedules or Medical First Aid Guide table. You will need this information to know not only what first aid measures and safety precautions to take when handling various hazardous class substances, but also to know how to contact emergency response personnel if a spill or leak of a hazardous substance occurs (whether at sea or on land). Also, you need to be aware of all required safety precautions you must take because AR 700-14 states that all Army personnel will be informed of the safety hazards involved in processing hazardous waste.

Cargo Handling Gear and Materials Handling Equipment

For you to properly plan your crew's labor requirements, inspect cargo, and supervise the loading and unloading of hazardous cargo, you will need to know how to properly use cargo handling gear. Ensure that you and the personnel for whom you are responsible take the following safety precautions when selecting and using cargo handling gear. (Cargo handling gear consists of items used to secure cargo while it is being raised or lowered by the ship's gear. In addition, this gear moves cargo to and from its stowage position in the ship.)

- Inspect all gear before it is used. Check slings for kinks, broken or frayed strands, and parting splices. Check shackles to ensure that pins are straight and screwed in all the way. If a hook shows signs of straightening out, replace it with a serviceable hook. Check chain slings for signs of stretching.
- Know the safe working load of all gear (TM 5-725).
- Do not exceed the safe working load of any part of the rigging or cargo handling gear at any time.
- When using open hooks to hold snatch blocks, mouse the hook and the snatch block gate.
- Do not permit kinks, twists, or knots to form in the slings.
- Do not permit a sling to cross an unprotected sharp corner or edge.
- Be sure that hoisting slings are properly positioned on cargo hooks.
- Never carry a load on the point of a hook.
- Check welded rings and hook eyes periodically for cracks and distortion.
- Never overload a sling, and never apply loads suddenly.
- Never be too confident of a new sling; the fact that it is new is no reason for overloading it.
- Remember that as the angle of a sling from the vertical is increased, its ability to support a load decreases. (Whenever possible, avoid angles of less than 45° from the horizontal.)

- When handling long drafts of cargo such as dunnage, pipe, and lumber, use tag lines and at least two slings.
- Never place a strain on the side of a pad eye.
- Condition all personnel to treat a draft as if it could fall at any instant.

Accidents caused by failure of cargo handling gear can usually be avoided by careful selection and use. Select the gear with care and inspect it thoroughly for serviceability before using it. Never use a piece of gear just because it happens to be handy.

Similar safety precautions apply in using **materials handling equipment** (MHE). The MHE consists of large, mechanically-powered equipment used to lift, transfer, and stack cargo (cranes). Ensure that you and your crew take the following safety precautions when using cranes.

- To avoid possible damage to the machine or injury to personnel, the operator, or individuals in the vicinity, always check the crane and all slings, cables, chains, and hooks before starting an operation.
- Once motion is started, ensure the crane is kept level.
- Never swing a crane rapidly. Centrifugal force can get the mechanism out of control or even upset the crane.
- Use standard signals for all operations.
- Keep the boom at least 10 feet away from power lines.
- Do not lift weights greater than the rated capacity of the crane for the boom radius you must use.
- Put all controls in neutral before servicing a crane or making repairs or adjustments, including troubleshooting.

MATERIAL COMPATIBILITY

Materials which may be stored together are shown in Table 1-2 and Table 1-3. (Both tables come from FM 55-70.)

Table 1-2. Compatibility Chart for Military Explosives and Hazardous Munitions

I.C.C. class		Class	I	II-A	II-B	II-C	II-D	II-E	II-F	II-G	II-H	II-J	III	IV	V	VI	VII	VIII	IX-A	IX-B	IX-C	X-A	X-B	X-C	X-D	X-E	XI-A	XI-B	XI-C	XI-D	Class	
C	Small-arms ammunition w/o explosive bullets, mechanical time fuze and like items	I	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	I
B	Bulk propellants, such as ballistite, cordite, FNH, NH, and NC powder, "Made-up bag charges" in outside shipping containers	II-A	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	II-A
B	Fixed ammunition w/o explosive projectiles and like items	II-B	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	II-B
B or C	Pyrotechnics (fireworks)	II-C	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	II-C
*Var.	Chemical ammunition—WP or PWP filled (solid)	II-D	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	II-D
*Var.	Chemical ammunition—HC filled (solid)	II-E	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	II-E
*Var.	Chemical ammunition—FS or FM filled smoke (liquid)	II-F	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	II-F
*Var.	Chemical ammunition—IM, NP, or PT filled, incendiary composition (oil gel)	II-G	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	II-G
None	Chemical ammunition—water activated	II-H	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	II-H
*Var.	Chemical ammunition—TH filled incendiary composition (solid)	II-J	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	II-J
B or C	Fuzes, PD w/o booster; fuzes AT mine (nonchemical) w/o booster; fuzes, bomb tail w/o booster; fuzes, tracer; primers; primer detonators, etc.	III	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	III
A	Fixed and semifixed ammunition with explosive loaded projectile	IV	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	IV
A	Separate loading projectiles filled with explosive "D"	V	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	V
A	BD fuzes; PD fuzes with booster; bomb fuzes with booster; rocket fuzes with booster; and like items	VI	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	VI
A	Separate loading proj. filled with HE other than explosive "D"	VII	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	VII
A or C	Blasting caps; detonators; AT mine fuzes (chemical); etc.	VIII	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	VIII
A or B	Explosives in bulk, such as black powder, propellant explosives for small arms, etc.	IX-A	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	IX-A
A	High explosives, such as dynamite, TNT, demolition blocks, etc.	IX-B	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	IX-B
A	Initiating and priming explosives in bulk	IX-C	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	IX-C
A	Explosive bombs, mines, torpedoes, etc.	X-A	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	X-A
A	Explosive bombs, mines, etc., packed with fuze in integral package	X-B	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	X-B
A	Guided missiles with solid propellant motors, w/ w/o HE warhead	X-C	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	X-C
A	Guided missiles with liquid petroleum fueled propellant motors, HE warhead	X-D	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	X-D
A	Rocket engines, liquid	X-E	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	X-E
A or Pois. A	Chemical ammunition—lethal	XI-A	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	XI-A
A or Pois. C	Chemical ammunition—nonlethal	XI-B	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	XI-B
*Var.	Fuels in containers for missile and rocket engines	XI-C	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	XI-C
*Var.	Oxidizers in containers for missile and rocket engines	XI-D	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	XI-D

Legend: *—Refers to different ICC classes: F, L, F, G, Cor, L, Oxy, M, etc.
 □—Shall not be stowed together.
 ◻—May be stowed together.
 For A, B, C, D, E, F, G, and H, refer to paragraph 146.29-99 of CG108 for proper stowage (reference Code of Federal Regulations (CFR) 46, paragraph 146.29-99, and other portions of CFR 46 to assure compatibility and to preclude conflicts).

Use of Chart: Following is an example of how to read the above chart: To determine if pyrotechnics (fireworks) (class II-C) is compatible with initiating and priming explosives in bulk (class IX-C), read from "pyrotechnics" horizontally to the intersection with vertical column headed "IX-C." The black dot at the intersection of the horizontal and vertical lines shows that the two classes "shall not be stowed together."

Table 1-3. Stowage Compatibility of Different Hazardous Materials by Water

		1	2(a)	2(b)	3	4(a)	4(b)	4(c)	5(a)	5(b)	6	7	8	9
Explosives.....	1	(*)	4	2	4	4	4	4	4	4	2	2	4	0
Flammable compressed gases	2(a)	4	--	0	2	1	2	1	2	4	0	2	1	0
Nonflammable compressed gases.....	2(b)	2	0	--	2	0	1	0	0	2	0	1	0	0
Flammable or combustible liquids.....	3	4	2	2	--	2	2	2	2	3	0	2	1	0
Flammable solids.....	4(a)	4	1	0	2	--	1	1	1	2	0	2	1	0
Flammable solids labeled spontaneously combustible.....	4(b)	4	2	1	2	1	--	1	2	2	0	2	1	0
Flammable solids labeled dangerous when wet.....	4(c)	4	1	0	2	1	1	--	2	2	0	2	1	0
Oxidizers.....	5(a)	4	2	0	2	1	2	2	--	2	1	1	2	0
Organic peroxides.....	5(b)	4	4	2	3	2	2	2	2	--	1	2	2	0
Poison A or poison B or irritating materials.....	6	2	0	0	0	0	0	0	1	1	--	0	0	0
Radioactive materials.....	7	2	2	1	2	2	2	2	1	2	0	--	2	0
Corrosive materials.....	8	4	1	0	1	1	1	1	2	2	0	2	--	0
Other regulated (ORM) materials.....	9	0	0	0	0	0	0	0	0	0	0	0	0	--

Degree of required separation: The table specifies the minimum separation requirements that apply when transporting different classes of hazardous materials on board a vessel, other than a ferry vessel. The symbols used in the table mean the following: "1"--away from; "2"--separated from; "3"--separated by a complete cargo compartment or hold from; "4"--separated longitudinally by an intervening complete cargo compartment or hold from; "0"--no general segregation specified (individual entries in the Hazardous Material Table in 172.101 of Title 49); "*"--consult revised Table I of CFR for segregation requirements between different explosives.

Illustration of use of this table: Problem: Determine compatibility of flammable compressed gases (2(a)) with organic peroxides (5(b)). Read across horizontal column "2(a)" until you intersect vertical column "5(b)". The number at the intersection is "4." Referring to the paragraph above (degree of required separation), the number 4 indicates that the two commodities must be "separated longitudinally by an intervening complete cargo compartment or hold."

EMERGENCY RESPONSE

In spite of your best efforts in handling hazardous materials, problems will arise. You will need to ensure your subordinates know how to react to these emergencies. The simplest method of addressing these emergencies is by using the Emergency Response Guidebook, DOT P5800.3, which is available through the Department of Transportation.

The purpose of this guidebook is to assist you in making decisions. During an incident with hazardous materials, you must--

- identify the material by either the 4-digit id number or the material name.
- then, proceed to the yellow index or blue index and look up the 2-digit guide number. (The yellow index numerically lists the ID number as shown in Figure 1-3. The blue index alphabetically lists the material name as shown in Figure 1-4).
- then, turn to the guide page indicated and read carefully (see Figure 1-5).

If you fail to find a guide number, call Chemtrec, which is a national clearing house for chemical reactions and safety. The number is in the Emergency Response Guidebook. If you fail to identify the material, use guide 11. For class A and B explosives and Blasting Agents, use guide 46.

ID No.	Guide No.	Name of Material	ID No.	Guide No.	Name of Material
1610	58	HALOGENATED IRRITATING LIQUID, n.o.s.	1638	53	MERCURY IODIDE
1611	55	HEXAETHYL TETRAPHOSPHATE	1639	53	MERCUROL
1612	18	HEXAETHYL TETRAPHOSPHATE and COMPRESSED GAS MIXTURE	1639	53	MERCURY NUCLEATE
1613	55	HYDROCYANIC ACID, aqueous solution, with not less than 5% hydrocyanic acid	1640	53	MERCURY OLEATE
1614	57	HYDROGEN CYANIDE, absorbed	1641	53	MERCURY OXIDE
1616	53	LEAD ACETATE	1642	53	MERCURIC OXYCYANIDE
1617	53	LEAD ARSENATE	1642	53	MERCURY OXYCYANIDE
1618	53	LEAD ARSENITE	1643	53	MERCURY POTASSIUM IODIDE
1620	53	LEAD CYANIDE	1644	53	MERCURY SALICYLATE
1621	53	LONDON PURPLE	1645	53	MERCURIC SULFATE
1622	53	MAGNESIUM ARSENATE	1646	53	MERCURY THIOCYANATE
1623	53	MERCURIC ARSENATE	1647	55	METHYL BROMIDE and ETHYLENE DIBROMIDE MIXTURE, liquid
1624	53	MERCURIC CHLORIDE	1648	28	ACETONITRILE
1625	42	MERCURIC NITRATE	1648	28	METHYL CYANIDE
1626	53	MERCURIC POTASSIUM CYANIDE	1649	58	ETHYL FLUID
1627	42	MERCUROUS NITRATE	1649	58	LEAD TETRAMETHYL
1628	53	MERCUROUS SULFATE	1649	58	MOTOR FUEL ANTI-KNOCK COMPOUND
1629	53	MERCURIC ACETATE	1649	58	TETRAETHYL LEAD
1629	53	MERCUROUS ACETATE	1649	58	TETRAMETHYL LEAD
1629	53	MERCURY ACETATE	1650	55	NAPHTHYLAMINE (beta)
1630	53	MERCURY AMMONIUM CHLORIDE	1651	53	NAPHTHYLTHIOUREA
1631	53	MERCURY BENZOATE	1652	53	NAPHTHYLUREA
1633	53	MERCURY BISULFATE	1653	53	NICKEL CYANIDE
1634	53	MERCURIC BROMIDE	1654	55	NICOTINE
1634	53	MERCUROUS BROMIDE	1655	55	NICOTINE, compounds and preparations, n.o.s.
1634	53	MERCURY BROMIDE	1656	55	NICOTINE HYDROCHLORIDE, and solutions
1636	53	MERCURIC CYANIDE	1657	53	NICOTINE SALICYLATE
1636	53	MERCURY CYANIDE	1658	55	NICOTINE SULFATE, liquid
1637	53	MERCURY GLUCONATE	1658	55	NICOTINE SULFATE, solid
			1659	53	NICOTINE TARTRATE
			1660	28	NITRIC OXIDE *
			1661	55	NITROANILINE

* Look for information next to this NAME in the TABLE OF EVACUATION DISTANCES in the back of this book. Use this in addition to the Guide Page if there is NO FIRE.

Figure 1-3. Extract from Emergency Response Guidebook-ID Number Index

Name of Material	Guide No.	ID No.	Name of Material	Guide No.	ID No.
ALUMINUM CHLORIDE, anhydrous	39	1726	AMMONIA SOLUTION with not less than 12% and not more than 44% ammonia	60	2672
ALUMINUM CHLORIDE SOLUTION	60	2581	AMMONIA SOLUTION with more than 44% ammonia *	15	2073
ALUMINUM FERROSILICON, powder	41	1395	AMMONIUM ACETATE	31	9079
ALUMINUM HYDRIDE	40	2463	AMMONIUM ARSENATE	53	1546
ALUMINUM NITRATE	35	1438	AMMONIUM BENZOATE	31	9080
ALUMINUM PHOSPHATE SOLUTION	60	1760	AMMONIUM BICARBONATE	31	9081
ALUMINUM PHOSPHIDE	41	1397	AMMONIUM BIFLUORIDE, solid	60	1727
ALUMINUM PHOSPHIDE PESTICIDE	53	3048	AMMONIUM BIFLUORIDE, solution	60	2817
ALUMINUM POWDER, coated	32	1309	AMMONIUM BISULFITE, solid	60	2693
ALUMINUM POWDER, uncoated	40	1396	AMMONIUM BISULFITE SOLUTION	60	2693
ALUMINUM RESINATE	32	2715	AMMONIUM CARBAMATE	31	9083
ALUMINUM SILICON, powder	40	1398	AMMONIUM CARBONATE	31	9084
ALUMINUM SULFATE SOLUTION	60	1760	AMMONIUM CHLORIDE	31	9085
ALUMINUM SULFATE, solid	31	9078	AMMONIUM CHROMATE	31	9086
ALUMINUM TRIBUTYL	40	2003	AMMONIUM CITRATE	31	9087
ALUMINUM TRIETHYL	40	1102	AMMONIUM DICHROMATE	35	1439
ALUMINUM TRIMETHYL	40	1103	AMMONIUM DINITRO-o-CRESOLATE	42	1843
AMINOCHLOROPHENOL	53	2673	AMMONIUM FLUORIDE	54	2505
2-AMINO-5-DIETHYLAMINO-PENTANE	31	2946	AMMONIUM FLUOROBORATE	31	9088
AMINOETHOXYETHANOL	60	1760	AMMONIUM FLUROSILICATE	53	2854
AMINOETHOXYETHANOL	60	3055	AMMONIUM HYDROGEN FLUORIDE, solid	60	1727
AMINOETHYLPIPERAZINE	60	2815	AMMONIUM HYDROGEN FLUORIDE SOLUTION	60	2817
AMINOPHENOL	55	2512	AMMONIUM HYDROGEN SULFATE	60	2506
AMINOPROPYLDIETHANOLAMINE	60	1760	AMMONIUM HYDROSULFIDE SOLUTION	28	2683
AMINOPROPYLMORPHOLINE	60	1760	AMMONIUM HYDROXIDE	60	2672
AMINOPROPYLPYPERAZINE	60	1760	AMMONIUM METAVANADATE	53	2859
AMINOPYRIDINE	55	2871	AMMONIUM NITRATE, liquid (hot concentrated solution)	35	2426
AMMONIA ANHYDROUS, liquefied *	15	1005			

* Look for information next to this NAME in the TABLE OF EVACUATION DISTANCES in the back of this book. Use this in addition to the Guide Page if there is NO FIRE.

Figure 1-4. Extract from Emergency Response Guidebook-Name Index

Guide 15

POTENTIAL HAZARDS**HEALTH HAZARDS**

Poisonous; may be fatal if inhaled.
 Contact may cause burns to skin and eyes.
 Contact with liquid may cause frostbite.
 Runoff from fire control or dilution water may cause pollution.

FIRE OR EXPLOSION

Some of these materials may burn but none of them ignite readily.
 Container may explode in heat of fire.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry.
 Stay upwind; keep out of low areas.
 Ventilate closed spaces before entering them.
 Wear **positive pressure** breathing apparatus and full protective clothing.
 Evacuate area endangered by gas. (See Isolation and Evacuation Table in back
 of guidebook; find the material by name.)
FOR EMERGENCY ASSISTANCE CALL CHEMTREC (800) 424-9300.
 If water pollution occurs, notify appropriate authorities.

FIRE

Small Fires: Dry chemical or CO₂.
Large Fires: Water spray, fog or foam.
 Do not get water inside container.
 Move container from fire area if you can do it without risk.
 Stay away from ends of tanks.
 Cool containers that are exposed to flames with water from the side until well
 after fire is out.
 Isolate area until gas has dispersed.

SPILL OR LEAK

Stop leak if you can do it without risk.
 Use water spray to reduce vapor but **do not** put water on leak or spill area.
Small Spills: Flush area with flooding amounts of water.
Large Spills: Dike far ahead of spill for later disposal.
 Do not get water inside container.
 Isolate area until gas has dispersed.

FIRST AID

Move victim to fresh air; call emergency medical care.
 If not breathing, give artificial respiration.
 If breathing is difficult, give oxygen.
 Remove and isolate contaminated clothing and shoes at the site.
 In case of contact with material, immediately flush skin or eyes with running
 water for at least 15 minutes.
 Keep victim quiet and maintain normal body temperature.
 Effects may be delayed; keep victim under observation.

Figure 1-5. Extract from Emergency Response
 Guidebook-Guide Page

Note: For Class C explosives, use Guide 50.

When in the vicinity of an accident involving any cargo--

- move and keep people away from the incident scene.
- do not walk into or touch any spilled material.
- avoid inhaling fumes, smoke, and vapors even if no hazardous materials are involved.
- do not assume that gases or vapors are harmless because of the lack of smell.

PART C - SUPERVISE HAZARDOUS MATERIALS HANDLING ON MOTOR VEHICLES

TRANSPORTATION OFFICER RESPONSIBILITIES

The transportation officer responsible for the shipment of hazardous materials will--

- comply with regulations and instructions governing the safe transportation of hazardous materials.
- inspect vehicles used for transportation of hazardous materials.
- ensure that drivers receive proper instruction (including accident and delay reporting) prior to dispatch of vehicles.
- maintain records of shipments of Classes A and B explosives, poisons, and Radioactive III materials.
- trace shipments which are overdue 24 hours after estimated date of arrival.
- Ensure completion and distribution of DD Form 6 (Report of Packaging and Handling Deficiencies).
- report discrepancies on SF 361 (Discrepancy in Shipment Report).

ROUTING

The MTMC area commander will select the routing for explosives and poisons, Classes A and B, and Radioactive III materials and for all hazardous materials exceeding 10,000 pounds. In addition, the MTMC area commander will route all shipments by

rail, motor carrier, or freight forwarder. The transportation officer will submit requests for routing prior to scheduling or forwarding. The transportation officer may route any hazardous material weighing less than 10,000 pounds that are not designated for routing by the area commander.

RECORDS

The transportation officer will maintain detailed records of shipments of Classes A and B explosives, poisons, and Radioactive III materials. If shipments have to be traced, you need accurate records for accountability. Possible ways of accomplishing this may be through log books, separate TCMD files for these materials, or any other method either locally required or, if no local requirement exists, selected by you.

INSPECTIONS

In the course of moving hazardous materials, you as the transportation officer are required to inspect equipment. Inspect vehicles using DD Form 626 (Motor Vehicle Inspection). Fill out each item and correct deficiencies before loading or unloading the vehicle.

MOTOR VEHICLE INSPECTION (TRANSPORTING HAZARDOUS MATERIAL)				REPORT CONTROL SYMBOL		
REG. NO.		ORIGIN		DESTINATION		
NAME OF CARRIER						
NAME OF DRIVER						
DATE AND HOUR						
INSTALLATION/ACTIVITY						
DRIVER'S STATE PERMIT NO.						
DOCTOR'S CERTIFICATE & DATE						
VEHICLE						
TYPE OF VEHICLE <input type="checkbox"/> TRUCK <input type="checkbox"/> TRUCK AND FULL TRAILER <input type="checkbox"/> TRACTOR AND DOUBLE TRAILERS <input type="checkbox"/> TRACTOR AND CLOSED SEM-TRAILER <input type="checkbox"/> TRACTOR AND FLAT-BED TRAILER		TRUCK NUMBER ORIGIN DESTINATION		TRAILER NO. NUMBER ORIGIN DESTINATION		
				SLEEPER CAB <input type="checkbox"/> YES <input type="checkbox"/> NO VALID LEASE <input type="checkbox"/> YES <input type="checkbox"/> NO I.C.C. NUMBER		
NOTE: All of the following items shall be checked on empty equipment prior to loading. Items with an asterisk(*) shall be checked on incoming loaded equipment.						
ITEM NO.	CHECK APPROPRIATE COLUMN (See reverse side for explanatory notes)	ORIGIN		DESTINATION		REMARKS (Explain unsatisfactory items; use reverse side if necessary)
		SAT	UNSAT	SAT	UNSAT	
1.	ENGINE; BODY, CAB AND CHASSIS CLEAN					
2.	STEERING MECHANISM					
3.	HOOK OPERATIVE					
4.	WINDSHIELD AND WIPERS					
5.	SPARE ELECT. FUSES AVAILABLE					
6.	REAR VIEW MIRRORS INSTALLED					
7.	HIGHWAY WARNING EQUIPMENT					
* 8.	FULL FIRE EXTINGUISHER INSTALLED					
9.	LIGHTS AND REFLECTORS OPERATIVE					
10.	EXHAUST SYSTEM					
* 11.	FUEL USED (If Prohibited)					
* 12.	FUEL TANK, LINE AND INLET					
13.	COUPLING DEVICES - KINGPIN LOCK					
* 14.	ALL BRAKES OPERATIVE					
* 15.	LANDING GEAR ASSEMBLY OPERATIVE					
16.	SPRINGS AND ASSOCIATED PARTS					
* 17.	TIRES					
18.	CARGO SPACE					
* 19.	ELECTRIC WIRING					
* 20.	TAIL GATE AND DOORS SECURED					
* 21.	FIRE AND WATER RESISTANT TARPULIN					
22.	ANY OTHER DEFECTS (Specify)					
<input type="checkbox"/> APPROVED (If rejected also reasons on reverse under "Remarks". Equipment shall be approved if deficiencies are corrected prior to loading.) <input type="checkbox"/> REJECTED		SIGNATURE (of Inspector) ORIGIN		SIGNATURE (of Inspector) DESTINATION		
ITEMS TO BE CHECKED PRIOR TO RELEASE OF LOADED VEHICLE						
23.	HAZARDOUS MATERIAL PROHIBITED BY DOT REGS. ARE NOT LOADED ONTO THIS VEHICLE			ORIGIN	DESTINATION	
* 24.	LOAD IS SECURED TO PREVENT MOVEMENT					
25.	WEIGHT IS PROPERLY DISTRIBUTED AND VEHICLE IS NOT OVERLOADED					
* 26.	SEALING APPLIED TO CLOSED VEHICLE, FIRE AND WATER RESISTANT TARPULIN APPLIED ON OPEN VEHICLE					
* 27.	SPECIAL INSTRUCTIONS (DD Form 326) FURNISHED DRIVER					
* 28.	COPY OF VEHICLE INSPECTION (DD Form 626) FURNISHED DRIVER					
* 29.	PROPER PLACARDS APPLIED					
* 30.	EQUIPMENT MADE UNDER DOT SPECIAL PERMIT NUMBER 300					
SIGNATURE (of Inspector) ORIGIN			SIGNATURE (of Driver) ORIGIN			
SIGNATURE (of Inspector) DESTINATION			SIGNATURE (of Driver) DESTINATION			

SAMPLE

DD FORM 626 JUN 72

REPLACES EDITION OF 1 SEP 68, WHICH IS OBSOLETE.

Figure 1-6. DD Form 626 (Front)

EXPLANATORY NOTES REFERENCES IN ITALICS BELOW ARE THE APPLICABLE PORTIONS OF THE DOT MOTOR CARRIER SAFETY REGULATIONS (49 C.F.R.) AND THE CODE OF FEDERAL REGULATIONS (C.F.R.); DOD REQUIREMENTS ARE ESTABLISHED BY THE DEPARTMENT OF DEFENSE (DOD)	
THE INSPECTOR MUST BE FAMILIAR WITH THE CITED PORTIONS OF THE SAFETY AND EXPLOSIVE REGULATIONS	
<p>DOCTOR'S CERTIFICATE - Certificate must not be over 24 months old (49 C.F.R.)</p> <p>Item 1, ENGINE, BODY, CAB, AND CHASSIS CLEAN (e.g., no excessive oil or grease) - Inspect to see that engine and compartment are clean, check cab to see that no excessive grease on cab and cab floor is free of debris; check under cab and chassis for excessive grease. (DOD Requirement)</p> <p>Item 2, STEERING MECHANISM - Inspect to see that steering mechanism is in good condition, in proper adjustment, correctly and securely mounted, and whether the steering gear case is leaking lubricant. Pay particular attention to the pitman arm and tie rod assembly to see that they are securely mounted and not bent out of normal shape. (DOD Requirement)</p> <p>Item 3, HORN OPERATIVE - Inspect to see that horn is securely mounted and of sufficient volume to serve its purpose. (49 C.F.R.)</p> <p>Item 4, WHEELS AND TIRES - Inspect to see that the windshields of the tractor are free from cracks, crazes or defects which would make operation of the vehicle unsafe, that the view of the driver is not obscured by stickers, that wipers operate properly, and that wiper blades are of proper kind and in good condition. Defroster operative when conditions require it. (49 C.F.R.)</p> <p>Item 5, SPARE ELECTRIC FUSES - Check to see that at least one spare fuse for each kind and type of installed fuse is carried on vehicle as a spare, or it is equipped with an overload protective device (circuit breaker) (49 C.F.R.)</p> <p>Item 6, REAR VIEW MIRRORS INSTALLED - Every truck and truck tractor shall have installed two rear vision mirrors, one at each side, firmly attached and so located as to reflect to the driver a view of the highway to the rear along both sides of the vehicle. Mirrors must not be cracked or dirty. (49 C.F.R.)</p> <p>Item 7, HIGHWAY WARNING EQUIPMENT - This equipment must include either three red electric lanterns in operating condition and two red flags or three red emergency reflectors and two red flags with standards adequate to maintain them in an upright position. Flame producing equipment is prohibited. Red flags must not be less than 12 inches square (49 C.F.R.)</p> <p>Item 8, FULL FIRE EXTINGUISHER - Inspect to see that one full fire extinguisher having an Underwriters' Laboratories rating of 10 B.C. or more is securely mounted and readily accessible. (49 C.F.R.)</p> <p>Item 9, LIGHTS OPERATIVE - (Head-Stop-Tail-Front and Rear Clearance) - Inspect all lights and switches, including clearance lights and turn signals, make sure they are not obscured by dirt or grease or have broken lens, high and low beam switch must be operative. EMERGENCY flashers operating on front and rear of vehicle. (49 C.F.R.)</p> <p>Item 10, EXHAUST SYSTEM - Inspect the exhaust pipe to see that it is securely attached to the exhaust manifold, that the gaskets or packing does not show visible evidence of leakage, and that the other end is clamped securely to the muffler. Inspect the muffler to see that it is in good condition and securely mounted. Check the tail pipe to see that it is securely clamped to the muffler, properly supported, and unobstructed at its outer end. The exhaust system shall discharge at a location to the rear of the cab and beyond any outside tanks of the tractor. (49 C.F.R.)</p> <p>Item 11, FUEL USED - Liquid petroleum gas burning equipment may be readily identified by the presence of pressure regulating valves in the fuel line near the tank and a breather pipe extending from the tank to the top of the cab. (DOD Requirement) (49 C.F.R.)</p> <p>Item 12, FUEL TANK, LINE, AND INLET - Inspect tanks and fuel lines to see that they are in completely serviceable condition, free from leaks or evidence of leakage and securely mounted. Examine caps for defective gaskets or plugged vents. Inspect the filler necks to see that they are in completely serviceable condition, securely supported and not leaking at joints. (49 C.F.R.)</p>	<p>Item 13, COUPLING DEVICES-KING PIN LOCKS - Inspect to see that the fifth wheel anchor plate and bed are in good condition, properly assembled and mounted, and adequately lubricated. King pin lock must operate freely and properly, lock securely, and not show excessive wear. (49 C.F.R.)</p> <p>Item 14, ALL BRAKES OPERATIVE - (Including hand brakes and air pressure warning devices) - Inspect for oil or grease leaks around drum flanges, pedal travel, air or vacuum line leaks, condition in tanks, compressor build up and governor cut off. Test for proper and adequate brake application. (49 C.F.R.)</p> <p>Item 16, SPRINGS AND ASSOCIATED PARTS - Examine visually the springs, suspension frame mechanisms, tension bar assemblies, and auxiliary parts such as U-bolts, shackles, center bolts and hangers, for leakage, improper adjustment, and, as appropriate, lack of lubrication. (DOD Requirement)</p> <p>Item 17, TIRES - Examine all tires for cuts, bruises, bumps, and blisters. All tires with cuts or injuries extending into the cord body and those worn smooth in the center of the tread are not acceptable. Insure that stones are removed from between duals. Tires must be properly matched on dual-equipped tractor and trailers. (49 C.F.R.)</p> <p>Item 18, CARGO SPACE - Inspect to see that cargo space is clean and in good condition to prevent damage to loading from exposed bolts, nuts, screws, nails, or other inwardly projecting parts. Check floor to make sure it is tight and free of holes. Floors shall not be permeated with oil or gasoline. (C.F.R.)</p> <p>Item 19, ELECTRIC WIRING - Electric wiring must be clean and properly secured, insulation must not be frayed or otherwise in poor condition. There must be no uninsulated wires or improper splices or connections. Wires and electric fixtures inside the body must be protected from the loading. (49 C.F.R.)</p> <p>Item 20, TAILGATES AND DOORS ON CLOSED EQUIPMENT SECURED - Inspect to see that all hinges are tight in body. Check for broken latches and safety chains. Doors must close securely. (49 C.F.R.)</p> <p>Item 21, FIRE AND WATER RESISTANT TARPULIN - If shipment is made on open equipment, check to make sure the loading is properly covered with a fire and water resistant tarpaulin, unless the material is in a certified fire and water resistant container. (C.F.R.)</p> <p>Item 23, MIXTURE OF EXPLOSIVES PROHIBITED - Check carefully to prevent loading of incompatible explosives. (C.F.R.)</p> <p>Item 25, WEIGHT IS PROPERLY DISTRIBUTED AND VEHICLE IS NOT OVERLOADED - Inspector should check the loading of the shipment to make sure that the loading plan or weight distribution recommendation furnished by the carrier is complied with and that the maximum gross weight that may be loaded on the vehicle for the particular shipment as stated by the carrier is not exceeded. (DOD Requirement)</p> <p>Item 29, PROPER PLACARDS - For Class A and B explosives check to see that the four reflectorized placards are conspicuously displayed, one in front, rear, and each side, and the lettering is at least 6 inches high. Placards will be furnished by the carrier. (DOD Requirement)</p> <p>Item 30, SPECIAL PERMIT NUMBER 368 - This item will be checked when a shipment is made under the provisions of DOT Special Permit No. 368. When checked, it signifies that the shipment was loaded in compliance with carrier's advice on maximum weight and that the driver is relieved from certifying to items 23, 24, and 25. (DOD Requirement)</p>
<p>REMARKS</p>	

GPO 1975 700-040/1

Figure 1-7. DD Form 626 (Back)

OPERATOR'S INSTRUCTIONS

When handling hazardous materials, the transportation officer must ensure that each driver receives a copy of DD Form 836 (Special Instructions for Motor Vehicle Drivers) (see Figure 1-8).

COMPATIBLE STORAGE AND SAFE HANDLING

Compatible storage and safe handling procedures have already been discussed earlier in this lesson. These same procedures apply to motor vehicles. In addition, if you have access to the Hazardous Materials Information System (HMIS) DOD 6050.5L, you will find it is a very valuable tool. The HMIS is a microfiche listing of hazardous materials which provides storage information, safety precautions, labeling information and spill procedures. This is not the only information it contains; however, you will find this data the most applicable for a transportation officer's requirements. Also remember that safety and/or storage information provided on the label by the manufacturer supersedes any other hazardous material guidelines. Compatibility guidance is also available from Table 12-3, FM 55-70, as shown in Table 1-4.

PART D - SUPERVISE HAZARDOUS MATERIALS HANDLING ON AIRCRAFT (MOBILIZATION ONLY)

AIR SHIPMENT GUIDANCE

The guiding force for the shipment of hazardous materials by air is TM 38-250, (Preparation of Hazardous Materials for Military Air Shipment). This publication contains information pertaining to labeling, classification, and compatibility on all hazardous materials.

MATERIAL COMPATIBILITY

Table 4-1 of TM 38-250 (see Table 1-5) provides an alphabetical listing of hazardous materials giving the load and storage (L/S) group in the last column. The L/S is a numbered group, within which, all items may be safely shipped together. Look up the L/S group for an item being shipped.

Note: Materials with the term "forbidden" under the hazard class are forbidden from shipment by military aircraft.

Check Table A-1 of TM 38-250 (see Table 1-6) to determine which other L/S groups are compatible. The X in the block of intersection shows that items may not be shipped together.

Table 1-5. Alphabetical Items Listing

Hazardous materials descriptions and proper shipping names	Hazard class	Identification number	Label(s) required (if not excepted)	Packaging Paragraph	L/S Group
METHYL DICHLORO-ACETATE	Corrosive material	UN2299	Corrosive	8-23 Table 8-1 Item 1 Table 8-2 Item 1	20
† METHYLDICHLOROARSINE	Poison A	NA1556	Poison gas	10-23	22
† METHYL DICHLOROSILANE	Flammable liquid	UN1242	Flammable liquid	6-19 Table 6-1 Item 12	18
† METHYLENE CHLORIDE. See DICHLOROMETHANE					
Methylene glycol di-nitrate	Forbidden				
METHYL ETHYL ETHER. See ETHYL METHYL ETHER					
METHYL ETHYL KETONE	Flammable liquid	UN1193	Flammable liquid	6-6	18
METHYL ETHYL KETONE PEROXIDE, in solution with not more than 9% by weight active oxygen. See ORGANIC PEROXIDE, LIQUID, or SOLUTION, N.O.S		UN2550			
Methyl ethyl ketone peroxide, in solution with more than 9% by weight active oxygen	Forbidden				
METHYL ETHYL PYRIDINE	Corrosive material	UN2300	Corrosive	8-23, Table 8-1, Item 1, Table 8-2, Item 1	20
† METHYL FORMATE	Flammable liquid	UN1243	Flammable liquid	6-6	18
METHYLFURAN	Flammable liquid	UN2301	Flammable liquid	6-6	18
<i>n</i> -Methylglucoside tetranitrate	Forbidden				
<i>n</i> -Methylglycerol trinitrate	Forbidden				

Table 1-6. Loading and Storage Chart for Transporting Explosives and Other Hazardous Materials (continued)

The table shows the explosives and other hazardous articles that must not be loaded or stored together. The letter X at an intersection of horizontal and vertical columns shows that these articles must not be loaded or stored together. Be sure to check notes for compatibility. For example, detonating fuzes, class A, with or without radioactive components, horizontal column 7 must not be loaded or stored with high explosives, class A, vertical column 2. The following L/S Groups and Notes apply to the table A1-1. Be sure to check the comparison with the group number for the loading and storage chart.

L/S	Group	Class A Explosives	L/S	Group	Class A Explosives
	1	Low explosives or black powder	9		Propellant explosives, jet thrust units (jato), igniters, jet thrust rocket motors, rocket engines (liquid); igniters, rocket motor, starter cartridges.
	2	High explosives, propellant explosives or detonating cord	10		Fireworks, special, or railway torpedoes.
	3	Initiating or priming explosives, wet: Diazondinitrophenol, fulminate of mercury, guanyl nitrosamino guanylidene hydrazine, lead azide, lead styphnate, nitro mannite, nitrosoguanidine, pentaerythrite tetranitrate, tetrazene, lead mononitroresorcinat			Class C Explosives
	4	Detonators and detonating primers ^{c/d/n}	11		Small arms ammunition or cartridges, practice ammunition.
	5	Ammunition for cannon with explosive projectiles, gas projectiles, smoke projectiles, incendiary projectiles, illuminating projectiles; ammunition for small arms with explosive projectiles, incendiary projectiles; rocket ammunition with explosive projectiles, gas projectiles, smoke projectiles, incendiary projectiles, illuminating projectiles; boosters (explosive); bursters (explosive) and supplementary charges (explosive) without detonators ^{b/m/}	12		Primers for cannon or small arms; empty cartridge bags-black powder igniters; empty cartridge cases, primed; empty grenades, primed; combination primers or percussion caps; toy caps; explosive cable cutters; explosive power devices; explosive rivets; starter cartridges, actuating cartridges.
	6	Explosive projectiles; bombs; torpedoes; mines; rifle or hand grenades(explosive); jet thrust units (jato); igniters; jet thrust, rocket motor; igniters, rocket motor ^b	13		Percussion fuzes, tracer fuzes or tracers.
	7	Detonating fuzes, class A, with or without radioactive components.	14		Time combination or detonating fuzes.
		Class B Explosives	15		Safety squibs, fuse lighters, fuse igniters, delay electric igniters, electric squibs, instantaneous fuse, igniter cord, or safety fuse.
	8	Ammunition for cannon with empty, inert-loaded or solid projectile, or without projectiles; or rocket ammunition with empty projectiles, inert-loaded or solid projectiles or without projectiles.	15a		Detonating cord
			16		Fireworks, common; flares; or signals
			17		Detonators, and detonating primers ^c
					Other Hazardous Materials
			18		Flammable liquids or flammable gases. Flammable liquid \square . Gas label.
			19		Flammable solids, oxidizer, or organic peroxide. Flammable solid, oxidizer or organic peroxide label ^{b,c}
			20		Corrosive materials. Corrosive label ^{d/e}
			21		Nonflammable gases. Nonflammable gas label
			22		Poisonous gases or liquids, class A poisons. Poisonous gas label ^h
			23		Etiologic agents/biological research material
			24		Poisonous liquids or solids, class B poisons ^g
			25		Irritating material ^{g/h}
			26		Radioactive materials. Radioactive material label ^{d/e/o}

Table 1-6. Loading and Storage Chart for Transporting Explosives and Other Hazardous Materials (continued)

<p>L/S</p> <p>Group Class A Explosives</p> <p>27 Engines and motors (internal combustion); aerospace ground equipment; and self-propelled vehicles</p> <p>28 Other Regulated Material.</p> <p>29 Blasting Agent.</p>	<p>transported with articles in table A-1, L/S GPS 1 through 7.</p> <p>f. Charged electric storage batteries (L/S GP 20) must not be loaded on the same aircraft with any class A explosive (L/S GPS 1 through 7).</p> <p>g. Cyanides or cyanide mixtures (L/S GP 24) must not be loaded with any corrosive materials (L/S GP 20).</p>
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Loading and Storage Notes and Compatibility

NOTES:

- a. Corrosive liquids must not be loaded with flammable solids, oxidizers (L/S GP 19), ammunition for cannon with or without projectiles (L/S GP 5 or 8), rocket motors (L/S GP 6 or 9), or propellant explosive (L/S GP 2 or 8), unless loaded on separate nonadjacent 463L aircraft pallets or separated by 88 inches for nonpalletized cargo.
- b. Chemical ammunition containing incendiary projectiles or white phosphorus with or without bursting charges (L/S GPS 5 and 6), or white phosphorus (L/S GP 19) must not be loaded or stored with any class A or B explosive. Projectile containing white phosphorus is not incompatible with itself.
- c. Ammonium nitrate, fertilizer grade (L/S GP 19) may be loaded, transported and, or stored with high explosives (L/S GP 2) or with detonators (L/S GPS 4 and 17) containing 1 gram or less of explosive each, excluding ignition and delay charges.
- d. Fissile Class III radioactive material (L/S GP 26) must not be loaded on the same aircraft with any other hazardous materials.
- e. Normal uranium, depleted uranium, and thorium metal in solid form (L/S GP 26) may be loaded and

- h. Gas identification sets (L/S GP 22 or 25) may be loaded and transported with all other named articles except those in L/S Group 3.
- i. Nitric Acid (L/S GP 20) in carboys must be separated from other corrosive materials in carboys when loaded on the same aircraft.
- j. Not Used.
- k. When items have not been drained and purged and have fuel in their systems, they will be loaded and transported as a flammable liquid (L/S GP 18).
- l. Not Used.
- m. Burstors (explosive), boosters (explosive) or supplementary charges without detonators (L/S GP 5) may be loaded with L/S Groups 7 and 15.
- n. Detonators (electric or nonelectric) (L/S GPS 4 and 17) and class A high explosives (L/S GP 2) may be loaded and transported in EOD MK 663, MOD O containers.
- o. For Navy sponsored oversea shipments, outside of CONUS, of iridium 192 and cobalt 60 radiographic isotopes (L/S GP 26), air shipments are prohibited except when authorized by Fleet Type Commander (TYCOM). Refer to NAVSUPINST 5101.11B.

LABELING AND CERTIFICATION

The transportation officer must ensure that the hazardous material being shipped has the appropriate DOT label affixed and is accompanied by a DD Form 1387-2 (Special Handling Data Certification). (Table 1-5 contains information for the DOT label.) Personnel who are school trained and qualified in the preparation of hazardous materials prepare the DD Form 1387-2.

ITEM NOMENCLATURE (1)		NET QUANTITY PER PACKAGE (2)	TRANSPORTATION CONTROL NO. (4)	
		CONSIGNMENT GROSS WEIGHT (3)	DESTINATION (5)	
SUPPLEMENTAL INFORMATION (6)			LOAD STORAGE/GROUP (7)	
			FLASH POINT (8)	
<small>This is to certify that the above named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Dept of Transportation. This is a MILITARY SHIPMENT! (Complete applicable blocks below)</small>				
9) This shipment is within the limitations prescribed for PASSENGER AIRCRAFT / CARGO AIRCRAFT ONLY (Delete nonapplicable aircraft)		ATAAATAMCO REGULATIONS (12)		
10) AFR 71-4, TM 38-250, NAVSUPPUB 505, MCO P4030.19, DLAM 4145.3, Paragraph		(13) 49 cfr	PARAGRAPH (14) 15 173.7 (a)	EXEMPTION (16) 17 DOT-E 7573
11) DOD 4580.32R (MILSTAMP)		TYPED NAME, SIGNATURE AND DATE (19)		
ADDRESS OF SHIPPER (18)				
DD Form 1387-2, JUN 86		SPECIAL HANDLING DATA / CERTIFICATION		

TRANSPORTATION CONTROL NUMBER (4)	NOMENCLATURE OF ITEM (1)	SPECIAL HANDLING DATA / CERTIFICATION CONTINUATION SHEET
DESTINATION (5)		
HANDLING INSTRUCTIONS		
DD Form 1387-2c, JUN 86		

Figure 1-9. DD Form 1387-2

INSPECTION AND QUALITY CONTROL

As transportation officer, you must take action to preclude entry of improper shipments of hazardous material into the transportation system. You will establish a quality control program, and consider 100 percent inspection to ensure that hazardous materials are packed, marked, labeled, and certified

to meet the requirements of TM 38-250 and safety of airlift criteria. Inspect each package to determine that the container is authorized and in condition for military air shipment of the material contained therein. Check shipper's certification for accuracy and ensure that it cites the correct packaging subparagraph. Remove damaged or improperly prepared packages from the transportation cycle immediately.

EXEMPTIONS

Items in Table 1-5 coded with a dagger or the Greek letter theta require exemptions for the movement of passengers with the material. Dagger coded items require approval at the headquarters having operational control of the aircraft. Theta coded items require approval by the air terminal operator.

LESSON ONE

Practice Exercise

The following items will test your grasp of the material covered in this lesson. There is only one correct answer for each item. When you have completed the exercise, check your answers with the answer key that follows. If you answer any item incorrectly, study again that part of the lesson which contains the portion involved. In answering some of the questions, you will need to refer to Figures 1-1, 1-2, and 1-3, and Tables 1-1, 1-3, 1-4, and 1-6 for information. It is your responsibility to know which figure(s) or table(s) to use.

1. Which of the following is the correct label for acetylene?
 - A. Corrosive.
 - B. Flammable gas.
 - C. Flammable liquid.
 - D. Explosive C.
2. Which paragraph of CFR 49 contains specific packaging requirements for acetylene?
 - A. 173.119.
 - B. 173.122.
 - C. 173.247.
 - D. 173.303.
3. Which of the following is the correct label for allylbromide?
 - A. Corrosive.
 - B. Flammable gas.
 - C. Flammable liquid.
 - D. Explosive A.
4. Which paragraph of CFR 49 contains packaging exceptions for allylbromide?
 - A. 173.114.
 - B. 173.118.
 - C. 173.244.
 - D. 173.505.

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SITUATION:

Identify the separation that must be maintained when loading the items in questions 5 and 6.

5. Explosives and flammable solids:
 - A. Away from.
 - B. Separated from.
 - C. Separated by a complete cargo compartment or hold from.
 - D. Separated longitudinally by an intervening cargo compartment or hold from.

6. Oxidizers and flammable solids:
 - A. Away from.
 - B. Separated from.
 - C. Separated by a complete cargo compartment or hold from.
 - D. Separated longitudinally by an intervening cargo compartment or hold from.

7. Which of the following actions would you take with an ammonia anhydrous spill?
 - A. Do not get water inside the container.
 - B. Do not touch spilled material.
 - C. Keep combustibles away from spilled material.
 - D. Shut off ignition sources.

8. Which of the following items would be incompatible with blasting caps if you loaded them on the same truck?
 - A. Rocket motors.
 - B. Empty grenades.
 - C. Torpedoes.
 - D. Detonating fuses.

LESSON ONE

PRACTICE EXERCISE

ANSWER KEY AND FEEDBACK

<u>Item</u>	<u>Correct Answer and Feedback</u>
1.	B. Flammable gas. (page 5)
2.	D. 173.303. (page 5)
3.	C. Flammable liquid. (page 5)
4.	B. 173.118. (page 5)
5.	D. Separated longitudinally by an intervening cargo compartment or hold from. (page 25)
6.	A. Away from. (page 25)
7.	A. Do not get water inside the container. (page 27)
8.	C. Torpedoes. (page 35)

LESSON TWO

ESTABLISH A NUCLEAR SURETY PROGRAM

MQS Manual Task: 01-7320.15-0100

OVERVIEW

TASK DESCRIPTION:

In this lesson you will learn to establish a nuclear surety program.

LEARNING OBJECTIVE:

ACTIONS: Describe the procedures required to establish a nuclear surety program.

CONDITIONS: You will be given access to information from AR 50-5 and AR 50-6.

STANDARDS: Establishment of the nuclear surety program will be in accordance with AR 50-5 and AR 50-6.

REFERENCES: The material contained in this lesson was derived from the following publications:

AR 50-5.

AR 50-6.

INTRODUCTION

Your role as a transportation officer may include commanding an organization with a nuclear mission. Should this be the case, you will need to establish a nuclear surety program to provide for the safety, security, and reliability of nuclear weapons and to provide controls to prevent nuclear accidents, incidents, or unauthorized weapons employment. Also, you will, along with or as the certifying official, assume responsibility for proper implementation of the Personnel Reliability Program (PRP).

PART A - APPLY NUCLEAR SURETY TO SHIPMENT

The Army Nuclear Surety Program is designed to ensure the safety, security, and reliability of nuclear weapons. It also provides controls to prevent nuclear accidents, incidents, or

unauthorized weapons employment. It provides this assurance through the correlation of a variety of Army functions and activities within existing command and staff structures. The major nuclear surety program activities relating to transportation are--

- logistical considerations.
- certification of the personnel reliability.

NUCLEAR MOVEMENT

The transportation officer must ensure movement of nuclear cargo by the safest means and over the safest routes possible. Keep movement to a minimum consistent with operational requirements.

Military airlift is the preferred mode of transport. Surface movement off military installations in CONUS is prohibited. Prior approval by the commander of the unified/specified command allows overseas surface movement.

Consider the following when planning for a nuclear movement:

- Known and potential hazards.
- Current intelligence relating to movement route.
- Type and mode of shipment.
- Availability of security resources.
- Available emergency assistance.
- Operations security.

The unit providing transportation will ensure that--

- the capability exists to meet required pick up and delivery schedules.
- adequate, properly inspected transportation equipment is available.
- all personnel have been trained and meet personnel reliability standards.
- loading, tie down, and unloading are as prescribed in appropriate publications.

Normally, waterborne movement of nuclear weapons will be aboard US Navy ships or aboard specially equipped ships of the Military Sealift Command.

Movement of nuclear weapons between CONUS military installations by rail is prohibited. However, if overseas, shipment by rail may be authorized for urgent operational requirements. Less-than-carload shipments are authorized only if exclusive use of the car is specified.

PART B - ENSURE PERSONNEL RELIABILITY THROUGH THE PERSONNEL RELIABILITY PROGRAM

PERSONNEL RELIABILITY PROGRAM (PRP)

The PRP is a peacetime program applicable only to personnel who have access to or control access to war reserve nuclear weapons, nuclear components, sealed authenticators, permissive action link, cipher system material, missile computer tapes, or nuclear reactors. The certifying official is ultimately responsible for the proper implementation of the program. This official is an O-6 or above or his lower ranking designee.

No one will be assigned to a nuclear duty position until he has been screened and certified as being qualified for the PRP and has been certified as being appropriately trained for specific nuclear duties. Fellow workers and supervisors must continually evaluate personnel in the PRP.

The concept of personnel reliability is a vital element in the Nuclear Surety Program. The unpredictability of human behavior precludes any positive test of reliability. An individual may be presumed to be reliable when there is no evidence to the contrary. Because there is no reliability test, the PRP provides for both preassignment screening and continuing evaluation and assessment of an individual's health, attitude, behavior, and duty performance.

The certifying official will immediately disqualify any individual who fails to meet or is suspected of no longer meeting the reliability standards of PRP. Disqualification may be either temporary or permanent, depending on the circumstances, character, and transitory or continuing nature of the cause of the unsuitability. Except for a physical or mental condition documented in the member's medical record, statements such as "alcohol abuse," "drug abuse," "contemptuous attitude," or "court martial conviction" are inadequate as support for disqualification. Any further information required for PRP is available in AR 50-5.

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LESSON TWO

PRACTICE EXERCISE

The following items will test your grasp of the material covered in this lesson. There is only one correct answer for each item. When you have completed the exercise, check your answers with the answer key that follows. If you answer any item incorrectly, study again that part of the lesson which contains the portion involved.

SITUATION: You are commanding a unit which is responsible for transporting nuclear weapons.

1. Your preferred method of shipment for a nuclear weapon in CONUS is by--
 - A. aircraft.
 - B. barge.
 - C. truck.
 - D. rail.

2. Which of the following is a correct statement relating to shipment of nuclear weapons by rail?
 - A. Shipments in CONUS may be made in an emergency.
 - B. Shipments overseas may be made at the discretion of the transportation officer.
 - C. Less than carload shipments are not authorized.
 - D. Overseas shipments require prior approval by the commander of the unified or specified command.

3. While establishing your PRP, you may assume that an individual is reliable when--
 - A. no adverse reports are on file.
 - B. there is no evidence to the contrary.
 - C. fellow workers like the individual.
 - D. supervisors like the individual.

4. Under PRP, fellow workers and supervisors must evaluate personnel--
 - A. occasionally.
 - B. monthly.
 - C. continually.
 - D. yearly.

LESSON TWO

PRACTICE EXERCISE

ANSWER KEY AND FEEDBACK

<u>Item</u>	<u>Correct Answer and Feedback</u>
1.	A. Aircraft. (page 48)
2.	D. Overseas shipments require prior approval by the commander of the unified or specified command. (page 49)
3.	B. There is no evidence to the contrary. (page 49)
4.	C. Continually. (page 49)