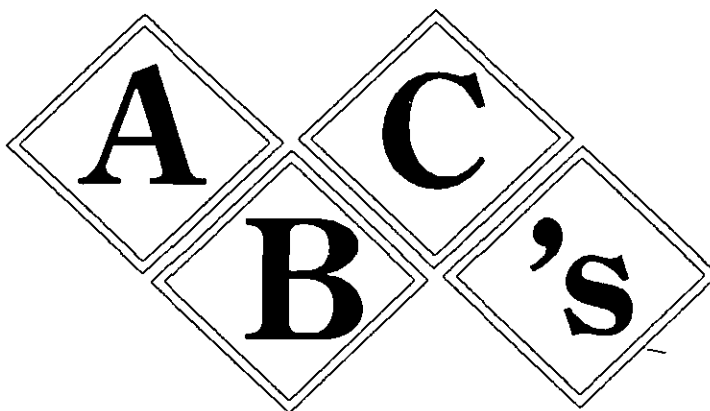
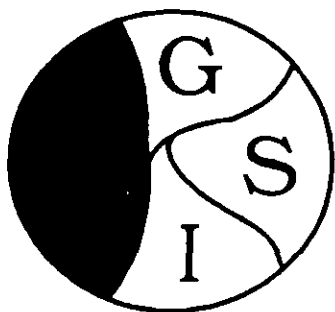
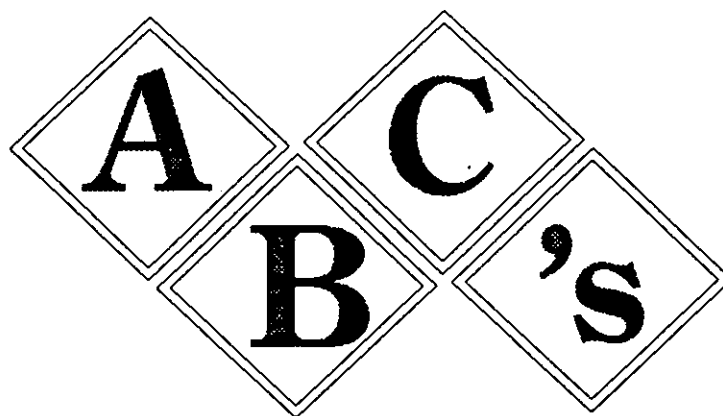
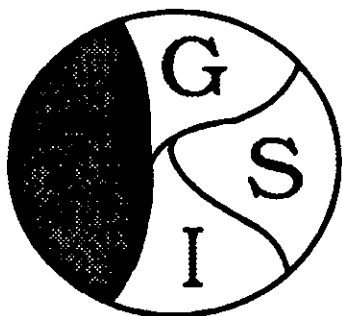




of
**The Transportation
of
Hazardous Materials**

A complete, step by step Guide to the
Transportation of Hazardous Materials, Wastes and Substances
Under the U.S. Department of Transportation's
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This book is respectfully dedicated to:

My God and my Lord to whom I owe all.

My wife Lois who is the love of my life, my partner, and the most precious of God's many blessings to me.

My mother-in-law, Della McCue, whose daily life is an illustration of the true meaning of love, motherhood, and Christ-like living.

My mom, Eleanor; my children Basil, Tom, Mary, and Becky; my grand children Basil Paul, Brant Patrick, and Mishay; and my brothers and sisters Galyn, Leta, Linus and Joan. They are my family. No man could ask for more.

My students to whom I have always given my best and from whom the joys and meaning of my life's work have flowed.

Those who realize that we are what we think and will make an effort to fill their minds with:

"whatever is true, whatever is honorable, whatever is right, whatever is pure, whatever is lovely, whatever is of good repute, if there is any excellence and if anything worthy of praise, let your mind dwell on these things." *Philippians 4:8*

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INTRODUCTION

Why Are Materials That Are Not Hazardous Transported?

Generally the transportation system is used to move non hazardous materials from Point A to Point B to meet the needs of the person or organization (Shipper) shipping the materials. These needs are as different as the filling of a customer's order or the movement of raw materials to where they are needed for production or other internal needs of the Shipper. As a general rule these materials are accompanied by documentation describing them, packaged to make sure they get to where they are going in good condition, and are handled in a manner that ensures the safety of Shipper and Carrier personnel, the general public, and the environment.

Why Are Hazardous Materials Transported?

Most shipments of Hazardous Materials are transported for the same reason that non Hazardous Materials are transported, to move them from Point A to Point B to meet the needs of the Shipper. Hazardous Materials are transported for various reasons such as to customers as finished products and internally as raw materials to manufacture products, for use as fuels, or as Hazardous Wastes for treatment or disposal to name a few. As is the case with non Hazardous Material shipments, Hazardous Materials shipments are accompanied by documentation describing them, packaged to make sure they get to where they are going in good condition and without releasing their contents while in the transportation system, and are handled in a manner that ensures the safety of Shipper and Carrier personnel, the general public, and the environment.

== FOUR HAZARDOUS MATERIALS EXPOSURES ==

S-Specific Safety Regulations

A-Actual Delay

F-Fines and Penalties

E-Embarrassment to Company, Industry, or Self

FIGURE 1

SAFE- The Four Hazardous Materials Exposures

The primary difference between Hazardous Materials and non Hazardous Materials shipments is not in the basic objective of the shipment, to move it from Point A to Point B or in the need to identify, document, package and transport the shipments safely. It is in HOW Hazardous Materials are identified, packaged, documented, stored and transported. The transportation of Hazardous Materials or Dangerous Goods, as they are called in international transportation, is governed by specific governmental regulations requiring that Hazardous Materials be identified, packaged, and transported in a specific way. This results in the exposure of the Shippers and Carriers of Hazardous Materials to four (4) things with which the Shippers and Carriers of non Hazardous Materials are not normally faced. These four exposures are summarized under SAFE in Figure 1 above and will be discussed individually starting on the next page.

- 1 **Specific Hazardous Materials Safety Regulations-** Shipments of Hazardous Materials are subject to a specific set of Hazardous Materials Transportation Regulations published by the U.S. Department of Transportation (49 CFR Parts 171-180). These regulations contain detailed instructions on how Hazardous Materials have to be Identified, Packaged, Marked, Labeled, Documented, and Placarded. Shipments not in compliance with the applicable regulations may not be Offered or Accepted for transportation.

GSI CR: The ABC's of Regulatory Organization, Int-4

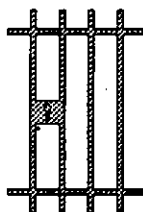
- 2 **Actual Delay-** Shipments of Hazardous Materials that are not in compliance with the Hazardous Materials Regulations may not be Offered or Accepted for Transportation (49 CFR 171.2(a)) or Transported within the transportation system (49 CFR 171.2(b)). If a shipment is found within the transportation system and it is not in compliance with the applicable regulations it will, in most cases, be delayed. In addition carrier acceptance inspections, special loading and compatibility requirements, enforcement inspections while they are in the transportation system, and the natural curiosity, worry and concern that carrier and enforcement personnel have when a Hazardous Material is being shipped can result in the delay of the shipment.

- 3 **Fines and Penalties-** In addition to resulting in the delay of the shipment, shipments of Hazardous Materials not in compliance with the applicable regulations can subject the Shipper, Forwarder, and Carrier, as appropriate, to Civil Penalties of up to \$25,000 per violation or Criminal Penalties of up to \$500,000, imprisonment of up to five (5) years, or both (49 USC 1809).

Civil Penalty- Civil Penalties are usually imposed when the Hazardous Materials regulations are not followed. This can result when something is not done that the regulations require to be done such as marking the correct Proper Shipping Name on a package, labeling etc.. It can also result when something was done that the regulations prohibit such as putting a Placard on a vehicle that does not contain Hazardous Materials. The act or failure to act speaks for itself and there is no requirement that the violation be intentional or that the person committing the violation even know there are Hazardous Materials Regulations in existence. Generally, if a person Offers or Accepts a material for transportation and that material is regulated as a Hazardous Material and it's not in compliance with the Hazardous Materials Regulations, one or more violations has occurred regardless of whether or not the persons intended to violate the Hazardous Materials Regulations or even knew they existed. It's the same as speeding. The act speaks for itself. In most cases the fact that we did not intend to speed does not change the result. A ticket is issued for failure to do something we were required to do.

Application: If a package of ACETONE was marked ACETONEE instead of ACETONE for the Proper Shipping Name that is a violation of the Hazardous Materials Regulations because it is misspelled. The correct Proper Shipping Name is actually ACETONE. If only one package is marked wrong the person offering the package for transportation and the Carrier that accepts it for transportation each are subject to a Civil Penalty of \$25,000. If 10 drums were marked wrong they would be subject to a Civil Penalty of \$250,000.00.

Criminal Penalty- A Criminal Penalty can be imposed when the Hazardous Materials regulations are violated intentionally. The person Offering the material being shipped, and either for transportation or transported it in violation of those regulations. It was not a mistake as is most often the case in a Civil Penalty but an intentional act to Offer, Accept, or Transport a shipment of Hazardous Materials in violation of the Hazardous Materials Regulations.



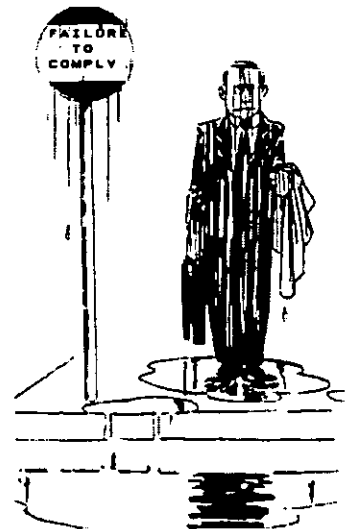
Application: As a general rule a person who intentionally Offers a package of Hazardous Materials requiring a "POISON" label without the label because they have to have it somewhere quick and the Carrier won't accept "POISON" labeled packages has committed a Criminal violation. They have intentionally failed to perform an act that they knew the regulations required them to perform and could face a Criminal Fine of up to \$500,000 and/or up to Five (5) years imprisonment.

4 **Embarrassment-** Shipments that are not in compliance with the Hazardous Materials Regulations can cause embarrassment to our Industry, Company or Organization, and ourselves. All of us at one time or another have heard of a shipment of Hazardous Materials that either leaks, explodes, burns, turns into a cloud or does some other neat thing that it's not supposed to do while in the transportation system.

Application: Millions of square miles to leak in but, as the result of an accident, a shipment of Ten 55 gallon metal drums of "Poisonous Killer Pesticide", a Division 6.1 Hazardous Material, is leaking from the back of the truck that it is being transported on in the middle of rush hour on the busiest expressway in the city. The truck is not placarded **POISON** and the leaking drums are not labeled **POISON**. Under normal conditions, in addition to Emergency Response personnel, the media also shows up. As the emergency is being handled it is discovered that the shipment was not in compliance with the Hazardous Materials Safety Regulations after two Emergency Response personnel and the Channel 89 News Anchor Person have been exposed to and injured by the effects of the leaking material. Instant embarrassment to the chemical and pesticide industry, the Shipping Organization or Company that Offered the shipment for transportation, and the Carrier that Accepted and Transported it. The probabilities are also great that personal and professional embarrassment will result to the individual or individuals within the Shippers Organization that had the responsibility to label the packages and provide the Placards to the carrier if the vehicle was not already placarded.

BOTTOMLINE=SAFETY

These are safety regulations. They set forth the minimum acceptable standards of safety. At times the individual parts may seem petty, but generally, when considered in total, the Hazardous Materials Regulations do provide a system that permits the transportation of Hazardous Materials safely. A package of AMMONIUM NITRITE is marked with the Proper Shipping Name of AMMONIUM NITRATE instead of AMMONIUM NITRITE. At first blush it seems pretty petty. So what an A for an I. They are both vowels. That difference is the difference between a material classed as an "Oxidizer" (AMMONIUM NITRATE) which may be transported in the transportation system if in compliance with the Hazardous Materials Regulations and a material that is very unstable and has explosive properties (AMMONIUM NITRITE) which is generally prohibited in the transportation system. Seemingly small and petty things can and do impact on safety!



THE A, B, C's OF REGULATORY ORGANIZATION

A. Reasons for Knowing How Regulations Are Organized- Imagine a telephone book that was not sorted alphabetically. It would be hard to look up a number, the information needed, because there was no organization to it. The problem would be the same if the person seeking the information did not know how the telephone book was organized. Most of us, one way or another have learned that a telephone book is organized alphabetically by name and have no problem using it to get the information we need. 49 CFR contains the minimum Federal safety standards applicable to the transportation of Hazardous Materials. To be in compliance with them we must know how they are organized so that the information needed can be found and used effectively.

B. What is 49 CFR and the Code of Federal Regulations (CFR)- The vast majority of regulations published by the Federal Government are published in the Code of Federal Regulations which is commonly abbreviated or referred to as CFR. The Code of Federal Regulations (CFR) is broken into numbered Titles with each Government Agency given their own numbered Title.

Visualize a set of encyclopedias consisting of many Volumes. Each volume is numbered and contains specific information. The Code of Federal Regulations (CFR) is the "encyclopedia of Government Regulations" consisting of many Titles (Volumes) each of which is numbered and contains the regulations pertaining to a specific agency and subject. The Title of the CFR containing the U.S. Department of Transportation's Hazardous Materials Regulations is Title 49 (49 CFR). This is commonly referred to as 49 CFR. The Hazardous Waste and Substance regulations of the U.S. Environmental Protection Agency (EPA) are contained in Title 40 of the CFR (40 CFR).

C. The Relationship Between the Title, Chapter, Sub Chapter, and Part- Titles are divided into Sub Titles, Chapters, Sub Chapters, Parts, Sub Parts, Sections, Paragraphs, Sub Paragraphs etc. The U.S. DOT's Hazardous Materials regulations covered in this text are all contained in **Sub Chapter C** of **Chapter I** of **Sub Title B** of **Title 49 CFR** which is entitled "Hazardous Materials Regulations". **Sub Chapter C** is divided into **Parts**. **Parts** run numerically from the front to rear of 49 CFR starting with Part 171 and ending with Part 179. The relationship between a Title, Chapter, Sub Chapter, and Part are illustrated in Figure 2.

It is helpful to remember that all the U. S. DOT Hazardous Materials Regulations are contained within **Sub Chapter C**. From time to time the Hazardous Materials Regulations (Parts 171-180 of 49 CFR) will contain language referring to "this Sub Chapter". The Sub Chapter being referred to is **Sub Chapter C**.

Title 49-TRANSPORTATION

SUB TITLE B- Other Regulations Pertaining To Transportation

Chapter I- Research and Special Programs Administration

SubChapter C- Hazardous Materials Regulations

Parts- 171-180

FIGURE 2

D. Keys to Everyday Use- Sections and Paragraphs

Parts are broken down into **Sections** which run, relatively speaking, numerically within the **Part**, starting with "1". For day to day use the specific information that will be used will be found within the **Sections** and **Paragraphs** of the various **Parts** of 49 CFR. The reference to 172.101 in Figure 3 refers to the 101st **Section** within **Part** 172. The **Section** starts with the first series of numbers to the right of the period after the **Part**. A **Section** reference must include the **Part** because each **Part** could have a **Section** "1" in it. A reference to 171.1 refers to the first **Section** within **Part** 171. A reference to 177.1 refers to the first **Section** within **Part** 177. The **Part** and the **Section** together however form a unique reference i.e. 171.1, 172.1, or 173.1 etc.

Sections are divided into **Paragraphs**, **Sub Paragraphs** etc. The first non capital (lower case) letter in parens to the right of the Section is the **Paragraph**. The first Arabic (American) number in parens to the right of the **Paragraph** is the **Sub Paragraph**. The (c) in Figure 3 illustrates a **Paragraph** reference and the (10) a **Sub Paragraph** reference.

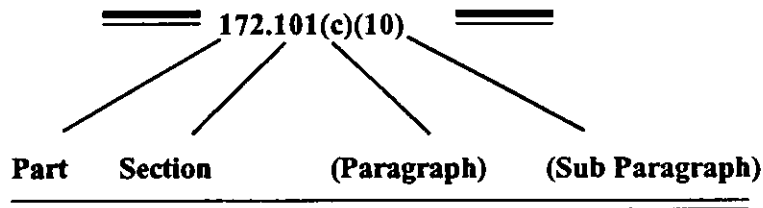


FIGURE 3

It should be noted that **Sub Paragraphs** are further broken down into Sub Sub Paragraphs which will be the first lower case Roman Numeral in parens after the Sub Paragraph and Sub Sub Sub Paragraphs which are indicated by a Capital letter in parens. The reference 172.101(c)(10)(i)(A) refers to Sub Sub Sub Paragraph (A) of Sub Sub Paragraph (i) of Sub Paragraph (10) of Paragraph (c) of Section 172.101.

172.101(c) Level 1 Paragraph
 172.101(c)(10) Level 2 Sub Paragraph
 172.101(c)(10)(i) Level 3 Sub Sub Paragraph
 172.101(c)(10)(i)(A) Level 4 Sub Sub Sub Paragraph

Figure 4

E. Sub Parts- Although not used for day to day research it should be noted that the **Parts** are divided into **Subparts** containing **Sections**. **Subparts** are lettered with a Capital (UPPER CASE) letter alphabetically within the **Part**. **Subpart A**, **Subpart B**, etc. **Sections** are contained within these **Subparts** and are numbered consecutively throughout the Part without regard to the Subpart they are in and do not start at .1 with each new Subpart. Sub Part C of Part 172 entitled Shipping Papers contains Sections 172.200 through 172.205. Sub Part D the next Subpart contains the Marking Requirements. It starts with Section 172.300. The only reason we need to know about Sub Parts is because on occasion 49 CFR will refer to a Sub Part. A reference to Sub Part F of Part 172 is a reference to Sections 172.500-172.560 containing the regulations pertaining to Placarding.

RESERVED- Intentionally left blank. Next page is 1.

THE A, B, C's OF USING THE § 172.101 TABLE (HAZARDOUS MATERIALS TABLE)

A. Key to Compliance- Proper use of the § 172.101 Table

The Hazardous Materials Table (§172.101 Table) in §172.101 of 49 CFR is set up similar to a "Telephone Book". It lists information alphabetically by Column and requires the use of the right name to get the right information. The Column Titles at the top of each Column describes the information contained in the Column. The Columns of the §172.101 Table (Hazardous Materials Table) are organized Alpha-numerically (1) through (10B). The contents of each Column will be discussed below as well as its relationship to the other functions necessary to achieve safety and compliance (172.101(b)-172.101(k)).

B. Column (1)- Symbols:

- + Fixes the Proper Shipping Name, Hazard Class, and Packing Group without regard to whether or not the material actually meets the definition of that Hazard Class or Packing Group or any other Hazard Class or Packing Group (172.101(b)(1)).
- A Means that the material covered by the entry is regulated as a Hazardous Material only when being transported by air except if the material is regulated as a Hazardous Substance or Hazardous Waste, in which case it is regulated by all modes including air (172.101(b)(2)).
- D Identifies Proper Shipping Names which may be used for domestic transportation but will, in most cases, not be appropriate for transportation under International Dangerous Goods regulations such as ICAO or the IMDG Code. An alternate Proper Shipping Name may be selected (172.101(b)(3)). The D in the *Aldrin, liquid* entry in Figure 2A illustrates the use of this symbol.
- I Identifies Proper Shipping Names which are appropriate for international transportation under International Dangerous Goods regulations such as ICAO or the IMDG Code. An alternate Proper Shipping Name may be used if only domestic transportation is involved (172.101(b)(4)). As a practical matter when shipping under the authority of International Regulations such as ICAO or the IMDG Code, most shipments of Hazardous Materials will be described using Proper Shipping Names selected from either ICAO (171.11) or the IMDG Code (171.12(b)).
- W Means that the material covered by the entry is regulated as a Hazardous Material only when being transported by water except if the material is regulated as a Hazardous Substance or Hazardous Waste, in which case it is regulated by all modes including water (172.101(b)(5)).

- C. Column (2) - Proper Shipping Name: This Column contains the Proper Shipping Name which is required to be marked on each package or overpack, entered on the Shipping Paper, and is the KEY TO COMPLIANCE and SAFETY. It is the starting point for the handling or processing of all Hazardous Materials or Dangerous Goods shipments. It establishes the "Row" or "Entry" in the Hazardous Material Table which contains the information needed to process the shipment such as the Class or Division, Identification Number, Packaging Authorizations, Labels, etc.

GSI CR: B. Packaging Authorization, 27; A. Marking, 35; A. Labeling, 39; A. Shipping Papers, 45

The Proper Shipping Name must be the MOST appropriate entry appearing in Column (2) in **Roman Type** that describes the Hazardous Material being shipped (172.101(c)). Reference to Figure 2A shows that *Acetone* would be a Proper Shipping Name for the chemical "Acetone" being shipped in its commercially pure form. *Italics* are not part of the Proper Shipping Name. In the *Aldrin, liquid* entry, illustrated in Figure 2A, the Proper Shipping Name is **Aldrin**. There is a Proper Shipping Name for EVERY Hazardous Material contained in Column (2) of the Hazardous Materials Table. Ethylcyclohexane is not specifically listed by its Technical or Chemical name in the Hazardous Materials Table. In its commercially pure form it is regulated as a Hazardous Material because it meets the definition of a Class 3. The most appropriate generic or n.o.s. Proper Shipping Name listed in the Hazardous Materials Table must be selected. In the case of Ethylcyclohexane the Proper Shipping Name would most likely be **Flammable liquids, n.o.s.**

GSI CR: A-B. Classification, 7; A. Proper Shipping Name, 11; A. Technical Name Rule, 15

Impact of Prefixes and Numbers on the Alphabetical Order of the Proper Shipping Names

As a general rule the Hazardous Material Table is arranged in alphabetical order without regard to the following:

1. Numbers. To find **1,1,1-Trichloroethane** look under **Trichloroethane**, not **1,1,1-**, in the Hazardous Materials Table.

2. The following Single Letters or Descriptions:

<u>Single Letters</u>	<u>Descriptions</u>
a- b-	alpha beta
m- N-	meta omega
n- O-	sec tert
o- p-	

Figure 2A illustrates the **n-Propyl nitrate** entry in the Hazardous Material Table. The user would have to look under **P** entries for **Propyl nitrate** and ignore the prefix **n-**. Neither **n-Propyl nitrate** nor **Propyl nitrate** is listed in the **n** entries of the Hazardous Material Table..

Hazardous Material Table - § 172.101 Table

Sym- bol	Hazardous materials descriptions and proper shipping names	Hazard class or Division	Identifi- cation Numbers	Pack- ing group
(1)	(2)	(3)	(4)	(5)
D	Acetone	3	UN1090	II
	Aldrin, liquid	6.1	NA2762	II
	n-Propyl nitrate	3	UN1865	II

FIGURE 2A

D. Column (3) - Class or Division: This Column contains the Class or Division assigned to the Proper Shipping Name covered by that entry or the word "Forbidden" (172.101(d)). In Figure 2A Column (3) shows the Hazard Classes or Division for the entry **Acetone** as **3**. The Class or Division must be entered on the Shipping Paper as part of the Basic Description (172.202(a)). If the word "Forbidden" appears in Column (3) the material covered by the entry may not be offered for transportation without special processing or approvals (172.101(d)(1)-(2)). A complete list of the different Classes, Divisions, and Definition Sections is contained in §173.2 and the GSI 49 CFR Class/Division Table on page 10. GSI CR: Classification, 7; GSI Class/Division Table, 10; C. Shipping Papers, 46; E. Placarding, 56

E. Column (4) - Identification Number: This Column contains the Identification Number assigned to the Proper Shipping Name (172.101(e)). As a general rule the Identification Number must be marked on each package or overpack and entered on the Shipping Paper. The prefix **NA** as illustrated in the **Aldrin, liquid** entry in Figure 2A indicates Proper Shipping Names that are not recognized for international transportation, except, in certain cases, for shipments to and from Canada. The prefix **UN**, as illustrated in both the **Acetone** and **n-Propyl nitrate** entries indicates that the Proper Shipping Name covered by the entry would be appropriate for both international and domestic transportation. As a practical matter when shipping under the authority of International Regulations such as ICAO or the IMDG Code, most shipments of Hazardous Materials will be described using the prefix and numbers associated with the Proper Shipping Name selected from either ICAO (171.11) or the IMDG Code (171.12(b)) as appropriate.

The appropriate Prefix shown as part of the Identification Number in Column (4) must be marked on each Non Bulk packaging as part of the Identification Number marking required by 172.301(a) and entered on the Shipping Paper as part of the Identification Number required in the Basic Description (172.202(a)).

GSI CR: C. Identification Number, Marking, 35; D. Shipping Papers, 46

F. Column (5) - Packing Group: Column (5) contains the Packing Group, if any, assigned to the Hazardous Material covered by the entry. The Packing Group will be an upper case Roman Numeral I, II, or III depending on the degree of hazard i.e. I Most Hazardous (Most Regulated), II Moderately Hazardous (Moderately Regulated), and III Least Hazardous (Least Regulated) (172.101(f)). Column (5) of Figure 2A shows that the Packing Group for all the entries illustrated is II. The Packing Group must be entered on the Shipping Paper as part of the Basic Description (172.202(a)).
GSI CR: Packing Group, 6; B. Classification, 7; E. Shipping Papers, 46

G. Column (6) - Labels: This Column contains the Primary and Subsidiary Hazard (Risk) labels that must be affixed to each package or overpack. Column (2) for the entries in Figure 3A indicates that the **FLAMMABLE LIQUID** label must be affixed to each package or overpack containing Acetone and that both **CORROSIVE** and **FLAMMABLE LIQUID** labels must be affixed to each **Dichlorobutene** package or overpack. Generally if more than one (1) label is listed, the first label listed represents the Primary Hazard and the second and subsequent label(s) represent the Subsidiary Hazard(s) (172.101(g)). It should be stressed that 172.402 may require that labels other than those shown in Column (6) be affixed to the package or overpack IN ADDITION to those contained in Column (6) (172.101(g)).
GSI CR: A. Labeling, 39

H. Column (7) - Special Provisions: Column (7) contains the codes for "Special Provisions" IF ANY, which could apply to the Hazardous Materials covered by the entry (172.101(h)). The specifics of each Special Provision is contained in 172.102. The Codes generally apply as follows:

Alpha numeric Codes:

A- Air transportation only.

H- Highway only.

N- Non Bulk Packaging only.

T- IM Portable Tanks only.

B- Bulk Packagings, except, in most cases IM Portable Tanks.

R- Rail only.

W- Water transportation only.

Numerical Codes: Apply to all modes, bulk and non bulk packaging if applicable.

Hazardous Material Table - § 172.101 Table

Hazardous materials Proper Shipping Names (2)	Label(s) Required (6)	Special Provis. (7)	Excep- tions (8A)	Non Bulk Pack- agings (8B)	Bulk Pack- agings (8C)	Pass. Aircraft Railcar (9A)	Cargo Aircraft Only (9B)	Vessel Stow- age (10A)	Other Provisions (10B)
Acetone	FLAMMABLE LIQUID	T8	150	202	242	5L	60L	B	
Calcium hydride	DANGEROUS WHEN WET	A19 N40	None	211	242	Forbidden	15 kg	E	
Dichlorobutene	CORROSIVE, FLAMMABLE LIQUID		None	201	243	0.5L	2.5L	C	12, 21, 25 40, 48, M4

FIGURE 3A

Knowledge of Code meanings and applicability can eliminate a lot of flipping back and forth between 172.101 and 172.102. Reference to Column (7) of the **Calcium hydride** entry in 172.101 or Figure 3A indicates 2 Codes that could apply. If, however, we are shipping a bulk packaging of **Calcium hydride**, none applies. The Codes with the Prefix N apply only to Non Bulk Transportation and those with the prefix A apply only to transportation by air.

I. Column (8) - Packaging Authorizations: Column (8) contains the Sections within Part 173 of 49 CFR authorizing the packaging to be used (172.101(i)). It is divided into 3 Columns as follows:

Column (8A)- Contains the Section within Part 173 containing exceptions to some of the requirements of the regulations. The word "None", as illustrated in the **Calcium hydride** and **Dichlorobutene** entries in Figure 3A, in this Column means that there are no exceptions except as may be authorized under the

Special Provisions in Column (7) of the §172.101 Table. The entry 150 in Column (8A) for the Acetone entry in the §172.101 Table or of Figure 3A indicates that exceptions authorized for Acetone will be found in Section 173.150. It should be pointed out that there may be exceptions authorized elsewhere such as in 173.4.

Column (8B)- Contains the Section within Part 173 containing the non bulk packagings authorized to be used. The entry 202 in Column (8B) for the Acetone entry in the §172.101 Table or Figure 3A indicates that the non bulk packaging authorized for Acetone will be found in Section 173.202.

Column (8C)- Contains the Section within Part 173 containing bulk packagings authorized to be used. The entry 242 in Column (8C) for the Acetone entry in the §172.101 Table or Figure 3A indicates that the bulk packaging authorized for Acetone will be found in Section 173.242.

- J. Column (9) - Quantity Limitations:** Column (9) is divided into two columns containing the maximum quantity that may be offered **per package** for transportation aboard "Passenger carrying aircraft or rail car" (Column (9A)) or Cargo Aircraft (Column (9B)). The entry 5 L in Column (9A) for the Acetone entry in Hazardous Materials Table or Figure 3A indicates that up to 5 L of Acetone may be offered **PER PACKAGE** for transportation aboard "Passenger carrying aircraft or rail car." The entry 60 L in Column (9B) for the Acetone entry in the Hazardous Materials Table or Figure 3A indicates that up to 60 L of Acetone may be offered **PER PACKAGE** for transportation aboard Cargo Aircraft. Except where otherwise indicated the quantities indicated are "net" not "gross". The word "Forbidden," as illustrated by the **Calcium hydride** entry in Figure 3A in Column (9A), means that the Hazardous Material covered by the entry may not be offered for transportation aboard Passenger carrying aircraft or railcars. The word "Forbidden" appearing in Column (9B) indicates that the Hazardous Material may not be offered for transportation aboard Passenger carrying aircraft or railcars or Cargo Aircraft (172.101(j)). The majority of Hazardous Materials transported by air are transported under the authority of ICAO and the quantity per package and packaging will generally be controlled by ICAO.
GSI CR: A. Packaging, 27; E. Cargo Aircraft Only Label, 42

- K. Column (10) - Vessel Stowage Requirements:** Column (10) is divided into two columns. The stowage locations aboard cargo and passenger vessels are contained in Column (10A) by a lettered code. The codes are defined in 172.101(k)(1)-(5). Other stowage requirements applicable to a particular Hazardous Material are indicated by codes in Column (10B). These Codes are defined in 176.84. The entry "B" in Column (10A) for the Acetone entry in either the Hazardous Materials Table or Figure 3A indicates that shipments of Acetone may be stowed "on deck" and "below deck" on a cargo vessel but must be stowed "on deck" on passenger vessels (172.101(k)).

CLASSIFICATION & PACKING GROUP

Classification Terminology

Class or Classification- Term used in International Regulations such as ICAO, IATA, IMDG, and the Canadian TDG Regulations for what 49 CFR calls the Hazard Class. (See "Hazard Class" below.)

Commercially Pure- As used in this text the term "Commercially" or "Technically" Pure means a material as it is commonly manufactured without the addition of any outside ingredients which would cause it to become a mixture or solution. It includes those impurities which are a natural result of the manufacturing process and includes "Reagent" as well as "Technical" Grade chemicals that are not mixtures.

Hazard Class- The category or type of Hazard assigned to a material. There are nine (9) Classes numbered 1 through 9. Each has its own Definition Section within Part 173. Generally the first paragraph within the Definition Section will contain the "Class Definition". Figure 7A on page 7 illustrates paragraph 173.120(a) which contains the Definition for "Class 3 Flammable Liquids" in Sub Paragraph 173.120(a)(1). A complete list of the Classes and Divisions, definition references, and a summary of the hazards involved with each will be found in the "GSI 49 CFR CLASS/DIVISION REFERENCE TABLE" on page 10. Section 173.2 of 49 CFR contains a list of the Classes, Divisions, and their 49 CFR Definition Section.

Hazardous Materials Table - § 172.101 Table

Sym- bol	Hazardous materials descriptions and proper shipping names	Hazard class or Division	Identifi- cation Numbers	Pack- ing group
(1)	(2)	(3)	(4)	(5)
D	Acetone	3	UN1090	II
	Aldrin, liquid	6.1	NA2762	II
	n-Propyl nitrate	3	UN1865	II

FIGURE 5A

Although some materials may meet the definition of more than one category or class, each Hazardous Material will be assigned to only one Hazard Class in either Column (3) of the Hazardous Material Table or through the hazard precedence procedure contained in Section 173.2a for most mixtures and materials not specifically listed in the Hazardous Material Table (172.101(d) & 173.2a).

GSI CR: A.-B. Classification, 7; C. Shipping Paper, 46; E. Placarding Selection, 56

Hazardous Material- A material, substance, or article which is capable of posing an unreasonable risk to health, property, and safety while in the transportation system and has been so *designated* by the Secretary of the Department of Transportation (171.8). The Secretary *designates* these substances and materials as "Hazardous Materials" in one of two (2) ways:

1. Listing them by their chemical (Technical) name in the Hazardous Material Table (§172.101 Table). Commercially pure Acetone is regulated as a Hazardous Material because it is specifically listed in the Hazardous Material Table (§172.101 Table). The Acetone entry in Column (2) of Figure 5A illustrates this method of Classification.

OR

2. By setting up criteria for "Hazard Classes" or "ORM Categories" which automatically causes all materials meeting the criteria to be regulated as "Hazardous Materials". Ethylcyclohexane, a liquid having a Flash point of 35°C (95°F), is regulated as a "Hazardous Material" because it meets the definition of a Class 3 Flammable liquid. A material meets the definition of a Class 3 under 49 CFR if its Flash point is not more than 60.5°C (141°F) (173.120(a)(1)).

Division- Some Classes such as 1, 2, 4, 5, and 6 are broken down into Divisions which is indicated by a decimal number after the Class Number. Reference to the "GSI 49 CFR CLASS/DIVISION REFERENCE

TABLE" on page 10 or 173.2 indicates that Class 6 has two Divisions. The 6.1 in the Aldrin entry in Column (3) of Figure 6A below is a Division. The number to the left of the "." is the "Class" and the Number to the right of the "." is the "Division". Aldrin is in 6.1 which is Division "1" of Class "6".

Mixture- A material composed of more than one chemical compound or element (49 CFR 171.8). A mixture may be either a liquid, solid, or gas. Some materials such as **Carbon dioxide and oxygen mixture** are specifically identified as mixtures in the Hazardous Material Table. Others such as **Paint** or **Ink**, which are a combination of other chemical compounds or materials, are examples of materials which, although a mixture, are not specifically identified as such in the Hazardous Material Table. (See "Solution" below.)

Packing Group- The degree of hazard. The Class or Division represents the type of Hazard associated with the Hazardous Material, 6.1, 8, etc. The "Packing Group" represents the degree of that type of Hazard within the Transportation System. Where applicable the Packing Group will be an Upper Case Roman Numeral I, II, or III (171.8). The lower the Packing Group Number the greater the degree of risk and the more it will be regulated. Among other things, the Packing Group dictates the entries in Columns 6-10(B) of the HMT-172.101 to be used, governs some of UN Performance tests for packaging, is a code marked on UN Specification Packaging, and is a required entry on the Shipping Paper.

Packing Group I- Greatest degree of Risk (Most Regulated)

Packing Group II- Moderate degree of Risk (Moderately Regulated)

Packing Group III- Least degree of Risk (Least Regulated but Regulated)

For materials specifically identified by their Technical Name in the §172.101 Table the Packing Group, if applicable, will be found in Column (5) of the entry. In addition, certain Classes and Divisions such as 3, 4.1, 4.2, 4.3, 5.1, 6.1 and 8 have Packing Group criteria which must be considered in Classifying

Hazardous Material Table - § 172.101 Table

Sym- bol	Hazardous materials descriptions and proper shipping names	Hazard class or Division	Identifi- cation Numbers	Pack- ing group
(1)	(2)	(3)	(4)	(5)
D	Acetone	3	UN1090	II
	Ink, printer's flammable	3	UN1210	II
	Aldrin, liquid	6.1	NA2762	II

FIGURE 6A

Hazardous Materials not specifically identified in the §172.101 Table by their Chemical (Technical Name) (172.101(f)). The "Packing Group Criteria" will usually be found in a Section which closely follows the Definition Section. Figure 7A illustrates this point for "Class 3 Flammable Liquids". The Packing Group Criteria is found in Section 173.121 which comes immediately after the Definition Section 173.120.

GSI CR: A.-B. Classification, 7; B. Packaging, 27; E. Shipping Paper, 46

Primary Hazard- See "Hazard Class" above.

Solution- A homogeneous liquid mixture of two (2) or more chemical compounds that will not undergo any segregation (separation) under conditions normally incident to transportation (49 CFR 171.8). It can be generally said that a "solution" is a "specialized type of mixture" because a solution must first be a mixture. It then becomes a solution IF it is a liquid AND will not separate under conditions normally incident to transportation. Some materials, such as **Ammonia solutions**, are specifically identified in the §172.101 Table as solutions and others such as **Paint** or **Ink** etc., are examples of mixtures which could be a "solution". (See "Mixture" above.)

Subsidiary Hazard (Risk)- The Subsidiary Hazard (Risk) means a hazard of the material other than its Hazard Class (Primary Hazard). It applies to materials meeting the definition of more than one hazard

class and is a hazard of the material other than its Primary Hazard as shown in either Column (3) of the Hazardous Materials Table or as determined using the Precedence of Hazard Table in 173.2a(b) when appropriate. It can impact areas such as the selection of the Proper Shipping Name, labeling, and Shipping Paper entries. (See "Hazard Class" on page 5.)

GSI CR: B. NOS Technical Name Rule, 15; B. Subsidiary Risk Labeling, 40

Technical Name- Recognized chemical name currently used in technical and scientific texts, journals, and handbooks (171.8).

Technically Pure- See "Commercially Pure".

It All Starts With The Hazard Class

For a material to be regulated as a Hazardous Material under 49 CFR it must meet the definition of one of the Classes or Divisions contained in Part 173 of 49 CFR. The First Step is to determine IF the material being shipped is regulated as a Hazardous Material because it meets the criteria of one or more of the Classes or Divisions contained in Part 173 of 49 CFR. If the material being shipped does not meet the criteria of one or more of them it is not regulated as a Hazardous Material. If the material being shipped meets the criteria of one or more of the Hazard Classes or Divisions contained in Part 173 it is regulated as a Hazardous Material. If there is a Packing Group Criteria for the Class or Division of the material being classified, it too must be determined.

GSI CR: GSI 49 CFR Class/Division Cross Reference Table, 10; A.-C. Proper Shipping Name, 11

173.120 Class 3-Definitions		
(a) Flammable Liquids. (1) For the purposes of this subchapter, a "flammable liquid" (Class 3) means any liquid having a flash point not more than 60.5°C (141°F).		
173.121 Packing Group Criteria		
Packing Group	Flash Point (Closed Cup)	Initial Boiling Point
I		=<35°C (95°F)
II	<23°C (73°F)	>35°C (95°F)
III	=>23°C (73°F)	>35°C (95°F)
	but	
	=<60.5°C (141°F)	

FIGURE 7A

Illustration: Reference to Figure 7A indicates that an "Ink" having a Flash Point of 20°C (68°F) and an Initial Boiling Point of over 35°C (95°F) would be regulated as a Class 3 with a Packing Group of II. On the other hand, an "Ink" not meeting the definition of any of the Classes or Divisions in Part 173 of 49 CFR would not be regulated as a Hazardous Material even though "Ink" is listed in the Hazardous Materials Table.

THE A, B, C's OF CLASSIFICATION

- A. Commercially Pure Materials Specifically Identified By Their Technical Name- As a GENERAL RULE commercially pure materials specifically identified in Column (2) of the §172.101 Table with a Proper Shipping Name that is their specific chemical or technical name will be regulated under the Class specified in Column (3) and the Packing Group shown in Column (5) for the entry (172.101(c)). Reference to Columns (2), (3), and (5) in Figure 6A for "commercially pure" Acetone indicates its Proper Shipping Name is Acetone, it is regulated as a Class 3, and has a Packing Group of II.

GSI CR: A. Proper Shipping Name, 11; B. Specifically Listed Material Rule, 12

B. Mixtures, Solutions, and Materials NOT SPECIFICALLY Identified By Their Technical Names- Mixtures and materials NOT specifically identified in Column (2) of the Hazardous Materials Table by a Proper Shipping Name that is their specific chemical or technical name must be classified by:

1. Comparing their characteristics against the criteria listed in Part 173 of 49 CFR to determine the Class or Classes under which the material is regulated IF ANY. A complete list of the 49 CFR Classes and Divisions, definition references, and a summary of the hazards involved will be found in the "GSI 49 CFR CLASS/DIVISION REFERENCE TABLE" on page 10.

and, for those Classes or Divisions having a Packing Group Criteria

2. Comparing their characteristics against the Packing Group Criteria to determine the Packing Group. GSI CR: Packing Group, 6; Technical Name Rule, 15

Hazardous Material Table-§172.101 Table

Sym- bol	Hazardous materials descriptions and proper shipping names	Hazard class or Division	Identifi- cation Numbers	Pack ing group	Label(s) Required (If not excepted)
(1)	(2)	(3)	(4)	(5)	(6)
	Acetone	3	UN1090	II	FLAMMABLE LIQUID
	Benzene	3	UN1114	II	FLAMMABLE LIQUID
	Flammable liquids, n.o.s.	3	UN1993	II	FLAMMABLE LIQUID
	Flammable liquids, corrosive, n.o.s.	3	UN2924	I	FLAMMABLE LIQUID CORROSIVE

FIGURE 8A

- a. **Technically Pure Chemicals** - Technically pure "Ethylcyclohexane" has a Flash Point of 35°C (95°F), an Initial Boiling Point over 35°C (95°F), and is not listed by its chemical name in Column (2) of the Hazardous Materials Table. Information from Sections 173.120 and 173.121 of Part 173 is contained in Figure 7A. A comparison of the characteristics of "Ethylcyclohexane" against the definition paragraph indicates that "Ethylcyclohexane" is regulated as a Class 3 because its Flash Point is less than 60.5°C (141°F). Further a comparison of the Flash Point and Initial Boiling Point of "Ethylcyclohexane" against the Packing Group Criteria contained in 173.121 indicates that "Ethylcyclohexane" would be in Packing Group III because the Flash Point is above 23°C (73°F) and the Initial Boiling Point is above 35°C (95°F). The Proper Shipping Name, (Technical Name in parentheses), Class, UN Number, and Packing Group would be:

Flammable liquids, n.o.s. (Ethylcyclohexane), 3, UN 1993, PG III

- b. **Single Class Mixtures**- A mixture of "Acetone" and "Benzene" having a Flash Point of 24.4°C (76°F) and an Initial Boiling Point of more than 35°C (95°F) which is not specifically identified in Column (2) of the Hazardous Materials Table by its technical name would be classified as follows. Reference to the §172.101 Table or Figure 8A indicates that although both "Acetone" and "Benzene" are listed separately their mixture is not. It's like combining Rum and Coke. When they are put together the resulting mixture has a different "name", "Rum and Coke". If a "Rum and Coke" was desired a person would not order "Coke". If a person wanted a "Coke" and ordered "Rum and Coke" they sure would be surprised at the result. A comparison of the characteristics of the mixture against the Class 3 Definition and Packing Group Criteria illustrated in Figure 7A indicates that the mixture of "Acetone" and "Benzene" would be Classed as a 3 and have a Packing Group of III because the Initial Boiling Point is above 35°C (95°F) with

a Flash Point of 24.4°C (76°F). The Proper Shipping Name, (Technical Name in parentheses), Class, UN Number, and Packing Group would be:

Flammable liquids, n.o.s. (Acetone/Benzene), 3, UN 1993, PG III

- c. **Multiple Class Materials or Mixtures-** If a material or a mixture that is not specifically identified in Column (2) of the Hazardous Materials Table by its Technical name or a mixture of materials meets the definition of more than one (1) Class, the (Primary) Hazard Class must be determined in accordance with the precedence indicated in Section 173.2a of 49 CFR. For Hazardous Materials classed as 3, 4.1, 4.2, 4.3, 5.1, 6.1, or 8 the precedence is generally determined by Precedence of Hazard Table in 173.2a(b) of 49 CFR, a portion of which is illustrated in Figure 9A below. The Primary Hazard Class will be the Class or Division appearing at the intersection of the row and column where the two Classes or Divisions, including their physical form and toxicity criteria, where appropriate, meet. The Subsidiary Risk (Hazard) will be the Class or Division that is not the (Primary) Hazard Class. If the Packing Groups for the Primary Hazard and Subsidiary Hazard are different the most stringent Packing Group must be used.

Precedence Of Hazard Table Illustration (173.2a(b))

	6.1,I	6.1,I	6.1,II	6.1,III	8, I	8,II	8,II	8,III
	dermal	oral			liquid	liquid	solid	liquid
3 I	3	3	3	3	3	3	(³)	3
[3 II]	3	3	3	3	3	[3]	(³)	3
3 III	6.1	6.1	6.1	3	8	8	(³)	3

(³) Impossible combination
 — Used to indicate other entries omitted from illustration

FIGURE 9A

Application: Using the Precedence of Hazard Table in §173.2a or Figure 9A it can be determined that a mixture of "Methanol" and "Potassium hydroxide" meeting the definition of both a Class 3, Packing Group II and a Class 8 Packing Group II would have a Hazard Class of 3, a Packing Group of II, and a Subsidiary Risk (Hazard) of 8. The [3] in Figure 9A illustrates that the Class or Division Number which appears at the point in the Table where the two (2) Classes and Packing Groups of the mixture intersect is a 3. Class 3 receives the Precedence and becomes the Primary Hazard. The Subsidiary Risk of the mixture will be 8 as indicated by the  in Figure 9A. The Packing Group of the mixture will be II because it is the common Packing Group for both of the ingredients of the mixture. If the constituents had different Packing Groups the Packing Group assigned to the mixture would be the one that is the most stringent Packing Group. The Proper Shipping Name, (Technical Name In Parentheses), Class, UN Number, Packing Group, and Subsidiary Risk for the mixture would be:

**Flammable liquids, corrosive, n.o.s. (contains Methanol/Potassium hydroxide)
 3, UN 2924, PG II, 8**

GS149 CFR CLASS/DIVISION REFERENCE TABLE

49 CFR Class or Division	Name of Class or Division	Definition Reference	Example(s)	Brief #1 Description of Type of Hazard
1.1	Explosives ^{#2}	173.50(b)(1)	Black powder	Mass explosion.
1.2	Explosives ^{#2}	173.50(b)(2)	Rocket Motors	Projection hazard.
1.3	Explosives ^{#2}	173.50(b)(3)	Fireworks, Type C	Fire w/minor blast or projection.
1.4	Explosives ^{#2}	173.50(b)(4)	Squibs	Devices w/minor explosion hazard.
1.5	Explosives ^{#2}	173.50(b)(5)	Water gels	Insensitive but mass explosion.
1.6	Explosives ^{#2}	173.50(b)(6)		Insensitive article-no mass explosion
2.1	Flammable Gas	173.115(a)	Propane	Flammable Gas.
2.2	Non Flammable, compressed, gas ^{#3}	173.115(b)	Oxygen, compressed	Contents under pressure 280 kPa (41 psia) at 20°C (68°F) & not a Division 2.1 or 2.3.
2.3	Poisonous Gas	173.115(c)	Oxygen difluoride	Poisonous Gas.
3	Flammable Liquid	173.120(a)	Acetone, Paint	Flash Point equal to or less than 60.5°C (141°F).
	Combustible Liquid	173.120(b)		>60.5°C (141°F) and <93°C (200°F)
4.1	Flammable Solid	173.124(a)	Safety Matches	Readily combustible, self reactive; certain wetted explosives.
4.2	Spontaneously Combustible	173.124(b)	Wet cotton	Pyrophoric or self heating materials. Ignite or heat when exposed to air.
4.3	Dangerous When Wet	173.124(c)	Calcium Carbide	Reacts w/water to give off Flamm. or Toxic Gas or becomes spontaneously combustible.
5.1	Oxidizer	173.127(a)	Potassium bromate	Yields Oxygen + Fire potential.
5.2	Organic Peroxide	173.128(a)	Ammonium nitrate fertilizers	Thermally unstable, burns rapidly, sensitive to impact
6.1	Poisonous Material	173.132(a)	Parathion liquid	Toxic to humans. Based on LD ₅₀ or LC ₅₀ i.e. Oral LD ₅₀ 500mg/kg(liquid)
6.2	Infectious Substances	173.134(a)	AIDS virus,	Viable microorganisms causing disease in humans/ animals.
7	Radioactive Materials	173.403	Uranium-233,	Specific Activity greater than 74k Bq/kg(.002 uCi/g)
8	Corrosive Materials	173.136(a)	Muriatic Acid	Destroys skin w/expos. =< 4 hrs. or metal corrosion rate >6.25mm a Yr.
9	Miscellaneous	173.140(a)	Dry Ice	Oxygen deprivation
		173.140(b)	n-Butyl phthalate	No other Class but is Hazardous Substance or Waste.
	ORM-D	173.144	Consumer commodity	Reclassification exception

^{#1} Summary as to safety hazard only. Definition Sections and Paragraphs must be consulted for specifics. ^{#2} 49 CFR also has Classification Codes & Compatibility Groups for Explosives (173.52). ^{#3} Includes non flammable, non poisonous Compressed Gases, Liquefied Gases, Pressurized Cryogenic gases, and Compressed Gases in Solution that do not meet the definition of either 2.1 or 2.3.

THE PROPER SHIPPING NAME

The Proper Shipping Name determines the entry or line in the Hazardous Materials Table that is used to make many other determinations such as Hazard Class, UN/NA Number, Packing Group, Labeling, Packaging Authorizations, Passenger and Cargo Quantities, and Vessel Stowage Requirements. It is the **key to regulatory compliance and safety** and is a required mark on the package and entry on the shipping documentation. Get the wrong Proper Shipping Name and there is virtually no way the shipment can be considered either safe or in compliance.

GSI CR: B. Packaging, 27; A. Marking, 35; A. Labeling, 39; A. Shipping Papers, 45

THE A, B, C's OF PROPER SHIPPING NAME DETERMINATION

A. **General Rule- The Most Specific Column (2) entry in Roman Type-** The Proper Shipping Name is obtained from Column (2) of the Hazardous Materials Table. The name in Column (2) of the Hazardous Materials Table in **Roman Type** that **MOST** appropriately (Specifically) describes the Hazardous Materials being shipped **MUST** be used (172.101(c)(12)). In Figure 11A all the entries in Column (2) except the *Dynamite, see* entry could be Proper Shipping Names because they are in **Roman type**. The *Dynamite, see* entry could not be a Proper Shipping Name because it is not in Roman type. In determining the "most appropriate" Proper Shipping Name from Column (2) the most specific information available, chemical name, product use, etc., should be used in the following order:

1. **Chemical Name-** If a material OR mixture is specifically identified by its Chemical (Technical) Name in Column (2) of the Hazardous Materials Table the most appropriate Proper Shipping Name will generally be that entry. This is most applicable when shipping material in its "commercially pure" form such as "Acetone" or normal commercial mixtures of materials listed by their chemical or technical name in the Hazardous Materials Table such as "Calcium hypochlorite mixtures." As illustrated in Column (2) of the Hazardous Materials Table or Figure 11A, Acetone would be a Proper Shipping Name for "commercially pure Acetone" and Calcium hypochlorite mixtures, dry would be the Proper Shipping Name for a dry (solid) mixture of "Calcium hypochlorite" classed as a Division 5.1.

Hazardous Material Table - § 172.101 Table

Sym- bol	Hazardous materials descriptions and proper shipping names	Hazard class or Division	Identifi- cation Numbers
(1)	(2)	(3)	(4)
D	Acetone	3	UN1090
	Alcohols, n.o.s.	3	UN1987
	Calcium hypochlorite mixtures, dry	5.1	UN2208
	Compounds, cleaning liquid	8	NA1760
	<i>Dynamite, see Explosive, blasting, type A</i>		
	Explosive, blasting, type A	1.1D	UN0081
	Flammable liquids, n.o.s.	3	UN1993

FIGURE 11A

2. **Generic Chemical or Usage Name-** If a material or mixture is not identified in the Hazardous Materials Table by its "Chemical Name" the next most appropriate Proper Shipping Name would be the Generic Chemical or Usage Name listed in Column (2) of the Hazardous Materials Table that best describes the Hazardous Materials being shipped. Examples of these Proper Shipping Names such as **Alcohol, n.o.s.** and **Compounds, cleaning liquid** are shown in Figure 11A.
3. **General Hazard Class Name-** If the Hazardous Material is not more appropriately (specifically) identified in Column (2) of the Hazardous Materials Table by any of the above, it must be identified

by the most appropriate general Hazard Class or other entry in Column (2) such as **Flammable liquid, n.o.s.**; **Corrosive liquid, n.o.s.**; **Flammable liquid, poisonous, n.o.s.**; **Environmentally hazardous substances, liquid, n.o.s.** etc (172.101(c)(12)(ii)).

Application 1. Specific Technical Name in §172.101 Table- Commercially pure "Acetone" has a Flash Point of -17.8°C (0°F), meets the definition of a Class 3, Packing Group II, and is specifically listed the §172.101 Table by name. Using Column (2) of the Hazardous Materials Table or Figure 12A below the Proper Shipping Name for a shipment of commercially pure "Acetone" is **Acetone** determined as follows:

- a. Is the chemical name of the material listed in Column (2) of the Hazardous Materials Table in **Bold Type**? **Yes**. The Proper Shipping Name **MUST** be **Acetone**. **Flammable liquids, n.o.s.** would not be an appropriate Proper Shipping Name, even though **Acetone** is a Class 3, Flammable Liquid, because there is a more specific name listed in Column (2). In most cases when shipping commercially pure materials, the "chemical" or "technical" name listed in Column (2) will be the Proper Shipping Name.

Hazardous Material Table - § 172.101 Table

Sym- bol	Hazardous materials descriptions and proper shipping names	Hazard class or Division	Identifi- cation Numbers	Pack- ing Group
(1)	(2)	(3)	(4)	(5)
	Acetone	3	UN1090	II
	Environmentally hazardous substances, liquid, n.o.s.	9	UN3082	III
	Flammable liquids, n.o.s.	3	UN1993	I
				II
				III
D	Hazardous waste, solid, n.o.s.	9	NA3077	III
AD	Other regulated substances, liquid, n.o.s.	9	NA3082	III

FIGURE 12A

Application 2. Specific Technical Name NOT in §172.101 Table- Commercially pure "Ethylcyclohexane" has a Flash Point of 35°C (95°F), meets the definition of a Class 3, Packing Group III, and is not specifically listed the §172.101 Table by name. It is used in "organic synthesis". Using Column(2) of the Hazardous Materials Table or Figure 12A the Proper Shipping Name for this material in its "technically pure" form would be **Flammable liquids, n.o.s** determined as follows:

- a. Is the chemical name of the material listed in Column (2) of the Hazardous Materials Table in **Bold Type**? **No**.
- b. Is a Generic or Usage Name listed in the Hazardous Materials Table? **No**.
- c. Select the general Hazard Class or other entry from Column (2) of the Hazardous Materials Table that is most appropriate for the Hazardous Materials being shipped. **Flammable liquids, n.o.s.** would be the General Hazard Class or N.O.S. entry that most accurately describes "Ethylcyclohexane" because there is not a more specific entry in the §172.101Table.
GSI CR: B. Technical Name Rule, 15

B. Specifically Listed Materials Mixture Rule- Generally, if A Hazardous Material that is listed in the Hazardous Materials Table by its **chemical (technical) name** IS MIXED with other materials *that are not regulated as Hazardous Materials*, the Proper Shipping Name **MUST BE the chemical name of the listed material** AND the qualifying word "mixture" or "solution" as appropriate (172.101(c)(10)(i)).

Application- Commercially pure **Acetone** is mixed with non regulated materials. The resulting mixture has a Flash Point of 20°C (68°F) and an Initial Boiling Point of more than 37.7°C (100°F). The Hazard Class, and Packing Group, of the mixture is Class 3, Packing Group, II. Reference to either the

Hazardous Materials Table or Figure 12A indicates that Acetone is listed, has a Hazard Class of 3, and Packing Group of II. The Proper Shipping Name, Hazard Class, UN Number and Packing Group which MUST be used for the mixture is :

Acetone Mixture, 3, UN 1090, PG II

1. Exceptions To The Specifically Listed Materials Mixture Rule- The "Specifically Listed Materials Mixture Rule" does not apply IF:

- a. The Hazard Class, Packing Group, or Subsidiary Hazard of the resulting mixture differs from that of the listed Hazardous Material in it (172.101(c)(10)(i)(C)).

Application- Commercially pure Acetone is mixed with non regulated materials. The resulting mixture has a Flash Point of 29.9°C (86°F) and an Initial Boiling Point of more than 37.7°C (100°F). The Hazard Class of the mixture is still 3 but the UN Packing Group changes from II to III. Acetone, the listed Hazardous Material in the mixture, has a Packing Group of II. The Packing Group of the solution is different from that of the listed Hazardous Material in it. The "Specifically Listed Materials Mixture Rule" does not apply and the most appropriate Proper Shipping Name for the mixture must be selected from Column (2) of the Hazardous Materials Table (172.101(c)(10)(ii)). The Proper Shipping Name, Hazard Class, UN Number and UN Packing Group which could be used for the mixture is:

Flammable liquids, n.o.s. (Acetone), 3, UN 1993, PG III

- b. The name in Column (2) of the Hazardous Materials Table specifically indicates it applies only to technically pure substances; the emergency response measures to be taken in the case of an emergency involving the mixture are significantly different from those of the listed Hazardous Materials, the packaging listed in Column (8) of the Hazardous Materials Table for the listed Hazardous Material is inappropriate for the mixture or solution (172.101(c)(10)(i)).

GS1 CR: "Mixture", "Packing Group", "Solution", 6; A. Technical Name Rule, 15

- C. Hazardous Waste Proper Shipping Names-** The word Waste will appear as part of the Proper Shipping Name for any Hazardous Waste being transported within the transportation system. If the word Waste does not appear as part of the most appropriate Roman type name for the material selected from Column (2) of the Hazardous Materials Table it must be added preceding the name selected. If technically pure Acetone was being shipped as a Hazardous Waste the Proper Shipping Name would be **Waste Acetone** (172.101(c)(9)). If the word Waste does appear as part of the Proper Shipping Name selected from Column (2) of the Hazardous Materials Table, as illustrated in the **Hazardous waste, solid, n.o.s.** entry in Figure 12A, do not add the word Waste or move it from where it appears (172.101(c)(4)).

A material that is regulated under 49 CFR only because it is a Hazardous Waste and does not meet the definition of any other Hazard Class is assigned to Class 9 and MUST be assigned one of the following Proper Shipping Names:

Hazardous waste, liquid, n.o.s.

Hazardous waste, solid, n.o.s.

Waste Environmentally hazardous substances, liquid, n.o.s.

Waste Environmentally hazardous substances, solid, n.o.s.

- D. Proper Shipping Names For Certain Class 9 Hazardous Substances-** A material that is regulated under 49 CFR only because it is a Hazardous Substance and does not meet the definition of any other Hazard Class is assigned to Class 9 and MUST be assigned one of the following Proper Shipping Names:

Environmentally hazardous substances, liquid, n.o.s.

Environmentally hazardous substances, solid, n.o.s.

Other regulated substances, liquid, n.o.s.

Other regulated substances, solid, n.o.s.

E. *Italics and Other Exceptions:*

1. ***Italics as Additional Information-*** Column (2) entries in *italics* are not part of the Proper Shipping Name. Sometimes they are used to provide additional descriptive information as illustrated in the **Aldrin, liquid** and **Aldrin, solid** entries in Figure 14A. The words *liquid* and *solid* help the user of the Hazardous Materials Table to select the right entry depending on the physical form of the **Aldrin**. The words *liquid* and *solid* are not part of the Proper Shipping Names because they are in *italics* not Roman type (172.101(c)).

Hazardous Material Table - § 172.101 Table			
Sym- bol	Hazardous materials descriptions and proper shipping names	Hazard class or Division	Identifi- cation Numbers
(1)	(2)	(3)	(4)
D	Aldrin, liquid	6.1	NA2762
D	Aldrin, solid	6.1	NA2761
	<i>Dynamite, see Explosive, blasting, type A</i>		
	Explosive, blasting, type A	1.1D	UN0081
D	<i>PCB, see Polychlorinated biphenyls</i>		
AW	Polychlorinated biphenyls	9	UN2315
	n-Propanol or propyl alcohol normal	3	UN1274

FIGURE 14A

2. ***See in Italics in Column (2)-*** Column (2) entries in *italics* are not part of the Proper Shipping Name. Italics are sometimes used for cross reference purposes as demonstrated in the *Dynamite, see Explosive, blasting, type A* and *PCB, see Polychlorinated biphenyls* entries in Figure 14A. The *Dynamite, see Explosive, blasting, type A* entry contains no information that can be used to process the shipment such as the Hazard Class, Identification Number etc.. It simply refers the user to the entry that does, the **Explosive, blasting, type A** entry. *Dynamite* may not be used as the Proper Shipping Name because it is in *italics*. The *PCB, see Polychlorinated biphenyls* entry contains no information that can be used to process the shipment. It simply refers the user to the entry that does, the **Polychlorinated biphenyls** entry. In this case however either **PCB** or **Polychlorinated biphenyls** may be used as the Proper Shipping Name because both appear in Roman type in Column (2) (172.101(c)(5)).
3. ***or in Italics In Column(2)-*** The word *or* in italics permits the use of any appropriate Roman Type Entry in the sequence as the Proper Shipping name. The **n-Propanol or propyl alcohol normal** entry in Column (2) of Figure 14A illustrates this point. The Proper Shipping Name would be either **n-Propanol** or **propyl alcohol normal**. The *or* in italics permits the use of any of the names appearing in Roman Type as the Proper Shipping Name (172.101(c)(2)).
4. ***Singular vs Plural and UPPER (CAPITAL) vs lower case-*** The Proper Shipping Name may be either in the singular or plural and in either capital or lower case letters. **Explosive, blasting, type A** is shown as a Proper Shipping Name in Column (2) of Figure 14A (172.101(c)(1)). Applying these exceptions the Proper Shipping Name could be any of the following: **Explosive, blasting, type A**; **Explosives, blasting, type A**; **EXPLOSIVE, BLASTING, TYPE A**; or **EXPLOSIVES, BLASTING, TYPE A**.
5. ***n.o.s. vs "n.o.i." or "n.o.i.b.n."-*** The abbreviations "n.o.i." which means "not otherwise indexed" or "n.o.i.b.n." which means "not otherwise indexed by name", may be used interchangeably with the abbreviation "n.o.s." which means "not otherwise specified" (172.101(c)(3)). This writer does not recommend using this exception because it is not authorized under International Dangerous Goods

Regulations and is so seldom used that it increases the probability of having problems with Carrier Acceptance and Enforcement Personnel.

6. **Using IMDG or ICAO Spelling-** The words of the Proper Shipping Name may be spelled in the same manner as they appear in the ICAO Technical Instructions or the IMDG Code. "Aluminum" may be spelled as "Aluminium" and "Sulfur" may be spelled as "Sulphur". The word "inflammable" may not be used in place of "flammable" (172.101(c)(1)). For strictly Domestic shipments using 49 CFR this writer recommends spelling the Proper Shipping Name exactly the way it appears in Column (2) of the Hazardous Material Table. If using the ICAO Technical Instructions or the IMDG Code under the authority of 171.11 or 171.12 respectively, he recommends spelling the Proper Shipping Name exactly as it appears in the regulations being used.
7. **Changing Order of Words in Proper Shipping Name-** When a Proper Shipping Name contains qualifying words, their sequence on the shipping papers and required markings is optional. The Proper Shipping Name "Compound, polishing liquid" may be shown as "Polishing compound, liquid" (172.101(c)(4)). This exception DOES NOT APPLY to Hazardous Wastes.

AUTHORS RECOMMENDATION: Keep it exactly as shown in Column (2)- Although permitted by the regulations your author recommends that the Proper Shipping Name on the shipping papers and all required markings be EXACTLY THE SAME AS SHOWN IN COLUMN (2) of the §172.101 Table. This will reduce potential problems with enforcement and carrier acceptance personnel and limit the possibility of your shipment being frustrated or delayed while in the transportation system.

THE A, B, C's OF THE TECHNICAL (n.o.s.) NAME RULE

- A. **Technical Name (n.o.s.) Rule-** The use of certain Proper Shipping Names, those listed in 172.203(k), trigger the requirement to add the Chemical or Technical Name, in parentheses, in association with the Proper Shipping Name on the Shipping Paper and when marked on Non Bulk Packages (172.203(k)). For the most part these Proper Shipping Names are general Hazard Class or other n.o.s. Proper Shipping Names such as Flammable liquids, n.o.s.; Infectious substances, affecting humans; Corrosive liquids, n.o.s., etc. Although not a part of the Proper Shipping Name this writer recommends that where the Technical Name Rule applies, it be considered at the same time the Proper Shipping Name is being determined for the following reasons:

1. Paragraph 172.301(b) of 49 CFR requires that the appropriate Technical Name be marked in parentheses in association with the Proper Shipping Name on non bulk packages.
GSI CR: "Technical Name" Definition, 7; B. Marking, 35; B. Shipping Paper, 45
2. Paragraph 172.203(k) of 49 CFR requires that the appropriate Technical Name be entered on the Shipping Papers in association with the Basic Description in parentheses. International air and water regulations require that the Technical Name or name(s) be entered immediately after the Proper Shipping Name in parentheses on both the Shipping Papers and non bulk package markings.
GSI CR: "Technical Name" Definition, 7; B. Marking, 35; B. Shipping Paper, 45

- B. **Three (3) General Types of Technical Name Entries-** These entries will generally fall into one of three (3) types of entries:

1. **Technically Pure- One Hazard Class- Name Not In the Hazardous Material Table**

A shipment of a Technically Pure material that is not listed in the Hazardous Materials Table (§172.101 Table) by its Chemical or Technical Name MUST use the MOST APPROPRIATE Proper Shipping Name appearing in Roman type in Column (2) of the Hazardous Materials Table. If that Proper Shipping Name is one of the Proper Shipping Names contained in 172.203(k)(3), the Technical Name of the material causing it to be regulated as a Hazardous Material MUST be shown in (parentheses) as required by 172.301(b) or 172.203(k) as appropriate.

A shipment of Technically Pure liquid Ethylcyclohexane meeting the 49 CFR definition of a Class 3 would be described on the markings for a non bulk package as follows:

Flammable liquids, n.o.s. (Ethylcyclohexane)

2. Mixture/Solution- One Hazard Class- One Hazardous Material

A "mixture" or "solution", containing only one Hazardous Material and meeting the definition of only one (1) Hazard Class MUST use the MOST APPROPRIATE Proper Shipping Name appearing in bold type in Column (2) of the §172.101 Table. If that Proper Shipping Name is one of the Proper Shipping Names contained in 172.203(k)(3) the Technical Name of the material causing it to be regulated as a Hazardous Material under that Hazard Class MUST be shown in parentheses as required by 172.301(b) or 172.203(k) as appropriate. The word "contains" may be used in association with the Technical Name, if appropriate, but is not required (172.203(k)).

A mixture of Acetone and other non Hazardous Materials meeting the 49 CFR definition of a Class 3 Packing Group III would be described on the markings for a non bulk package as follows:

Flammable liquids, n.o.s. (Contains Acetone)

or

Flammable liquids, n.o.s. (Acetone)

3. Multiple Classed Materials or Mixture/Solution- Two or More Hazardous Materials

A "mixture" or "solution", containing two (2) or more Hazardous Materials or a Technically Pure material not specifically listed in the §172.101 Table meeting the definition of more than one Hazard Class, must be classified as required by 49 CFR and MUST use the MOST APPROPRIATE Proper Shipping Name appearing in Roman type in Column (2) of the § 172.101Table. If that Proper Shipping Name is one of the Proper Shipping Names contained in 172.203(k)(3), the Technical Names of at least two (2) components most predominantly contributing to the hazard or hazards of the mixture or solution MUST be shown in parentheses as required by 172.301(b) or 172.203(k) as appropriate. The word "contains" may be used in association with the Technical Name, if appropriate, but is not required (172.203(k)).

A mixture of Acetone and Ethylcyclohexane meeting the 49 CFR definition of a Class 3 having a Packing Group of II would be described on the marking for a non bulk package as follows:

Flammable liquids, n.o.s. (Contains Acetone, Ethylcyclohexane)

or

Flammable liquids, n.o.s. (Acetone, Ethylcyclohexane)

A mixture of Methanol and Potassium hydroxide meeting the 49 CFR definition of a Class 3, Packing Group II and a Class 8, Packing Group II would be described on the markings for a non bulk package as follows:

Flammable liquids, corrosive, n.o.s. (Contains Methanol, Potassium hydroxide)

or

Flammable liquids, corrosive, n.o.s. (Methanol, Potassium hydroxide)

GSI CR: Subsidiary Hazard, 6; B. Subsidiary Hazard Labeling, 40

THE A, B, C's of HAZARDOUS SUBSTANCES

- A. EPA Hazardous Substance Definition**- The U.S. Environmental Protection Agency (EPA) is the agency given the primary responsibility for the determination of and establishment of regulations applying to "Hazardous Substances" under Federal Laws such as the Clean Water Act (CWA), Comprehensive Environmental Response Compensation and Liability Act (CERCLA), and the Clean Air Act (CAA). The EPA listing of Hazardous Substances can be found in 40 CFR Part 302.

It can generally be said that a particular material is regulated as a Hazardous Substance because of its potential to pollute air or water if released into the environment in certain quantities. EPA, because of this potential, requires that a report be made to the National Response Center (1-800-424-8802 or 202-426-2675) whenever more than a certain quantity of these materials is released into the environment (40 CFR 302.6). This quantity is called the "Reportable Quantity" which is commonly abbreviated as RQ. If a material has the potential to be regulated as a Hazardous Substance it will be assigned to one of the "RQ Groups" shown in Figure 17A based on the EPA's determination of the pollution potential of a specific quantity of a given material if released to the environment.

***** RQ Groups in Pounds and Kilograms *****

1 lb.	10 lbs.	100 lbs.	1000 lbs.	5000 lbs.
.45 kg	4.54 kgs.	45.4 kgs.	454 kgs.	2270 kgs.

Figure 17A

- B. Hazardous Substance Relationship Between U.S. DOT and EPA**- A Hazardous Substance is regulated by EPA because of its pollution potential not because it poses a danger while being transported in commerce. EPA has the responsibility to regulate Hazardous Substances in and out of the transportation system. The U.S. Department of Transportation (DOT) has the primary responsibility for regulating the transportation of Hazardous Materials. In many cases materials that EPA regulates as Hazardous Substances are also regulated by DOT as Hazardous Materials while in the transportation system.

In order to minimize the effect of two (2) different Federal Regulatory Agencies being involved with shipments of Hazardous Substances in the transportation system, EPA and the (DOT) have agreed that the primary enforcement of Hazardous Substance requirements while in the transportation system will be done by the DOT. It should be stressed, that although enforcement within the transportation system is left to the DOT, it is still the EPA that determines the materials and RQ which cause a particular amount of a material to be regulated as a Hazardous Substance. DOT writes and enforces regulations ensuring compliance with the EPA requirements while Hazardous Substances are being transported.

- C. DOT Hazardous Substance Definition**- The DOT and EPA regulations are basically the same as far as the materials and RQs go. The difference is that the EPA regulations are written in terms of "total quantity" and the DOT regulations are written in terms of the "total quantity per package" or transport vehicle, if the material is not packaged. The reason for this difference is explained somewhat when one considers that in most cases materials being transported within the transportation system are going to be packaged in one form or another and will be released to the environment only if the package is broken, leaks, or is otherwise compromised.

Under the DOT definition a **package** is regulated as a Hazardous Substance if it (the package) contains:

1. A material listed in the Appendix to §172.101.
2. In an amount that equals or exceeds the Reportable Quantity (RQ) for that material as shown in the Appendix to §172.101.

D. How To Determine Whether or Not It's A DOT Hazardous Substance- To determine whether or not a particular package is regulated as a Hazardous Substance while in the transportation system three (3) things are needed:

1. The specific chemical name(s) of the material(s) being shipped in the package;
 - (a.) **Additional Hazardous Waste Consideration-** There are separate EPA Hazardous Waste D, F, and K, Number listings in the §172.101 Appendix starting after the Alphabetical listing of Hazardous Substances in List 1 of the Appendix. In making a Hazardous Substance determination for a package of Hazardous Waste, the "EPA Hazardous Waste Number" should also be checked in the appendix to §172.101.
2. The Appendix to Section 172.101 of 49 CFR;
3. The amount of the particular chemical(s) in the package in pounds or kilograms.

The Appendix to Section 172.101, entitled the "List of Hazardous Substances and Reportable Quantities" contains two Tables listing the materials and their RQs which EPA has determined are Hazardous Substances. Table 1 covers "Hazardous Substances Other Than Radionuclides" and Table 2 covers "Radionuclides". The Appendix will be found in the pages right after the Hazardous Materials Table. For the purposes of illustration, Excerpts from the Appendix to Section 172.101 are reproduced as Figure 18A below.

If the material in the package:

1. Is listed in the Appendix to 172.101 AND
2. Equals or exceeds the Reportable Quantity (RQ) listed for that material as listed in the Appendix.

The package is regulated as a Hazardous Substance under 49 CFR.

Excerpts from the Appendix To 172.101 Table 1- Hazardous Substances Other Than Radionuclides		
Hazardous Substance	Synonyms	Reportable Quantity (RQ) Pounds (Kilograms)
Acetone*	2-Propanone	5000 (2270)
Antimony trioxide		1000 (454)
Benzene*		10 (4.54)
Cupric Chloride*		10 (4.54)
POLYCHLORINATED BIPHENYLS (PCBs)	Aroclor 1016	1 (.454)
* Means that this name is listed as a Proper Shipping Name in the HMT-172.101		

FIGURE 18A

Illustration: A 55 gallon drum of Acetone weighing 200 kg (441 lbs) would not be regulated as a Hazardous Substance. Although reference to Figure 18A indicates that Acetone is listed in the Appendix, the amount in the package does not equal or exceed the RQ of 2270 kg (5000 lbs) listed for Acetone. On the other hand, 11,355 L (3000 gals) of Acetone weighing 10,886 kg (24,000 lbs) being shipped in a Cargo Tank (One Package) would be regulated as a Hazardous Substance because the package (the Cargo Tank) contains a material that is listed in the Appendix in an amount that equals or exceeds the RQ listed 2270 kg (5000 lbs).

- E. If It Is a DOT Hazardous Substance It Is Regulated By 49 CFR-** Any package meeting the definition of a Hazardous Substance is regulated at all times while in the transportation system.

1. Hazardous Substance Meeting the Definition of a 49 CFR Hazard Class- A package containing a Hazardous Substance that ALSO meets the definition of a DOT Hazard Class must be shipped using that Hazard Class and an appropriate Proper Shipping Name selected from the Hazardous Materials Table in accordance with all the requirements of 49 CFR applicable to that Proper Shipping Name and Hazard Class. In addition, the package must also be in compliance with all the additional Hazardous Substance requirements of 49 CFR that apply. Reference to the Appendix to 172.101 indicates that a 11,355 L (3,000 gals) Cargo Tank of **Acetone** weighing 10,886 kg (24,000 lbs) is regulated as a Hazardous Substance. **Acetone** has a Flash Point of -17.8°C (0°F) and is regulated under the DOT Hazard Class of 3, Packing Group II. It must be shipped using the Proper Shipping Name of **Acetone**, 3; AND must have the letters **RQ** on the Shipping Paper either before or after the Basic Description to meet the 49 CFR requirements applicable to Hazardous Substances (172.203(c)(2)).

A 55 gallon drum of **Acetone** weighing 200 kg (440 lbs) is not regulated as a Hazardous Substance. The drum must be shipped, however, in full compliance with all the requirements of 49 CFR applicable to **Acetone**. The letters "RQ" should not be marked on the package or entered on the Shipping Paper because the package is not regulated as a Hazardous Substance.

2. Hazardous Substance Not Meeting the Definition of a 49 CFR Hazard Class- A Hazardous Substance that DOES NOT meet the definition of a DOT Hazard Class and is not a Hazardous Waste, MUST be classed as a Class 9, and offered for transportation using one of the following Proper Shipping Names:

Environmentally hazardous substances, liquid, n.o.s.

Environmentally hazardous substances, solid, n.o.s.

Other regulated substances, liquid, n.o.s.

Other regulated substances, solid, n.o.s.

In addition it must be offered in compliance with all the Class 9 and Hazardous Substance requirements of 49 CFR that apply.

Illustration: Reference to Figure 18A or Table 1 to the Appendix to Section 172.101 indicates that a 544 kg (1200 lb) package of "Antimony trioxide" powder is regulated as a Hazardous Substance. "Antimony trioxide" does not meet the definition of any Hazard Class. The shipment of a 544 kg (1200 lb) package of "Antimony trioxide" would be classed as a Class 9 and shipped using the Proper Shipping Name **Environmentally hazardous substances, solid, n.o.s.** and otherwise packaged, marked, labeled, and documented as required by 49 CFR for that Proper Shipping Name. A 408 kg (900 lb) package of "Antimony trioxide" is not regulated as a Hazardous Substance and is not subject to the Hazardous Material regulations contained in 49 CFR.

- F. Specific ADDITIONAL DOT Hazardous Substance Requirements-** In addition to the 49 CFR requirements generally applicable to the Proper Shipping Name, Hazard Class, Packing Group, and quantity of material being shipped there are ADDITIONAL Hazardous Substance marking requirements for non bulk packages (172.324) and additional Hazardous Substance entries required on the Shipping Papers (172.203(c)) for both Non Bulk and Bulk Packages of DOT Hazardous Substances. The specific DOT Hazardous Substance requirements are summarized in Chart Form in Figure 20A on page 20 and will be covered in detail in the Marking and Shipping Paper portions of this Text.

GSI CR: F. Marking, 37; C. Shipping Paper Entries, 48

International Shipments of Hazardous Substances- Although 49 CFR generally permits the use of other regulations for shipments of Hazardous Materials between the U.S. and Canada and for the air and water transportation of Dangerous Goods, it does so only if certain conditions are met. One of those conditions will be compliance with the Additional Hazardous Substance Requirements of 49 CFR (171.11(d)(1) for ICAO Air; 171.12(b)(4) for the IMDG Code; and 171.12a(b)(10) for the Canadian TDG Regulations).

ADDITIONAL D.O.T. HAZARDOUS SUBSTANCE REQUIREMENTS

Specific Hazardous Substance Requirements	Non Bulk Packaging	Bulk Packaging
1. RQ Marked on Package (172.324(b)).	Yes	No
2. The Name of Hazardous Substance constituent as listed in Appendix to 172.101 marked on the package in parentheses if not part of the Proper Shipping Name (172.324(a)). or IF a Hazardous Waste	Yes	No
2. "F" or "K" Waste Stream Number or "D Number" or "EPA ——" marked on package in parentheses as appropriate.	Yes	No
3. RQ Entered on Shipping Paper either before or after the Basic Description (172.203(c)(2)).	Yes	Yes
4. Name of the Hazardous Substance Constituent(s) entered in parentheses on the Shipping Paper if not part of the Proper Shipping Name (172.203(c)(1)). or if a Hazardous Waste	Yes	Yes
4. "F" or "K" Waste Stream Number", "D Number", or "EPA ——" entered in parentheses on the Shipping Paper as appropriate.	Yes	Yes
5. Carrier Discharge Notification (40 CFR 302.6(a)).	Yes	Yes
Replace "—" with "corrosivity", "ignitability", "reactivity" or "toxicity" as appropriate.		

FIGURE 20A

G. Carrier Hazardous Substance Discharge Notification- When a DOT Hazardous Substance is discharged from a package or transport vehicle while in the transportation system the Carrier (Person In Charge) must notify the National Response Center of the discharge as soon as they have knowledge of it. The notification must be telephoned to 1-800-424-8802 or 202-267-2675 and must contain the information required by 40 CFR 302.6. Although while in the transportation system, this is primarily a Carrier responsibility your author strongly recommends that Shippers ensure the report is made. In addition, it would be a good idea to require the Carrier to notify them concurrently with notification to the National Response Center.

H. 40 CFR WARNING: It is your author's opinion that the reporting requirements of 40 CFR 302.6 require a report to be made whenever a Hazardous Substance designated in 40 CFR Part 302 is discharged in an amount that equals or exceeds the RQ for that substance as designated in that Part. 49 CFR creates additional requirements for Marking and Shipping Paper entries for those materials listed in the §172.101 Appendix ONLY. It does not control the reporting requirements or Hazardous Substances not in the Appendix. In the Note to §171.15 DOT acknowledges that 40 CFR 302.6 does. If EPA has designated a material and RQ in 40 CFR 302 that is not reflected in the §172.101 Appendix or the 49 CFR definition of a Hazardous Substance, a Discharge Report must be made even though that material is not regulated as a Hazardous Substance under 49 CFR.

Illustration: If the contents of 20 drums of Acetone, each containing 220 kg (440 lbs) of Acetone were released, 40 CFR 302.6 requires that the Discharge Report be made. Under 49 CFR, each of the 20 Packages is not regulated as a Hazardous Substance. Confusing and inconsistent? Yes. Must the Discharge Report still be made? Yes!

The A, B, C's of HAZARDOUS WASTE IDENTIFICATION FOR TRANSPORTATION

A. 49 CFR Definition of a Hazardous Waste- 49 CFR defines a "Hazardous Waste" as any material that is subject to the Hazardous Waste Manifest requirements of the Environmental Protection Agency (EPA) specified in 40 CFR Part 262 (171.8). If there is no EPA manifest requirement there is no regulation by DOT as a "Hazardous Waste" under 49 CFR. On the other hand if EPA requires a Uniform Hazardous Waste Manifest for the material being transported under 40 CFR Part 262, the material is a "Hazardous Waste". Said another way, a Hazardous Waste under 49 CFR is whatever EPA and 40 CFR says it is.

B. When Does 40 CFR Part 262 Require the Use of A Manifest? A Generator (Shipper) must prepare the Uniform Hazardous Waste Manifest according to the instructions contained in the Appendix to 40 CFR Part 262 whenever they transport or offer for transportation a Hazardous Waste for off site disposal, treatment, or storage (40 CFR 262.20(a)).

C. 40 CFR Definition of a SOLID WASTE- A Solid Waste is any discarded material which is not otherwise excluded from being a Solid Waste by 40 CFR (40 CFR 261.2(a)(1)). It has nothing to do with its physical form. A "Solid Waste" is any material that is being discarded regardless of its physical form gaseous, liquid, or solid.

D. When is a Material Being DISCARDED? A material is being discarded when it is:

1. **Abandoned-** A material is abandoned by being disposed of, burned or incinerated or accumulated, stored, or treated (but not recycled) before or in lieu of being abandoned by being disposed of, burned or incinerated (40 CFR 261.2(b)). As a general rule if the material is going to be disposed or burned, it is being abandoned.

Illustration: A 55 gallon drum of liquid "Acetone" being shipped for incineration is a solid waste.

or

2. **Recycled-** A material that is recycled or accumulated, stored or treated before recycling as specified in 40 CFR 261.2(c)). Exclusions for certain materials and situations are contained in 40 CFR 261.2(e)).

or

3. **Inherently Waste-like-** Materials having Hazardous Waste Numbers F020, F021, F022, F023, F026, F028, or any other material added to the list in accordance with 40 CFR 261.2(d) that is being recycled.

E. 40 CFR Definition of a Hazardous Waste- In general terms, the EPA defines a "Hazardous Waste" as a "Solid Waste" that is not otherwise excluded from being a Hazardous Waste under 40 CFR that either:

1. **Is listed in Subpart D of Part 261 of 40 CFR (40 CFR 261.3(a)(2)).**

a. **By name as being an Acute Hazardous Waste in 40 CFR 261.33(e).** Solid wastes that are listed by name in 40 CFR 261.33(e) are Acute Hazardous Wastes. Generally these wastes will have an EPA Hazardous Waste Number prefixed with a "P" such as Aldrin-P004, Hydrogen cyanide-P063, or Zinc cyanide-P121.

b. **By name as a Toxic or otherwise designated waste in 40 CFR 261.33(f).** Solid wastes that are listed by name in 40 CFR 261.33(f) are Hazardous Wastes. Generally these wastes will have an EPA Hazardous Waste Number prefixed with a "U" such as Acetone-U002, Benzene- U019 or 1,1,2,-Trichloroethane- U227.

Both a. and b. above include listed materials which are formulated or manufactured for commercial or manufacturing use including the material in its commercially pure or technical grade and all formulations in which the material is the sole active ingredient. Although it includes the residue or contaminated soil, water, or debris resulting from the cleanup or spill of any of the

materials listed, it does not include a material such as a manufacturing process waste that contains any of the materials listed (40 CFR 216.33(d) and Comment following). Where a manufacturing process waste is deemed to be a Hazardous Waste because it contains a listed substance it will be either listed as a Hazardous Waste from a Non Specific Source (261.31) or as a Hazardous Waste from a Specific Source (262.32).

- c. **As a Hazardous Waste from Non Specific Sources in 40 CFR 261.31-** Solid wastes that are listed by name in 40 CFR 261.31 are Hazardous Wastes from non specific sources. Generally these wastes will have an EPA Hazardous Waste Number prefixed with a "F" such as F003 for a solid waste that is a used non-halogenated solvent like "Acetone".
- d. **As a Hazardous Waste from Specific Sources in 40 CFR 261.32-** Solid wastes that are from a source listed by name in 40 CFR 261.32 are Hazardous Wastes from specific sources. Generally these wastes will have an EPA Hazardous Waste Number prefixed with a "K" such as K003 for a solid waste that is "wastewater treatment sludge from the production of molybdate orange pigments".

OR

- 2. **Exhibits any of the characteristics of Hazardous Wastes identified in Subpart C of 40 CFR (40 CFR 261.3(a)(2)).**
 - a. **Characteristic of Ignitability-** A solid waste exhibiting any of the following general characteristics is regulated as a Hazardous Waste and has the EPA Hazardous Waste Number of D001:
 - (1). Liquids that have a flash point of less than 60°C (140°F) (40 CFR 261.21(a)), or
 - (2). Is not a liquid and can cause fire through friction, absorption of moisture, or spontaneous chemical changes and, when ignited burns so vigorously and persistently that it creates a hazard, or
 - (3). Is a Division 2.1 (Flammable Gas) under 49 CFR 173.115, or
 - (4). Is a Division 5.1 (Oxidizer) under 49 CFR 173.127.
 - b. **Characteristic of Corrosivity-** A solid waste exhibiting any of the following general characteristics is regulated as a Hazardous Waste and has the EPA Hazardous Waste Number of D002:
 - (1). Is aqueous and has a pH less than or equal to 2 or greater than 12.5 (40 CFR 261.22(a)), or
 - (2). Is a liquid and corrodes steel (SAE 1020) at a rate greater than 6.35 mm (0.250 inches) per year at a temperature of 55°C (130°F) (40 CFR 261.22(a)).
 - c. **Characteristic of Reactivity-** A solid waste exhibiting any of the following general characteristics is regulated as a Hazardous Waste and has the EPA Hazardous Waste Number of D003:
 - (1). Reacts violently or forms a potentially explosive mixture with water; generates toxic gases, vapors, or fumes in sufficient quantities to present a hazard to health or the environment when mixed with water; or is normally unstable and readily undergoes violent change without detonating (40 CFR 261.23(a)).
 - (2). Is a forbidden explosive as defined in 49 CFR 173.54; defined by 49 CFR as a Divisions 1.1, 1.2, or 1.3 (Class A or B explosives) in 49 CFR 173.50; it is readily capable of explosive decomposition or reaction at standard temperature and pressure; or other characteristics contained within 40 CFR 261.23 (a).

- d. **Characteristic of Toxicity-** A solid waste exhibits the characteristic of Toxicity if, using the Toxicity Characteristic Leaching Procedure Test (TCLP) in Appendix II to 40 CFR Part 261, the extract from a representative sample of the solid waste is determined to contain any of the contaminants listed in Table 1 of 40 CFR 261.24 at a concentration equal to or greater than the value shown for the contaminant in Table 1 (40 CFR 261.24(a)). There is a list of over 38 different contaminants listed in Table 1. Each has its own EPA Hazardous Waste Number prefixed with a "D", starting with D004- Arsenic.

F. Exclusions- The following general exclusions could apply. The 40 CFR reference given should be consulted for specific applicability. It should be stressed that although these exclusions might exclude something from being regulated as a Hazardous Waste under 40 CFR, any such materials meeting the definition of a Hazardous Material under 49 CFR will be regulated as such while in the transportation system.

1. **Samples-** As a general rule, samples being sent to a laboratory for analysis as to their composition or characteristics (261.4(d)) and for treatability studies (261.4(e) and 261.4(f)) are excluded when collected, processed, and offered for transportation as required by the applicable regulations.

GSI CR: 49 CFR Sampling Relief, 172.101(c)(11)

2. **Residues in empty containers-** Any residue of a Hazardous Waste remaining in a container from which all the wastes have been removed using the practices commonly employed to remove materials from that type of container, e.g. pouring, pumping, aspirating etc., is not a Hazardous Waste if:

- a. The container contains no more than 2.5 centimeters (1") on the bottom; or no more than 3% by weight of the total capacity of the container remains if the container is less than or equal to 110 gallons in size, or no more than .3% by weight of the total capacity of the container remains if the container is greater than 110 gallons in size.

GSI CR: DOT Definition of Residue, 171.8; Empty (Residue) Packagings, 173.29

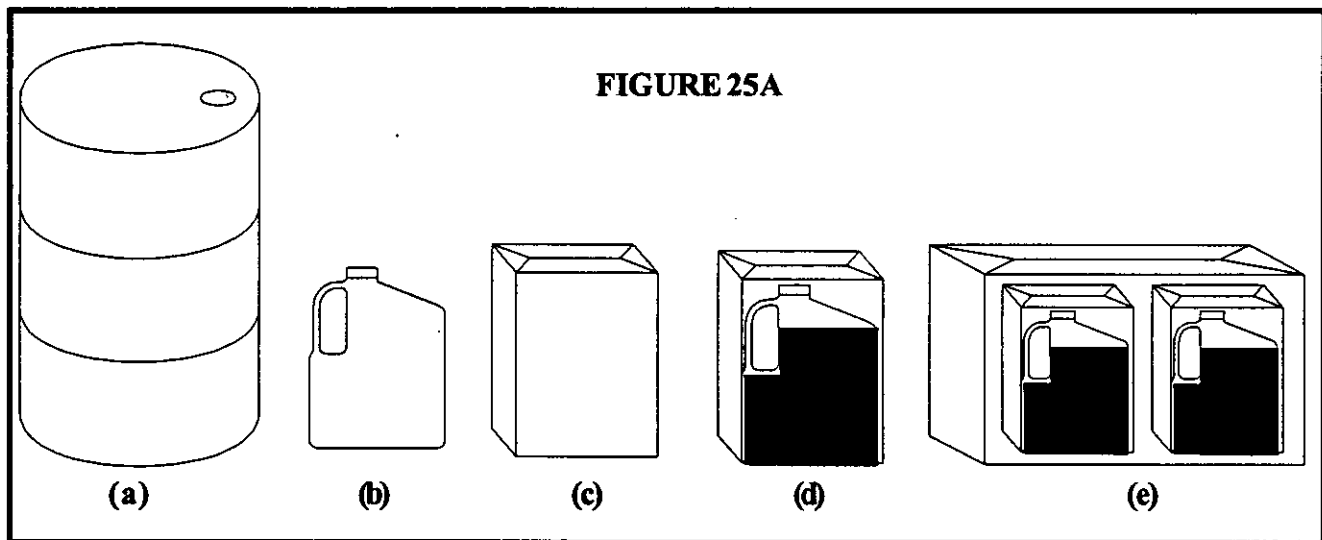
- b. The container that has held a Hazardous Waste that is a compressed gas is empty when the pressure in the container approaches atmospheric.
- c. Containers containing an Acute Hazardous Waste listed in 261.31, 261.32, or 261.33(e) is processed as required by 40 CFR 261.7(b)(3).

RESERVED- Intentionally left blank. Please turn to page 25.

THE A, B, C's OF PACKAGING TERMINOLOGY

Terminology plays an important part in understanding the packaging process. The differences between "packaging", "package", and "Overpack" as well as the different types of packagings is critical when working with the packaging process. Let's take a logical step by step look at some of the terms we will be using.

- A. **Packaging-** Receptacles (Containers) AND any other components necessary for the receptacle to perform its containment function and meet the packaging requirements of Parts 171-180 of 49 CFR. For the most part these receptacles, components, and other requirements are contained within Part 173 of 49 CFR. The "Packaging Authorizations" Columns (8A)-(8C) of the Hazardous Materials Table refer to Sections within Part 173 containing one or more authorized packagings that may be used to package the Hazardous Material covered by the entry. In addition, other "General Packaging" requirements such as cushioning materials, are contained elsewhere in 173.24, 173.24a, Column (7) Special Provisions, etc.. Items (a)-(c) in Figure 25A illustrate examples of different non bulk packagings (171.8).
GSI CR: H-I. Columns (7)-(8), 3; C. & D. Packaging Selection, 28



1. **Combination Packaging-** One or more inner packagings used in combination with a non-bulk outer packaging. It does not include a composite packaging. In Figure 25A, the combination of Inner Packaging (b) with Outer Packaging (c) results in Combination Packaging (d) (171.8).
 - (a). **Outer Packaging-** The outermost packaging (enclosure) of a combination or composite packaging together with any cushioning or absorbent materials and any other components necessary to protect and contain the inner packagings or receptacles. In Figure 25A, box (c) is an example of an Outer Packaging.
 - (b). **Inner Packaging-** A packaging for which an outer packaging is required. It does not include the inner receptacle of a composite packaging. In Figure 25A, plastic bottle (b) is an example of an Inner Packaging.
 2. **Single Packaging-** A non bulk packaging other than a combination packaging. Generally this consists of a single receptacle (packaging) into which the material is loaded. Drum (a), in Figure 25A, illustrates a Single Packaging.
 3. **Composite Packaging-** A packaging consisting of an outer packaging and an inner receptacle constructed so that the inner receptacle and outer packaging form an integral packaging. Once assembled it remains an integrated single unit and is filled, stored, transported, and emptied as such (171.8). A drum with a liner is an example of a composite packaging.
- B. **Package-** The total result of the packaging process including all required packaging(s) plus the Hazardous Material (contents) closed and ready for marking and labeling (171.8). Item (d), in Figure 25A, illustrates a Package. The contents have been added and all required packagings have been assembled, closed and

are ready for marking and labeling (171.8). Item (d) in Figure 25A is a "Combination Package" because "Combination Packaging" was combined with the contents. When the contents are added to drum (a) in Figure 25A and all the openings are properly closed the result will be a "Single Package" because "Single Packaging" was combined with the contents.

- C. **Overpack-** An Overpack is an enclosure that is used by a single consignor to provide protection or convenience in the handling of a package or to consolidate two or more packages (171.8). Item (e) in Figure 25A illustrates the overpacking of two of the Item (d) Combination Packages into one enclosure for the purposes of consolidation.

GSI CR: K. Overpack Marking, 38

It should be stressed that each package in the Overpack must be in full compliance with all applicable packaging regulations, properly marked, labeled, and eligible in all respects to be transported by itself. In addition each package must be placed in the overpack and the outside of the Overpack marked and labeled as required by § 173.25. In general this will require that all:

1. The Marks and Labels on each of the packages overpacked be reproduced on the outside of the overpack unless the Marks and Labels on the overpacked packages are visible from the outside of the Overpack (173.25(a)(2)).
2. The packages subject to the orientation markings of 172.312 be placed in the overpack with their filling holes upward and that the overpack be marked on two opposite vertical sides with the orientation marking arrows required by 172.312 (173.25(a)(3)).
3. Overpacks of Specification Packagings be marked with an indication that the overpacked packages inside comply with prescribed specifications unless the Specification Markings on the overpacked packages are visible from the outside of the Overpack (173.25(a)(4)).
4. Packages containing Class 8 or Division 5.1 materials in Packing Group I may not be overpacked with any other material (173.25(a)(5)).

THE A, B, Cs OF PACKAGING

- A. Determine The Quantity Per Package To Be Shipped-** The quantity per package plays a big part in the packaging process. It plays a very important part in selecting packaging which is efficient for the quantity of material being shipped. Among other things the total quantity per package and quantity per inner packaging can determine such things as whether or not the package is regulated as a Hazardous Substance, eligible for exceptions, and applicability of Special Provisions. This information is absolutely critical for using Columns (9A) and (9B) of the Hazardous Material Table and 173.27(f) to package the Hazardous Material being shipped by air under 49 CFR. As one of the initial steps of the packaging process your author recommends that the total amount per package and quantity per inner packaging be determined. In determining quantities the metric (SI) system is used (171.6(a)).
GSI CR: Metric Conversion Chart, Appendix V

Illustration: We are packaging a 4 L (Liter) package of Acetone. The Acetone is to be packed in two (2) 2 L glass bottles (Inner Packagings) which will in turn be packed in a Fiberboard Box.

Hazardous Material Table - § 172.101 Table

Hazardous materials Proper Shipping Names (2)	Pack- ing group (5)	Special Provis. (7)	Excep- tions (8A)	Non Bulk Pack- agings (8B)	Bulk Pack- agings (8C)	Pass. Aircraft Railcar (9A)	Cargo Aircraft Only (9B)	Vessel Stow- age (10A)	Other Provisions (10B)
Acetone	II	T8	150	202	242	5 L	60 L	B	
Calcium hydride	I	A19 N40	None	211	242	Forbidden	15 kg	E	
Corrosive solids, n.o.s.	I		None	211	240	1 kg	25 kg	B	M3
	II		154	212	240	15 kg	50 kg	A	M3
	III		154	213	240	25 kg	100 kg	A	M3

FIGURE 27A

- B. Select the Packaging Authorization Section-** Each Hazardous Material must be packaged in accordance with the packaging requirements of 49 CFR. This starts with ensuring that any packagings selected to package the Hazardous Material is authorized for the material being shipped by one of the "Packaging authorizations" in Columns (8A)-(8C) of the Hazardous Materials Table entry applicable to the material being packaged. All numbered references (authorizations) in these Columns refer to Sections within Part 173 of 49 CFR. Columns (8A) and (8B) generally apply to Non Bulk Packaging and Column (8C) applies to Bulk Packagings.
GSI CR: I. Column (8), 3

Illustration: Reference to Columns (8A)-(8C) of the Hazardous Materials Table or Figure 27A for the Acetone entry indicates that the Packaging Exceptions will be authorized in 150 (173.150), Non Bulk Packaging authorized in 202 (173.202), and the Bulk Packaging authorized in 242 (173.242). Reference to Columns (8A)-(8C) of the Hazardous Materials Table or Figure 27A for the Calcium hydride entry indicates that No Packaging Exceptions are authorized for that material because the word "None" appears in Column (8A). It further indicates that Non Bulk Packaging is authorized in 211 (173.211), and the Bulk Packagings authorized in 242 (173.242).

Packing Group Impact- For entries in the Hazardous Materials Table with more than one Packing Group, such as the Corrosive solids, n.o.s. entry in Figure 27A, the selection of the Packaging Authorization Section depends on the Packing Group in Column (5) of the Hazardous Materials Table. If the Corrosive solids, n.o.s. is a Packing Group I, reference to Columns (8A)-(8B) for that Proper Shipping Name and Packing Group entry indicates that No Packaging Exceptions are authorized for that material because the word "None" appears in Column (8A). It further indicates that Non Bulk Packaging is authorized in 211 (173.211). On the other hand if Corrosive

solids, n.o.s. is a Packing Group II, reference to Columns (8A)-(8B) for that Proper Shipping Name and Packing Group entry indicates that Packaging Exceptions are authorized in 154 (173.154) and that the Non Bulk Packaging is authorized in 212 (173.212).

- C. **Packaging Selection**- Normally, absent the use of an exception, the packaging to be used to package the material must be authorized for the material in the appropriate Packaging Authorization Section to which referred by entries in Columns (8B)-(8C) (173.24(c)). These Sections are all located in Part 173 of 49 CFR. A Column (8B) reference to 202 is a reference to §173.202. Normally, as illustrated by Figure 28A, the Packaging Authorization Section for Non Bulk Packagings will be separated into Combination Packagings and Single Packagings. The numbers and letters after some of the packagings such as the "Fiberboard box: 4G" and the "Steel Drum: 1A1" refer to UN Specification Packaging.
GSI CR: E. UN Specification Packaging Indications and Codes, 29; H. Exceptions, 31

Illustration: Reference to 173.202 for the packaging to be used for Acetone indicates that it may be packaged in Glass Inner Packagings inside a "4G" Fiberboard box. A combination package containing two (2) 2 L glass bottles of Acetone inside a UN 4G Fiberboard Box is authorized (173.202(b)). This Section would also permit the transportation of 20 L of Acetone in a Single Packaging consisting of a "1A1" Steel Drum providing it was not being offered for or transported on passenger aircraft (173.202(c)).

- D. **General Packaging Considerations**- Each packaging must meet the applicable general packaging requirements contained in Subpart B of Part 173, the performance level requirements of Part 178 as appropriate for the Packing Group being packaged, and comply with the packaging requirements of any applicable Special Provisions listed for the entry in Column (7) of the Hazardous Materials Table.
GSI CR: H. Column (7), 3

1. **Examples of SOME Common General Packaging Requirements**

- a. **All Packages all the time**- Each package used to transport Hazardous Materials must be designed and constructed and have its contents so limited that under conditions normally incident to transportation there will be no release of the material to the environment and its packaging integrity will not be compromised (173.24(b)).

- b. **Compatibility-Permeability**- All packagings used must be compatible with the material, particularly as applies to corrosivity, permeability, softening, premature aging, and embrittlement (173.24(e)).
- c. **Outage**- Outage is the space between the liquid level and the top of the receptacle. This space allows for expansion of the material. Liquids must not completely fill a receptacle at a temperature of 55oC (131oF) or less (173.24a(d)).
- d. **Cushioning and Securing**- Inner packaging of combination packagings must be so packed, cushioned, and secured so as to prevent their breakage or leakage and to control their movement within the outer packaging under conditions normally incident to transportation (173.24a(a)(3)).

WARNING: These are just some of the more common general packaging requirements applicable to non bulk packagings. Subpart B of Part 173 particularly Section 173.24, 173.24a for non bulk packagings, 173.24b for bulk packagings, 173.26 for quantity limitations, and 173.27 for air transportation under 49 CFR must be carefully checked.

Excerpts From § 173.202

§ 173.202 Non-Bulk packagings for liquid hazardous materials in Packing Group II

- (b) The following combination packagings are authorized:

Outer Packagings:

Steel drum: 1A1 or 1A2
Plywood box: 4D
Fiberboard box: 4G

Inner Packagings:

Glass or earthenware receptacles
Plastic receptacles
Metal receptacles
Glass ampoules

- (c) Except for transportation by passenger aircraft, the following single packagings are authorized:

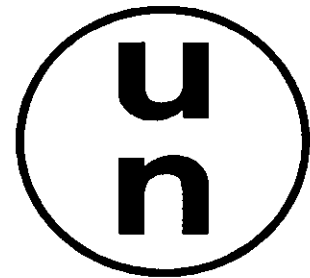
Steel drum: 1A1 or 1A2
Plastic Drum: 1H1 or 1H2

FIGURE 28A

E. UN Specification Package Indications and Codes

1. **UN Indication** - The package must be marked with the "UN Symbol" (Brand), the letter "u" over the top of the letter "n" inside a circle. In lieu of the "UN Symbol" just the letters UN may be applied (marked) on metal receptacles (49 CFR 178.503(a)(1)).

GSI CR: UN Performance Oriented Packaging, Appendix I, Page 15



2. **Packaging Type Code, Material of Construction Code, and the Category Within Type Code:** The Type of Packaging will be indicated by an

Arabic number such as the number 1 for a drum or the number 4 for a box. The material that the packaging is constructed from will be indicated by an UPPER CASE Latin letter such as the letter A for steel or the letter G for Fiberboard. A UN1A is a steel drum. A  4G is a Fiberboard Box. In some cases such as barrels, drums, and jerricans, there is a number which indicates the category of a container within a certain Type and Material. In marking drums and jerricans, a "closed head" container would be indicated by the number 1 and an "open head" container would be indicated by the number 2 marked immediately after the Material of Construction Code. A drum marked UN1A1 would be a closed head steel drum and a drum marked UN1A2 would be an open head steel drum. Figure 29A below contains a summary of the more commonly used Packaging Types, Materials, and Category Codes.

Type-Material-Category Table

Type	Material	Category
1 Drums	A Steel	<u>A, B, or H Drums-Jerricans</u>
2 Barrels	B Aluminum	1 Closed Head
3 Jerricans	C Natural Wood	2 Open Head
4 Boxes	D Plywood	<u>A or B Boxes</u>
5 Bags	F Reconstituted Wood	1 Ordinary A or B
6 Composite Packagings	G Fiberboard	2 A or B w/inner liner or coating
	H Plastic	<u>C Boxes</u>
	L Textile	1 Ordinary
	M Paper, multiwall	2 w/sift proof walls
	N Metal other than steel or aluminum	<u>H Boxes</u>
	P Glass Porcelain, or stoneware.	1 Expanded Plastic
		2. Solid Plastic
		<u>L Bags</u>
		2 Sift proof
		3. Water Resistant
		<u>M Bags</u>
		2 Multi wall, water resistant

FIGURE 29A

3. **Composite Packaging-** When dealing with Composite Packagings two (2) letters are used, in sequence, for the Material Code. The first letter indicates the material of the inner receptacle and the 2nd indicates the material of the outer packaging. A UN6HA1 is a Composite Packaging consisting of a plastic inner receptacle in a steel drum. For combination packagings only the codes for the outer packaging is used. The Inner Packagings may be metal, glass, etc. and there will generally be no indication of their type or construction marked on the outside of the package.

F. UN Specification vs Non Specification Packaging

Packagings are either "Specification" or "Non Specification". UN specification packagings are packagings which meet certain governmental requirements covering minimal construction and material requirements and the ability to pass applicable UN Performance Tests. In 49 CFR the UN construction and materials requirements will be found starting at 178.504 and the UN Packaging Performance Tests will be found in Subpart M of Part 178.

If the packagings or completed package, as appropriate, meet the prescribed requirements, they may be marked with the Specification Mark showing they have qualified under the appropriate specification. Under the UN Specification Packaging scheme all UN Specification Packages will have the prescribed

----- Illustrations of Common UN/ICAO Markings -----

UN1A1/Y/150/91
USA/GSI1234

A UN 1A1 closed head steel drum, tested to Packing Group I standards. No Relative Density entry is shown so it may only be used for materials with a relative density not exceeding 1.2. The drum was tested under the Hydrostatic Pressure Test to 150 kilopascals (21.75 psi), was manufactured in 1991 and was marked under the authorization of the USA. The GSI is the symbol of the person authorizing the marking of the package with the UN markings and the numbers 1234, identify a particular packaging type or design.

UN6HA1/Y1.4/250/91
USA/GSI 1233

A UN6HA1 composite packaging, 6, consisting of a plastic inner receptacle, H, inside a closed head steel drum, A1. The packaging has been tested to Packing Group II standards, is suitable for materials with a Relative Density of up to 1.4, was tested under the Hydrostatic Pressure Test to 250 kilopascals (36.26 psi), was manufactured in 1991, and was marked under the authorization of the USA. The GSI is the symbol of the person authorizing the marking of the package with the UN markings and the numbers 1233, identify a particular packaging type or design.

 4G/X30/S/91
USA/GSI 1232

A UN 4G Fiberboard box, tested to Packing Group I standards for a maximum Gross Weight of 30 kgs (60Lbs). It is intended only for Solids or inner packagings, was manufactured in 1991, marked under the authority of the USA. The GSI is the symbol of the person authorizing the marking of the package with the UN markings and the numbers 1232, identify a particular packaging type or design.

FIGURE 30A

UN Specification mark on the required "outside packaging" of the package. Examples of some of the more commonly used UN packagings are contained in Figure 30A and 178.503(d)). As a general rule, under the UN system there is no requirement that the "inner packagings" used in "combination" packages be marked with any UN Specification Mark.

Non Specification Packagings just have to meet the applicable General Packaging Requirements of Subpart B of Part 173, applicable Special Provisions specified in Column (7), and other requirements contained in the Packaging Authorization authorizing the use of the non specification packaging and will generally have no UN Specification marks on them. In most cases the "limited quantity" packagings contained in Exception Packaging Authorizations will be non specification packagings. They will be described within the Packaging Section in general terms such as a "glass", "metal", or "fiberboard box" with no UN Specification Packagings specified.

GSI CR: D. General Packaging Considerations, 28

- G. **UN Performance Oriented Packaging Tests - Overview-** The standard UN Performance Oriented Packaging tests and the general purpose of each is as follows:

<u>Test Type (49 CFR Reference)</u>	<u>Ability of Package/Packaging To</u>
Drop (178.603)	Contain and protect the Dangerous Goods if the package is dropped.
Leak proofness (178.604)	Prevent leakage of liquids under conditions of normal transport.
Stacking (178.606)	Maintain stability w/in a stack while stacked with similar type packages.
Hydrostatic Pressure (178.605)	Prevent leakage of liquids under pressure.
Vibration Standard (178.608)	Withstand vibrations without rupture or leakage (USA Only) .

Reader Note: For a full discussion of UN Performance Packaging *see* Appendix I.

- H. **Exceptions-** Generally packaging exceptions, if any, are contained in the Sections in Part 173 referred to by the Packaging Authorizations in Column (8A) of the Hazardous Materials Table. It can generally be said that if Column (8A) says "None", there is no packaging exception authorized for the material.

1. **Limited Quantities-** The term Limited Quantity (Ltd Qty) as used in 49 CFR does not mean the same thing as when used in the International Maritime Dangerous Goods Code or the ICAO Technical Instructions For The Safe Transport of Dangerous Goods By Air. As used in 49 CFR the term means a material that is packaged in accordance with a "limited quantity" paragraph or sub paragraph contained within the Packaging Section to which you are referred by Column (8A) of the Hazardous Materials Table for the entry. Generally the Limited Quantity paragraph will be (b) in this Section and start off with wording such as "Limited quantities of". If Column (8A) does not contain an Exception Authorization for a particular entry or if the Hazardous Material is not packaged in the manner and quantity prescribed by the "limited quantity paragraph" the material may not be offered for shipment as a "limited quantity."

GSI CR: B. Ltd Qty Shipping Paper entry, 47

Illustration- Can a 2 L glass bottle of Acetone, a Class 3 Packing Group II material, packaged inside a strong outside container (fiberboard box) be offered for transportation as a "limited quantity"? Reference to Column (8A) for the Acetone entry in the Hazardous Materials Table or Figure 27A on page 27 indicates the "Exceptions" for Acetone can be found in Section 173.150. The "limited quantity paragraph" in Section 173.150 is paragraph (b) (173.150(b)).

A comparison of the packaging being used against the packaging indicated in Subparagraphs (1)-(3) of 173.150(b) indicates the package IS NOT eligible to be offered as a "limited quantity" because it is not packaged in accordance with the "limited quantity paragraph". Under this Exception Authorization the maximum amount of a Packing Group II material per inner packaging is limited to 1 L each. The 2 L glass bottles are not eligible. What IF the two (2) 2 L glass bottles were replaced with four (4) 1 L glass bottles? By following the same sequence as above we would determine the NEW packaging meets the requirements and would be eligible to be offered and transported as a "limited quantity" (173.150(b)(2)).

- a. **Limited Quantity Benefits-** Shipments eligible to be shipped as limited quantities are generally excepted from one or more of the requirements of 49 CFR such as labeling, DOT Specification Packaging, Placarding, etc. These exceptions (benefits) can result in substantial cost savings and increased transportation efficiency, particularly by highway. As a general rule, the exceptions (benefits) are listed in the "paragraph" preceding the packaging requirements which are normally contained in the "subparagraphs". Reference to 173.150(b) in 49 CFR would indicate that packages eligible to be shipped as a Limited Quantity would be excepted from labeling, specification packaging, and Placarding when transported by all modes except air. When transported by air, UNDER 49 CFR, only the exceptions for specification packaging and Placarding apply and all packages must be labeled. It should be

noted that although the packaging does not have to be UN Specification Packaging, that all packagings and packages, including those for which there is an exception must meet the general packaging requirements contained in Subpart B of Part 173.

It MUST BE STRESSED that the "benefits" can fluctuate from one "limited quantity paragraph and material" to another and, as noted above, even within the same paragraph depending on the mode of transportation used. The limited quantity benefits for Class 3 materials contained in 173.150(b) are different from the limited quantity benefits for Division 6.1 materials contained in Section 173.153(b). As with any exception or exemption, an analysis, similar to the above, should be conducted to ensure the shipment does not exceed the scope of the relief provided.

GSI CR: B. Ltd Qty Shipping Paper Entry, 47

GSI CR: A. Placarding Applicability, 55

2. **Small Quantity Exception-** Section 173.4 of 49 CFR provides substantial exceptions for very small quantities of most Hazard Materials. The regulatory relief provided is extensive and covers the areas of packaging, marking, labeling, shipping papers, and Placarding providing the shipment meets all the conditions contained within that Section. Three General conditions which must be met in all cases are:

1. The MAXIMUM quantity of material that may be shipped in EACH inner container is limited to the following for:
 Liquids other than Division 6.1, Packing Group I-30 ml (1 ounce)
 Solids other than Division 6.1, Packing Group I-30 g (1 ounce)
 Division 6.1, Packing Group I-1 g (.04 ounces)
2. The Gross Weight of the completed "package" can not exceed 29 kg (64 pounds). "Gross Weight" is the material PLUS the packaging.
3. The outside of EACH package must be marked with the words:
 "This package conforms to conditions and limitations specified in 49 CFR 173.4"
4. It should be stressed that the above are just three (3) of the conditions. Section 173.4 contains other conditions relative to packaging, cushioning materials, drop tests etc. Anyone desiring to use the exceptions contained in 173.4 should check that Section for compliance with all applicable conditions.

3. **Other Exceptions-** There are other exceptions contained in the regulations which may or may not be applicable to particular shipments. Examples and 49 CFR references are:

Agricultural Operations- (173.5)

Consumer Commodities- (171.8 plus "Consumer Commodities" authorization in Exception Authorization Section to which referred by Column (8A) for the material being reclassified.)

Hazardous Wastes:

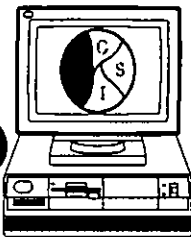
Lab Packs- (173.12(b))

Open head drum- (173.12(a))

Reuse of Packagings- (173.12(c))

Salvage Drums- (173.3(c))

Modal Exceptions in Parts 174-177 as appropriate.



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OWNER REGISTRATION FORM

We know that you will find GSI's "A, B, C's of the Transportation of Hazardous Materials" to be a valuable reference tool. In an effort to keep it current GSI Computer Services Inc. will be publishing an "A, B, C's of the Transportation of Hazardous Materials Update Letter". This letter will be edited by the author of the "A, B, C's of the Transportation of Hazardous Materials", Mr. Gary J. Groman, will contain changes and updates to your edition of the book and timely information on regulatory changes. It will be provided FREE to Registered Owners of the "A, B, C's of the Transportation of Hazardous Materials". To become a Registered Owner, the Registration Form furnished below must be returned to the above address within 30 days.

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Telephone Number () _____ Date Product Was Acquired ____/____/____

Product Obtained From (Please Circle As Appropriate)

☐ GSI Class

☐ Labelmaster

☐ Direct Purchase GSI

☐ Other _____

Please Furnish Information on the following:

GSI In House Training Programs (Conducted by GSI staff)

☐ Basic Transportation of Hazardous Materials Course (Pre HM-181)

☐ Basic Transportation of Hazardous Materials Course (HM-181)

☐ Basic transportation of Hazardous Wastes Course

☐ Basic Air Transportation of Dangerous Goods Course

☐ **Ultimate Demo** For TERIMS (Transportation Emergency Response Information Management System)

RESERVED- Intentionally left blank. Please turn to page 35.

RESERVED- Intentionally left blank. Please turn to page 35.

THE A,B,C's OF MARKING

- A. Proper Shipping Name-** The Proper Shipping Name from Column (2) of the § 172.101 Table must be marked on the outside of EACH package or overpack as illustrated by the Acetone marking in Figure 35A (172.301(a)). The Proper Shipping Name is the most appropriate name for the Hazardous Material appearing in Column (2) of the § 172.101 Table in Roman Type.

GSI CR: A. Proper Shipping Name Determination, 11; A. Shipping Paper, 45

Hazardous Wastes: If the Proper Shipping Name in Column (2) of the § 172.101 Table for a Hazardous Waste does not contain the word **Waste** it must be added preceding the Proper Shipping Name appearing in Column (2) and marked on the package or overpack in a manner similar to the **Waste Flammable liquids, n.o.s.** marking in Figure 36A on Page 36. If the Proper Shipping Name shown in Column (2) of the § 172.101 Table for a Hazardous Waste does contain the word **Waste** as it does for the Proper Shipping Names **Hazardous waste liquids, n.o.s.** and **Hazardous waste solid, n.o.s.**, the word **Waste** must be left exactly where it appears and the Proper Shipping Name marked on the package or overpack must be exactly as listed in Column 2 of the § 172.101 Table (172.101(c)(9)).

GSI CR: A. & E. Hazardous Waste Definition, 21

- B. Technical Name Rule-** If the Proper Shipping Name marked on the package is one of the names listed in 172.203(k)(3), the Technical Name or Names required by 172.203(k) must be marked on the surface of the package in parentheses in association with the Proper Shipping Name (172.301(b)). The (Ethyl ether, Xylene) markings following the Proper Shipping Name **Waste Flammable liquids, n.o.s.** in Figure 36A on page 36 illustrates how this marking should be made.

GSI CR: A. Technical Name Rule, 15; B. Shipping Paper, 45

- C. Identification (UN/NA) Number-** The Identification (UN or NA) Number including the UN or NA prefix shown in Column (4) of the § 172.101 Table must be marked on the outside of EACH package or overpack in association with the marked Proper Shipping Name as illustrated by the UN 1090 marking in Figure 35A (172.301(a)). Although Limited Quantities do not have to be marked with the Identification Number

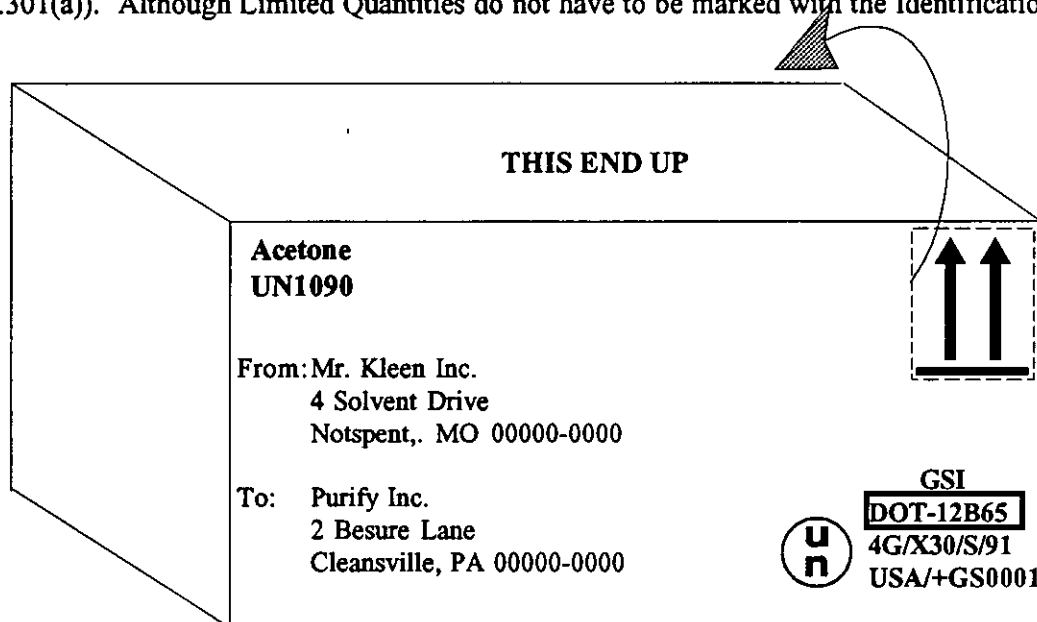


FIGURE 35A

(172.301(f)(1)), this writer recommends that it always be marked on the package so that it is not left off when the exception does not apply.

GSI CR: E. Column (4) Identification (UN or NA) Number, 2; D. Shipping Paper, 46

- D. Name & Address-** The name and address of EITHER the Consignee or the Consignor should also be marked on the package as illustrated for a box in Figure 35A and for a drum in Figure 36A on page 36 (172.301(d)). Although there are exceptions contained in 172.301(d)(1)-(2) your author recommends

that the Name and Address of BOTH the Consignee and Consignor be marked on the package. This will enhance the likelihood of the package getting to the consignee, eliminate the potential for omission when required, and facilitate the standardization of the marking process for all shipments.

1. **Hazardous Wastes:** For packages of Hazardous Wastes this requirement is normally met by complying with the provisions of 40 CFR 262.32(b) which requires each package of Hazardous Wastes having a capacity of 110 gallons or less to be marked with the following warning and information:

HAZARDOUS WASTE- Federal Law Prohibits Improper Disposal. If found, contact the nearest police or public safety authority or the U.S. Environmental Protection Agency.

Generator's Name and Address
Manifest Document Number

Packages of Hazardous Wastes marked as above will meet the requirement of both 172.306 and 40 CFR 262.32(b). It should be noted that there is no required format or U.S. DOT or EPA label that must be used to meet these requirements. These markings are illustrated in Figure 36A.

- E. **Orientation Markings-** Any combination package containing a Hazardous Material in liquid form should have any inside packaging containing liquid Hazardous Materials packed in the outside packaging with their closures upward. In addition the outside of the package should be marked with the **orientation markings** as specified in ISO Standard R780-1968 on two (2) opposite vertical sides. The arrows must point upward so as to indicate the orientation of the inside container(s) as illustrated in Figure 35A on Page 35

(172.312(a)). Although this mark is not required to be marked on packages containing solids, it is not a violation to do so and your author would encourage that it be done.

GSI CR: A. Combination Packaging, 25

There are some exceptions to the Orientation Marking requirement contained in paragraph 172.312(c) for certain types of shipments. GSI STRONGLY recommends that all combination packages containing liquid Hazardous Materials being offered for transportation under 49 CFR be automatically marked with the Orientation Arrows so as to indicate the orientation of the inside container. This will ensure regulatory compliance, increase the ease of training, and enhance safety by helping to keep the Hazardous Material in the package from leaking because the orientation of the package is not maintained. It's cheap insurance. Except for indicating the proper package orientation, arrows may not be placed on packages containing liquid Hazardous Materials (172.312(b)).

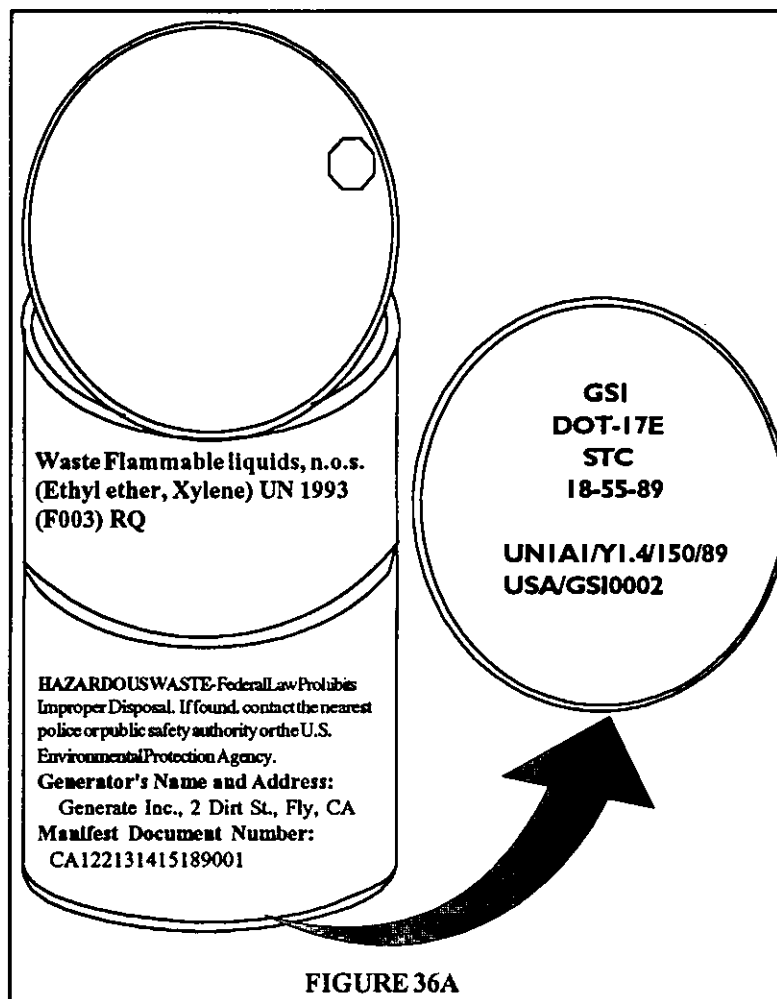


FIGURE 36A

F. Hazardous Substances- Each non bulk package of Hazardous Materials containing a Hazardous Substance as defined in 49 CFR must be marked with:

1. The letters **RQ** in association with the marked Proper Shipping Name (172.324(b)). The **RQ** marking is not part of the Proper Shipping Name. It is added in association with the Proper Shipping Name. Although 49 CFR is not specific as to where the **RQ** must be marked your author recommends marking the **RQ** on the package in a way similar to that illustrated in Figures 36A and 37A.

GSI CR: C. Definition of, 17; C. Shipping Paper Entry, 48

2. If the Proper Shipping Name DOES NOT contain the name of the substance from the Appendix to 172.101 causing it to be regulated as a Hazardous Substance, the name of the substance as listed in the Appendix to 172.101 must be marked on the package or overpack, (in parentheses), in association with the Proper Shipping Name (172.324(a)(1)). The (**Cupric acetate**) markings in Figure 37A illustrate this marking.

GSI CR: C. Definition of, 17; C. Shipping Paper Entry, 48

- a. **Hazardous Waste-** If the Hazardous Substance being shipped is also a Hazardous Waste, one of the following, as appropriate and in parenthesis, may be substituted for the name listed in the Appendix (172.324(a)(2)-(3)):

GSI CR: F. Shipping Papers, 49

- (1). **F or K Wastes-** The EPA F or K Waste Number as illustrated in Figure 36A on Page 36.

- (2). **Characteristic Hazardous Wastes-** The D Number or the entry EPA followed by the appropriate characteristic **ignitability, corrosivity, reactivity, or toxicity**.

G. Packaging Specification Marks- If specification packaging is required the appropriate Specification Markings should be marked on the required outside packaging of the package as illustrated in Figure 35A and 36A. This is normally part of the "production process" and will already be marked on the packaging. It is mentioned here as a cross check.

GSI CR: UN Specification Marking, Appendix 1, Page 11

H. Poisonous Hazardous Materials

1. **Inhalation Hazard (Non Bulk Packaging)-** Any non bulk package containing Division 2.3 materials or Division 6.1 Packing Group I liquids which are poisonous by inhalation under the criteria specified in §173.133(a)(2) shall be marked with the words **Inhalation Hazard** in association with the required labels (172.313(a)).

GSI CR: E. Shipping Paper Entry, 48; Placarding, 172.505

- a. **Inhalation Hazard (Bulk Packaging)-** Any bulk package containing Division 2.3 materials or Division 6.1 Packing Group I liquids which are poisonous by inhalation under the criteria specified in § 173.133(a)(2) shall be marked with the words **Inhalation Hazard** in association with the required placards on at least two (2) sides (172.313(a)).

2. **POISON-** Each non bulk plastic outer packaging used as a single or composite packaging for Division 6.1 materials must be permanently marked with the word **POISON** in letters at least 6.3 mm (.25 inches) high within 150 mm (6 inches) of the closure (172.313(b)).

I. Exemption Packaging- If the package being marked is authorized by an Exemption the outside of the package must be marked **DOT-E** followed by the number assigned (172.301(c)). i.e. **DOT-E 1234**.

GSI CR: A. Shipping Paper Entry, 47

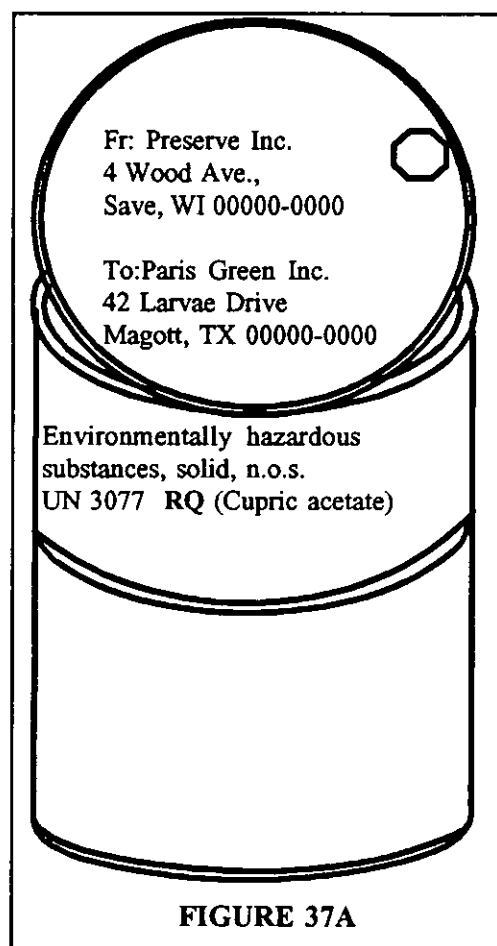


FIGURE 37A

J. **Radioactive Materials (RAM)**- In addition to any other required markings, the following marks must be considered and marked as applicable if the package contains a regulated Radioactive Material:

- a. USA in conjunction with the package specification marking IF the Radioactive materials are destined to be exported (172.310(a)(3)).
- b. Marked **TYPE A** or **TYPE B** as appropriate (172.310(a)(2)).
- c. The Gross weight (mass) if more than 110 pounds (50 kg) (172.310(a)(1)).

K. **Overpack**- Overpacks of Specification Packagings must be marked with an indication that the overpacked packages inside comply with prescribed specifications unless the Specification Markings on the overpacked packages are visible from the outside of the Overpack (173.25(a)(4)). The Marks and Labels on each of the packages overpacked be reproduced on the outside of the overpack unless the Marks and Labels on the overpacked packages are visible from the outside of the Overpack (173.25(a)(2)).

An Overpack is an enclosure that is used to provide protection or convenience in the handling of a package or to consolidate two or more packages (171.8). Packages containing Class 8 or Division 5.1 materials in Packing Group I may not be overpacked with any other material (173.25(a)(5)).

GSI CR: C. Overpack Definition & Illustration, 26

L. **ORM-D Designation**- In addition to any other marking requirements, if Column (3) of the §172.101 Table shows the Hazard Class as an **ORM-D**, each package must also be marked with the appropriate **ORM-D** Designation (172.316(a)). This marking is illustrated in Figure 38A and should be marked on the package as follows:

1. Use **ORM-D** for all modes but air.
2. Use **ORM-D -AIR** for shipments prepared and packaged for air under §173.27.
3. Be marked on an end or side of the package immediately following or below the Proper Shipping Name inside a rectangle that is approximately 6.3mm (1/4") larger on each side than the Designation itself.

M. **Class 1 EX #-** Unless excepted by paragraphs 172.320(b)-172.320(d) each package of Class 1 (Explosives) must be marked with the EX-number for each substance, article or device contained within it (172.320(a)).

N. **Prohibited Marking**- No person may mark a package with the Proper Shipping Name or Identification Number of a Hazardous Material unless the package contains the identified Hazardous Materials.

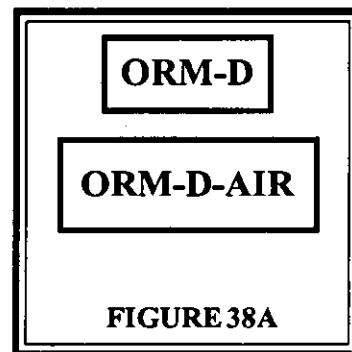
GSI CR: D. Prohibited Labeling, 42; G. Prohibited Shipping Paper Entries, 45; B. Placarding, 55

O. **Marking Specifications**

1. **Non Bulk**- All the markings required to be marked on the outside of the package by Subpart D of Part 172 of 49 CFR must be **printed** on the surface of the package on a background of a sharply **contrasting color**, be **durable**, in English, and unobscured by labels, attachments or anything else that could substantially reduce their effectiveness (172.304(a)).

GSI CR: UN Package Specification Markings, Appendix I, Page 11

2. **Bulk Packagings**- The general marking requirements and specifications for bulk packagings are contained in 172.302. In addition the specific marking requirements will be found in 172.326 for Portable Tanks, 172.328 for Cargo Tanks, 172.330 for Tank Cars and multi-unit tank car tanks, and 172.332 for any other bulk packaging.



THE A, B, C's OF LABELING

Difference Between "Marking" & "Labeling"

The question is often asked "What is the difference between marking and labeling?". Generally they both do the same thing, communicate information about the material in the package or its handling. The difference, then, is not in WHAT they do but in HOW they do it. The regulations pertaining to marking are not very specific as to their size, color, or shape (172.304). On the other hand the regulations pertaining to the labeling required by Subpart E of Part 172 are very specific as to size, color, and shape (172.407).

GSI CR: DOT Labeling Chart With Colored Pictures, Appendix IV

- A. **172.101 Table Label (Column (6))** - Unless excepted each package or containment device must be labeled with the label or labels specified in Column (6) of the §172.101 Table (172.400(a)). To select the proper §172.101 Table Label find the Proper Shipping Name entry in Column (2) of the §172.101 Table. Once the Proper Shipping Name is found the label or labels will be found in Column (6) directly to the right of the Packing Group entry in Column (5). Labels representing the Primary Hazard, the Class shown in Column (3) for the entry, must have the Class Number or, for Division 5.1 or 5.2, the Division Number in the lower corner of the label (172.405(b)). For all Classes except Class 7 and 9 the use of text indicating the hazard is optional i.e. **CORROSIVE** (172.405(a)).

GSI CR: F. & G. Columns (5) & (6), 3

Hazardous Material Table - § 172.101 Table					
Sym bol	Hazardous materials descriptions and proper shipping names	Hazard class or Division	Identifi- cation Numbers	Pack ing group	Label(s) Required (If not excepted)
(1)	(2)	(3)	(4)	(5)	(6)
D	Acetone	3	UN1090	II	FLAMMABLE LIQUID
	Dichlorobutene	8	NA2920	I	CORROSIVE, FLAMMABLE LIQUID
	Bipyridilium pesticides, liquid, toxic, n.o.s.	6.1	UN3016	I	POISON
				II	POISON
				III	KEEPAWAY FROM FOOD
	Flammable liquids, corrosive, n.o.s.	3	UN2924	I	FLAMMABLE LIQUID, CORROSIVE

FIGURE 39A

Illustrations:

- Reference to Columns (5) and (6) of the §172.101 Table or Figure 39A for the Proper Shipping Name Acetone indicates that the label to be applied to each package of Acetone is the **FLAMMABLE LIQUID** label. Figure 40A on page 40 illustrates the proper application of this label.
- If Column (6) shows more than one label for the Proper Shipping Name and Packing Group, all labels shown for that Proper Shipping Name and applicable Packing Group must be affixed. Reference to Columns (5) and (6) of the §172.101 Table or Figure 39A for the Proper Shipping Name **Flammable liquids, corrosive, n.o.s.** indicate that two (2) different labels, the **FLAMMABLE LIQUID** label and **CORROSIVE** label, must be applied to each package. Both labels must be applied as required by §172.406.
- The label or labels selected from Column (6) must be appropriate for the Proper Shipping Name of the material and the Packing Group of the material as shown in Column (5). Reference to Columns

(5) and (6) of the §172.101 Table or Figure 39A for the Proper Shipping Name **Bipyridilium pesticides, liquid, toxic, n.o.s.** indicates that the label to be applied to each package of **Bipyridilium pesticides, liquid, toxic, n.o.s.** having a Packing Group of I or II is the **POISON** label but that the **KEEP AWAY FROM FOODS** label must be used if the Packing Group is III.

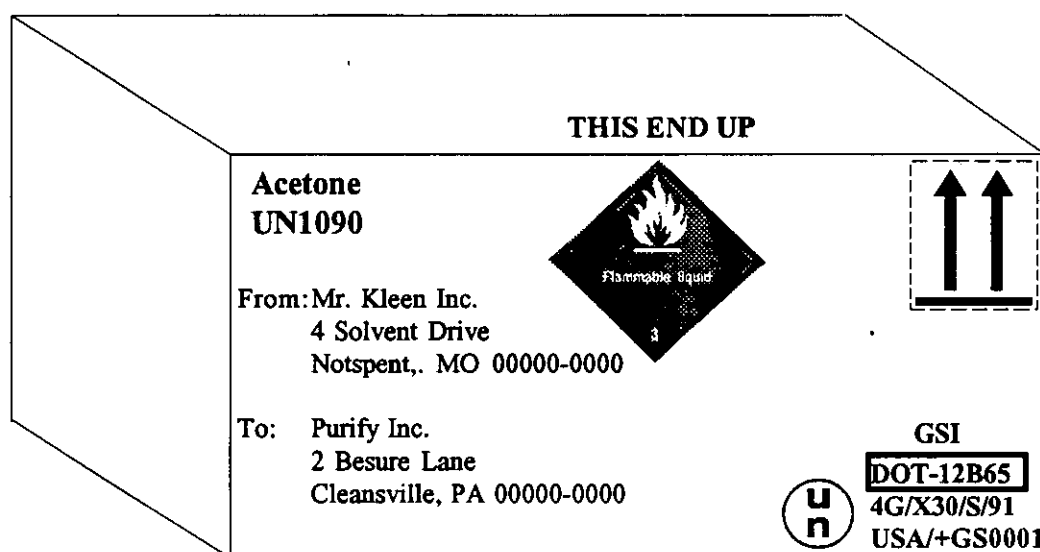


FIGURE 40A

B. Subsidiary Risk (Hazard) Labeling- As a general rule each Hazardous Material will be classed under ONE DOT Hazard Class. This will generally be the Hazard Class appearing in Column (3) of the §172.101 Table, required to be entered as part of the Basic Description on the Shipping Paper, and used to select the initial Labels. Some materials however meet the definition of more than one Hazard Class. The hazard or hazards not identified by the Primary Hazard are called Subsidiary Hazards (Risks). Subsidiary Hazard labels may not have the Class or Division number displayed on them (172.405(b)).

- 1. Subsidiary Risk Labeling of Materials Specifically Listed in the § 172.101 Table-** Generally the Subsidiary Risk of material specifically listed in the §172.101 Table can be determined by comparing the Primary Hazard Class shown in Column (3) to the Labeling in Column (6). Generally if more than one (1) label is listed, the first label listed represents the Primary Hazard and the second and subsequent label(s) represent the Subsidiary Hazard(s) (172.101(g)).

GSI CR: G. Column (6)-Labels, 3

Illustration: Reference to the **Dichlorobutene** entry in the §172.101 Table or Figure 39A on page 39 indicates, in Column (3), that the Primary Hazard is Class 8. Column (6), for that entry, shows that both a **CORROSIVE** and **FLAMMABLE LIQUID** label must be used. The **CORROSIVE** label, the first label listed, covers the Primary Hazard and the **FLAMMABLE LIQUID** label, the second label listed, with the 3 removed, would cover the Subsidiary Risk.

- 2. Other Subsidiary Risks Labeling-** Other than Class 2 materials, each package containing a material meeting the definition of more than one (1) Hazard Class must be labeled with Subsidiary Hazard labels in accordance with the Subsidiary Hazard Labels Table in 172.402(a). This table is illustrated in Figure 41A on page 41. This requirement applies to all materials meeting the definition of more than one Hazard Class even to a material specifically identified in the §172.101 Table if Column (6) does not contain the Subsidiary Risk.

Illustration: A mixture having a primary Hazard Class of 3, a Subsidiary Hazard of Class 8, and a Packing Group of II would have to be labeled with the **FLAMMABLE LIQUID** label for the Primary Hazard Class 3. In addition, a comparison of the Subsidiary Hazard and its Packing

Group to the Subsidiary Hazard Column for 8 and Packing Group II Row in the Subsidiary Hazards Labels Table in 172.402(a) or Figure 41A shows an X where they intersect. A **CORROSIVE** label would also be required to show the Subsidiary Hazard even if not shown in Column (6) of the § 172.101 Table. The **CORROSIVE** label must have the 8 removed because it is a Subsidiary Hazard label. The Primary and Subsidiary Hazard labeling for this example is shown in Figure 41B.

SUBSIDIARY HAZARD LABELS							
Subsidiary hazard level (Packing Group)	Subsidiary Hazard (Class or Division)						
	3	4.1	4.2	4.3	5.1	6.1	8
I	X	***	***	X	X	X	X
II	X	X	X	X	X	X	X
III	*	N	X	X	N	N	**

X- Required for all modes. N- None Required.
 *- Required for vessel only **- Required for aircraft and/or vessel.
 ***- Impossible as Subsidiary Hazard

FIGURE 41A

C. Label Placement- When labeling is required they must be affixed to a surface of the package or containment device, other than the bottom, on the same surface as the marked Proper Shipping Name if the dimensions of the package or containment device is adequate (172.406(a)). When Primary and Subsidiary Hazard labels are required they must be displayed next to each other (within 150 mm (6 inches) of one another) (172.406(c)).

- 1. Placement Exceptions-** Labels may be printed on or placed on a securely affixed tag or affixed by any other suitable means to cylinders; packages with irregular surfaces to which labels cannot be satisfactorily affixed; and to packages containing no Class 7 (Radioactive Materials) with dimensions less than those of the required label (172.406(b)).

Illustrations: Figure 40A illustrates the placement of a single label and Figure 41B illustrates the application of Primary and Subsidiary Risk labels.

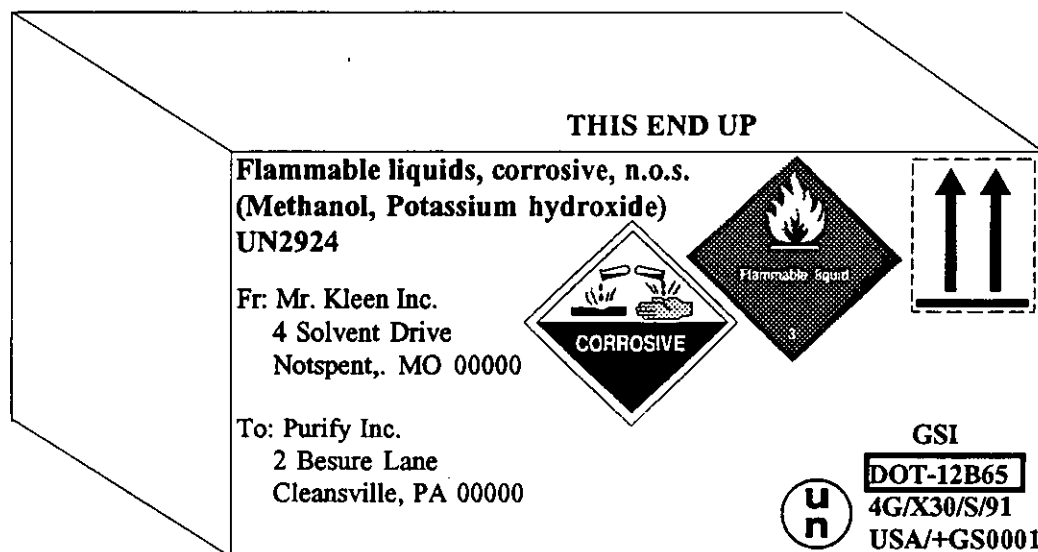


FIGURE 41B

D. Prohibited Labeling- Labels required by Subpart E of Part 172 must not be put on packages that do not contain Hazardous Material or do not represent a hazard of the Hazardous Material in the package (172.401(a)). No mark or other media may be placed on a package that could by its color, design, or shape be confused with any label prescribed in Subpart E of Part 172 (172.401(b)). These prohibitions do not apply to packages labeled in accordance with the UN Recommendations, the IMDG Code, the ICAO Technical Instructions or the Canadian TDG Regulations (172.401(c)).

GSI CR: N. Marking, 38; G. Shipping Paper Entries, 45; B. Placarding, 55

E. Other Labels

1. **Cargo Aircraft Only label-** If the package or overpack contains either a Hazardous Material or Dangerous Good that can be transported ONLY on Cargo Aircraft, a **CARGO AIRCRAFT ONLY (DANGER)** label must be affixed to the surface of the package or overpack adjacent to the Hazard Class label (172.402(b)).
2. **Radioactive Materials (Class 7)-** Packages containing Class 7 (Radioactive Materials) requiring labels must be labeled in accordance with 172.403(a) with two (2) of the right "Category" Labels and have the Name of the radionuclide, activity, and Transport Index, as appropriate entered in the corresponding space on the label (172.403(g)).
 - a. **Radioactive Materials (Class 7) with Subsidiary Hazard-** Each package containing a Class 7 (Radioactive Material) that also meets the definition of one or more additional Hazard Classes must be labeled as a Class 7 as required by §172.403 and for each additional hazard (172.402(c)).
3. **Empty Label-** There is no required use of the "Empty" label but it can be used to cover up existing marks and labels on "empty packages" that last contained Hazardous Materials (173.29(b)(1)). This label will probably most often be used on "Empty" packages of Class 7 (Radioactive Materials)(173.427(d)).

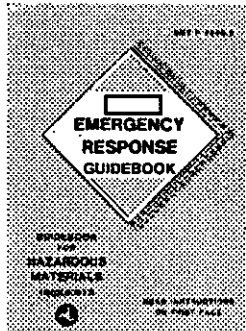
THE A, B, C's OF SHIPPING PAPERS

Introduction

A. Biggest Source of Violation Activity and Shipment Delay- It has been this author's personal experience that the vast majority of violation activity and shipment delay is caused by Shipping Papers not prepared in accordance with 49 CFR (or other applicable regulations). Any Inspector, State Trooper, Enforcement Person, or Carrier Acceptance Person, worth their salt will start their inspection with the Shipping Paper. Obviously if everyone looks at it and it is not correct, problems will result. This writer recommends as strongly as he can that emphasis be placed on ensuring that the Shipping Papers are correct. This will help Emergency Response Personnel respond effectively to accidents or incidents involving the shipment, eliminate potential enforcement activity, and limit potential customer problems that result when a shipment is delayed.

B. Use By Emergency Response Personnel- Once the shipment leaves the Shipper's facility and enters the transportation system it is subject to those "conditions normally incident to transportation" as well as those that are not "normally incident" to transportation such as vehicle accidents, punctured drums, etc. In the event of an accident or incident involving the shipment, Emergency Response Personnel will have to make IMMEDIATE decisions as to how to handle it. The Shipping Paper provides VITAL INFORMATION needed to make these decisions such as, but not limited, to the Proper Shipping Name, Hazard Class, the Identification Number and the amount of material involved.

The Identification (UN/NA) Number a required entry on the Shipping Paper. It is keyed to the "Emergency Response Guidebook". This Guidebook gives Emergency Response personnel information relative to the Hazard associated with the material, recommended responses, and other actions. If the UN or NA Number is not on the Shipping Paper, Emergency Responders will not have the information they need. It could hang in the balance.



ber from Column (4) of the §172.101 Table is required on the Shipping Paper. It is keyed to the "Emergency Response Guidebook" which gives Emergency Response personnel information associated with the material, recommendations such as evacuation etc. Obviously if the Shipping Paper or otherwise visible Emergency Response information is missing, the benefit of this quick cross reference is lost.

GSI CR: Appendix II- Introduction to Emergency Response Information Under Subpart G of 49 CFR

C. Definition of "DOT 49 CFR" Shipping Paper- The U.S. DOT defines the term "Shipping Paper" as a "shipping order, bill of lading, manifest, or other document serving a similar purpose" that contains certain information (171.8). To be in compliance with 49 CFR, whatever "form" is used as the Shipping Paper, MUST contain the information REQUIRED by:

172.202 containing the **Basic Description** requirements consisting of:

1. Proper Shipping Name (172.202(a)(1)).
2. Hazard Class (172.202(a)(2)).
3. Identification Number (UN/NA) Number (172.202(a)(3)).
4. Packing Group, if any, preceded by the letters PG (172.202(a)(4)).
5. 1-4 above in sequence (172.202(b)).
6. Quantity of Material (172.202(a)(5)).

172.203 containing **Additional Description** requirements which MAY apply to a particular Basic Description.

172.204 containing the **Certification** and Signature requirements.

Although not part of the definition it should be noted that 172.201(d) requires the inclusion of the Emergency Response Telephone Number required by §172.604.

D. "U.S. DOT "vs "Normal" Shipping Paper- The term "Shipping Paper" as normally used within the transportation system means the piece of paper or documentation used for piece count, billing, accountability and other purposes involved with the day to day transportation of Hazardous as well as non hazardous materials. As used in 49 CFR the term "Shipping Paper" means documentation containing the specific Hazardous Materials information required by 49 CFR.

49 CFR does not require the use of any specific form as the "DOT Shipping Paper". The system is flexible enough to permit the use of ANY form so long as the required 49 CFR information is on the form (171.8). As a practical matter by Highway it is very common to see the normal "Straight Bill of Lading" used for shipments of both hazardous and non hazardous goods. On the other hand, although not required by 49 CFR, the air industry requires the use of a particular Document called the SHIPPER'S DECLARATION FOR DANGEROUS GOODS and those that ship Hazardous Wastes commonly use the Uniform Hazardous Waste Manifest. As long as the information required by DOT is present on whatever form is used the DOT Shipping Paper requirements have been met.

E. General Applicability- As a general rule if a Hazardous Material is offered for transportation the person offering it MUST describe the material on a Shipping Paper in the manner required by Subpart C of Part 172 (172.200(a)).

1. Exceptions- Except for Hazardous Wastes and Substances, "DOT Shipping Papers" ARE NOT normally required for shipments of materials (172.200(b)):

a. Identified by the letter A or W in Column (1) of the §172.101 Table except when offered or intended for transportation by the mode indicated, A for Air and/or W for Water.

GSI CR: B. Column (1) Symbols, 1

b. That are ORM-D's except when offered or intended for transportation by air. (172.200(b))

Straight Bill				
No. Of Units & Type	HM	DESCRIPTION AND CLASSIFICATION (Proper Shipping Name, Hazard Class, UN/NA Number, PG)	Net Quantity (Wt/Vol)	Total Quantity (Wt/Vol)
1 Box		Grandmas Kites	45 kg	48 kg
1 Box	X	Acetone, 3, UN1090, PG II	4 L	6 kg
1 Drum	X	Flammable liquids, n.o.s. (Ethylcyclohexane) 3, UN1993, PG III	220 L	220 kg
1 Box	X	Flammable liquids, corrosive, n.o.s. 3, UN 2924, PG II (Methanol, Potassium hydroxide) EMERGENCY CONTACT: 800-424-9300	25 kg	29 kg

FIGURE 44A

F. General Shipping Paper Description Requirements- All required shipping descriptions must:

1. Printing- It must be printed (manually or mechanically), in English, and in a legible manner (172.201(a)(2)).

2. Codes and Abbreviations- It may contain no codes or abbreviations except as authorized or required by 49 CFR (172.201(a)(3)).

3. Multiple Page Shipping Papers- A Shipping Paper may consist of more than one page provided each page is numbered consecutively AND the First Page bears a notation specifying the total number of pages included in the Shipping Paper i.e. Page 1 of 3 Pages (172.201(c)).

4. **Hazardous Materials with NON Hazardous Materials On The Same Shipping Paper-** When a Hazardous Material is shown on the same shipping papers with a non hazardous material the description of the HAZARDOUS MATERIAL must be:

1. Shown first (172.201(a)(1)(i)), or
2. Entered in an ink of a contrasting color. (172.201(a)(1)(ii)). In this case the description can be located anywhere on the shipping paper and/or intermixed with the non hazardous material entries, or
3. Identified by the entry of an X placed BEFORE the Proper Shipping Name in a Column captioned "HM" (172.201(a)(1)(iii)). If this option is used the Hazardous Materials may be placed anywhere on the Shipping Paper.

Illustration- In Figure 44A the "Grandma's Kites", the first entry on the Shipping Paper, is not a Hazardous Material. It is described on a Shipping Paper with Hazardous Materials. They are listed first and not entered in an ink of a contrasting color so an X must be placed in the "HM Column" before the Proper Shipping Name for each of the Hazardous Material entries. Your author believes that, in most cases, the X option will be the most efficient of the three (3) choices.

- G. **Prohibited Entries-** A material not may not be described on a Shipping Paper Number (172.202(e)).



meeting the definition of a Hazardous Material per using either a DOT Hazard Class or a UN/NA

Illustration: A package of "Paint" having a Flash Point of over 250°F may not be described on a Shipping Paper as "Paint, Flammable liquid, UN1263", "Paint, Flammable liquid", or "Paint, UN1263". A recommendation would be to describe it as Paint.

GSI CR: N. Marking, 38; D. Labeling, 42; B. Placarding, 55

THE A B C's OF THE BASIC DESCRIPTION (172.202)

To ensure compliance with 49 CFR all Shipping Papers, including Hazardous Waste Manifests, must contain a **Basic Description** containing the following information in sequence:

- A. **Proper Shipping Name-** The FIRST Item in the Basic Description Sequence is the Proper Shipping Name listed in Column (2) of the §172.101 Table for the Hazardous Material (172.202(a)(1)). The entries Acetone, Flammable liquids, n.o.s., and the Flammable liquids, corrosive, n.o.s. in Figure 44A illustrate this entry.

GSI CR: C. Column (2), 1; A. Proper Shipping Name Determination, 11; A. Marking, 35

- B. **Technical Name Rule-** If the Proper Shipping Name is one of the names listed in 172.203(k)(3) the Technical Name or Names required by 172.203(k) must be entered in parentheses in association with the Basic Description. Although not a part of the Basic Description this writer has elected to discuss it here because of its close association with the Basic Description not only under 49 CFR but under international regulations such as ICAO and the IMDG Code.

If only one material causes the material to be a Hazardous Material, its Technical Name must be listed in parentheses as illustrated in the **Flammable liquids, n.o.s. (Ethylcyclohexane)** entry in Figure 44A. If the Hazardous Material is a mixture or solution of two (2) or more Hazardous Materials the Technical Names of at least two (2) components most predominantly contributing to the hazards must be entered in parentheses (172.203(k)(2)). The **Flammable liquids, corrosive, n.o.s. (Methanol, Potassium hydroxide)** entry in Figure 44A illustrates this requirement. The location of either of the Technical Names in parentheses for either of these entries in Figure 44A is considered to be in "association with the Basic Description".

The word "contains" may also be used in association with the Technical Name if appropriate (172.203(k)). Your author believes the use of the word "contains" would be appropriate in the case of a mixture or solution and not appropriate when describing commercially pure materials. Actual concentrations or concentration ranges are required for Organic Peroxides (Division 5.2) which may qualify for more than one generic description depending on the concentration (172.203(k)).

GSI CR: A. Technical Name Rule, 15; B. Marking, 35

- C. **Hazard Class**- The SECOND Item in the Basic Description Sequence must be the HAZARD CLASS listed in Column (3) of the §172.101 Table for the Hazardous Material 3, 4.3, 6.1, 8 etc. (172.202(a)(2)).

Straight Bill				
No. Of Units & Type	HM	DESCRIPTION AND CLASSIFICATION (Proper Shipping Name, Hazard Class, UN/NA Number, PG)	Net Quantity (Wt/Vol)	Total Quantity (Wt/Vol)
2 Bxs	X	Aldrin, 6.1, NA2761, PG II, DOT-E1234, RQ	56 lbs	64 lbs
25 bxs	X	Butane, 2.1, UN1011, Ltd Qty	300 lbs	400 lbs

FIGURE 46A

All the Class or Division entries immediately after the Proper Shipping Names in Figures 44A and 46A illustrate the Hazard Class entry. Although some materials may meet the definition of more than one Hazard Class the entry to be entered, as illustrated by the Class 3 entry in the **Flammable liquids, corrosive, n.o.s.** description in Figure 44A, for a material with a Subsidiary Risk, must reflect the Primary Hazard. Although there is a permissive provision within 172.202(a)(2) that permits the addition of additional information such as the Subsidiary Hazard in parentheses after the required Hazard Class entry, it is this writer's opinion that it will tend to confuse the issue and result in a lack of standardization. GSI CR: D. Column (3), 2; Classification, 7; B. Subsidiary Risk Labeling, 40; E. Placarding, 56

- D. **Identification (UN/NA) Number**- The THIRD Item in the Basic Description Sequence is the Identification Number including the appropriate prefix, UN or NA, listed in Column(4) of the §172.101 Table for the entry (172.202(a)(3)). This entry is illustrated in all the Hazardous Materials descriptions in Figures 44A and 46A right after the Class or Division entries and contains either the prefix UN or NA. GSI CR: E. Column (4), 2; C. Identification (UN/NA) Number Marking, 35

- E. **Packing Group**- The FOURTH Item in the Basic Description Sequence is the Packing Group listed for the material in Column (5) of the §172.101 Table preceded by the letters PG (172.202(a)(4)). The Packing Group is an upper Case Roman Numeral I, II, or III. All the Hazardous Materials descriptions in Figures 44A and 46A except for **Butane** in Figure 46A illustrate this entry. As illustrated by the **Butane** description in Figure 46A, no Packing Group is entered if none appears in Column (5) of the §172.101 Table.

GSI CR: F. Col. (5), 3; Packing Group Definition, 6; A.-B. Classification, 7; B. Select Packaging, 27

- F. **Required Sequence of Basic Description**- The Proper Shipping Name, Hazard Class, Identification Number, and Packing Group MUST BE IN SEQUENCE with nothing between them except as permitted or required. The proper sequence for these entries is illustrated in the Hazardous Materials descriptions in Figures 44A and 46A (172.202(b)). The only thing this writer recommends even considering interspersing between them is the Technical Name in parentheses between the Proper Shipping Name and Hazard Class as permitted by 172.202(d).

- G. **Quantity of Material**- Except for empty packagings, compressed gas cylinders, and bulk packagings the "Total Quantity" of the material covered by the Basic Description, including the units of measurement, must be entered on the Shipping Paper (172.202(a)(5)). Although the regulatory standard for units of

measurement is the International System of Units (SI or Metric) (171.6(a)) D.O.T. has publicly stated, through its HMIX Bulletin Board that either SI or U.S. Units of measurement may be used. Both methods are illustrated in Figures 44A through 51A. A list of conversion values and abbreviations is contained in §171.6 and the Metric Conversion Chart in Appendix V. The TOTAL QUANTITY entry may:

1. Be given weight OR volume or as otherwise appropriate.
2. Appear either before OR after OR both before and after the Proper Shipping Name, Hazard Class and Identification Number information on the Shipping Paper and may be abbreviated (172.202(c)).
3. Be either the "net amount" of the material in the package or the "Gross Weight", the weight of the material in the package plus the packaging, as appropriate. Generally the "net" figure is used for air or Hazardous Waste shipments and the "Gross Weight" for Highway Shipments.

Illustration: All the entries in the "Quantity" Columns of Figures 44A through 46A illustrate these entries.

Author's note: Although the above is not currently in HM-181 it is in the 1990 Edition of 49 CFR, has been for years, and will undoubtedly be put back in as HM-181 is rewritten over the next couple of years. Use of the "net quantity" will ensure compliance in either case.

- H. Emergency Response Telephone Number-** A 24 hour Emergency Response Telephone number, including Area or International Access Code, must be listed on the Shipping Paper. It must be monitored at all times the Hazardous Materials are in the transportation system and be the number of a person who has "comprehensive emergency response and accident mitigation information for that material or has immediate access to a person who" has such knowledge (172.604(a)). The number must be entered immediately following the description of each Hazardous Material or entered once in a clearly visible location with an indication that it is for Emergency Response Information IF the number applies to each Hazardous Material entered on the Shipping Paper (172.604(a)(3)). The single number method is illustrated in Figure 44A.

GSI CR: Appendix II- Introduction to Emergency Response Information Under Subpart G of 49 CFR

ADDITIONAL DESCRIPTION REQUIREMENTS (172.203)

In any case where a Shipping Paper is required it will, at a minimum, **contain a Basic Description**. In addition, one OR more of the Additional Description requirements contained in Section 172.203 MAY or MAY NOT apply to a given Basic Description. Each paragraph in 172.203 represents a potential Additional Description Item that could be required. If one or more of the Additional Description Items specified in 172.203 applies to the Hazardous Material described in the Basic Description, the appropriate entries must be made. If none apply to the particular Basic Description then no Additional Description information has to be entered.

This writer recommends that, EXCEPT where required to be placed elsewhere, the Additional Description information should be entered AFTER the Basic Description on the Shipping Paper.

THE A, B, C's OF ADDITIONAL DESCRIPTION REQUIREMENTS (172.203)

- A. DOT Exemptions-** If the Basic Description describes a Hazardous Material being shipped under a DOT Exemption, the notation DOT-E followed by the "Exemption Number" assigned must be entered in association with the Basic Description (172.203(a)). A shipment being shipped under "DOT Exemption # 1234" must have the entry DOT-E 1234 entered on the Shipping Paper after the Basic Description as shown for the Aldrin entry in Figure 46A.

- B. Limited Quantity-** If a material is offered for shipment as a "limited quantity" the words **Limited Quantity** or **Ltd Qty** must be entered on the Shipping Paper after the Basic Description (172.203(b)). This entry is illustrated by the entry **Ltd Qty** after the Butane description in Figure 46A.

GSI CR: H. Limited Quantities, 31

C. Hazardous Substances

1. **RQ-** At a minimum the letters **RQ** must be entered on the Shipping Paper either before or after the Basic Description IF the material covered by the Basic Description is regulated as a Hazardous Substance as shown in the **Aldrin** entry in Figure 48A (172.203(c)(2)).

GSI CR: Hazardous Substances, 17; F. Marking, 37

2. **Name of Hazardous Substance-** In addition, IF the name(s) of the constituent(s) causing it to be regulated as a Hazardous Substance, as listed in the Appendix to 172.101, is not part of the Proper Shipping Name it must be entered in parentheses in association with the Basic Description. The (**n-Butyl phthalate**) entry in the **Environmentally hazardous substances, liquid, n.o.s.** description in Figure 48A illustrates this entry (172.203(c)(1)).

GSI CR: Hazardous Substances, 17; E. Marking, 37

Straight Bill				
No.Of Units & Type	HM	DESCRIPTION AND CLASSIFICATION (Proper Shipping Name, Hazard Class, UN/NA Number,PG)	Net Quantity (Wt/Vol)	Total Quantity (Wt/Vol)
2 Bxs	X	Aldrin, 6.1, NA2761, PG II, DOT-E1234, RQ	28 kg	30 kg
10 Drms	X	Motor fuel anti-knock mixtures (Tetraethyl lead), 6.1, UN1649, PG I (Tetraethyl lead) RQ	500 L	2200 kg
1 Bx	X	Environmentally hazardous substances, liquid, n.o.s., 9, UN3082, PG III (n-Butyl phthalate) RQ	15 kg	18 kg
1 Bx	X	Magnesium hydride, 4.3, UN2010, PG I Dangerous when wet	15 kg	20 kg

FIGURE 48A

- D. **Dangerous When Wet-** If the package is required to be labeled with a **DANGEROUS WHEN WET** label the entry **DANGEROUS WHEN WET** must be entered on the Shipping Paper in association with the Basic Description (172.203(j)). As a general rule this entry will be required for all Division 4.3 Hazardous Materials. The **DANGEROUS WHEN WET** entry in the **Magnesium hydride** description in Figure 48A illustrates this entry.

E. Poisons-Inhalation Hazard

1. **Poison-** IF the material meets the definition of a Division 6.1 (Poison) under 49 CFR and the fact that it is a Division 6.1 (Poison) is not disclosed by either the Proper Shipping Name, or the Hazard Class the word "Poison" must be entered on the SHIPPING PAPER in association with the Basic Description (172.203(m)(1)).

Illustration- The **Waste Allyl acetate** entry in Figure 49A shows the Hazard Class as 3. **Allyl acetate** has a Subsidiary Hazard (Risk) of 6.1. There is no indication in either the Proper Shipping Name or Hazard Class entry that the material meets the definition of a Division 6.1. As illustrated by the **Poison** entry for the **Waste Allyl acetate** description in Figure 49A the word **Poison** must be added as an additional description item.

2. **Technical Name-** If the Technical Name of the compound or principal constituent causing it to be regulated as a Division 6.1 (Poison) under Part 173 of 49 CFR is not part of the Proper Shipping Name, it must be added in parentheses as required by 172.203(k) (172.203(m)(2)).

GS1 CR: N.O.S. Technical Name Rule, 15; B. Shipping Paper Entry, 45

Illustration: The Motor fuel anti-knock mixtures description in Figure 48A is a Division 6.1 (Poison). The name of the constituent causing it to be regulated as a Division 6.1 (Poison) is Tetraethyl lead. It is not part of the Proper Shipping Name and must therefore be added in parentheses as required by 172.203(k). The (Tetraethyl lead) entry in the Motor fuel anti-knock mixtures description in Figure 48A illustrates this entry.

3. **Poison-Inhalation Hazard-Hazard Zone-** If the Basic Description covers a Division 2.3 (Poisonous Gas) or a Division 6.1, Packing Group I which is poisonous by inhalation under the criteria specified in 173.133(a)(2) the word **Poison-Inhalation Hazard** and the words **Hazard Zone A**, **Hazard Zone B**, **Hazard Zone C**, or **Hazard Zone D**, as appropriate must be entered. The word Poison does not have to be repeated if it is already part of the Shipping Description (172.203(m)(3)).

GS1 CR: H. Inhalation Hazard Marking, 37; E. Multiple Placarding, 56

UNIFORM HAZARDOUS WASTE MANIFEST		1. Generator's US EPA ID No.	Manifest Document No.	2. Page 1 of			
11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID No.)				12. Containers No. Type	13. Total Quantity	14 Unit Wt/Vol	15 Waste No.
a. Waste Allyl acetate, 3, UN2333, PG II, RQ (D001) Poison				10 DM	1500	P	
b. Hazardous waste solid, n.o.s., 9, NA3077, PG III RQ (EPA toxicity)				10 DM	4400	P	

FIGURE 49A

- F. **Hazardous Wastes-** Shipments of Hazardous Wastes must be described on a specific form, the Uniform Hazardous Waste Manifest (EPA 8700-22), prepared in accordance with 40 CFR 262.20 (172.205(a)). The instructions for preparing this form for Blocks other than 11. are sufficiently explained in the Appendix to 40 CFR Part 262 and will not be explained in this text. In addition it is generally used as the DOT Shipping Paper under the permissive provisions of §172.205(h). Except as noted below, the description of a Hazardous Waste on the Manifest is the same as for any other Hazardous Material:

1. **Waste in Proper Shipping Name-** The word **Waste** must be added preceding the Proper Shipping Name if it is not part of the Proper Shipping Name appearing in Column (2) of the §172.101 Table as illustrated by the **Waste Allyl Acetate** entry in Figure 49A. If the word **Waste** is part of the Proper Shipping Name appearing in Column (2) of the §172.101 Table, leave it where it is. The **Hazardous waste solid, n.o.s.** entry in Figure 49A illustrates this point.

GS1 CR: B. Hazardous Waste Proper Shipping Names, 12

2. **Quantity and Unit of Measurement Code-** The Quantity of Material covered by the Description must be entered in Column (Item) 13 on the Manifest. The Units of Measurement must be entered in Item 14 using the abbreviations specified in the Instruction for Item 14 in the Appendix to Part 262 of 40 CFR which are illustrated below:

G= Gallons P= Pounds T=Tons (2,000 lbs) Y= Cubic Yards
 L= Liters K= Kilogram M=Metric tons (1000 kg) N=Cubic Meters

Illustration: All the entries for Items 13 and 14 in Figures 49A and 50A illustrate this entry.

UNIFORM HAZARDOUS WASTE MANIFEST		1. Generator's US EPA ID No.	Manifest Document No.	2. Page 1 of		
11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID No.)				12. Containers No. Type	13. Total Quantity	14. Unit Wt/Vol
a. Waste Flammable liquid, n.o.s., (Acetone/Xylene), 3, UN1993 PG II (F003) RQ				1 TT	16000	L

FIGURE 50A

3. **Container Number and Type Code:** Item 12 requires an entry for the "Number" (No.) and "Type" of containers being used to transport the Hazardous Waste. The entry for the "Type" of container must be as specified in the Instructions for Item 12 in the Appendix to Part 262 of 40 CFR. Some of the more commonly used packagings and their respective Container Codes are listed below:

CF=Fiber or plastic boxes, cartons, cases CY=Cylinders DT=Dump Truck
 DF=Fiberboard or plastic drums, barrels, or kegs DM=Metal drums, barrels, kegs
 TC=Tank Cars TP=Tank Portable TT=Cargo Tank (Tank Trucks)

Illustrations: All the descriptions in Figures 49A and 50A illustrate this requirement.

4. **Hazardous Substance- Name Exception-** If the Hazardous Waste is also regulated as a Hazardous Substance and the Proper Shipping Name does not contain the name of the Hazardous Substance as listed in the Appendix to 172.101, one of the following, as appropriate and in parentheses, may be substituted for the name of the substance as listed in the §172.101 Appendix (172.203(c)(1)):

GSI CR: D. Hazardous Substance Determination, 18

(a). **Waste Streams-** If the Hazardous Waste being described is from an F or K Waste Stream the EPA F or K Waste Stream Number as illustrated in Figure 50A.

(b). **Characteristic Hazardous Wastes** - If the Hazardous Waste is a Characteristic Waste the corresponding D Number **OR** the entry EPA followed by the appropriate characteristic ignitability, corrosivity, reactivity, or toxicity as illustrated in Figure 49A on Page 49 may be entered in parentheses in lieu of the name of the substance listed in the Appendix to §172.101 (172.324(a)(2)-(3)).

(1). **Separate D, E, and K Number Listings In Appendix to 172.101-** There are separate EPA Hazardous Waste D, F, and K, Number listings in the §172.101 Appendix starting after the Alphabetical listing of Hazardous Substances in List 1 of the Appendix. In making a Hazardous Substances determination for a package of Hazardous Wastes the "EPA Hazardous Waste Number" should be checked in the §172.101 Appendix.

G. RESIDUE LAST CONTAINED (Almost Empty)- Although permitted, except for any tank car containing any "Residue" of a Hazardous Material or packages containing a "Residue" of a Hazardous Substance, as defined in 171.8, there is no requirement that the entry **RESIDUE: Last Contained** be used in association with any Basic Description (172.203(e)(1)).

The Basic Description for a Tank Car containing the residue of any Hazardous Material or any other package containing the residue of a Hazardous Substance must be prefaced with the entry **RESIDUE: Last Contained** (172.203(e)(2)-(3)).

Illustration- The Description on a Tank Car containing a Residue of Acetone would be as illustrated in the Acetone entry in Figure 51A. The letters RQ are not included because the Tank Car does not contain an RQ of a Material listed in the §172.101 Appendix. The RQ for Acetone is 2270 kg (5000 lbs). The Residue in the Tank Car is only 400 kg (800 lbs). The Residue of Silver nitrate in the drum is 2 kg (4 lbs) which exceeds the .454 kg (1 lb) RQ for Silver nitrate. The Basic Description on the Shipping Paper must be prefaced with the words **RESIDUE Last Contained** as shown in Figure 51A.

Straight Bill				
No. Of Units & Type	HM	DESCRIPTION AND CLASSIFICATION (Proper Shipping Name, Hazard Class, UN/NA Number, PG)	Net Quantity (Wt/Vol)	Total Quantity (Wt/Vol)
1 TC	X	RESIDUE Last Contained Acetone, 3, UN1090 PG II PLACARDED: Flammable Residue	400 L	
1 Drm	X	RESIDUE Last Contained Silver nitrate, 5.1, UN1493, PG II RQ Both the Tank Car and Drum are shown on 1 Shipping Paper for the purposes of illustration only.	2 L	

FIGURE 51A

The Remainder of this Page and Page 52 intentionally left blank. Please go to Page 53.

RESERVED- Intentionally left blank. Please turn to page 53.

THE A, B, C's of SHIPPING PAPER CERTIFICATION

- A. **Shipper's Certification-** The Certification must be on the Shipping Paper containing the Basic Description. The Shipper is certifying that the Hazardous materials described on the Shipping Paper have been properly classified, packaged, marked, labeled, documented, and are in full compliance with 49 CFR (172.204(a)).
- B. **Signature-** The Certification must be legibly signed by a principal, officer, partner, or employee of the shipper or his agent. It may be signed manually, by typewriter, or by other mechanical means. The person who signs the Certification is certifying, on **BEHALF OF THE SHIPPER**, that the shipment is in compliance with all applicable regulations.
1. **Hazardous Waste Manifest-** Item 16 of the Manifest contains the required certification. It must have the Printed or typed Name of the individual signing in the appropriate box, a manual signature in the appropriate box, and must be dated in the appropriate box.
- C. **Form of the Certification-** For highway and/or rail the Certification in 172.204(a)(1) should be used. This Certification, which is reproduced in Figure 53A, is commonly preprinted on Bills of Lading used for Highway and Rail transportation of Hazardous Materials and is the Certification preprinted on the Hazardous Waste Manifest in Item 16.

<u>CERTIFICATION (172.204)</u> 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 Department of Transportation. (Signature) FIGURE 53A
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- D. **No Certification Required-** Except for Hazardous Wastes no Certification is required for Hazardous Materials offered for transportation by motor vehicle AND transported in a cargo tank supplied by the carrier OR by the shipper as a private carrier unless the Hazardous Material is to be reshipped or transferred to another carrier (172.204(b)(1)). No certification is required for the shipment of an empty tank car by rail which previously contained a Hazardous Material and which has not been cleaned or purged (172.204(b)(2)).

THE A, B, C's OF PLACARDING

A. Placarding Selection (KIS Method)- Placards must be selected from the Tables provided in 172.504 which are illustrated in Figure 55A on page 55 (172.504(a)). To select the appropriate Placard using the KIS (Keep It Simple) Method do the following:

1. Select the Class or Division Placard from the §172.504 Tables.

- a. Determine the Hazard Class or Division Number of the Hazardous Material. This can usually be determined from the Hazard Class portion of the Basic Description on the Shipping Paper or Column (3) of the §172.101 Table.
GSI CR: C. Basic Description, page, 46
- b. Refer to the top left hand corner of Table 1 in §172.504 or, for training purposes only, Figure 55A on Page 55. Go down the "Hazard Class or Division" (First) Column until the Hazard Class or Division Number of the Hazardous Material is found. If it's not found in Table 1 go to Table 2.
- c. Once the Hazard Class or Division Number is found in that Column go to the right to the "Placard Name" (Second) Column. The Placard Name in this Column of the entry is the name of the placard to be used. The "Placard Design Section Reference" (Third) Column contains a reference to the Section within Part 172 containing a black and white picture and specifics of the placard named in the "Placard Name" Column. Four (4) of the required placards must be used.
- d. Repeat a.-c. for each different Hazard Class or Division Number being shipped.

2. Multiple Placarding Requirements of §172.505- In addition to any placards required by the §172.504 Tables each transport vehicle, portable tank, freight container, or unit load device containing the following must be placarded as indicated:

- a. A Division 2.3 or 6.1 (Poisonous material) for which the **Poison- Inhalation Hazard** entry is required on the Shipping Paper by 172.203(m)(3) must be placarded with **POISON** or **POISON GAS** placards, as appropriate for the Division being placarded, on each side and end. This placarding is in addition to any other placards required by §172.504. If the placard required by §172.504 require a **POISON** or **POISON GAS** placard duplication is not required (172.505(a)).

GSI CR: E. Inhalation Hazard on Shipping Paper, 48

- b. A material that has a Subsidiary Hazard (Risk) of Division 4.3, Dangerous When Wet, as defined in §173.124 must be placarded with **DANGEROUS WHEN WET** placards on each side and end in addition to any other placards required by §172.504 (172.505(c)).

- c. 454 kg (1001 lbs) or more gross weight of fissile or low specific activity uranium hexafluoride must be placarded with **RADIOACTIVE** and **CORROSIVE** placards on each side and end (172.505(b)).

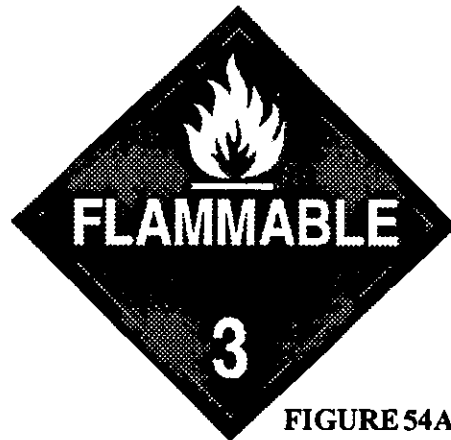


FIGURE 54A

Illustration: The Hazard Class for Acetone is 3. The name of the placard in the Second Column of the Class 3 entry in Table 2 of §172.504 is **FLAMMABLE**. None of the mandatory Multiple Placarding requirements of §172.505 apply. Four (4) **FLAMMABLE** placards must be used. Figure 54A is a black and white illustration of this red and white placard.

B. Placarding Exceptions- Thus far nice, easy, general placarding rules (KIS Method of Placarding). Get the Class or Division, select the appropriate placard(s) from the §172.504 Tables, check §172.505 for Multiple Placarding applicability, and make sure one (1) of each required placard is on each side and end

Category (Hazard Class/Division Number Additional description)	Placard Name	Design Reference
TABLE 1		
1.1	EXPLOSIVES 1.1	172.522
1.2	EXPLOSIVES 1.2	172.522
1.3	EXPLOSIVES 1.3	172.522
2.3	POISON GAS	172.540
4.3	DANGEROUS WHEN WET	172.548
6.1 (PG I, Inhalation Hazard only)	POISON	172.554
7 (Radioactive Yellow III label only)	RADIOACTIVE	172.556
TABLE 2		
1.4	EXPLOSIVES 1.4	172.523
1.5	EXPLOSIVES 1.5	172.524
1.6	EXPLOSIVES 1.6	172.525
2.1	FLAMMABLE GAS	172.532
2.2	NON-FLAMMABLE GAS	172.528
3	FLAMMABLE	172.542
Combustible Liquid	COMBUSTIBLE	172.544
4.1	FLAMMABLE SOLID	172.546
4.2	SPONTANEOUSLY COMBUSTIBLE	172.547
5.1	OXIDIZER	172.550
5.2	ORGANIC PEROXIDE	172.552
6.1 (PG I-II No PG I Inhalation Hazard)	POISON	172.554
6.1 (PG III)	KEEP AWAY FROM FOOD	172.553
6.2	None	
8	CORROSIVE	172.558
9	CLASS 9	172.560
ORM-D	None	

FIGURE 55A

of whatever is being placarded. There are however, placarding exceptions that could apply. If the exceptions cause problems forget them and use the KIS Method. The worst thing that could happen using the KIS Method is that placards might be used that are not required. This is not a violation because of the Permissive Placarding provisions of §172.502(d) which specifically permits the display of placards when a Hazardous Material is being transported even though an exception could be used, providing the placarding otherwise meets the placarding requirements of 49 CFR.

1. The Table 2- 454 kg (1001 Pound) Exception- Placarding is not required for HIGHWAY and RAIL shipments of vehicles, rail cars, or freight containers containing:

a. Less than 454 kg(1,001 lbs) aggregate (total) Gross Weight.

OF

b. Hazardous Materials listed in Table 2.



FIGURE 55B

Illustration: If a motor vehicle has 400 kg (882 lbs) gross weight (total weight of material plus packaging) of Class 8 materials and 400 kg (882 lbs) "gross weight" of Class 3 Hazardous Materials for a total gross weight of 800 kg (1764 lbs) placarding would be applicable. The "aggregate" (total) gross weight of ALL the Hazardous Materials listed in Table 2 is not less than 454 kg (1,001 pounds). On the other hand, if the vehicle contained 200 kg (441 pounds)gross weight of EACH of these Table 2 materials placarding would not be mandatory. The total gross weight of Table 2 Hazardous Materials is 400 kg (882 lbs) which is less than 454 kg (1001 lbs) (172.504(c)).

a. The 454 kg (1001 Pound) Exception Does Not Apply To- This exception does not apply to the following (172.504(c))

- (1). Table 1 Hazardous Materials, or
- (2). Transport vehicles and freight containers required to be placarded under 172.505, or
- (3). Transportation by aircraft or vessel, or
- (4). Portable Tanks, Cargo Tanks, and Tank Cars

2. The Table 2- DANGEROUS Placard Exception- A DANGEROUS Placard may be used in lieu of individual placards for freight containers, motor vehicles, rail cars, and unit load devices containing two or more Hazard Classes or Divisions of Hazardous Materials requiring different Placards specified in Table 2.



a. The DANGEROUS Exception Does Not Apply- This exception does not apply to the following (172.504(b)):

- (1). Table 1 Hazardous Materials, or
- (2). When 2268 kg (5,000 pounds) or more of one Hazard Class or Division is loaded at one loading facility.

Illustration- A motor vehicle containing 1362 kg (3,003 lbs) of Class 3 and 1362 kg (3,003 lbs) of a Division 6.1, Packing Group II Hazardous Materials may be placarded with either DANGEROUS placards or FLAMMABLE and POISON placards. If 3,000 kg (6607)pounds of Class 3 were loaded onto the truck at the next stop the truck must be placarded with FLAMMABLE Placards because 2,268 kg (5,000 lbs) or more of one Hazard Class or Division was loaded at one loading facility. In addition, the truck must be placarded with POISON placards to reflect the 1362 kg (3,003 lbs) of Division 6.1 materials also on board(172.504(b)).

3. Non Bulk Residue Exception- Non Bulk packagings containing only the residue of Table 2 Hazardous Materials do not have to be included in determining placarding (172.504(d)).

4. Additional Exceptions- Additional Class, Division and Placard specific exceptions are authorized in 172.504(f)).

5. Applicability- Placarding applies to every shipment of Hazardous Materials except:

- a. Division 6.2 Infectious Substances
- b. ORM-D Materials
- c. Combustible liquids in Non Bulk Packagings

- d. Limited Quantities of Hazardous Materials when the words **Ltd Qty** or **Limited Quantity** appear on the Shipping Paper as required by 172.203(b).

GSI CR: H. Ltd Qty Exception, 31; B. Ltd Qty Shipping Paper Entry, 47

- e. Hazardous Materials packaged and offered for transportation under §173.4.

GSI CR: H. Small Quantities, 32

C. Placarding Display- No person may transport a Hazardous Material in a motor vehicle or rail car unless the required placards are affixed **IN THE PROPER MANNER**. At a minimum, those having a placarding responsibility should ensure the following:

1. At least one of each of the required Placards is affixed to each **END** and **SIDE** of the motor vehicle or rail car (172.504(a)). A shipment of Division 4.3, Dangerous When Wet materials as defined in §173.124, must be placarded with four (4) **DANGEROUS WHEN WET** placards in a manner similar to that illustrated in Figure 57A.
2. The Placards are readily visible from the direction the motor vehicle faces except from the direction of another motor vehicle or rail car to which the placarded motor vehicle or rail car is attached (172.516(a)).

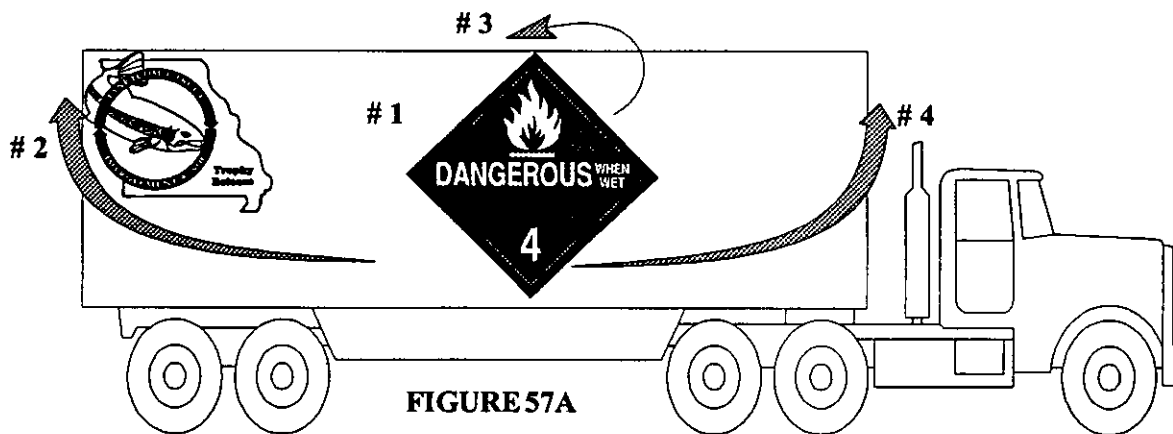


FIGURE 57A

3. The Placards are secured so that the words or Identification Numbers (when authorized) are displayed horizontally reading from left to right (172.516(c)(5)). The **DANGEROUS WHEN WET** placarding in Figure 57A is in compliance with this provision. The **FLAMMABLE** placard in Figure 57 B is not.
4. The Placards are located at least 3 inches away from any marking or advertising. The 3 inches is a minimum. Keep the Placards a sufficient distance away from other marks and advertising so that the "effectiveness" of the Placarding is not "substantially" reduced (172.516(c)(4)). The **DANGEROUS WHEN WET** Placard in Figure 57A complies with this requirement.
5. The Placards are maintained by the Carrier in such a manner that their legibility, color, visibility, and format are not substantially reduced due to damage, deterioration, or obscurement by dirt or other matter (172.516(c)(6)).
6. The Placards are either affixed to a background of a contrasting color or have a dotted or solid line outer border which contrasts to the background color (172.516(c)(7)).

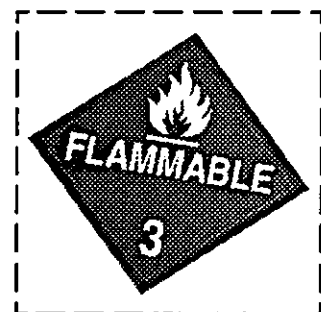


FIGURE 57B

D. **Shipper Carrier Responsibility-** Placarding applies to each person who offers a Hazardous Material for transportation OR who transports a Hazardous Material (172.500(a)).

1. **Shipper-** IF placarding is applicable to a particular shipment being offered for transportation the Shipper (person offering) MUST comply with the following:

- a. **Highway Shipments-** Provide (Offer) the placards unless the motor vehicle is already placarded (172.506(a)). The requirement is that the Shipper provide (offer) the placards. The best way for the Shipper to ensure that the vehicle is placarded is to "eye ball it". Although not required by 49 CFR this author recommends that, at a minimum, the shipper make a standard notation on the shipping paper similar to the following for every shipment:

Placards offered by _____ Accepted _____ Rejected _____
(Person offering puts initials in space after "by" and the appropriate response.)

- b. **Rail Shipments-** Affix the placards to the rail car (172.508(a)). The Shipper must also make the entry "Placarded" followed by the name of the placard on the Shipping Paper as required by 172.203(g)). It should be noted that placards displayed on transport containers, motor vehicles, or portable tanks may be used to satisfy the rail placarding requirements IF the placards and method of display are in accordance with 49 CFR (172.508(a))

2. **Carriers By All Modes-** Regardless of who has the responsibility to provide or affix placards "no person" may transport a Hazardous Material unless it is placarded as required by 49 CFR (172.500(a), 172.506(a)(1) for Highway Carriers, and 172.508(b) for Rail Carriers).

E. **What is to Be Placarded and Number of Placards-** Unless excepted by 49 CFR each motor vehicle, bulk packaging, freight container, unit load device, or rail car containing any quantity of Hazardous Materials **must be placarded on both sides and ends** with the type of placards specified in Tables 1 and 2 of §172.504 and any other placards required (172.504(a)). Whenever placarding is required **four (4)** of each placard must be used.

F. **Prohibited Placarding**

1. **No Hazardous Materials or Wrong Placard-** There is a specific prohibition against placarding a motor vehicle, freight container, unit load device, or portable tank that does not contain a Hazardous Material. Further, the placard MUST represent a hazard of the material being offered or transported (172.502(a)). To use a placard two conditions must be met:

- a. The motor vehicle, freight container, unit load device, portable tank or rail car must actually contain a Hazardous Material.

AND

- b. The placard must represent a hazard of the material. It must be the right placard.

GSI CR: N. Marking, 38; D. Labeling, 42; F. Shipping Paper Entries, 45

2. **Signs or Devices Which Could Be Confused With A Placard-** Signs or other devices which may be confused with the required placards may not be affixed to motor vehicles, freight containers, portable tanks, or rail cars. Things that could cause confusion are items such as color, shape, design, or content. As a practical matter if you think you might have a problem in this area it would be a good idea to get an interpretation from RSPA (172.502(a)(2)).

- a. **International Placarding Exception-** The prohibited placarding provisions of 172.502(a) do not apply to motor vehicles, rail cars, unit load devices, freight containers, or other bulk packagings placarded in accordance with the:

1. IMDG Code
2. UN Recommendations
3. Canadian TDG Regulations

This PERMISSIVE provision is to facilitate the international transportation of Dangerous Goods (Hazardous Materials) by permitting Placarding which would otherwise be prohibited because the materials did not meet the definition of a Hazardous Material under 49 CFR or the International Placards were similar to but different from the 49 CFR Placards (172.502(b)).

G. Placard Specifications- There are very specific Placarding Specifications relating to the 414 kPa (60 p.s.i.) Mullen Test requirements; the 30 day exposure test; minimum size requirements of 273 mm (10.8 inch) per side with a solid line border approximately 12.7 mm (.5 inches) from each edge; and other design requirements in 172.519.

1. Display of Class or Division Numbers- The Class or Division Number as shown in §172.522-172.560 is required for Placards corresponding to the Primary Hazard Class or Division. The Class or Division Number may not be displayed on a Placard corresponding to a Subsidiary Risk (172.519(b)(4)).
GSI CR: Subsidiary Risk Definition, 6; B. Classification, 7; B. Labeling, 40

2. Text on Placards- Except for the RADIOACTIVE (Class 7) Placard text on placards is optional (172.519(b)(3)).

3. Color- The colors on placards must meet the requirements of 172.519(d). Note: The illustrations of Placards in this Section are in "black and white". Full color illustrations of the DOT Placards are contained in the "Official DOT Hazardous Material Warning Placard Chart" in Appendix 3.

RESERVED- Intentionally left Blank,

THE A,B,C's OF THE CLASS 3 TO COMBUSTIBLE EXCEPTION

- A. **What is it?** This Exception permits Class 3 liquids (Flammable liquids) having a Flashpoint at or above 38°C (100°F) and not more than 60.5°C (141°F) which are not being transported by air or vessel to be reclassified as **Combustible Liquids** (173.150(f)(1)).

Illustration: A Class 3 Paint having a Flashpoint of 50°C (122°F) may be reclassified to a **Combustible liquid** for domestic transportation by highway and rail but not air or vessel.

- B. **Advantages-** When used in conjunction with the Combustible Liquid Non Bulk Packaging Exception contained in 173.150(f)(2) it permits a material that would normally be required to meet Class 3 requirements to be Offered, Accepted, and Transported within the transportation system under the less stringent requirements that apply to **Combustible Liquids**. As illustrated below, these less stringent requirements can range from complete deregulation for most non bulk packagings to the use of non specification packaging in the case of bulk packagings.

1. Illustrations

Non-Bulk Packagings- For all practical purposes a 220 L (55 Gallon) drum of a Class 3 Paint having a Flashpoint of 50°C (122°) reclassified to a **Combustible liquid** under the "Class 3 To Combustible Exception" contained in 173.150(f)(1) is **NO LONGER regulated as a Hazardous Material** under the provisions of 49 CFR. The Combustible Liquid Non Bulk Packaging Exception states that the Hazardous Material regulations "do not apply to a material classed as a combustible liquid in a non bulk packaging unless the combustible liquid is a hazardous substance is a hazardous waste " (173.150(f)(2)).

Bulk Packagings- A 12,000 L (3000 Gallons) Cargo Tank a Class 3 Paint having a Flashpoint of 50°C (122°) reclassified to a **Combustible liquid** under this Exception will not be required to be packaged in either UN Standard or DOT specification packagings (173.150(f)(3)).

- C. **Caution-** The Class 3 to Combustible liquid exception contained in 173.150(f)(1) does not apply to transportation by air or water and has absolutely no applicability to the Offering and Accepting of Dangerous Goods for transportation by air or water under the Dangerous Goods Regulations contained in ICAO, IATA, or IMDG Code. The Non Bulk Packaging Exception contained in 173.150(f)(2) does not apply to Combustible liquids that are also Hazardous Wastes or Hazardous Substances.

THE A,B,C's of the CONSUMER COMMODITY (ORM-D) EXCEPTION

A. What is a "Consumer commodity"? In general terms a "Consumer Commodity" is a Hazardous Material AND its packaging that is distributed in a form intended or suitable for sale at the retail level for consumption by individuals for the purposes of personal care or household use including drugs and medicines (171.8). In addition the Hazardous Material must be Offered for transportation under the terms of an appropriate Consumer Commodities (ORM-D) Reclassification Exception.

Nothing is born a **Consumer Commodity**. ALL **Consumer Commodities** are Hazardous materials that are eligible for and Offered in accordance with an appropriate Consumer Commodities (ORM-D) Exception. For all practical purposes it is a domestic reclassification exception that permits those Hazardous Materials meeting the requirements of the exception to be reclassified from whatever Hazard Class or Division they are currently in to the ORM-D Hazard Class and to be Offered for transportation using the Proper Shipping Name **Consumer commodity**. Every material shipped as a **Consumer commodity** can be traced back to another Hazard Class or Division and Proper Shipping Name.

Illustration: A four (4) ounce package of "Va Va Boom" perfume containing flammable solvents and having a Flashpoint of 36°C (97°F) would normally be classed as a 3, Packing Group III and Offered for transportation using the Proper Shipping Name **Perfumery products**. This product is packaged and intended for sale at the retail level for personal care use. IF it also meets the other requirements for the Consumer Commodity (ORM-D) Reclassification Exception its Hazard Class changes to ORM-D and its Proper Shipping Name becomes **Consumer commodity**.

B. The Four Step Consumer Commodity ORM Reclassification Exception- The Consumer Commodities, ORM-D Exception reclassification process is a four (4) step procedure. The Hazardous Material and its packaging must pass ALL FOUR (4) STEPS or its not eligible to be reclassified and shipped under this exception.

1. DETERMINE WHETHER OR NOT THE MATERIAL AND ITS PACKAGING MEET THE DEFINITION OF A "CONSUMER COMMODITY" AS CONTAINED WITHIN 171.8. The material AND its packaging must be suitable OR intended for sale at the retail level for consumption by individuals for personal care or household use.

Application: A four (4) ounce package of "Va Va Boom" perfume meeting the definition of a Class 3, a one (1) liter package of Aldrin Insecticide meeting the definition of a Division 6.1, and a 16 ounce cylinder of Propane Fuel meeting the definition of Division 2.1 being shipped to Walmart for sale all meet this definition. They are packaged and suitable for sale at the retail level for consumption by individuals for personal care or household use. On the other hand a 55 gallon drum of "Va Va Boom" being shipped to a plant for bottling would not meet this definition because the size of the packaging is NOT SUITABLE for sale at the retail level for use by individuals for personal care or household use. The retail personal use criteria is pertains to suitability or intent, not actual use or intent.

2. DETERMINE WHETHER OR NOT THERE IS AN EXCEPTION AUTHORIZATION FOR THE MATERIAL IN Column (8A) OF THE §172.101 TABLE (HMT). It can generally be said that if there is no Exception Authorization permitted in Column (8A) of the HMT for the entry covering the Hazardous Material it is NOT ELIGIBLE to be reclassified and shipped as a **Consumer commodity, ORM-D**.

Application: Reference to Column (8A) in either the §172.101 Table (HMT) or Figure 63A indicates that there is an Exception authorized in Column (8A) for both **Perfumery products** and **Propane** but not for **Aldrin**. **Aldrin** would not be eligible for the exception because there is no Exception Authorized in Column (8A). **Perfumery products** and **Propane** might be eligible for reclassification, because there is an Exception Authorization Section listed in Column (8A) of the §172.101 Table for these materials, IF they can also meet the requirements of Steps 3 and 4, for the Exception.

3. **DETERMINE IF AN ORM-D EXCEPTION IS AUTHORIZED IN THE SPECIFIC SECTIONS APPLICABLE TO THE MATERIAL.** Generally the "Consumer Commodity Authorization", if any, will be found in the Exception Authorization Section referred to Column (8A) the §172.101 Table in a paragraph entitled "Consumer Commodities". In addition to meeting Steps #1 & #2 above a specific Consumer Commodities Exception must be authorized for the material in the Section(s) in Part 173 referred to by the §172.101 Table.

Application: Reference to the Exceptions Authorization Sections for the **Perfumery products** and **Propane**, 173.150 and 173.306 respectively indicates that there is a Consumer Commodities exception contained in paragraph 173.150(c) for **Perfumery products** and in paragraph 172.306 (h) for **Propane**. If the Hazardous Materials, as packaged, meet Step #4 they are eligible to be reclassified and Offered for transportation as a **Consumer commodity, ORM-D**. If not they are not.

4. **DOES THE PARTICULAR HAZARDOUS MATERIAL AND ITS PACKAGING MEET THE CONDITIONS CONTAINED WITHIN THE SPECIFIC CONSUMER COMMODITY EXCEPTION PARAGRAPH?** In addition to meeting the requirements of Steps 1-3 above the Hazardous Material and its packaging must meet all the conditions contained within the Consumer Commodities Exception paragraph applicable to the material. At a minimum these conditions will include those necessary to ship the material under the "Limited Quantity Exception". In some cases, as illustrated by paragraph 173.306(h) for the **Propane**, there will be additional conditions that must be met. If either the Hazardous Material or its packaging does not meet the conditions of the applicable Consumer Commodities Exception paragraph the Hazardous Material may not be reclassified as an **ORM-D** and Offered for transportation as a **Consumer Commodity**.

Application: Reference to paragraph 173.150(c) would permit a 4 ounce package of "Va Va Boom", a Class 3, **Perfumery product**, packaged in one (1) 4 ounce glass bottle inside a "non specification" fiberboard box and otherwise meeting the conditions of 173.150 to be reclassified as an **ORM-D** and Offered for transportation as a **Consumer Commodity**. On the other hand reference to 173.306(h) indicates that a 16 ounce cylinder of **Propane** does not meet the requirements of this Consumer Commodity Exception paragraph. Even though it meets the first three (3) steps of the process the 16 ounce cylinder of **Propane** MAY NOT be reclassified as an **ORM-D** and Offered for transportation as a **Consumer Commodity**.

Hazardous Material Table - § 172.101 Table				
Hazardous materials Proper Shipping Names (2)	Pack- ing group (5)	Special Provis. (7)	Excep- tions (8A)	Non Bulk Pack- agings (8B)
Aldrin, liquid	II		None	202
Perfumery products	II	T7, T30	150	202
	III	B1, T7, T30	150	203
Propane			306	304

FIGURE 63A

C. General Effect Of Reclassification- If a Hazardous Material is eligible for and reclassified as an ORM-D its Proper Shipping name becomes **Consumer commodity** and that is the entry in the §172.101 Table that becomes applicable to the Hazardous Material. A comparison between the **Consumer commodity** and **Perfumery products** entries in the §172.101 Table or Figure 64A below shows that once reclassified as an ORM-D there is nothing in the system that alerts Emergency Responders, transportation workers and others to the previous Hazard Class or Proper Shipping Name. It is this author's opinion that Hazardous Materials that are properly reclassified, packaged, and otherwise shipped in accordance with the Consumer Commodities Exceptions pose minimal risk while being transported in the transportation system. The words properly reclassified, packaged, and otherwise shipped in accordance with the regulations must be stressed. It is his further opinion that Hazardous Materials Offered for transportation under this exception that are not properly reclassified, packaged, and otherwise shipped in accordance with the regulations can, because of the broad scope of this exception, significantly increase the risks associated with the transportation of such materials.

Hazardous Material Table-§172.101 Table

Sym- bol	Hazardous materials descriptions and proper shipping names	Hazard class or Division	Identifi- cation Numbers	Pack ing group	Label(s) Required (If not excepted)
(1)	(2)	(3)	(4)	(5)	(6)
D	Aldrin, liquid	6.1	NA2762	II	POISON
D	Consumer commodity	ORM-D	None		None
	Perfumery products	3	UN1266	II	FLAMMABLE LIQUID
	Propane see also Petroleum gases, liquefied	2.1	UN1978		FLAMMABLE GAS

FIGURE 64A

D. Specific Effects of the Consumer Commodities ORM-D Exception- The following changes in the normal regulatory compliance procedures result when a particular Hazardous Material is shipped as a **Consumer commodity, ORM-D**:

1. IDENTIFICATION

- a. Proper Shipping Name: **Consumer commodity**
- b. Hazard Class: **ORM-D**
- c. ID Number: There is no UN or NA Number.

In effect, for the purposes of transportation, the Hazardous Material **LOSES ITS PREVIOUS IDENTITY** and becomes a **Consumer commodity**. As discussed in C. above and illustrated in Figure 64A if a **Perfumery products** is shipped as a **Consumer commodity** the Proper Shipping Name changes from **Perfumery products** to **Consumer commodity**; the Hazard Class changes from Class **3** to **ORM-D**; and the ID Number of **UN 1266** that applies to the **Perfumery products** entry no longer applies. The effects of this Exception on Marking and Labeling is illustrated in Figure 65A.

2. PACKAGING- One of the main advantages of the Consumer Commodities ORM-D Exception is that the packaging does not have to meet the UN Standard or U.S. DOT Specification packaging requirements. This does not mean that there are no packaging standards that apply however because, in general, the

combination packagings requirements of the appropriate Limited Quantity Exception will require the use of strong outer packagings and compliance with the General Packaging Requirements of Subpart B of Part 173. (173.156(b)).

3. MARKING AND LABELING- With the exception of the ID Number marking packages containing Consumer Commodities must be marked with all other applicable information required to be marked on non bulk packages of Hazardous Materials (172.300(a)). The Labeling required by Subpart E of Part 172 does not apply to Consumer commodities (172.400a(b)).

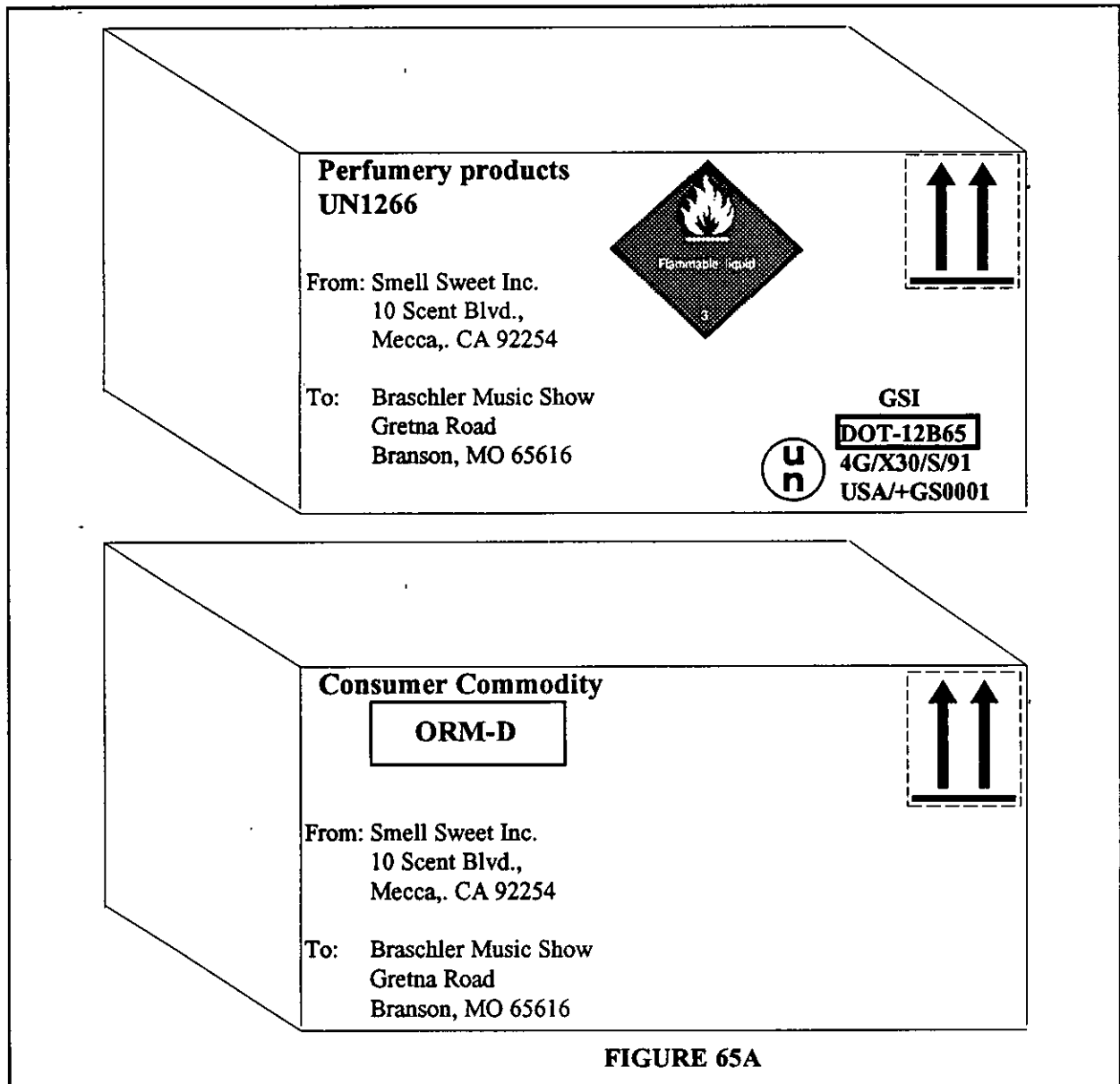


FIGURE 65A

(a). ORM-D Designation- In addition to all other required Markings each package containing Consumer commodities must be marked on at least one end or side immediately following or below the Proper Shipping Consumer commodity with the designation ORM-D or ORM-D-AIR, as appropriate. The appropriate ORM-D Designation must be in a rectangle that is approximately 6.3 mm (0.25 inches) larger on each side than the designation itself. The ORM-D designation for a shipment of a Consumer commodity, ORM-D other than by air is illustrated in Figure 65A.

4. **SHIPPING PAPERS-** Shipping Papers are not required for "Consumer commodity" shipments unless:

1. Being shipped by Air ((172.200(b)(3))

OR

2. The **Consumer commodity** is regulated as either a Hazardous Substance or Hazardous Waste. The Shipping Paper exception contained in the appropriate Consumer Exception paragraph used for the reclassification does not apply to Hazardous Substances or Hazardous Wastes.
GSI CR: Hazardous Substances, 17; Hazardous Wastes, 21; Shipping Papers, 43

5. **PLACARDING-** There are no ORM-D placards and Placarding is not required for ORM-D materials (172.500(b)(2)).

E. Consumer Commodity, ORM-D "Retail Outlet" Exception- Paragraph 173.156 (b) permits an additional limited exception to the strong outside packaging requirements of Sections 173.150-173.155 and §173.306 and the ORM-D Designation marking required by 172.316 for ORM-D materials unitized in carts, cages, or similar overpacks when being transported by Private or Contract Motor Carrier from a distribution center to a retail outlet.

F. Domestic Exception Only- The Consumer Commodities ORM-D Exception is a U.S. (Domestic Exception) and has no general applicability when shipping Internationally under the provisions of IATA, ICAO, or the IMDG Code.

Appendices

UN PERFORMANCE ORIENTED PACKAGING

by: Gary J. Groman, BSBA, JD

Detailed Design and Construction Standards

The "detailed design and construction standards" used for packagings by the United States under 49 CFR and similar, but different standards used by other countries throughout the world, has provided an excellent level of safety for the safe transportation of Dangerous Goods throughout the world for many years. Such standards are however, complex, numerous, and differ in specifics from country to country. In some cases, they differ for transportation by different modes within the same country. In the United States alone, the 1990 Edition of 49 CFR contains over 10 different "detailed design and construction standards" for closed head steel drums, some of which may be used for transportation by air and some of which may not (Subpart D of Part 178).

The problems associated with the different but similar "detailed design and construction standards" of various countries throughout the world and with the transportation of the different packagings authorized by one country into another and their impact on free trade between countries were obvious. Also of primary concern was the fact that the "detailed design and construction standards" of one country were very seldom, if ever, understood or enforced by those outside of the country that used the specific standard. There was no one packaging safety standard that could be used by those having a safety responsibility within the international transportation system whether carrier, shipper, or enforcement personnel, to determine whether or not a particular packaging was authorized in any given situation. The "UN Performance Oriented Packaging (POP) standard" was developed by the UN Committee of Experts on the Transport of Dangerous Goods to address these problems and provide for packaging safety while facilitating the free flow of these packagings within international commerce.

Source of UN Performance Oriented Packaging (POP) Standards

Generally, it can be said that "UN Performance Oriented Packaging (POP) standards" are developed by the UN Committee of Experts on the Transport of Dangerous Goods and published in Chapter 9 of the "UN Recommendations for the Transport of Dangerous Goods" commonly called the "Orange Book". This serves as the basis and authority for the Performance Oriented Packaging requirements published in the ICAO Technical Instructions For The Safe Transport of Dangerous Goods By Air (ICAO) and the International Maritime Dangerous Goods Code (IMDG). In addition, it serves as the basis for the Performance Oriented Packaging standards adopted by individual countries. In the United States the Performance Oriented Packaging standards for non bulk packagings in ICAO have been authorized for all air transportation since January 1, 1983. In addition, although not mandatory until at least October 1, 1996 for domestic transportation, 49 CFR, as of January 1, 1991, permits the use of the UN Performance Oriented Packaging standards for non bulk packagings for all domestic transportation of Hazardous Materials (171.14(b)). One source of obtaining the publications shown in bold type is American Labelmark (Label Master) 1-800-621-5808.

UN Performance Oriented Packaging (POP) Standards

The UN Performance Oriented Packaging (POP) standard is based on the anticipated performance of the packaging within the transportation system rather than the detailed design and construction of the packaging. Although there are minimal construction standards for Performance Oriented Packaging (POP) contained in the UN Publications mentioned above they are expressed in general terms rather than the detailed terms used for "design and construction" based packaging standards. As an example, the construction standards for the one closed head steel drum authorized under the UN Performance Oriented Packaging standard, the UN1A1 steel drum, take up about 25% of one (1) page. The detailed construction standards for just 3 of the over 10 authorized closed head steel drums contained within Sub Part B, Part 178 of the 1990 Edition of 49 CFR, those in the DOT-17 series, take up over 7 full pages (178.115-178.117).

The primary emphasis of Performance Oriented Packaging standards is to secure the level of safety desired by ensuring the ability of a given package type to successfully pass a series of performance tests designed to test

its ability to withstand the normal conditions incident to transportation rather than its design or construction.

UN Performance Oriented Packaging Standards Apply to Non Bulk Packagings

As of January 1, 1991 the UN Performance Oriented Packaging standards that have been developed apply to non bulk packagings, those having a rated capacity of no more than 400 kg (880 lbs) for solids or an internal volume of no more than 450 L (118.9 Gallons) for liquids. They do not apply to cylinders, Radioactive Materials and bulk packagings (49 CFR - Page 52403 of the Federal Register dated 12/21/90 and 9.1.2 of the "UN Recommendations for the Transport of Dangerous Goods").

UN Packing Groups

Most of the Performance Oriented Packaging tests are based on the Packing Group for which the packaging is being tested (qualified). Most Dangerous Goods are assigned to a Packing Group which indicates their relative degree of danger while in the transportation system (49 CFR 171.8 ; Introductory Note 2 to Part 3 in ICAO; 3.0.6 in IATA; and 1.2 of Annex I to the IMDG Code). The Hazard Class gives the type of Hazard. The Packing Group gives the degree of that hazard. This author prefers to look at it this way, the Hazard Class tells us that a material is regulated as a Hazardous Material or Dangerous Goods and the Packing Group tells us just how regulated it is:

Packing Group I	Greatest Danger (Most Regulated)
Packing Group II	Moderate Danger (Moderately Regulated)
Packing Group III	Least Danger (Least Regulated)

Performance Oriented Packaging Tests - Overview

The standard UN Performance Oriented Packaging tests and the general purpose of each is as follows:

<u>Test Type</u>	<u>Ability of Package/Packaging To</u>
Drop	Contain and protect the Dangerous Goods if the package is dropped.
Leak proofness	Prevent leakage of liquids under conditions of normal transport.
Hydrostatic Pressure	Prevent leakage of liquids under pressure.
Stacking	Maintain stability w/in a stack while stacked with similar type packages.

UN Performance Testing

General Pre Testing Requirements

In most cases the packagings to be used in testing will require some special preparation prior to the conduct of the actual tests (49 CFR 178.602; 7;4.2 in ICAO; 6.2.11-6.2.15 in IATA; and 8.3 of Annex I to the IMDG Code). At a minimum this will include:

1. **All Tests - Paper or Fiberboard**: Paper or Fiberboard packagings must be preconditioned for 24 hours in an atmosphere maintained within certain temperature and relative humidity. Although there are choices the preferred is a relative humidity of 50% plus or minus 2% at a temperature of 23°C (73°F) plus or minus 2°C (4°F) (49 CFR 178.602(d); 7;4.2.3; 6.2.13 in IATA; and 8.3.3 of Annex I to the IMDG Code).
2. **All Tests - UN4G Fiberboard Box**: The water resistance of the outer layer of the Fiberboard used in the UN4G Fiberboard box has to be such that the increase in weight, as determined by a test carried out over a 30 minute period using the Cobb method of determining water absorption, does not exceed more than 155 grams per square meter (0.0316 lbs per square foot) (49 CFR 178.516(b)(1); 7;3.1.10.1 in ICAO; 6.1.21 in IATA; and 7.11.1 of Annex I to the IMDG Code).

3. **All Tests - Plastic Drums, Jerri Cans, and Composite Packagings:** Under the UN Packaging Standard a chemical compatibility/permeability test must be performed on the actual samples of plastic packagings used for all tests where the plastic of the packaging will come in contact with the material being transported (7;4.2.4 of ICAO; 6.2.14 of IATA; and 8.3.5 of Annex 1 of the IMDG Code). The U.S. standard is different. See 173.24(e) and page 6 of this Appendix.

DROP TEST

1. **Number of Samples and Type of Drop:** The number of packages to be dropped and the drop orientation depends on the type of packaging being tested. A UN4G combination packaging would require five (5) packages, one for each drop, prepared as for transportation and conditioned as required. Individual packagings would be dropped flat on the bottom, top, one (1) long, one (1) short side and on a corner. The number and type of drops for other packaging types can be found in 49 CFR 178.603; 7;4.3 of ICAO; 6.2.15 of IATA; and 8.4 of Annex 1 to the IMDG Code.

2. **Required For:** All packages prepared and filled as for transportation.

3. **Special Preparation of Samples Unique to Test:**

- a. **All Packagings** - Must be filled to not less than 95% of their capacity for solids and to not less than 98% for liquids (49 CFR 178.602(b); 7;4.3.2 of ICAO; 6.2.11 of IATA; and 8.4.2 of Annex 1 to the IMDG Code).
- b. **Plastic Packagings:** Tests for plastic drums, jerricans, boxes, composite packagings, and combination packages with inner plastic packagings, other than bags or expanded polystyrene boxes, must be performed when the temperature of the samples and their contents has been reduced to -18°C (0°F) or lower (49 CFR 178.603(c); 7;4.2.1 of ICAO; 6.2.16 of IATA; and 8.3.1 of Annex 1 to the IMDG Code).

4. **Description of Test & Drop Height-** Packages prepared as for transportation are dropped from the appropriate height onto a non resilient, rigid, horizontal and flat surface. The number and type of drops depend on the specific packaging being tested. The drop heights will depend on the Packing Group of the material for which the packaging will be used as follows:

<u>UN Packing Group</u>	<u>Drop Height</u>
I	1.8 m (70.8")
II	1.2 m (46.8")
III	.8 m (30")

- a. If the Relative Density exceeds 1.2 and the test is performed with water, the drop heights should be computed by multiplying the Relative Density by the factor indicated below as appropriate for the UN Packing Group for which it is being tested:

<u>UN Packing Group</u>	<u>Drop Height</u>
I	Relative Density x 1.5 m
II	Relative Density x 1.0 m
III	Relative Density x .67 m

Illustration: The drop height for a packaging being tested using water for a material with a Relative Density of 1.6 and Packing Group II would be 1.6 m (63").

5. **Criteria for Passing Test:** There is no leakage of material in the package, no release of the inner packagings from the outer packaging, and no other indication of any damage likely to affect safety during transportation. Except for combination packagings, each packaging containing liquids must be leakproof when equilibrium has been reached between the internal and external pressures. It should be noted a slight discharge from a drum, jerrican, box, or bag immediately after impact need not be considered a failure provided no further leakage occurs (49 CFR 178.603(f)(5); 7;4.3.5 of ICAO; 6.2.19 of IATA; and 8.4.5 of Annex 1 to the IMDG Code)).

LEAKPROOFNESS TEST

1. Number of Samples:

- a. Design Qualification Testing - Three (3) of each different packaging. Each must pass.
- b. Production/Reconditioning Testing: All packagings (49 CFR 178.604(b); 7;4.1.9 of ICAO; 6.2.9 of IATA; and 3.12 of Annex 1 to the IMDG Code).

2. Required For: All packagings designed to contain liquids except inner packagings of combination packagings.

3. Special Preparation of Samples Unique to Test: See Special Note: 6 below.

4. Description of Test: Generally the packaging to be tested will be placed under water and restrained. Compressed gas will be applied to the packaging at a pressure not less than that shown below as appropriate for the Packing Group for which it is being tested (49 CFR 178.604(e); 7;4.3.2 of ICAO; 6.2.22 of IATA; and 8.5.4 of Annex 1 to the IMDG Code):

<u>UN Packing Group</u>	<u>Test Pressure (Gauge)</u>
I	Not less than 30kPa (4 psi)
II	Not less than 20kPa (3 psi)
III	Not less than 20kPa (3 psi)

5. Criteria for Passing Test: No leakage of air from the packaging. Generally this will be indicated by the formation of air bubbles.

6. Special Note: This test, when required, must be performed on all Production Packagings as well as Pre Production (Design Qualification) packagings. Basically this means that this test must be conducted on the packaging prior to production to qualify it and on each produced packaging before its initial use. It must also be performed after each reconditioning prior to reuse. The Design Qualification tests must have their own closures properly fitted to the packaging. The Production and Reconditioning tests do not require that the packages be fitted with their own closures (49 CFR 178.604(c); 7;4.4.3 of ICAO; 6.2.25 of IATA; and 8.6.1 of Annex 1 to the IMDG Code).

INTERNAL (HYDROSTATIC) PRESSURE TEST

1. Number and Type: Three (3) samples per design type and manufacturer must be tested.

2. Required For: All plastic, metal, and composite packagings intended to contain liquids. This test is not required on inner packagings of combination packagings unless they are intended for transportation by air (49 CFR 178.605(a); 7;4.5.1 of ICAO; 6.2.23 of IATA; and 8.5.5 of Annex 1 to the IMDG Code).

3. Special Preparation of Samples Unique to Test: - None

4. Description of Test: Packagings to be tested are filled with water or other suitable liquids completely so as to eliminate all air pockets. Using a hydrostatic pressure supply the appropriate amount of pressure is applied internally, through a fitting that has been installed on the packaging for this purpose. The appropriate test pressure must be maintained for **five (5) minutes** for metal and composite packagings of glass, porcelain, or stoneware and **30 minutes** for plastic and composite packagings of plastic material.

Test Pressures: Except for packagings designed and being tested for Packing Group I, the Test Pressure will vary depending on the Vapor Pressure of the material and on which of the three (3) authorized testing methods used. Packagings being tested for **Packing Group I** must be tested at a minimum test pressure of 250kPa (36 psi) (49 CFR 178.605(d); 7;4.5.3 of ICAO; 6.2.27 of IATA; and 8.6.4 of Annex 1 to the IMDG Code).

5. **Criteria for Passing Test:** Each packaging tested must not leak.

6. **Pressure Requirements for Air Transportation:** For all practical purposes the inner packaging exception DOES NOT apply to air shipments because of General Packaging Requirements which create minimum pressure requirements (49 CFR 173.27(c); 3;1.1.6.1 of ICAO; and 5.0.13 of IATA). All packagings transported by air for which the retention of liquids is their primary function must be capable of withstanding, without leakage, the following pressures as applicable to the Packing Group:

a. **Packing Group I:**

- (1.) All packagings other than inner packagings of combination packagings: A Minimum pressure of 250kPa (36.3 psi) (49 CFR 178.605(d); 7;4.5.4 of ICAO; and 6.2.28 of IATA).
- (2.) Inner Packagings of Combination packagings: All packagings must be capable of withstanding an internal pressure which produces a pressure differential of not less than 95kPa (13.8 psi) OR a pressure related to the vapor pressure of the liquid to be transported determined in accordance with one (1) of the two(2) methods permitted WHICHEVER IS GREATER (49 CFR 173.27(c); 3;1.1.6.1 of ICAO; and 5.0.13 of IATA).

b.. **Packing Groups II:** All packagings must be capable of withstanding an internal pressure which produces a pressure differential of not less than 95kPa (13.8 psi) OR a pressure related to the vapor pressure of the liquid to be transported determined in accordance with one (1) of the two(2) methods permitted WHICHEVER IS GREATER (49 CFR 173.27(c); 3;1.1.6.1 of ICAO; and 5.0.13 of IATA).

c. **Packing Group III:**

- (1). Class 3 or Division 6.1 Only: All packagings must be capable of withstanding an internal pressure which produces a pressure differential of not less than 75 kPa (10.88 psi) OR a pressure related to the vapor pressure of the liquid to be transported determined in accordance with one (1) of the two (2) methods permitted WHICHEVER IS GREATER (49 CFR 173.27(c); 3;1.1.6.1 of ICAO; and 5.0.13 of IATA).
- (2). All Other Classes and Divisions: All packagings must be capable of withstanding an internal pressure which produces a pressure differential of not less than 95 kPa (13.8 psi) OR a pressure related to the vapor pressure of the liquid to be transported determined in accordance with one (1) of the two (2) methods permitted WHICHEVER IS GREATER (49 CFR 173.27(c); 3;1.1.6.1 of ICAO; and 5.0.13 of IATA).

STACKING TEST

1. **Number of Samples:** Three (3) test samples for each packaging to be tested.

2. **Required For:** All packagings except bags (49 CFR 178.606(a); 7;4.6.1 of ICAO; 6.2.30 of IATA; and 8.7 of Annex 1 to the IMDG Code).

3. **Special Preparation of Samples Unique to Test:**

- a. **All Packagings** - Must be filled to not less than 95% of their capacity for solids and to not less than 98% for liquids (178.602(b)).

4. **Description of Test:** Each test sample shall be subject to a force applied to the top surface of the sample that is equivalent to the total weight of identical packages which might be stacked on top of it during transportation. In determining the amount of force to be applied the minimum height of the stack including the sample must be no less than 3 m (10 ft). The force must be applied to the top of the sample in the same manner as applied by actual packages stacked on top of it; evenly dispersed etc.

APPLICATION: A sample having a height of 304.8 mm (12 in) weighing a Gross Weight (Mass) of 6 kg. (13.2 lbs.) would be subjected to a force of at least 54 kg (119lbs) because, including the sample, nine (9) more identical packages would be required to reach the minimum stacking height of 3 m (10 ft). The force must be applied for

a period of 24 hours except in the case of plastic 6HH composite packaging, drums, and jerricans, intended for liquids, in which case, it must be applied for a period of 28 days at a temperature of not less than 40°C (104°F) (49 CFR 178.606(d); 7;4.6.4 of ICAO; 6.2.33 of IATA; and 8.7.3 of Annex 1 to the IMDG Code).

5. **Criteria for Passing Test:**

- a. **Evaluation** - No test sample may leak, show any deformation or distortion likely to cause instability in stacks of packagings or reduce its strength, or any deterioration which could adversely affect transportation safety.
- b. **Stability Determination** - Stacking stability is considered adequate when after the Stacking Test and evaluation described in 4. and 5.a. above have been completed, and, in the case of plastic receptacles after cooling to ambient temperature, two (2) filled packages of the same type are placed on each filled test sample and maintain their position for a minimum of one (1) hour.

VIBRATION STANDARD (HM-181 Only)

Packagings being tested under Subpart L of Part 178 of 49 CFR must also meet the vibration standard requirements of Section 178.608 (173.24a(a)(5)). There is no similar test required under the UN Testing scheme as of January 1, 1991 however, we at GSI recommend that the Vibration Standard be met for all non bulk packaging marked as complying with UN Performance Oriented Packaging standards. Although an argument can be made that the authority in 171.11 and 172.12 permits the certification and use of UN packaging tested under ICAO or the IMDG Code, which does not require the vibration test, it is a basically useless argument in terms of potential civil liability and standardization of packaging for both domestic and international transportation.

1. **Number of Samples:** Three (3).
2. **Required For:** All packagings.
3. **Special Preparation:** Selected at random and filled and closed as for shipment.
4. **Description of the Test:** Placed on a vibrating platform and restrained from horizontal movement but left free to bounce, rotate, and move vertically. The test must be performed for one (1) hour at a frequency that causes the package to be raised from the platform in such a manner that a piece of material such as steel strapping or paperboard can be passed between the bottom of any package and the platform, a distance of approximately 1.6mm (.063"). Immediately following the period of vibration each package must be removed from the platform, turned on its side and checked for any indication of leakage.
5. **Criteria For Passing Test:** No rupture or leakage from any package.

Compatibility/Permeability Testing For Plastic Packagings

Although there is no specific UN Compatibility/Permeability Test specified as part of the UN Performance Oriented Packaging Tests, there are general requirements that require the consideration of these factors for all plastic packagings to be used in the actual UN Performance Tests (Part 7;4.2.4 of ICAO, 6.2.14 of IATA, and 8.3.5 of Annex 1 to the IMDG Code).

The bottom line is that, under the UN standards, some sort of test to determine the permeability and compatibility of a plastic packagings or receptacles for their intended contents or, an authorized equivalent, **must be performed on all the actual plastic packagings to be used** in the Drop, Leakproofness, Hydrostatic, or Stacking tests involving the use of those packagings.

In general terms, "Permeability" is a measure of the amount of material that passes through the packaging during the test period. It is calculated as the difference in the gross weight (gross mass) of the package at the end of the test period from the original gross weight at the beginning of the test period and will generally be expressed in terms of percentage of the original gross weight of the package. Compatibility has to do with whether or not the intended contents of the package cause permanent deformation, deterioration, cracking, excessive corrosion,

embrittlement, leakage, rupture or other defects likely to cause leakage or a packaging failure.

Basically the test involves packaging the material as it will be offered for shipment and storing it for a prescribed period of time at a prescribed temperature. After the prescribed period, the permeability measurements are taken and a visual inspection is conducted to see if the packaging integrity has been effected. Some of the acceptable test methods are described in Part 7;4.2.4 of ICAO; 6.2.14 of IATA, 8.3.5 of Annex 1 of the IMDG Code, Appendix B to Part 173 of 49 CFR, and in Annex A1 of ASTM D4919-89.

It is again stressed that the compatibility of plastic packagings for the material they are going to contain must be established **PRIOR to conducting the UN Performance tests** using an acceptable test method. **The actual packages used to perform the UN Performance tests must be the packages used in the Compatibility Test.** This helps insure that any potential compatibility problems will not impact in an unfavorable manner on the ability of the packagings to pass the required performance tests.

MANUFACTURER

The "manufacturer" is defined by 49 CFR 171.8 as "any person who certifies that a packaging complies with a UN or DOT standard, including a person who applies or directs another to apply a DOT specification marking or a UN mark to a packaging."

DESIGN QUALIFICATION TESTING

The entire UN performance oriented packaging system is designed to insure that the design, construction, and assembly of all packages meet the Performance Oriented Qualification tests at the start of production initially for the package design and for each new or different packaging (178.601(d)).

Testing Documentation and Retention: In addition to conducting the tests the manufacturer must keep records documenting the tests at each location where that packaging is manufactured and at each location where the design qualification tested are conducted. These records must be kept for as long as the packaging is produced and for at least two (2) years thereafter. At a minimum the records should include "specific types, dates, locations, packaging specifications, test specifics (drop heights, hydrostatic pressure, etc.), results, and test operators' names or name of person responsible for the testing" (178.601(k)(1)).

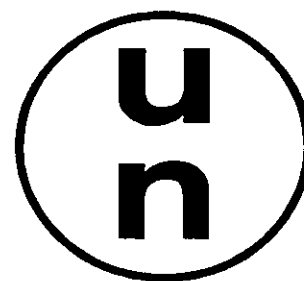
PERIODIC RETESTING

Periodic Retesting must be done by the manufacturer to insure that the packaging produced and used is capable of passing the design qualification tests. For single or composite packagings this retesting must be no less than once each 12 months. For combination packagings this retesting must be done no less than once each 24 months (178.601(e)). The times given are the maximum times between tests. It should be stressed that it is the manufacturer's responsibility to insure that the packaging as used is at all times and in all respects capable of passing the design qualification tests and other wise is in compliance with all applicable regulations. This may require more frequent testing. Note too that time period is based on the passage of months not years. A single packaging tested on July 1, 1990 would have to be retested within 12 months of that date or no later than June 30, 1991.

Testing Documentation and Retention: In addition to conducting the periodic retests the manufacturer must keep records documenting the tests at each location where that packaging is manufactured and at each location where the period retests are conducted. These records must be kept until the tests are successfully performed again and for at least two (2) years from the date of each test. At a minimum the records should include "specific types, dates, locations, packaging specifications, test specifics (drop heights, hydrostatic pressure, etc.), results, and test operators' names or name of person responsible for the testing" (178.601(k)(2)).

UN SPECIFICATION PACKAGE MARKING

General Requirements- The manufacturer must mark every package that is required to conform to the UN Standard with the appropriate information indicated below in the sequence indicated. The markings must be stamped, embossed, printed, burned; or otherwise marked on the packaging so as to provide adequate accessibility, permanency, legibility, and contrast (178.3(a)(3)).



Size of Markings- Unless otherwise specified the required UN Markings must be 6.0mm (.2 ") if the capacity is equal to or less than 30 kg (66 lbs) or 30 L (7.9 Gals.) and 12.0 mm (.47 ") if the capacity is more than 30 kg (66 lbs) or 30 L (7.9 Gals.) (178.3(a)(4)).

Location of Markings- The required UN markings must be clearly visible and may not be marked on a "removeable head" (178.503(a) and 178.503(b)).

1. **UN Indication-** The package must be marked with the "UN Symbol" (Brand), the letter "u" over the top of the letter "n" inside a circle. In lieu of the "UN Symbol" just the letters UN are required on metal containers (receptacles) (49 CFR 178.503(a)(1)).
2. **Packaging Identification Code-** The Packaging Identification Code consists of the Type of Packaging, Material of Construction, and a Category within the type when applicable (178.503(a)(2)). Table 1 below contains a summary of the most commonly used "Codes". The Type of Packaging will be indicated by an Arabic number such as the number 1 for a drum or the number 4 for a box (178.502(a)(1)). The material that the packaging is constructed from will be indicated by an UPPER CASE Latin letter such as the letter A for steel or the letter G for Fiberboard. A UN1A is a steel drum (178.502(a)(2)). A  4G is a Fiberboard box. In some cases such as barrels, drums, and jerricans, there is a number which indicates the category of a container within a certain Type and Material. In marking drums and jerricans a "closed head" container would be indicated by the number 1 and an "open head" container would be indicated by the number 2 marked immediately after the Material of Construction Code. A drum marked UN1A1 would be a closed head steel drum and a drum marked UN1A2 would be an open head steel drum.

Table 1-Type-Material-Category

Type	Material	Category
1 Drums	A Steel	A, B, or H Drums-Jerricans
2 Barrels	B Aluminum	1 Closed Head
3 Jerricans	C Natural Wood	2 Open Head
4 Boxes	D Plywood	A or B Boxes
5 Bags	F Reconstituted Wood	1 Ordinary A or B
6 Composite Packagings	G Fiberboard	2 A or B w/inner liner or coating
7 Pressure Receptacle	H Plastic	C Boxes
	L Textile	1 Ordinary
	M Paper, multiwall	2 w/sift proof walls
	N Metal other than steel or aluminum	H Boxes
	P Glass Porcelain, or stoneware.	1 Expanded Plastic
		2 Solid Plastic
		L Bags
		2 Sift proof
		M Bags
		2 Multi wall, water resistant

- a. **Equivalent Packagings-** The letter "W" after the Identification Code indicates that the packaging, although the same type as that indicated by the code, is either manufactured or tested in a manner different than that specified in §178.505-178.523 or Subpart M of Part 178 under an approval issued by the Associate Administrator for Hazardous Materials Safety (178.503(a)(2)).
 - b. **Composite Packagings-** When dealing with Composite Packagings two (2) letters are used, in sequence, for the Material Code. The first letter indicates the material of the inner receptacle and the 2nd indicates the material of the outer packaging. A UN6HA1 is a Composite Packaging consisting of a plastic inner receptacle in a steel drum (178.502(b)).
 - c. **Combination Packagings-** Only the codes for the outer packaging is used on combination packagings. The Inner Packagings may be metal, glass, etc. and there will be no indication of their type or construction marked on the outside of the package (178.502(c)).
3. **Performance Standard Code -** An upper case "X", "Y" or "Z" indicating the performance standard for which the packaging has been successfully tested as follows:

X Meets Packing Group I, II, and III

Y Meets Packing Group II, and III

Z Meets Packing Group III only.

Illustration: A box marked $\textcircled{\text{U}}\text{n}$ 4G/X should be a fiberboard box that has successfully passed the **Packing Group I** testing standards. A drum marked UN1A1/Y should be a closed head steel drum that has successfully passed the **Packing Group II** standards (178.503(a)(3)).

4. **Designation of Relative Density (Specific Gravity) or Gross Mass -** A number designating either the Specific Gravity or Gross Mass, as appropriate, for which the packaging has been successfully tested should come right after the Performance Standard Code as follows:

a. **Packagings without Inner Packagings intended to contain liquids:** Must be marked with the specific gravity rounded off to the first decimal place for which the packaging has been successfully tested. The Specific Gravity is not required when the Specific Gravity does not exceed 1.2. A drum marked UN1A1/X1.4/ should be a closed head steel drum that has been successfully tested to Packing Group I standards for a Specific Gravity of up to 1.4.

b. **Packagings intended to contain solids or Inner packagings:** Must be marked with the Maximum Gross Mass (Weight) in Kilograms for which the packaging has been successfully tested. A box marked $\textcircled{\text{U}}\text{n}$ 4G/Y30/ should be a Fiberboard Box that has been tested to Packing Group II standards for a maximum Gross Weight of 30 kgs (66 lbs.).

5. **Either an "S" or the Hydrostatic Test Pressure in kilopascals -** An Upper Case S should be marked immediately after the Designation of Specific Gravity or Gross Mass, as appropriate, to designate that the packaging is intended only for **solids or inner packagings**. If the packaging is a single or composite packaging intended to contain liquids the Hydrostatic Test Pressure in kilopascals, (kPa) rounded off to the nearest 10 kPa for which the packaging has been successfully tested must be marked in this sequence. A drum marked UN1A1/X1.4/250/ should be a closed head steel drum that has been successfully tested to Packing Group I standards for a material that does not have a relative density of more than 1.4 and has successfully passed the Hydrostatic Pressure Test at 150 kilopascals (21.75 psi). A box marked $\textcircled{\text{U}}\text{n}$ 4G/Y30/S/ should be fiberboard box, tested to Packing Group II standards with a Gross Weight of 30 kgs (66 lbs.) intended to contain either solids or inner packagings.

6. **Last 2 Digits of the Year of Manufacture** - The last two digits of the year during which the packaging was manufactured must be marked next in the sequence (178.503(a)(6)). A box marked 4G/Y30/S/91 should be fiberboard box, tested to Packing Group II standards with a Gross Weight of 30 kgs (60 lbs.) and intended to contain either solids or inner packagings which was manufactured in 1991. A drum marked UN1A1/X1.4/150/91 must be a closed head steel drum that has been successfully tested to Packing Group I for a material that does not have a relative density of more than 1.4, successfully passed the Hydrostatic Pressure Test at 150 kilopascals (22 psi), and which was manufactured in 1991.

a. **Type 1H and 3H Packagings**- In addition certain plastic packagings such as the 1H1, 1H2, 3H1, and 3H2 must also be marked with the month that the packaging was manufactured which may be marked on the packaging in a place that is different from the remainder of the markings (178.503(a)(6)).

----- **Table 2- Illustrations of Common UN Markings** -----

UN1A1/Y/150/91
USA/+GS1234

A UN 1A1 closed head steel drum, tested to Packing Group I standards. No Relative Density entry is shown so it may only be used for materials with a relative density not exceeding 1.2. The drum was tested under the Hydrostatic Pressure Test to 150 kilopascals (22 psi), was manufactured in 1991 and was marked under the authorization of the USA. The GSI is the symbol of the person authorizing the marking of the package with the UN markings and the numbers 1234, identify a particular packaging type or design.

UN6HA1/Y1.4/250/91
USA/+GS1233

A UN6HA1 composite packaging, 6, consisting of a plastic inner receptacle, H, inside a closed head steel drum, A1. The packaging has been tested to Packing Group II standards, is suitable for materials with a Relative Density of up to 1.4, was tested under the Hydrostatic Pressure Test to 250 kilopascals (36.26 psi), was manufactured in 1991, and was marked under the authorization of the USA. The GSI is the symbol of the person authorizing the marking of the package with the UN markings and the numbers 1233, identify a particular packaging type or design.

4G/X30/S/91
USA/+GS1232

A UN 4G Fiberboard box, tested to Packing Group I standards for a maximum Gross Weight of 30 kgs (60Lbs). It is intended only for Solids or inner packagings, was manufactured in 1991, marked under the authority of the USA. The GSI is the symbol of the person authorizing the marking of the package with the UN markings and the numbers 1232, identify a particular packaging type or design.

7. **The International Motor Vehicle Symbol** - The International Motor Vehicle Symbol of the country under whose authority the testing and marking was done must be marked after the Year of Manufacture. Packagings tested and marked under the authority of the United States, must be marked with the letters USA (178.503(a)(7)). For packagings tested and marked under the authority of another country this mark is the International Motor Vehicle Symbol of the country under whose authority the testing and marking was done, such as, CAN for Canada, F for France, D for Germany, GB for Great Britain, IL for Israel, J for Japan, NL for Holland or the Netherlands, and SU for the Soviet Union. The markings USA as shown in Table 2 above illustrate this marking.

8. **Identification of Manufacturer or Other Identification** - Either the name of the manufacturer or some other identification of the packaging specified by the appropriate national authority must be marked on the packaging after the International Motor Vehicle Symbol. Packagings tested and marked under the authority of the United States must be marked with either the Name and Address or symbol of the person applying the UN packaging specification markings to the packaging. If a symbol is used it must be registered in advance with the Associate Administrator of Hazardous Materials Safety (RSPA). The markings of the symbol +GS as shown in Table 2 on Page I-13 illustrate this marking.

Packagings that have been tested and certified by an Approval and Certification Agency certified by DOT in accordance with Subpart E of Part 107 of 49 CFR may meet this requirement by marking the Registered Symbol of the Certifying Agency. In addition some unique form of identification will normally follow the symbol of the Certifying Agency to identify a particular packaging type and certification. A UN1A1 steel drum marked as shown in Figure 2 on Page I-13 indicates that someone with the registered symbol +GS has certified that the drum meets all applicable UN packaging requirements. Questions involved with the compliance of this packaging with applicable packaging regulations would more than likely be resolved through contact with the organization to whom the symbol +GS is registered and, in this case, would center around their particular Approval or Certification #1234 to see whether or not the package as offered for shipment was the same type and design as that certified by the Certification or Approval Agency.

9. **Metal or Plastic Drums/Jerricans Intended to be Reconditioned:** Metal or plastic drums which are intended for reuse as either single packagings or as an outer packaging for a Composite Packaging must have the minimum thickness of the material, shown in millimeters and abbreviated **mm** as the last item in this sequence, as illustrated below (178.503(a)(10)):

UN1A1/Y/150/91
USA/+GS1234 1 mm

10. **Reconditioned Packagings** - Packages that have been reconditioned must be marked with the following additional marks near the other required specification packaging marks (178.503(c)):
- The name or symbol of the country in which the reconditioning was performed. Use **USA** for packagings reconditioned in the USA; and
 - The name and address or registered symbol of the reconditioner. If a symbol is used it must be registered in advance with the Associate Administrator for Hazardous Materials Safety; and
 - The month and last two (2) digits of the year of reconditioning such as **11-91**; and
 - The letter **R**; and
 - The letter **L** if the packaging successfully passed a leakproofness test as part of the reconditioning process.

Illustration: A UN1A1 steel drum marked as indicated below indicates that it has been reconditioned by a reconditioner with the symbol **RB**, in the United States, as indicated by the code **USA**, during October of 1991, as shown by the **10-91**. The letter **R** indicates that it is a reconditioned drum and the letter **L** that the drum has successfully passed the leakproofness test.

UN1A1/Y1.4/150/90
USA/NS1234 1 mm
USA/RB/10-91RL

**INTRODUCTION TO GSI'S
TRANSPORTATION EMERGENCY RESPONSE
INFORMATION MANAGEMENT SYSTEM (TERIMS)**

By: Gary J. Groman, BSBA, JD

**EMERGENCY RESPONSE INFORMATION
WITHIN THE TRANSPORTATION SYSTEM
UNDER SUBPART G OF 49 CFR**

New Emergency Response Liability for Shippers

The third publishing of HM-126C "Emergency Response Communication Standards", by the Research and Special Programs Administration (RSPA), is contained in the August 17, 1990 Federal Register starting at page 33707. Except as noted immediately following, the effective date of HM-126C **has been delayed until December 31, 1990**. The effective date for the requirement to mark the Technical Name on non bulk packagings filled for shipment prior to December 31, 1990 has been delayed until December 31, 1991. Although not mandatory until the dates indicated above immediate compliance is authorized.

When the new Emergency Response Information requirements become effective, shippers of Hazardous Materials will be required to ensure that "Emergency Response information conforming to the requirements of this Subpart (Subpart G of Part 172 of 49 CFR) is **immediately available for use at all times the hazardous material is present.**" (172.600(c)(1)). It must be specific Emergency Response information "that can be used in the mitigation of an incident involving Hazardous Materials" (172.602(a)).

The Emergency Response Information requirements of the new Subpart G leaves shippers in a very vulnerable enforcement and liability position in the event of an accident or incident involving the transportation of their Hazardous Materials. This liability is further expanded by the general way the requirements are stated in this Subpart. Words such as "at a minimum" and "comprehensive" are not exactly words of limitation. In addition DOT (RSPA) has used wording in the "Preamble" to the Final Rule Making for HM-126C indicating that the Final Rule is "intended to provide specific information relative to the hazards of the material being transported..." and later in the same paragraph states "This information may be in any format..... so long as that document provides information, which at a minimum, provides" (Federal Register, June 27, 1989, page 27142).

Maximum Shipper Liability vs Minimum Carrier Liability

When the actual regulatory wording and information in the Preamble to HM-126C are considered together it does not take a legal Solomon to realize that it is the primary responsibility of the person offering the Hazardous Material for transportation (the Shipper) to supply specific Emergency Response information relative to the Hazardous Material being transported. Although there is a requirement on the part of the Carrier to ensure that the information is immediately available, the Carrier has little more liability than they have currently.

Why? It is the Shipper's responsibility to either present the Carrier with the specific information required by 172.602(a) **or** ensure that in fact such information is immediately available at the time the Hazardous Material is Offered for transportation (172.602(c)). In addition, it is the Shipper's responsibility to furnish the Emergency Response Telephone Number(s) on the Shipping Paper as required by 172.604(a). The accuracy and suitability of the information provided is the responsibility of the Shipper.

The Carrier's very limited liability consists of insuring that the Emergency Response information that was immediately available at the time the Hazardous Materials were offered for transportation is carried as required by 172.602(c)(1) and is made immediately available to Emergency Response or other appropriate personnel responding to "an incident involving a (the) Hazardous Material, or (is) conducting an investigation which involves a Hazardous Material" (172.600(c)(2)). Whether or not the information is specific enough for the material being shipped or provides the minimum information, the major real liability associated with these new regulations, is the responsibility of the Shipper.

How GSI's Transportation Emergency Response Information Management System (TERIMS) Can Help Ensure Regulatory Compliance

GSI's Transportation Emergency Response Information Management System (TERIMS) provides an efficient and simple way to not only meet the regulatory requirements of both 172.602 and 172.604 but to enhance the safety involved with the transportation of Hazardous Materials within the transportation system by providing:

1. State of the art computer access to the information contained in the U.S. DOT's Emergency Response Guidebook (ERG).
2. The ability to develop and manage efficiently, Customized Emergency Response information on the products your company offers or accepts for transportation. This information may be based wholly or in part on the information contained within the DOT ERG, created separately, or be a combination of both. It may be incorporated directly from the U.S. DOT ERG portion of TERIMS without retyping and used as is or modified as appropriate to develop Emergency Response Information that is specific for the products and/or Hazardous Wastes you offer for transportation within the transportation system.
3. Provides the Initial Emergency Response Information required by 172.602(a) that can be as general or as product specific as needed to ensure regulatory compliance and do it in a simple efficient manner.
4. A convenient way to gather and manage the comprehensive Emergency Response Information required to be available when Emergency Responders call the telephone number required by 172.604(a). Once entered into TERIMS it can be used directly by those in your organization to meet the requirements of 172.604(a) or printed out and provided to those agencies and organizations that agree to provide that information for us as permitted by 172.604(b).
5. An efficient method of storage, retrieval, and utilization of all transportation related Emergency Response Information using state of the art technology to access and use the information as needed.

Detailed Discussion of Subpart G to Part 172 of 49 CFR

The rest of this page through page 6 contains a more detailed discussion of the requirements for the Emergency Response information contained within Subpart G of Part 172. GSI's Transportation Emergency Response Information Management System (TERIMS) is an IBM PC Program designed to ensure regulatory compliance, enhance safety, and reduce your organization's exposure to the civil liability that can accrue as a result of the failure to comply with the regulatory requirements of this Subpart G. Readers of this book can obtain a free demo disk of this program by calling 1-417-334-7071.

TWO DIFFERENT TYPES OF INFORMATION REQUIRED

In general Subpart G of 49 CFR requires two (2) different types of Emergency Response Information. The **First** is what we call the "Minimum Initial Responder Information" which must be immediately available either on or in association with the Shipping Papers at all times when Hazardous Materials are present (172.602). The **Second** is the comprehensive product specific Emergency Response information which must be immediately available from a person who is contacted through a Shipper provided Emergency Response telephone number listed on the Shipping Paper (172.604).

First Type

Minimum Initial Responder Information (172.602)

This information will assist the Initial Responder at the scene of an accident or incident and as "**a minimum**", in addition to the information required to be on the Shipping Paper by 172.202 and 172.203, "must contain information" on "Immediate hazards to health; risks of fire or explosion; immediate precautions to be taken in the event of an accident or incident, immediate methods for handling fires, initial methods for handling spills, or leaks in the absence of fire, and preliminary first aid measures" (172.602(a)).

How is it Provided

The required Emergency Response Information must be printed legibly in English and be available for use away from the package containing the Hazardous Material it relates to (172.602(b)(1)-(2)). It may be presented in one of three (3) ways:

1. "On a Shipping Paper" (172.602(b)(3)(i)) or,
2. In a document other than a Shipping Paper "providing the Basic Description and Technical Names are on the document as required by 172.202 and 172.203(k)" (172.602(b)(3)(ii)) or,
3. "Related to the information on a Shipping Paper in a separate document... in a manner that cross references the description of the Hazardous Material on the Shipping Paper with the Emergency Response information contained in the document" (172.602(b)(3)(iii)).

Method #1, putting the information on the Shipping Paper, is not practical in most situations because it will result in voluminous Shipping Papers with Emergency Response information between each entry. Method #2, using a separate document and providing the Basic Description and Technical Names as required by 172.202 and 172.203(k), is restrictive and, in our opinion, is best used, if at all, in those situations where the Technical Name(s) is not required by 172.203(k). When various Hazardous Materials are shipped on the same Shipping Paper using a generic Proper Shipping Name such as **Flammable liquid, n.o.s.** Method #2 is not very practical because of the requirement to include the Technical Name(s). This could result in 10 separate Emergency Response documents containing Emergency Response Information for one (1) Shipping Paper describing 10 different **Flammable liquid, n.o.s.** Hazardous Materials each requiring different Technical Name entries under 172.203(k).

Least Restrictive With Most Flexibility

Of these three (3) choices we at GSI believe that Method #3 provides the most efficient and flexible method for Shipper compliance. It permits the use of a separate document to provide the Emergency Response information providing the information is "related to the information on the Shipping Paper." Such a relationship may be established by including the Proper Shipping Name or ID Number on the separate document. It does not require the inclusion of the Technical Name and in this writer's opinion, provides much more flexibility than that provided in 172.602(b)(3)(ii).

One (1) such document containing the required Emergency Response Information, the Proper Shipping Name **Flammable liquid, n.o.s.** and the ID Number **UN1993** could cover one (1) Shipping Paper describing 10 different **Flammable liquid, n.o.s.** Hazardous Materials requiring different Technical Name entries providing the Emergency Response Information on the document was applicable to each. The relationship between the document and the Shipping Paper is established by the Proper Shipping Name **Flammable liquid, n.o.s.** and the ID Number **UN1993**.

Although this method will most commonly be used in conjunction with the use of Emergency Response Guidance Documents such as the D.O.T. Emergency Response Guide Book (ERG), its use is permitted for any document that provides the required cross referencing and is not limited to the ERG or similar type documents (172.602(b)(3)(iii)).

Second Type Comprehensive Product Specific Emergency Response Information (172.604)

The comprehensive product specific Emergency Response incident mitigation information required by 172.604(a) must be furnished by each person who offers a Hazardous Material for transportation through a 24 hour Emergency Response telephone number. This telephone number must be:

1. Monitored at all times the Hazardous Material is in the transportation system including incidental storage by a person who is either:
 - a. Knowledgeable of the hazards and characteristics of the Hazardous Material being shipped and has comprehensive Emergency Response and incident mitigation information for that material or
 - b. Has immediate access to a person who has such knowledge and information and

2. Entered on the Shipping Paper as follows:

- a. Immediately following the description of each Hazardous Material required by 172.202 and 172.203 or
- b. Once in a clearly visible location on the Shipping Paper if
 - (1). The number is applicable to each Hazardous Material on the Shipping Paper and
 - (2). Contains an indication that it is for Emergency Response information purposes. We at GSI recommend prefacing the number with the wording **EMERGENCY CONTACT** or similar wording such as **Emergency Response Number** etc.

Use of Another Agency or Organization

The person offering the Hazardous Material for transportation may use the telephone number of another agency or organization capable of providing the detailed information concerning the Hazardous Material if:

1. That agency or organization has accepted the responsibility for providing that information in accordance with the requirements of 172.604(a) and
2. The person offering the Hazardous Material for transportation has ensured that the agency or organization acting on their behalf has received current information on the hazards and characteristics of the Hazardous Material being shipped and the comprehensive Emergency Response and incident mitigation information for that material meeting the requirements of 172.604(a)(2), before the Hazardous Material is offered for transportation (172.604(b)).

CHEMTREC and 172.604

CHEMTREC is, in this author's opinion, the premier provider of Emergency Response information to Emergency Responders in the event of an accident or incident involving the transportation of Hazardous Materials. It is his further opinion however, that registration with CHEMTREC under their current system does not relieve the Shipper from the 172.604(a) responsibility to have a person immediately available at the telephone number furnished to CHEMTREC, at the time of registration, with the comprehensive product specific Emergency Response and incident mitigation information for the particular material being shipped. In terms of 172.604 CHEMTREC is acting as an answering and referral service and it is up to the shipper to make sure that the information required by 172.604(a)(2) is immediately available when CHEMTREC calls in the event of an Emergency Response request for this information.

Get It In Writing

In using another agency or organization, CHEMTREC or otherwise, as authorized in 172.604(b) to meet your responsibilities under 172.604(a) we at GSI recommend that, at a minimum, the person offering the Hazardous Material for transportation:

1. Keep a copy of the "comprehensive emergency response and incident mitigation information" for the particular material being shipped that was sent to that organization. and
2. Get a written dated acknowledgement from that organization that:
 - a. It has received that information and
 - b. They accept the "responsibility for providing the detailed information concerning the Hazardous Material as required by 172.604(a) and
 - c. Will hold your organization harmless from any enforcement or civil liability resulting from their failure to furnish such information as required.

IT REQUIRES SOME THOUGHT

The providing of the Emergency Response information required by Subpart G of Part 172 is not as simple as saying "We will use the ERG" or, "Our MSDSs are OK", or "We'll require the Carrier to have an ERG on the vehicle." When considering how we are going to meet the requirements of this paragraph it should be remembered that although DOT cites the MSDS and Emergency Guidance manuals as examples of

possible ways to meet the requirements of Subpart G, it in no way authorizes their use as an automatic means of compliance with either 172.602 or 172.604 if they do not meet all the applicable requirements of those Sections.

Use of MSDS Under 172.602

In the preamble to HM-126C RSPA points out that it "has not required nor prohibited the use of MSDS as a means of providing the information...". Later in the same paragraph RSPA points out "However as has been made evident in the course of this rule making action, (that) no single standard exists for the preparation of MSDSs to provide emergency response information for transportation incidents....the MSDS may not, in all instances, provide specific information relative to response actions to be taken during transportation related incidents (Federal Register, June 27, 1989, page 27142). The experience of this author in dealing with MSDS information is consistent with the RSPA's findings, particularly, as relates to transportation related incidents and accidents.

May the MSDS be used to meet the requirements of 172.602(a)? Yes. Is an MSDS blessed with automatic compliance with the requirements of 172.602(a)? No! Although an MSDS may be used it must contain the specific information required in 172.602(a). On July 25, 1990 GSI Inc. received a written interpretation from RSPA stating that the use of an MSDS not containing the specific information required by 172.602(a) does not constitute compliance with 172.602(a).

If the MSDS is going to be used to meet the requirements of 172.602(a), we at GSI recommend that the user ensure that, at a minimum, it contains the specific items of information required by 172.602(a). We further recommend that steps be taken to provide the information in one place on the MSDS in a manner that is readily accessible and understandable to Emergency Response Personnel. i.e. Don't make them hunt through 14 pages of information to get what they need

Use of MSDS Under 172.604

May the MSDS be used to meet the requirements of 172.604(a)? Using the same rationale as above the answer is a qualified "Yes". Is an MSDS blessed with automatic compliance with the requirements of 172.604(a)? No! Although an MSDS may be used, if it is, it must contain specific information about the "hazards and characteristics of the Hazardous Material being shipped" and "comprehensive emergency response and incident mitigation information" for that Hazardous Material.

It is this author's opinion that it is very unlikely that an MSDS for a particular product would meet the requirements of 172.604(a)(2) unless it had been specifically designed to contain the information required by that paragraph. On July 25, 1990 GSI Inc. received a written interpretation from RSPA stating that the use of an MSDS not containing the specific information required by 172.604(a)(2) does not constitute compliance with 172.604(a)(2).

But CHEMTREC Requires an MSDS for Registration

In a conversation with Mr. Mike Donahue of CHEMTREC on July 31, 1990 he informed this writer that CHEMTREC's requirements for the MSDS was a CHEMTREC requirement for registration and that the mere submission of the MSDS by those registering with CHEMTREC was not intended to be compliance with 172.604(a). He further stated that they were receiving thousands of MSDSs and that no one at CHEMTREC was checking them to see if they contained any of the information required by 172.604(a)(2) let alone to see if it was accurate. He stressed that the compliance with 172.604(a) would be achieved, in most cases, by the organization registering with CHEMTREC, through the Emergency Response Contact Person and Telephone Number that is part of the Registration.

Use of the Emergency Response Guide (ERG) Under 172.602

No One Method Required

The Preamble to the Final Rule Making states "RSPA (DOT) has not imposed a requirement that the ERG be carried on each transport vehicle and be maintained at facilities involved with the transportation of Hazardous Materials. Rather the Final Rule requires that specific emergency response information accompany shipments of hazardous Materials and be present at transportation facilities."

Earlier in the same paragraph RSPA states that the Final Rule is "intended to provide specific information relative to the hazards of the material being transported...." Later, in the same paragraph, RSPA states

"This information may be in any format..... so long as that document provides information, which at a **minimum**, provides the description of the Hazardous Material, immediate health hazard information, risks of fire and explosion, immediate precautions to be taken in the event of an accident or incident, immediate methods of handling large and small fires, initial methods for handling of spills or leaks, and preliminary first aid measures" (Federal Register, June 27, 1989, page 27142).

Does Use of ERG Ensure Compliance? Maybe!

Can the ERG be used to meet the requirements of 172.602(a)? Yes. Is the ERG blessed with automatic compliance with the requirements of 172.602(a)? The answer to that question is not as easy as it first seems. That's right folks, even though millions of ERGs will be printed and sold allegedly to ensure compliance with the provisions of 172.602(a) the answer has to be a qualified maybe.

On the July 25, 1990 GSI Inc. received a written interpretation from RSPA stating that the use of the ERG is "one option available that may be used to comply with the requirements of 172.602(a). Further, in the same interpretation, in response to the question:

"Does the sending of a letter or contractual provision between the shipper and carrier, requiring carriers to have copies of the ERG aboard their vehicles, relieve the shipper from any further responsibility to ensure that the information required by 172.602(a) is immediately available at the time the Hazardous Material is offered for transportation?"

RSPA replied:

"The answer is no. Section (paragraph) 172.600(c) states that no person may offer, accept, or transport hazardous materials unless the required emergency response information is available for use at all times. Therefore, if a person offers hazardous materials to a carrier and the required emergency response information is not present, the offerer would be in violation of these requirements. We believe this objective is similar to the one addressed by 172.506, which requires a person offering a Hazardous Material for transportation to provide the required placards to a motor carrier, unless the motor vehicle is already placarded as required."

Based on the above RSPA permits the use of the ERG but does not require its use. In addition, if used, the person offering the Hazardous Material for transportation must ensure that the ERG being used is "maintained as specified." It is this author's opinion, based on the wording in 172.602(c) and the above cited interpretation, this would include at a minimum, checking the ERG to ensure that information required by 172.602(a) is in fact in the ERG at the time the Hazardous Material is offered for transportation.

If The ERG Is Used

If the ERG is used for compliance with 172.602(a) we at GSI recommend the following:

1. Have some basis for stating that the information provided through the use of the ERG is appropriate for the specific Hazardous Material being offered for transportation. **and**
2. Check the copy of the ERG being used, whether shipper or carrier furnished, to make sure that it has the Yellow, Blue, Orange, and Green bordered pages, if applicable, that apply to each specific Hazardous Material being offered for transportation.

Civil Liability

Although from a pure enforcement point of view, based on some wording in the Preamble this writer could make a semi effective argument that use of the ERG constitutes compliance with the provisions of 172.602(a), that argument would hold very little water as to an organization's civil liability. In this writer's opinion RSPA has created a new area of job security for the legal profession through the expanded liability created in the wording in 172.602 itself and the Preamble to the Rule Making.

It is his further opinion that the pure rote utilization of the ERG without making sure that the resulting Guide Page covers the hazards of and provides the required 172.602(a) information for the particular Hazardous Material being transported, exposes the person offering the Hazardous Material for transportation to increased civil liability. In this regard he is not alone. Mr. Gordon Rousseau, in his excellent article in the May/June issue of The Chemical Packaging Review entitled "Emergency Response-- A New Liability" states

"Many have been misled by DOT's frequent reiterations about the use of the ERG as a potentially satisfactory document. They may have stopped reading or thinking too early. From a liability perspective the ERG page clearly is not an automatically adequate solution." To that this writer would add "Amen."

**TERIMS Can Help Ensure Regulatory Compliance
and Limit Civil Liability**

We believe that GSI's Transportation Emergency Response Information Management System (TERIMS) provides an efficient and simple way to meet the regulatory requirements of both 172.602 and 172.604; limit the civil liability of your company or organization; and enhance the safety involved with the transportation of Hazardous Materials within the transportation system. Further the use of TERIMS to print the Emergency Response information required by 172.602(a) will ensure that in fact the information furnished at the time the Hazardous Materials are offered for transportation is as specific and current as desired, was in fact provided, and eliminate the need to inspect a copy of the ERG to see that all the required pages are present for each Hazardous Material offered for transportation.

Readers of this book can obtain a free demo disk of this program by calling 1-417-334-7071.

APPROVED THIRD-PARTY PACKAGING CERTIFICATION AGENCIES

The following third-party packaging certification agencies have been approved by the Department of Transportation to certify conformance of packagings with UN standards pursuant to 49 CFR; Part 107, Subpart E as of June of 1991. For ease of use the list is sorted Alphabetically by State.

Wyle Laboratories
7800 Governor's Drive West
P.O. Box 077777
Huntsville, AL 35807
205- 837-4411

Charles E. Tudor CP-P/MH
3869 Mammoth Cave Court
Pleasanton, CA 94588
415- 462-4493

Lansmont Corporation
Ryan Ranch Research Park
5 Harris Court Bldg. N
Monterey, CA 93940
408- 373-3800

Wyle Laboratories
1841 Hillside Avenue
Norco, CA 91760
714- 737-0871

Package Design & Testing Corp. of New England
10 Hazelwood Road
East Granby, CT 06026
203- 653-8086

Park City Packaging, Inc.
490 Sniffen Lane
Stratford, CT 06497
203- 378-7384

Smurfit Plastic Packaging, Inc.
1204 East 12th Street
Wilmington, DE 19802
302- 573-2581

Stone Container Corp.
P.O. Box 105
Contonment, FL 32533
904-968-5414

Yowell International
7805 Ellis Road
Melbourne, FL 32940
407- 725-3611

Construction Technology Laboratories, Inc.
5420 Old Orchard Road
Skokie, IL 60077
708- 965-7500

Container-Quinn Testing Labs.
170 Shepard Ave.
Wheeling, IL 60090
708 537-9470

Gaynes Testing Laboratories, Inc.
1642-52 West Fulton Street
Chicago, IL 60612
312- 421-5257

Pro-Pack Testing Laboratory, Inc
15 N. Florida
Belleville, IL 62221
618 277-1163

Jefferson-Smurfit Corporation & Container Corp.
of America
450 East North Ave.
Carol Stream, IL 61088-2195
708- 260-3590

Westinghouse Elec. Corp. ISLD
111 Schilling Road, MS 7980
Hunt Valley, MD 21030
301- 584-5368

Hedwin Corporation
1600 Roland Heights Avenue
Baltimore, MD 21211
301- 467-8209 Ext. 312

Distribution Dynamics Labs. Inc.
14958 Martin Drive
Eden Prairie, MN 55344
612- 937-4746

TEN-E Packaging Services
3670 Dodd Road
Eagan, MN 55123
612- 683-0063

Ecolab, Inc.
940 Lone Oak Road
Eagan, MN 55121
612- 452-1460

Package Research Laboratory
41 Pine Street
Rockaway, NJ 07866
201 627-4400

Union Camp
P.O. Box 3301
Princeton, NJ 08543
609- 986-1200

Union Carbide Corporation
P.O. Box 670
Bound Brook, NJ 08805
201- 563-5000

United States Testing Company, Inc.
1415 Park Avenue,
Hoboken, NJ 07030
201-575-5252

Container Testing Laboratory, Inc.
607 Fayette Avenue
Mamaroneck, NY 10543
914- 381-2600

Georgia Pacific
1660 Indian Wood Circle
Maumee, OH 43537
419- 891-5963

GH Package-Product Testing & Consulting, Inc.
11301 Jefferson Avenue
Sharonville, OH 45241
513- 733-8378

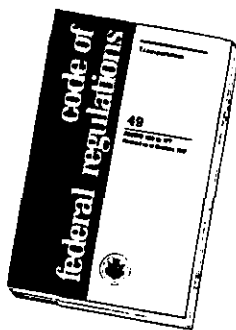
Owens - Illinois
One Seagate-25-L-GC
Toledo, OH 43666
419- 247-7424

Delvalco Consultants
2 McKinley Avenue
Malvern, PA 19355
215- 644-9117

Pro Pack Inc.
76 Jansen Avenue
Essington, PA 19029
215-521-4050

RVR Package Testing Center
1702 Taylor Street
Houston, TX 77007
713- 861-8221

U.S. Department of
Transportation
**Research and
Special Programs
Administration**



DOT CHART 9

Hazardous Materials Marking, Labeling & Placarding Guide

This Marking, Labeling and Placarding Guide will assist shippers, carriers, fire departments, police, emergency response personnel, and others in complying with, and enforcing the regulations governing the safe transport of hazardous materials by highway, rail, water and air.

The information and illustrations presented in this Guide are intended to serve as an introduction to regulations governing hazardous materials transportation. The Guide should be read in conjunction with the Hazardous Materials Regulations (HMR; 49 CFR 100-199). Published annually, and amended periodically, the HMR are the key to compliance and contain the information needed to comply with the requirements for the safe transport of hazardous materials.

Hazardous materials markings, labels, placards, and shipping papers serve to communicate the hazards posed by materials in transportation. Hazard communication is the key to effective emergency response, and is also used to alert transportation workers and the general public of the presence of hazardous materials, insure that non-compatible materials are not loaded together in the same transport vehicle, and provide the necessary information for reporting hazardous materials incidents. The purpose of this Guide is to explain and identify the markings, labels and placards which appear on packages, freight containers and transport vehicles containing hazardous materials.

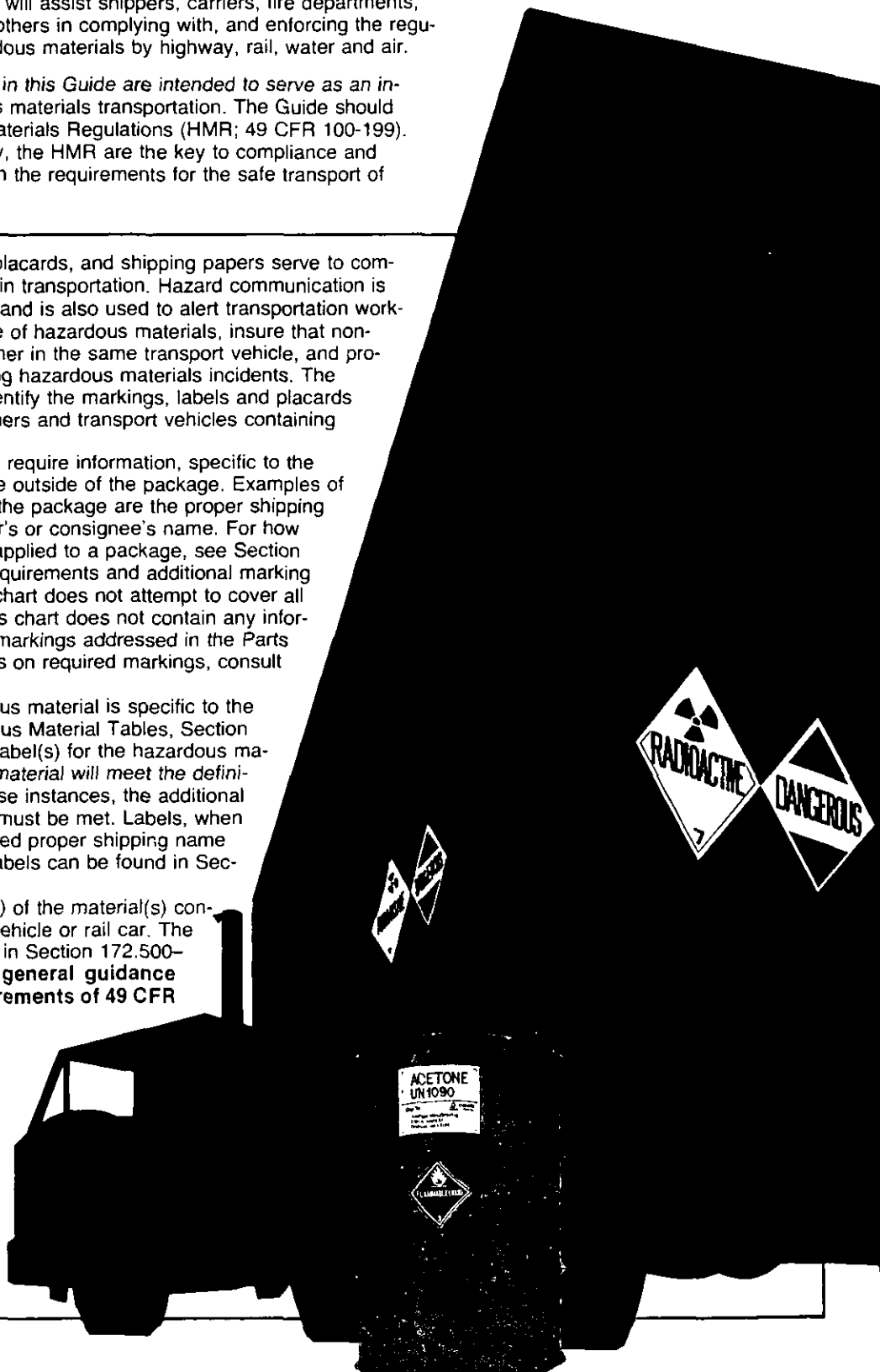
Marking regulations (Section 172.300) require information, specific to the hazardous material, to be "marked" on the outside of the package. Examples of information required to be marked on the package are the proper shipping name, identification number and consignor's or consignee's name. For how markings required by the HMR are to be applied to a package, see Section 172.304. For exceptions to the marking requirements and additional marking requirements, see Section 172.300. This chart does not attempt to cover all the marking requirements. In particular this chart does not contain any information related to specification packaging markings addressed in the Parts 178 and 179 of 49 CFR. For further details on required markings, consult the appropriate sections in the HMR.

The Labeling of a package of hazardous material is specific to the hazard class of the material. The Hazardous Material Tables, Section 172.101 and 172.102, identify the proper label(s) for the hazardous material listed. In some cases, a hazardous material will meet the definition of two or more hazard classes. In these instances, the additional labeling requirements of Section 172.402 must be met. Labels, when required, must be placed next to the marked proper shipping name (Section 172.406). The requirements for labels can be found in Section 172.400-172.450.

Placards represent the hazard class(es) of the material(s) contained within the freight container, motor vehicle or rail car. The requirements for placarding are contained in Section 172.500-172.558. **NOTE: This document is for general guidance only and is not a substitute for the requirements of 49 CFR 100-199.**

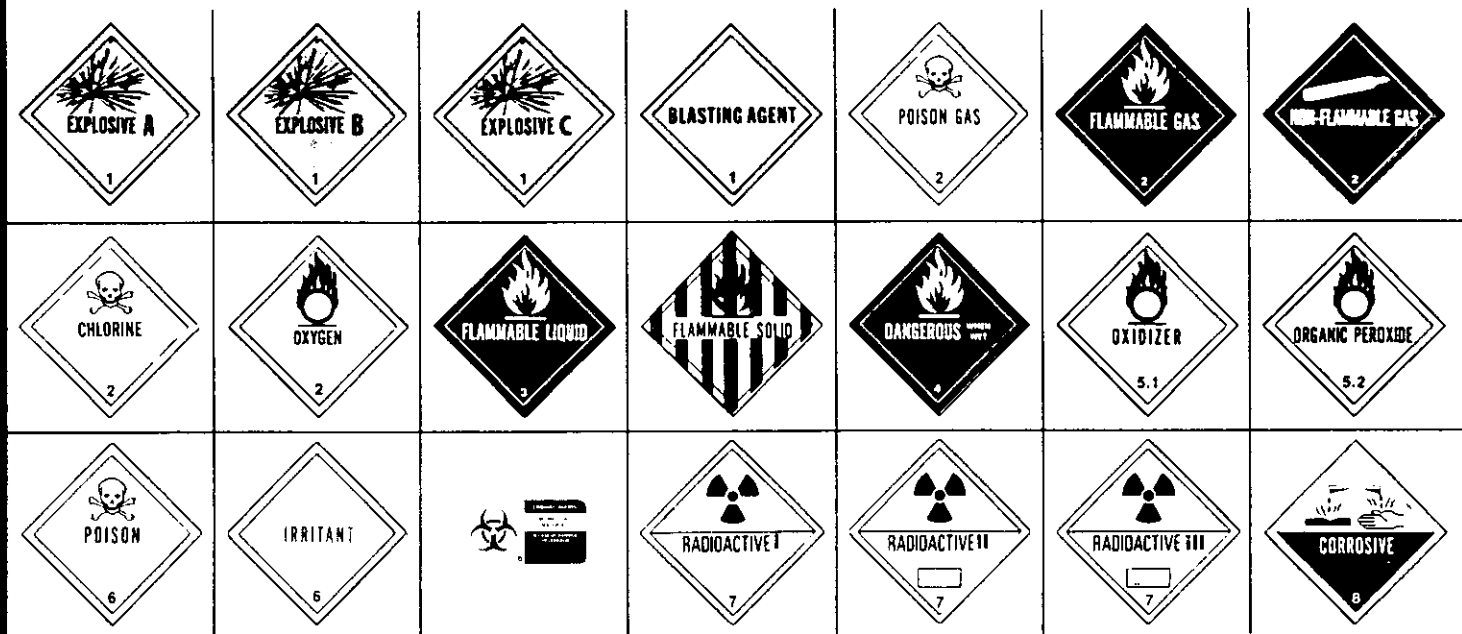
Response begins with identification.

transport vehicle carrying 1 package of radioactive Material labeled Yellow III, 500 pounds of Flammable Liquid and 600 pounds of Corrosive Materials would be placarded with both RADIOACTIVE and DANGEROUS placards.



Hazardous Materials Warning Labels

DOMESTIC LABELING



General Guidelines on Use of Labels (CFR, Title 49, Transportation, Parts 100-177)

- Labels illustrated above are normally for *domestic shipments*. However, some air carriers may require the use of International Civil Aviation Organization (ICAO) labels.
- Domestic Warning Labels may display UN Class Number, Division Number (and Compatibility Group for Explosives only) [Sec. 172.407(g)].
- Any person who offers a hazardous material for transportation **MUST** label the package, if required [Sec. 172.400(a)].
- The Hazardous Materials Tables, Sec. 172.101 and 172.102, identify the proper label(s) for the hazardous materials listed.
- Label(s), when required, must be printed on or affixed to the surface of the package near the proper shipping name [Sec. 172.406(a)].
- When two or more different labels are required, display them next to each other [Sec. 172.406(c)].
- Labels may be affixed to packages (even when not required by regulations) provided each label represents a hazard of the material in the package [Sec. 172.401].

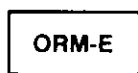
**Check the Appropriate Regulations
Domestic or International Shipment**

Additional Markings and Labels

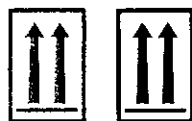
HANDLING LABELS



Cargo Aircraft Only
172.402(b)

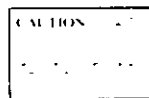


172.316

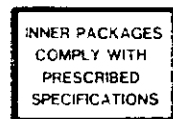


172.312(a)(c)

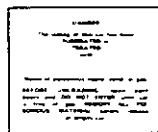
Package
Orientation
Markings



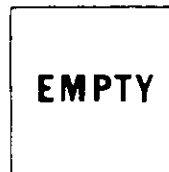
Bung Label
172.402(e)



173.25(a)(4)



Fumigation
173.9



173.427

Poisonous Materials



172.505



172.301

Materials which meet the inhalation toxicity criteria specified in Section 173.3a(b)(2), have additional "communication standards" prescribed by the HMR. First, the words "Poison-Inhalation Hazard" must be entered on the shipping paper, as required by Section 172.203(k)(4), for any primary capacity units with a capacity greater than one liter. Second, packages of 110 gallons or less capacity must be marked "Inhalation Hazard" in accordance with Section 172.301(a). Lastly, transport vehicles, freight containers and portable tanks subject to the shipping paper requirements contained in Section 172.203(k)(4) must be placarded with POISON placards in addition to the placards required by Section 172.504. For additional information and exceptions to these communication requirements, see the referenced sections in the HMR.

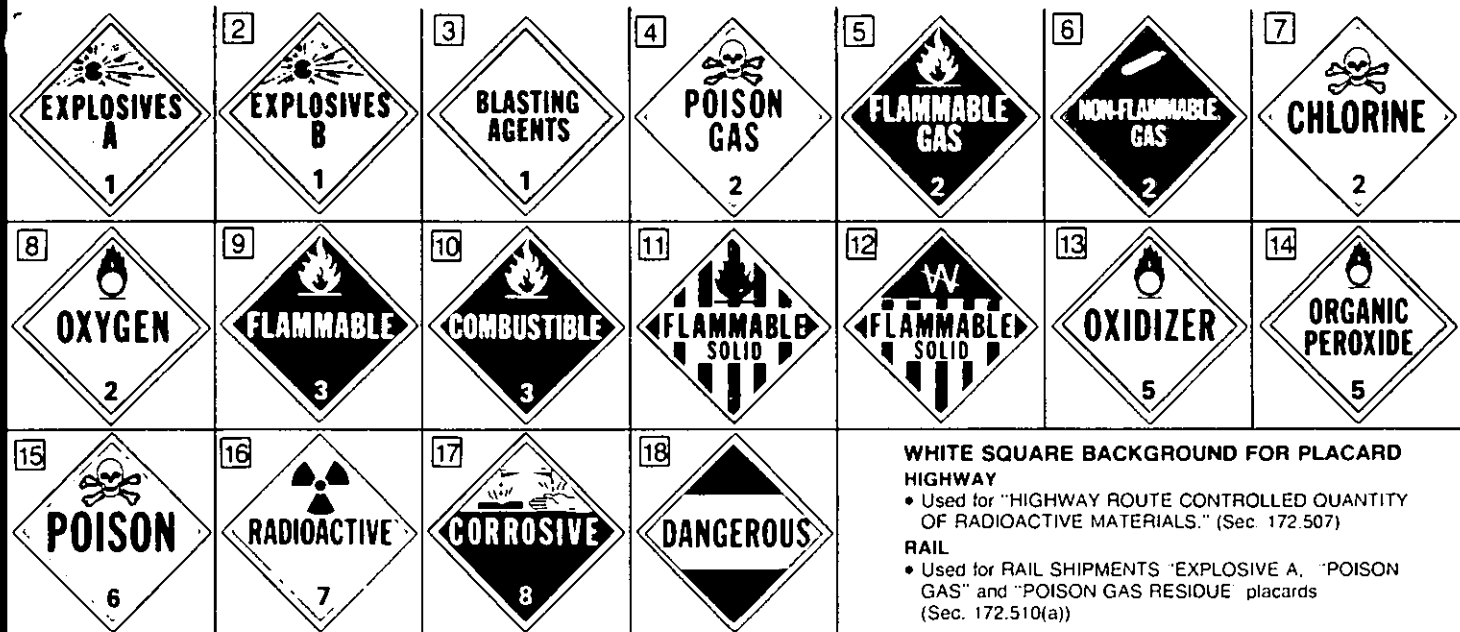
Here are a few additional markings and labels pertaining to the transport of hazardous materials. The section number shown with each item refers to the appropriate section in the HMR. The Hazardous Materials Tables, Section 172.101 and 172.102, identify the proper shipping name, hazard class, identification number, required label(s) and packaging sections.

Keep a copy of the DOT Emergency Response Guidebook handy!

Hazardous Materials Warning Placards

DOMESTIC PLACARDING

Illustration numbers in each square refer to Tables 1 and 2 below.



Guidelines

(CFR, Title 49, Transportation, Parts 100-177)

- Placard any transport vehicle, freight container, or rail car containing any quantity of material listed in Table 1
- Materials which are shipped in portable tanks, cargo tanks, or tank cars must be placarded when they contain any quantity of Table 1 and/or Table 2 material
- Motor vehicles or freight containers containing packages which are subject to the "Poison-Inhalation Hazard" shipping paper description of Section 172.203(k)(4), must be placarded POISON in addition to the placards required by Section 172.504 (see Section 172.505)
- When the gross weight of all hazardous material covered in TABLE 2 is less than 1000 pounds, no placard is required on a transport vehicle or freight container
- Placard freight containers 640 cubic feet or more containing any quantity of hazardous material classes listed in TABLES 1 and/or 2 when offered for transportation by air or water (see Section 172.512(a)). Under 640 cubic feet see Section 172.512(b)

TABLE 1

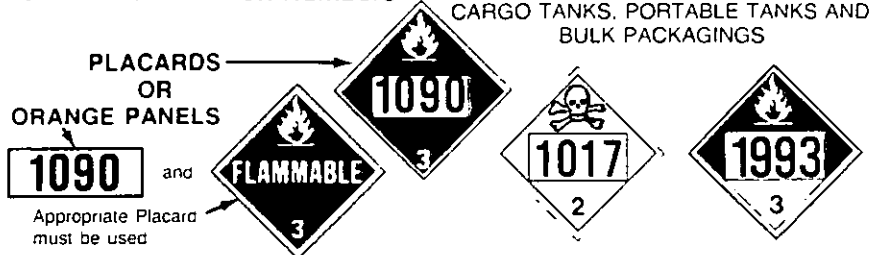
Hazard Classes
Class A explosives
Class B explosives
Poison A
Flammable solid (DANGEROUS WHEN WET label only)
Radioactive material (YELLOW III label)
Radioactive material
Uranium hexafluoride fissile (Containing more than 10% U235)
Uranium hexafluoride, low-specific activity (Containing 10% or less U235)

Note: For details on the use of Tables 1 and 2, see Sec. 172.504 (see footnotes at bottom of tables)

TABLE 2

No.	Hazard Classes	No.
1	Class C explosives	18
2	Blasting agent	3
4	Nonflammable gas	6
	Nonflammable gas (Chlorine)	7
12	Nonflammable gas (Fluorine)	15
	Nonflammable gas (Oxygen, cryogenic liquid)	8
16	Flammable gas	5
	Combustible liquid	10
	Flammable liquid	9
	Flammable solid	11
	Oxidizer	13
	Organic peroxide	14
	Poison B	15
	Corrosive material	17
	Irritating material	18

UN or NA Identification Numbers



- When hazardous materials are transported in Tank Cars (Section 172.330), Cargo Tanks (Section 172.328), Portable Tanks (Section 172.326) or Bulk Packagings (Section 172.331), UN or NA numbers must be displayed on placards, orange panels or, when authorized, plain white square-on-point configuration
- UN (United Nations) or NA (North American) numbers are found in the Hazardous Materials Tables, Sections 172.101 and 172.102
- Identification numbers may not be displayed on POISON GAS, RADIOACTIVE, or EXPLOSIVE A, EXPLOSIVE B, BLASTING AGENTS, or DANGEROUS placards (See Section 172.334)
- In lieu of the orange panel, identification numbers may be placed on plain white square-on-point configuration when there is no placard specified for the hazard class (e.g., ORM-A, B, C, D, or E) or where the identification number may not be displayed on the placard. See Section 172.336(b) for additional provisions and specifications
- When the identification number is displayed on a placard the UN hazard class number must be displayed in the lower corner of each placard (see Section 172.332(c)(3))
- Specifications of size and color of the Orange Panel can be found in Section 172.332(b)
- NA numbers are used only in the USA and Canada

Additional Placarding Guidelines



A transport vehicle or freight container containing two or more classes of material requiring different placards specified in Table 2 may be placarded DANGEROUS in place of the separate placards specified for each of those classes of material specified in Table 2. However, when 5000 pounds or more of one class of material is loaded therein at one loading facility, the placard specified for that class must be applied. This exception provided in Section 172.504(b), does not apply to portable tanks, tank cars, or cargo tanks.

CAUTION: Check each shipment for compliance with the appropriate hazardous materials regulations — Proper Classification, Packaging, Marking, Labeling, Placarding, Documentation — prior to offering for shipment

In an emergency, call Chemtrec, 1-800-424-9300

Examples of Canadian and International Placards and Labels

The shipment of hazardous materials internationally is governed by one or more regulatory bodies with regulations that may be similar to domestic regulations or radically different. Canada, for example, has adopted wordless placards and labels because their country is bilingual. Canada also requires cargo and rail tanks to use retro-reflective placarding. However, Canada and the United States have reciprocity regarding the use of wordless and worded placards and labels.

Several international organizations govern the transportation of hazardous materials according to the mode of transportation. If a shipment is going by water, the International Maritime Organization (IMO) has authority. The International Civil Aviation Organization (ICAO) is concerned about the safe shipment of dangerous goods

(i.e., hazardous materials) by air. Transport Canada (TC) is the Canadian counterpart to the U.S. Department of Transportation (DOT).

The United Nations publishes "Recommendations for the Transport of Dangerous Goods," a publication that is used by many nations of the world when promulgating regulations. Since the safe transport of hazardous materials is of concern to people everywhere, the work done by the United Nations is of critical importance world-wide. Labels and placards used in the Canadian, IMO, and ICAO regulations are generally based on the U.N. Recommendations, although Canada has some labels and placard designs that vary from the U.N. White borders are optional on International Placards

Examples of Wordless Placards and Labels

Pictured here are typical wordless placards and labels required for use in Canada and many other countries around the world.

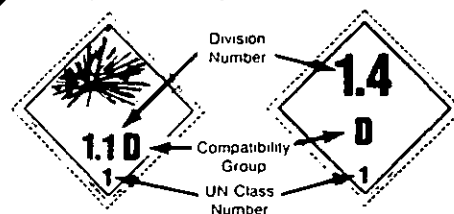
Examples of International and Canadian Placards and Labels

Spontaneously Combustible and Keep Away From Food placards and labels are used internationally and in Canada. The Corrosive Gas placard and label are used exclusively in Canada. Most placards and labels used internationally are similar (color and symbols) to those required by DOT regulations

UN Class Numbers

- Class 1: Explosives
- Class 2: Gases (compressed, liquified or dissolved under pressure)
- Class 3: Flammable liquids
- Class 4: Flammable solids or substances
- Class 5: Oxidizing substances, Division 5.1, Oxidizing substances or agents
Division 5.2, Organic peroxides
- Class 6: Poisonous and infectious substances
- Class 7: Radioactive substances
- Class 8: Corrosives
- Class 9: Misc. dangerous substances

Examples of Explosive Labels



The Numerical Designation represents the Class or Division. Alphabetical Designation represents the Compatibility Group (for Explosives only). Division Numbers and Compatibility Group combinations can result in over 30 different "Explosives" labels (see IMDG Code/ICAO).



For complete details, refer to one or more of the following

- Code of Federal Regulations, Title 49, Transportation, Parts 100-199. [All modes]
- International Civil Aviation Organization (ICAO) Technical Instructions for the Safe Transport of Dangerous Goods by Air [Air]
- International Maritime Organization (IMO) Dangerous Goods Code [Water]
- "Transportation of Dangerous Goods Regulations" of Transport Canada. [All Modes]

U.S. Department of Transportation Research and Special Programs Administration

Available from:

American Labelmark Co.

5724 N. Pulaski Rd. • Chicago, IL 60646

Toll Free: 1-800-621-5808 • In Illinois: 312-478-0900

METRIC CONVERSION CHART

When the value in the Column 2 of each conversion type is being used as the SI (Metric) Unit the U.S Value will be in Column 3. When the value in the Column 2 is being used as the U.S. Value the SI (Metric) equivalent will be in Column 1.

WEIGHT		
1	2	3
kg	<lb kg>	lbs
0.113	0.25	0.551
0.227	0.5	1.102
0.34	0.75	1.653
0.454	1	2.205
0.907	2	4.409
2.268	5	11.02
4.536	10	22.05
6.804	15	33.07
9.072	20	44.09
11.34	25	55.12
13.61	30	66.14
18.14	40	88.18
22.68	50	110.2
27.22	60	132.3
205	454	1001
1028	2268	5000

VOLUME- Gals		
1	2	3
L	<Gal L>	Gals
0.946	0.25	0.066
1.893	0.5	0.132
2.839	0.75	0.198
3.785	1	0.264
7.571	2	0.528
18.93	5	1.321
37.85	10	2.641
56.78	15	3.962
75.71	20	5.282
94.64	25	6.603
113.6	30	7.923
151.4	40	10.56
189.3	50	13.21
208.2	55	14.53
450.1	118.9	31.4
1703	450	118.8

VOLUME- LITERS		
1	2	3
L	<Qt L>	Qt
0.237	0.25	0.264
0.473	0.5	0.529
0.71	0.75	0.793
0.946	1	1.057
1.893	2	2.114
3.786	4	4.228
9.464	10	10.57
14.2	15	15.86
18.93	20	21.14

TEMPERATURE		
1	2	3
C	<F C>	F
-73.3	-100	-148
-45.6	-50	-58
-31.7	-25	-13
-17.8	0	32
-6.67	20	68
-5	23	73.4
-3.89	25	77
0	32	89.6
9.999	50	122
22.72	72.9	163.2
22.78	73	163.4
36.11	97	206.6
48.88	120	248
59.99	140	284
60.55	141	285.8
79.44	175	347
93.32	200	392

PRESSURE		
1	2	3
kPa	<Psi Kpa>	psi
6.894		1 0.145
101.3		14.7 2.132
103.4		15 2.175
468.8		68 9.86
689.4		100 14.5
698.4		101.3 14.69
1724	250	36.25
1930	280	40.6
2068	300	43.5
5033	730	105.9