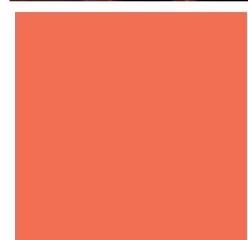
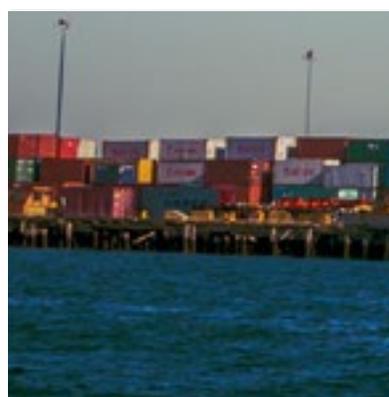


Guide to Training Hazardous Materials Employees Involved in Transportation



Guide to Training Hazardous Materials Employees Involved in Transportation

Fifth Edition



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PREFACE

The American Coatings Association's (ACA's) Guide to Training Hazardous Materials Employees Involved in Transportation aims to assist paint and coatings manufacturers, suppliers, and distributors in complying with U.S. Department of Transportation (DOT) regulations pertaining to hazardous materials (hazmat) employee training. These regulations are found in Part 172, Subpart H, of the Hazardous Materials Regulations (HMR; 49 CFR Parts 171 – 180).

As required by DOT regulations, training of hazmat employees must include general awareness/familiarization training, function-specific training, safety training, security awareness training, and if applicable, driver training and in-depth security training. This manual discusses the required training and recordkeeping responsibilities.

The guide's training chapters cover the general hazardous materials transportation skills encountered at a typical paint and coatings facility. Every effort has been made to include all relevant information within the training chapters; however, employers may need to tailor the training chapters for their specific operations and employee responsibilities. Employers are responsible for certifying that each of their hazmat employees has been adequately trained and tested by appropriate means.

ACA advises its members to refer regularly to a copy of the hazardous materials regulations (Title 49, Code of Federal Regulations) or view the regulations for free online at www.ecfr.gov.

ACA is a voluntary, nonprofit trade association working to advance the needs of the paint and coatings industry and the professionals who work in it. The organization represents paint and coatings manufacturers, raw materials suppliers, distributors, and technical professionals. ACA serves as an advocate and ally for members on legislative, regulatory and judicial issues, and provides forums for the advancement and promotion of the industry through educational and professional development services.

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INTRODUCTION

In the Hazardous Materials Regulations (HMR), Title 49 of the Code of Federal Regulations (49 CFR), hazmat employee training requirements are codified at Part 172, Subpart H. Additional training requirements were added for specific modes of transportation and are prescribed in 49 CFR Parts 174, 175, 176, and 177.

The regulations require the hazmat employer to:

- Train their hazmat employees in the safe and secure loading, unloading, packaging, hazard communication, documentation, handling, storing, and transporting of hazardous materials, as well as in emergency preparedness for responding to accidents or incidents involving the transportation of hazardous materials;
- Test hazmat employees on appropriate areas of responsibility;
- Certify, with appropriate documentation, that hazmat employees have received training; and
- Develop/maintain records of current training (including the preceding three years) for hazmat employees.

Based on information provided through its hazardous materials incident reporting system, the U.S. Department of Transportation's (DOT) Pipeline and Hazardous Materials Safety Administration (PHMSA) has concluded that human error is the most probable root cause of transportation incidents and associated consequences involving releases of hazardous materials. PHMSA is responsible for promulgating regulations to ensure safety and security in the transportation of hazardous materials. The regulations that detail the training standards are intended to reduce the number of hazardous materials incidents caused by human error and mitigate the effects of incidents when they occur.

Training is defined in these regulations as a systematic program that ensures a hazmat employee has familiarity with the general provisions of the hazardous material transportation regulations; is able to recognize and identify hazardous materials; has knowledge of specific regulatory requirements applicable to functions performed by the employee; has knowledge of emergency response information, self-protection measures and accident prevention methods and procedures; and, is aware of security issues related to the transportation of hazardous materials.

Under §171.8, a "hazmat employer" is defined as a person, including a self-employed person, who uses one or more of his/her employees in connection with:

1. Transporting hazardous materials in commerce;
2. Causing hazardous materials to be transported in commerce; or
3. Designing, manufacturing, fabricating, inspecting, marking, maintaining, reconditioning, repairing or testing a package, container, or packaging component that is represented, marked, certified, or sold by that person as qualified for use in transporting hazardous materials in commerce.

The regulations also define a "hazmat employee" (§171.8) as a person who is employed by a hazmat employer and who, in the course of employment, directly affects hazardous materials transportation safety. This term includes owner- operators of motor vehicles that transport hazardous materials in commerce. This term also includes any individual, including self-employed individuals, employed by a hazmat employer who, during the course of employment:

1. Loads, unloads, or handles hazardous materials;
2. Designs, manufactures, fabricates, inspects, marks, maintains, reconditions, repairs, or tests a package, container or packaging component that is represented, marked, certified, or sold as qualified for use in transporting hazardous material in commerce.
3. Prepares hazardous materials for transportation;
4. Is responsible for the safety of transporting hazardous materials; or
5. Operates a vehicle used to transport hazardous materials.

PHMSA has interpreted the definition of “hazmat employees” to include such personnel as research and development workers who ship product samples which are hazardous materials; filling line personnel; purchasing employees; and salespersons directly involved in the transportation process. In other words, if an employee’s job function affects safety in the transportation of hazardous materials, then that employee needs to be trained.

Under §172.702, Applicability and Responsibility for Training and Testing, employers are responsible for ensuring that all of their hazmat employees are trained in accordance with these requirements and are tested by appropriate means. Furthermore, hazmat employees must be trained before performing any transportation-related functions. It is the duty of each hazmat employer to comply with the applicable requirements of these training regulations.

Additionally, the use of public and private training sources is permitted to satisfy these requirements. If training is completed by other parties, but testing is not performed, the employer must still test the employee.

Compliance dates for initial as well as recurrent training are established in §172.704(c). A new hazmat employee, or a hazmat employee who changes job functions, is required to be trained on the regulatory compliance required in performing their job function. The hazmat employee may perform those functions prior to completion of training provided that:

- the employee performs those functions under the direct supervision of a properly trained and knowledgeable hazmat employee; and
- the required training is completed within 90 days after employment or change in job function.

Recurrent hazmat employee training is required at least once every three years. The three-year period begins on the date of the most recent training completed. DOT has stated that relevant training received from a previous employer or other source may be used to satisfy these requirements, provided a current record of training is obtained from the employee’s previous hazmat employer or other source. However, the hazmat employer is not relieved of the responsibility for ensuring that the previous training has qualified the employee to perform the job function for which they were hired.

In order to verify compliance, hazmat employers must maintain specific records. A record of current training, inclusive of the preceding three years, must be retained for each hazmat employee during the course of employment by that employer and for 90 days thereafter.

The record must include:

- the hazmat employee’s name;
- the date of the most recent hazmat training;
- a description, copy, or the location of the materials used to meet the training requirements;
- the name and address of the person providing the training; and
- certification that the employee has been trained and tested as required.

Hazmat employers who import or export hazardous materials by sea as authorized by §171.12, or who offer or transport hazardous materials by air as authorized by §171.11, may provide function-specific training relating to the requirements of the [International Maritime Dangerous Goods \(IMDG\) Code](#) or the [International Civil Aviation Organization \(ICAO\) Technical Instructions](#) as an alternative to the function-specific requirements of the HMR, as appropriate. However, HMR function-specific training may still be required for conditions and limitations specified within these sections.

TRAINING REQUIREMENTS

PHMSA training requirements are found in 49 CFR Part 172, Subpart H. PHMSA has intentionally made the training requirements as broad and objective as practicable to accommodate training programs and materials currently used in both public and private sectors. PHMSA maintains that this approach provides the necessary latitude for the development of effective training programs. The level and duration of training is the responsibility of the employer; PHMSA has not specified a level or duration of training and does not intend to review or certify training programs.

It is PHMSA's position that training performed to satisfy other federal agency requirements, such as the Occupational Safety and Health Administration's (OSHA's) hazard communication standard (29 CFR §1910.1200), or hazardous waste operations and emergency response (29 CFR §1910.120) requirements, may be used to satisfy DOT's training requirements in whole or in part, depending on the nature and extent of that training.

PHMSA's training requirements consist of five (5) core elements: General Awareness/Familiarization, Function-Specific, Safety, Security Awareness, and In-Depth Security. These elements (required by §172.704) apply to all modes of transport. In addition, modal-specific training may be required. Air carriers must comply with §175.20 and the training requirements in 14 CFR. Water carriers are prohibited from transporting hazardous materials unless each of their hazmat employees is trained as required by Subpart H and the records are maintained on board the vessel for each crew member as specified in §176.13. Motor carriers may not transport hazardous materials unless each of its employees is trained in the general requirements of Subpart H as specified in §177.800 and must also provide driver training as detailed in §177.816. Drivers must receive additional training in the requirements of the Federal Motor Carrier Safety Regulations and motor vehicle and specialized equipment operations.

Although recurrent training is required at least once every three years, it should be noted that hazmat employees are required to be trained on any regulatory change that affects their job function or operation from a transportation safety standpoint, regardless of the three-year schedule. This training must be completed before the employee performs that job function. A new hazmat employee or an employee who changes hazmat job functions may perform a function prior to completion of training if the function is performed under the direct supervision of a trained and knowledgeable hazmat employee and the required training is completed within 90 days after employment or a job function change.

General Awareness/Familiarization Training

This training is intended to raise an employees' awareness of the HMR and the purpose and meaning of hazard communication requirements (markings, labeling, placarding and shipping papers). The result of this training is intended to ensure that an employee is able to recognize and identify hazardous materials in the workplace.

PHMSA has training resources available through its website at:
<https://www.phmsa.dot.gov/training/hazmat/training-requirements-industry>.

Function-specific Training

Function-specific training is intended to teach the necessary knowledge, skills, and abilities for an individual's job function. This training is intended to give employees knowledge of applicable sections of the HMR to perform their job function.

The employer must first determine what hazmat transportation function(s) their employees are responsible for performing. The employer must train and test the employee on those specific job function(s). For example, an employee who is only responsible for executing hazardous materials shipping papers would only need to be trained and tested on Subpart C of Part 172 (shipping papers) of the HMRs.

This guide includes training chapters designed to be used to assist in presenting function-specific training.

Safety Training

This training is required for hazmat employees who handle or transport packagings containing hazardous materials during the course of transportation (e.g., packers and warehouse workers), and persons who have the potential for exposure to hazardous materials as a result of transportation accidents (e.g., drivers).

Safety training is intended to provide the necessary information concerning hazards posed by materials in the workplace under normal conditions or in likely accident scenarios. This training also includes appropriate personal-protection measures and, if applicable, how to use emergency response information and equipment, methods and procedures for avoiding accidents, and any remedial actions necessary after a release of hazardous materials.

DOT has stated that this training is not intended to satisfy the training needs or requirements of emergency responders. It is intended to address those employees who have limited responsibility for emergency response. Examples of limited responsibility for emergency response include notifying others of an emergency, using a fire extinguisher, or acting to mitigate the immediate effects of a release of hazardous materials.

This training needs to be developed on a facility-specific level. The employer needs to establish and instruct employees who handle or transport packages containing hazardous materials on the proper procedures for handling incidental and significant spills.

Security Awareness Training

All hazmat employees must receive security awareness training. This training must provide an awareness of security risks associated with the transportation of hazardous materials and methods designed to enhance transportation security. In addition, the training must cover how to recognize and respond to possible security threats.

This manual contains a module to assist in presenting security awareness training.

In-depth Security Training

Certain hazmat employers are required to develop and implement security plans in accordance with Subpart I of Part 172 (See additional information on Security Plan Requirements in Chapter 11). Those employers must train their hazmat employees regarding the plan and its implementation. This training must cover company security objectives, specific security procedures, employee responsibilities, actions to take in the event of a security breach and the organizational security structure. DOT has stated in several letters of interpretation that this training requirement is limited to employees who handle hazardous materials covered by the plan or are responsible for implementation of the security plan.

This training must be facility-specific, based on the contents of a facility's security plan.

Driver Training

In addition to the above requirements, drivers must be given training on the safe operation of motor vehicles, and the applicable requirements of the Federal Motor Carrier Safety Regulations (FMCSR). These regulations are found in Title 49, Parts 390 through 399.

Driver training must include the following areas:

- pre-trip safety inspections;
- the use of vehicle controls, including safety and emergency equipment;
- safe vehicle operations, including dangers associated with weather or road conditions;
- proper procedures regarding tunnels, bridges and railroad crossings;
- requirements pertaining to attendance of vehicle, parking, smoking, routing, and incident reporting; and
- loading and unloading of materials.

In addition to the above requirements, specialized training in the characteristics of liquid loads is required for persons who operate cargo tanks or vehicles with portable tanks with a capacity of 1,000 gallons or more.

PHMSA has stated that compliance with the current requirements for a commercial driver's license (CDL) with a tank vehicle or hazardous materials endorsement provides a driver with the general knowledge and skills necessary to operate a commercial motor vehicle with hazardous materials cargo safely and may satisfy the training requirements of §177.816. Additional specialized training may be required based on the specific job function and material-specific requirements related to the handling of the hazardous material.

The hazmat employer will need to determine to what extent the CDL training, testing, and its hazmat endorsement satisfy the required hazmat employee training for drivers. All aspects of the driver training requirements must also conform with respect to the frequency and recordkeeping requirements as specified in §172.704.

Recordkeeping

A record of training must be created and retained by the employer for each hazmat employee (§172.704(d)). Each record of training must include the preceding three years and be maintained for as long as the individual is employed as a hazmat employee and for 90 days thereafter. At a minimum, the record of training must contain the following information:

- (1) The hazmat employee's name;
- (2) The most recent completion date for the hazmat employee's training;
- (3) A description, copy, or the location of the training materials used to meet the requirements;
- (4) The name and address of the person providing the training; and
- (5) Certification that the hazmat employee has been trained and tested, as required by Subpart H.

Enforcement of the training requirements is the responsibility of each individual DOT modal administration. Compliance or non-compliance with the training regulations will be determined during safety and compliance reviews, performed by the modal administration inspectors.

Violations of these training requirements as well as any hazardous materials regulations are subject to civil and criminal penalties. The civil penalties carry a fine of up to \$81,993 and, for violations resulting in death, serious injury/illness, or substantial property damage, up to \$191,316. For training related violations, the minimum fine is \$493 per employee, per day. In addition, a person who knowingly violates or willfully violates provisions required by the HMR may be imprisoned up to a maximum of five years and, in the case where a violation involves a release of hazardous materials which results in death or bodily injury, up to a maximum of 10 years.

The following page is an example of a hazmat employee training record that contains the required information.

Note: Not all areas of training are required for all employees.

Hazmat Employee Training Record

Employee's Name: _____ Position: _____

Location of Training Materials: _____

Training Completion Date (most recent): _____

REQUIRED FOR ALL HAZMAT EMPLOYEES

TYPE OF TRAINING	TEST DATE	NAME AND ADDRESS OF PERSON PROVIDING TRAINING
General Awareness/ Familiarization		
Security Awareness		

REQUIRED ONLY IF INVOLVED IN JOB FUNCTION

FUNCTION-SPECIFIC TRAINING	TEST DATE	NAME AND ADDRESS OF PERSON PROVIDING TRAINING
Marking And Labeling		
Placarding		
Domestic Shipping Papers		
Classification		
Loading And Unloading		
In-Depth Security		

REQUIRED IF EMPLOYEE HAS POTENTIAL FOR EXPOSURE TO HAZARDOUS MATERIALS

TYPE OF TRAINING	TEST DATE	NAME AND ADDRESS OF PERSON PROVIDING TRAINING
Safety Training		

REQUIRED FOR DRIVERS ONLY

TYPE OF TRAINING	TEST DATE	NAME AND ADDRESS OF PERSON PROVIDING TRAINING
Driver Training		

I hereby certify that the above employee has been trained and tested pursuant to the requirements of Part 172, Subpart H, of 49 CFR.

(Supervisor and date)

GUIDE OVERVIEW

The proceeding sections aim to aid hazmat employers in complying with the function-specific and security awareness training requirements. The next eleven (11) chapters cover, in general, areas of concern for the safe and secure transportation of products of the paint and coatings industry. The chapters are:

1. How to Use the HMR
2. How to Use the HMT
3. Classification
4. Packaging
5. Marking and Labeling
6. Shipping Documents
7. Placarding
8. Loading and Unloading
9. Paint and Paint-Related Material in Aerosol Containers
10. OSHA Hazard Communication Standard (HCS) Guidance
11. Security Plan Requirements

Each chapter is designed to be used as an employee “textbook,” for either classroom or individual training. Test evaluations follow each chapter. The appropriate test evaluations should be completed by the hazmat employee, as a means for assessing the employee’s understanding of the required skill, as well as satisfying the testing requirement.

While every effort was made to include all relevant hazardous materials transportation skills, it is advised that an employer review each of the chapters as it relates to their particular facility and employee function(s). Employers may need to tailor these chapters to include skills required at their specific facilities.

To use this training guide and chapters fully, employers will need to evaluate each of their hazmat employees and determine which hazardous material transportation skill(s) their employees are required to perform in their job capacities. Employees should then be trained and tested on the skill(s) required for their specific job functions using the appropriate chapter(s). It may not be necessary for all hazmat employees to review all chapters.

A current copy of the hazardous materials regulations (HMR), Title 49, Code of Federal Regulations (49 CFR), will be beneficial to the employee while working on these chapters. Regulations are accessible online for free at www.ecfr.gov. Parts and section(s) of the regulations are referenced throughout the chapters and it is recommended that employees review the regulatory requirements of each section.

After the employee completes the appropriate chapter(s), the corresponding Test Evaluation should be completed. The employee may reference the guide and 49 CFR for information required to complete the Test Evaluation. The employer or supervisor should evaluate the completed test evaluation(s) for accuracy in order to determine the effectiveness of the training and to ensure that the employee understands the regulatory requirements associated with each job function.

CHAPTER 1 – HOW TO USE THE HAZARDOUS MATERIALS REGULATIONS

1.1 The Hazardous Materials Regulations

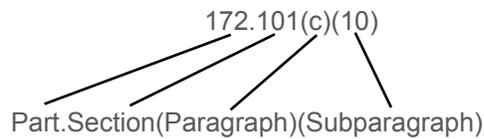
The U.S. Department of Transportation’s (DOT) Hazardous Materials Regulations (HMR) are in Subchapter C of Chapter I of Subtitle B of Title 49 of the Code of Federal Regulations.

Title 49 – Transportation
Subtitle B – Other Regulations Relating to Transportation
Chapter I – Pipeline and Hazardous Materials Safety Administration (PHMSA)
Subchapter C – Hazardous Materials Regulations

The Code of Federal Regulations (CFR) has the force of the law. The regulations are issued by federal agencies to carry out the responsibilities imposed on those agencies by Congress.

1.2 How to Read the Hazardous Materials Regulations

Subchapter C is divided into parts. The parts comprising the HMR run in sequence numerically starting with Part 171 and ending with Part 180.¹ Parts are divided into sections, which run numerically within the part. Sections are further divided into paragraphs, subparagraphs, etc.



Subparagraphs are further divided into sub-subparagraphs, sub-sub-subparagraphs, etc.

172.101(c)	Paragraph
172.101(c)(10)	Subparagraph
172.101(c)(10)(i)	Sub-subparagraph
172.101(c)(10)(i)(A)	Sub-sub-subparagraph

There are also subparts, which are groups of sections that all address a particular subject. For example, Subpart C of Part 172 is titled Shipping Papers and contains §172.200 through §172.205; Subpart D of Part 172 contains marking requirements, etc). However, it is probably easier to think of the Subchapter as parts divided into sections, and related sections being grouped together into a subpart.

§ is a typographical glyph commonly called the section sign or section symbol. It is frequently used when referring to sections of the HMR.

¹ All the US DOT Hazardous Materials Regulations used to process hazardous material shipments are contained within Subchapter C, parts 171-180 of 49 CFR. However, there are administrative requirements and information contained in Parts 106 and 107 of 49 CFR. These include, but are not limited to, PHMSA’s Rulemaking procedures, Special Permit procedure, and the Registration and Fee Assessment Program.

1.2.1 Rules of Construction, §171.9

Unless specifically stated otherwise:

- Singular words include the plural;
- Plural words include the singular;
- Masculine words include the feminine;
- “must” means **required**;
- “shall” means **required**;
- “should” means **recommended**, but not required;
- “may” means **permitted**, but not required;
- “includes” means **includes, but not limited to**; and,
- “no person may” means **no person is required, authorized, or permitted to...**

For more information on how to use the HMR along with exercises and knowledge tests, please download and read PHMSA’s [How to Use the Hazardous Materials Regulations](#) training document.

CHAPTER 2 – HOW TO USE THE HAZARDOUS MATERIALS TABLE

The process of complying or determining compliance with the HMR is centered around the Hazardous Materials Table (HMT) in 49 CFR §172.101. The HMT lists alphabetically, by proper shipping name, those materials that are considered hazardous for the purposes of transportation. The HMT identifies information about a particular hazardous material, such as the hazard class or division, identification number, packing group, and label code. It also specifies or references necessary information for further preparation and handling, including requirements for packaging, marking and labeling, quantity limitations for aircraft and railcars, vessel stowage, and transport vehicle placarding.

To use the HMT, one must first understand the information found in each of the columns. The column headings describe the information contained in each column. The main columns are organized numerically (1) through (10). The best way to avoid mistakes in reading the HMT is to place a ruler or other straight-edge under the proper shipping name and read the entries found in each column, horizontally, left to right, in the numbered sequence. The contents of each column are discussed in-depth here.

Symbols (1)	Hazardous Materials descriptions and proper shipping names (2)	Hazard class or Division (3)	Identification Numbers (4)	PG (5)	Label Codes (6)	Special provisions (7)	(8) Packaging (§173.***)			(9) Quantity limitations		(10) Vessel stowage	
							Exceptions (8A)	Non-bulk (8B)	Bulk (8C)	Passenger aircraft/ rail (9A)	Cargo aircraft only (9B)	Loca- tion (10A)	Other (10B)
	Acetone	3	UN1090	II	3.....	IB2,T4,TP1	150...	202...	242...	5 L	60 L	B	
	Aerosols, <i>flammable, (each not exceeding 1 L capacity)</i>	2.1	UN1950		2.1...	153,N82	306...	None..	None	75 kg	150kg	A	48,87,126
	Aerosols, <i>non-flammable, (each not exceeding 1 L capacity)</i>	2.2	UN1950		2.2...		306, 307	None..	None	75 kg	150 kg	A	48,87,126
+	Aniline	6.1	UN1547	II	6.1...	IB2,T7,TP2	None...	202...	243...	5 L	60 L	A	40
AW	Carbon dioxide, solid or Dry ice	9	UN1845	III	None		217	217	240	200 kg	200 kg	C	40
D	Consumer commodity	ORM-D	None		None		156, 306	156, 306	None	30 kg gross	30 kg gross	A	
+I	Methanol	3	UN1230	II	3, 6.1	IB2,T7,TP2	150...	202...	242...	1 L	60 L	B	40
D	Methanol	3	UN1230	II	3	IB2,T7,TP2	150...	202...	242...	1 L	60 L	B	40
	Polychlorinated biphenyls, liquid	9	UN2315	II	9	9,81,140, IB7	155...	212...	240...	100 kg	200 kg	A	95
	Polychlorinated biphenyls, solid	9	UN2315	II	9	9, 81, 140, IB3,T4,TP1	155...	202...	241...	100 L	220 L	A	95
	<i>Paint including paint, lacquer, enamel, stain, shellac solutions, varnish, polish, liquid filler, and liquid lacquer base.</i>	3	UN1263	I	3...	T11,TP1, TP8	150...	201...	243...	1 L	30 L	E	
	<i>Paint including paint, lacquer, enamel, stain, shellac solutions, varnish, polish, liquid filler, and liquid lacquer base.</i>	3	UN1263	II	3...	149,B52, IB2,T4,TP1 ,TP8	150...	173...	242...	5 L	60 L	B	
	<i>Paint including paint, lacquer, enamel, stain, shellac solutions, varnish, polish, liquid filler, and liquid lacquer base.</i>	3	UN1263	III	3...	B1,B52,IB3 ,T2,TP1	150...	173...	242...	60 L	220 L	A	
	<i>Paint or Paint related material</i>	8	UN3066	II	8	B2,IB2,T7, TP2	154...	173...	242...	1 L	30 L	A	
	<i>Paint or Paint related material</i>	8	UN3066	III	8	B52,IB3,T4 ,TP1	154...	173...	241...	5L	60 L	A	
	<i>Paint related material including paint thinning, drying, removing or reducing compound</i>	3	UN1263	I	3	T11,TP1, TP8	150...	201...	243..	1 L	30 L	E	
	<i>Paint related material including paint thinning, drying, removing or reducing compound</i>	3	UN1263	II	3	149,B52, IB2,T4,TP1 ,TP8	150...	173...	242...	5L	60 L	B	
	<i>Paint related material including paint thinning, drying, removing or reducing compound</i>	3	UN1263	III	3	B1,B52,IB3 ,T2,TP1	150...	173...	242...	60L	220 L	A	
G	Solids containing flammable liquids, n.o.s.	4.1	UN3175	II	4.1	47,IB6,IP2	151	212	240	15 kg	50kg	B	
	Xylenes	3	UN1307	II	3	IB2,T4,TP1	150...	202...	242...	5 L	60 L	B	
	Xylenes	3	UN1307	III	3	B1,IB3,T2, TP1	150...	203...	242...	60 L	220 L	A	

Column (1) – Symbols, §172.101(b)

Column (1) of the HMT may contain one or more of the following six symbols: +, A, D, G, I, and W. These symbols designate groups of hazardous materials with specific transportation requirements. If none of the symbols apply, the column will be blank. The table below describes the meaning of each symbol.

Symbol	Meaning
+	Fixes the proper shipping name, hazard class, and packing group for that entry. The term “fixes” means that you may not change the proper shipping name, hazard class, or packing group, even if the material does not meet the hazard class definition. When the plus sign is assigned to a proper shipping name in Column (1) of the HMT, it means that the material is known to pose a risk to humans.
A	Indicates that the specific material is only regulated if offered or transported by aircraft, unless the material is a hazardous substance or a hazardous waste. If the material is a hazardous substance or a hazardous waste, then it is regulated in all modes of transportation (including air).
D	Identifies entries on the HMT that are only recognized for domestic transportation and may be inappropriate for transportation under international regulations.
G	Indicates that “n.o.s.” (not otherwise specified) and generic proper shipping names are required to be supplemented with the technical name(s) of the hazardous ingredients, in parenthesis in association with the basic description.
I	Identifies entries on the HMT that are recognized for international transportation under international dangerous goods regulations (e.g. ICAO Technical Instructions or the IMDG Code). These entries may be used for both international and domestic transportation.
W	Indicates that the specific material is only regulated if offered or transported by water vessel, unless the material is a hazardous substance or a hazardous waste. If the material is a hazardous substance or a hazardous waste, then it is regulated in all modes of transportation (including water).

Column (2) – Hazardous Materials Descriptions and Proper Shipping Names, §172.101(c)

Column (2) of the HMT lists the authorized proper shipping names for hazardous materials. Only those names authorized within the HMT may be used to describe materials which are regulated as hazardous. The shipper must choose the most specific proper shipping name that most accurately describes the hazardous material (see “Choosing a Proper Shipping Name” module).

If the material is listed in Column (2) of the HMT by technical name, it is a regulated material. If the entry is shown in Roman type, it must be used as the proper shipping name unless modifications are authorized or required. Examples of modifications would include mixtures and/or solutions, alternate shipping names preceded by the word “or” in italics, and shipping names listed following the word “see” in italics. Words in italics may be used for additional description but are not required.

Column (3) – Hazard Class or Division, §172.101(d)

Column (3) identifies the hazard class or division assigned to the proper shipping name, or the word “Forbidden.” There are nine categories or hazard classes in the United Nations classification system, and each are assigned a hazard class number designation. Materials in classes 1, 2, 4, 5, and 6, are also identified by the Division number. For instance, Class 2, Division 1, Flammable gas, is identified as 2.1. A complete list of the different classes, divisions, and definition sections can be found in §173.2.

Column (4) – Identification Number, §172.101(e)

Column (4) lists the identification number assigned to each proper shipping name. Some materials, which have identical or similar hazards, may be identified by the same number. The letters “UN” will precede the four-digit identification number prescribed by the United Nations for those proper shipping names which are suitable for international and domestic transportation. The four-digit numbers with the “NA” prefix are associated with proper shipping names which may only be used to identify materials being shipped within North America. The identification number in Column (4) is intended to provide assistance to emergency response personnel in identifying materials and indexing proper response measures at accidents.

Column (5) – Packing Group, §172.101(f)

Column (5) specifies the packing group or groups assigned to a material corresponding to the proper shipping name and hazard class for that hazardous material. The HMT specifies one or more packing groups assigned to most hazardous materials. There are no packing groups designated for materials in the following groups: Class 2, Class 7, and Division 6.2. So, materials in the paint and coatings industry in Class 2, or those liquids classified as Combustible liquids, do not have assigned packing groups.

The packing group denotes the degree of danger presented by the material in transportation and should not be confused with packaging standards. Packing group designations are:

Packing Group I (PG I) - Great Danger

Packing Group II (PG II) - Moderate Danger

Packing Group III (PG III) - Minor Danger

If more than one Packing Group is listed in Column (5) for a single entry, the packing group for the hazardous material must be determined by using the criteria specified in 49 CFR, Subpart D, Part 173.

Column (6) – Label Codes, §172.101(g)

Labels are used to communicate the hazard or multiple hazards that are present in the package. Column (6) of the HMT specifies the hazard warning label or labels that must be applied and displayed on each package filled with a material conforming to the associated hazard class and proper shipping name.

If two or more label codes are listed, the first represents the primary hazard and the other(s) represent the subsidiary hazard(s) for that entry. No label is required for a material classified as a combustible liquid or for a Class 3 material that is reclassified as a combustible liquid. All labels listed in Column (6) must be affixed to the package unless otherwise excepted (e.g. limited quantity exception). The “Marking and Labeling” module of this manual provides additional information on labeling packages containing hazardous materials.

Column (7) – Special Provisions, §172.101(h)

Column (7) of the HMT contains the codes for any special provision that could apply to the hazardous material. The meaning and requirements of each special provision are set forth in §172.102. Special provisions are coded with letters and/or numbers applicable to certain entries in Column (2). These codes are applicable to the mode/s of transportation for specific materials and the type of packaging authorized under specific conditions. If the space in Column (7) corresponding to the proper shipping name in Column (2) does not contain any letters and/or numbers, then no special provisions apply.

The following is a brief description of the codes:

- (1) A code consisting of numbers applies to all modes of transportation and all packagings (both bulk and non-bulk packagings).
- (2) “A” codes apply only to transportation by aircraft.
- (3) “B” codes apply only to bulk shipments, except intermodal (IM) portable tanks.
- (4) “IB” or “IP” codes apply only to transportation in Intermediate Bulk Containers (IBCs).
- (5) “N” codes apply only to non-bulk packagings.
- (6) “R” codes apply only to transportation by rail.
- (7) “T” or “TP” codes apply only to IM portable tanks.
- (8) “W” codes apply only to transportation by water vessel.

Note: When the special provision in Column (7) describes packaging(s) requirements, they are in addition to the specific packaging requirements in Part 173 and/or listed in Column (8) of the HMT.

Column (8) – Packaging, §172.101(i)

Column (8) is divided into three columns: (8A), (8B), and (8C). When a 3-digit number appears in any of the three columns, it is intended that it should be read as preceded by the §173 and a decimal point. For example, using the proper shipping name “Paint” in Class 3, PG I, the entry “243” in Column (8C) should be read as §173.243.

When an entry is found in Column (8A), it specifies the section in the regulations that covers the exception(s) to the requirements for the entry. If the word “None” appears in Column (8A) there are no exceptions that apply, unless they are permitted through Special Provisions in Column (7).

These exceptions may include limited quantity exceptions for labeling, documentation, and specification packaging, or exceptions to all regulations in 49 CFR for materials with limited hazards or in small packages.

Column (8B) prescribes the packaging requirements by sections for non-bulk packagings (see definitions). The word “None” in Column (8B) means that non-bulk packagings are not authorized for the material, except as may be permitted by Special Provisions in Column (7).

Column (8C) references the sections which prescribe packaging requirements for bulk packagings other than IM portable tanks. The word “None” in this column means that bulk packagings are not authorized, unless permitted by Special Provisions in Column (7). Authorization for bulk shipments in IM portable tanks, when applicable, will be found in Column (7).

Column (9) – Quantity Limitations, §172.101(j)

Column (9) is divided into two columns, 9A and 9B, specifying the maximum quantity that may be offered per package for shipments that are intended for transportation by passenger rail car or aircraft (9A) or cargo aircraft (9B). Column 9A specifies the maximum quantities that may be offered for transportation in one package for a passenger rail car or aircraft, while Column 9B specifies the maximum quantities that may be offered for transportation in one package for cargo aircraft only. Entries in Column 9 specify the net quantity that is permitted in one package. If the word “Forbidden” appears in Column 9, materials shipped using the corresponding proper shipping name may not be shipped in any quantity by the mode indicated. Additional requirements for shipping hazardous materials by air within the United States can be found in §173.27. When shipping by air, consult the [ICAO](#) and [IATA](#) regulations, which are used by most air carriers in the United States.

Column (10) – Vessel Stowage, §172.101(k)

Column (10) of the HMT identifies stowage requirements aboard water vessels and must be considered when shipping hazardous materials by water. Column 10 is divided into two parts: 10A specifies the authorized stowage locations for hazardous materials aboard cargo and passenger vessels and 10B specifies codes for stowage requirements for specific hazardous materials. When shipping by water, consult the [IMDG Code](#), which is used by most water carriers in the United States and internationally.

Test Evaluation – How to Use of the Hazardous Materials Table

Read each of the following questions carefully. Select the MOST appropriate answer for each of the following questions and mark the corresponding space on the answer sheet provided. Only ONE answer per question may be marked on the answer sheet.

1. The letter “D” appearing in Column (1) of the HM Table indicates:
 - a. The proper shipping name in Column (2) is to be used for drums only
 - b. The material listed in Column (2) is always an ORM-D
 - c. The proper shipping name in Column (2) may be used for domestic transportation but may not be appropriate for international transport
 - d. Additional description is required in parentheses with the proper shipping name in Column (2)

2. A material may be authorized to be packaged as a limited quantity if:
 - a. A section number is listed in an entry in Column (8A)
 - b. A section number is listed in an entry in Column (8B)
 - c. A section number is listed in an entry in Column (7)
 - d. A section number is listed in an entry in Column (8C)

3. The number(s) which appear in Column (6) indicate:
 - a. The UN identification number for the material
 - b. Special Provisions which apply to a listed material
 - c. The Packing Group in which the material is classified
 - d. The label or multiple labels which must be displayed on a package unless excepted by the regulations

4. The word “Forbidden” in Column (9A) indicates the material in Column (2):
 - a. May not be transported by any mode
 - b. May not be transported by aircraft
 - c. May not be transported by passenger aircraft but might be permitted on cargo aircraft unless also forbidden
 - d. May not be transported in bulk packagings by rail

5. When offering a cargo tank shipment of “Varnish” meeting the definition of a FLAMMABLE LIQUID the proper shipping name to be used on the shipping paper should be:
 - a. Varnish
 - b. Paint related material
 - c. Coating solution
 - d. Paint

6. A “Hazardous Substance” is defined as a material listed:
 - a. In Column (2) of the HM Table
 - b. In Column (2) of the HM Table and in Appendix “A” of §172.101
 - c. In Appendix “A” of §172.101 and the quantity in one package meets or exceeds the reportable quantity
 - d. Any of the definitions in Part 173 for Class 1 through Class 9

7. When determining the proper shipping name from Column (2) which must be marked on the package and entered on the shipping papers:
 - a. Only that portion of the entry in Roman print must be entered
 - b. The entire description in Roman print and italics must be entered
 - c. Only that portion of the entry in italics is required to be entered
 - d. Any of the names in Roman print or in italics may be used

8. When determining the packaging which is authorized for shipping a material described as “UN1263, Paint, 3, III” in a five (5) gallon metal container, the appropriate section to use is:
 - a. §173.173
 - b. §173.150
 - c. §173.242
 - d. §173.241

9. An “Aerosol” receptacle containing spray paint may be renamed “consumer commodity” and shipped as an ORM-D if an authorization is provided in:
 - a. §173.150(b)
 - b. §173.242
 - c. §173.306(i)
 - d. None of the above

10. When offering a cargo tank loaded with 6500 gallons of liquid described on the shipping paper as “UN3066, Paint related material, 8, III” the following “Special Provisions” in §172.102 would apply:
 - a. N71
 - b. B52
 - c. T4
 - d. All the above

Answer Key: Test Evaluation – How to Use of the Hazardous Materials Table (§172.101)

1. c.
2. a.
3. d.
4. c.
5. d.
6. c.
7. a.
8. a.
9. c.
10. b.

CHAPTER 3 – CLASSIFICATION

3.1 Objective

The objective of this module is to enable one to understand the United Nations hazard classification system adopted in the HMR, and to use the system to classify those hazardous material products which are offered for transportation by the paint and coatings industry. An explanation of special restrictions and exceptions that may apply to such products in domestic and international commerce based upon their hazard class is provided, as well.

3.2 Introduction

Classification is the most important step in the preparation of hazardous materials for shipment because it lays the foundation for all other hazardous material transportation requirements that follow. An incorrect classification will lead to the incorrect application of the regulations. The hazard classification directly affects:

- Types and sizes of packaging authorized
- Shipping paper descriptions and additional information
- Marking and labeling of bulk and non-bulk packagings
- Placarding of bulk packagings and transport units
- Loading and unloading requirements
- Stowage and segregation of packages and vehicles or freight containers
- Emergency response information and equipment

Although the majority of hazardous materials offered for transport are finished product paints, resins, and paint related materials, hazardous materials can also include:

- Raw Materials
- Intermediates
- Hazardous Wastes
- Empty Containers
- Sundry Products
- Samples
- Lab Chemicals
- Pretreatment Products
- Experimental Products

The remainder of this module will focus on how to determine whether or not a material is regulated for transportation as a hazardous material and to classify a material properly using the classification criteria within the regulatory definitions. It is important to note that DOT regulations do not allow you to overclassify a material for transportation. It is just as wrong, for example, to ship a non-regulated material as regulated, as it is to ship a regulated material as non-regulated. Imagine an emergency medical technician first-responder hesitating to render assistance to an injured driver because of unnecessary hazard class placards displayed on the side of a vehicle!

3.3 Definition of a Hazardous Material

The terms “Hazardous Materials” and “Dangerous Goods” can be used interchangeably to describe materials regulated for transportation. U.S. DOT regulations for example, reference “Hazardous Materials” to identify materials that are regulated for transportation, while the international regulations for transportation by air and water refer to these regulated materials, substances, or articles as “Dangerous Goods.”

The HMR defines a hazardous material as a substance or material which has been determined by the Secretary of Transportation to be capable of posing an unreasonable risk to health, safety, and property when transported in commerce and which has been designated as a hazardous material under section 5103 of the federal hazardous materials transportation law (49 U.S.C. 5103). The term includes hazardous substances, hazardous wastes, marine pollutants, elevated temperature materials and any other material meeting the defining criteria for hazard classes and divisions in Part 173.

DOT regulates only those materials which present acute immediate hazards in transportation such as fire, explosion, corrosion, or toxicity. Hazardous materials regulated for transportation are classified according to their dangerous characteristics into nine (9) categories called “hazard classes,” with the defining criteria for each outlined in 49 CFR, Part 173. Some hazard classes are further divided into “divisions” based on the type of hazard within the class. The table below summarizes the various hazard classes and divisions and provides some common examples to the paint industry.

Class or Division	Name	Common Paint Examples	DOT Regulation Section
Class 1	Explosives		173.50
Division 2.1	Flammable Gas	Aerosols	173.115
Division 2.2	Non-Flammable Gas	Aerosols	173.115
Division 2.3	Poison Gas		173.115
Class 3	Flammable Liquids and Combustible Liquids	Paint and Resins	173.120
Division 4.1	Flammable Solid	Aluminum Pastes	173.124
Division 4.2	Spontaneously Combustible		173.124
Division 4.3	Dangerous When Wet		173.124
Division 5.1	Oxidizer	Catalysts	173.127
Division 5.2	Organic Peroxide	Catalysts	173.128
Division 6.1	Toxic Substances	Isocyanates	173.132
Division 6.2	Infectious Substances	Medical Waste	173.134
Class 7	Radioactive		173.403
Class 8	Corrosive	Paint Removers	173.136
Class 9	Miscellaneous	Hazardous Substances (RQ) Marine Pollutants Powder Coatings Water-Borne Paint	173.140
ORM-D	Other Regulated Material	Consumer Commodity	173.144

3.4 Hazard Classification Objective

The hazard class of a material will dictate the packaging, labeling, handling, placarding, and the shipping paper description requirements. Hazardous materials that are most commonly shipped are listed by their proper shipping names in the Hazardous Material Table (HMT) at §172.101. If the material intended to offer for transport is listed in the HMT, simply look it up in the alphabetical list and identify the hazard class in Column (3). If there is a choice of hazard classes or packing groups, examine the laboratory analysis for the material and compare it to the classification and packing group criteria to determine the most correct entry. For example, a material known to be “Paint” with a flash point of 60.5 °C (141° F) or less is identified in the HMT by name and shows a hazard class of Class 3. However, Column (5) of the Table lists three different packing groups for the entry “Paint,” and one must now ascertain the flash point and boiling point of that particular paint in order to identify the most correct entry. The packing group criteria for Class 3 is examined in this module. Once the correct proper shipping name entry has been selected, the remainder of the shipping description is taken from the corresponding columns in the HMT.

If the flash point and boiling point would cause the paint to fall into packing group II of Class 3, the shipping description would be:

UN1263, Paint, 3, II

Once the basic shipping description has been completed, the HMT also provides the required labels and packaging requirements. Classification of the material is critical to all other compliance steps.

If the material intended for shipping is a mixture of one or more materials or is a material not listed by name in the HMT, the process is a bit more complex, since one may need to determine the hazard class and packing group before selecting the proper shipping name. For example, a mixture of two or more liquids known to have a flash point of 60.5° C (141° F) or less and also meeting the definition of a corrosive material and falling within packing group II, might best be described (based on precedence of hazard criteria) by the proper shipping name “Flammable liquids, corrosive, n.o.s.” based on these known hazardous characteristics and the precedence or seriousness of each of those hazards. The precedence of hazard criteria is discussed later in this module.

NOTE: Only the Proper Shipping Name, Hazard Class, and UN Number apply to every hazardous material shipment. The remainder of the information may or may not apply.

3.5 Hazard Classification Process

In order to begin the classification process, there are some basic questions which must first be answered.

3.5.1 Is the material regulated for transportation?

First determine if the material meets the definition of one or more of the nine hazard classes, or meets the definition of a hazardous substance, or meets the definition of a marine pollutant, or meets the definition of a hazardous waste. Remember, these are all included in the definition of a hazardous material.

3.5.2 Is the material listed by name in the Hazardous Materials Table?

The HMT in §172.101 provides an alphabetical listing of the most common proper shipping names used for describing hazardous materials for transportation. Use only those proper shipping names listed in the HMT when offering hazardous materials for transportation in accordance with the HMR. If a material is not listed by name in the HMT, it does not mean that the material is not hazardous. If the material is not specifically listed by name in the HMT, one must examine its hazardous characteristics and, if it meets the definition of a hazardous material, one must select the most appropriate proper shipping name from those listed. The most appropriate name may be based upon its use, such as “Paint related material,” or may be based upon its hazardous characteristics, such as “Flammable liquid, n.o.s.” Use the HMT in 49 CFR, Part 172, §172.101(c) to find the best description to match the material.

3.5.3 Are there any special provisions or exceptions that apply to the material in the quantity to be shipped?

Some materials that present limited hazards in transportation may be eligible for an “exception” from specific parts of the regulations when certain conditions are met. Other materials may be subject to additional “Special Provisions” which must be followed. One of the exceptions to be examined in detail here, since it may significantly affect products of the paint and coatings industry offered for transport, is the U.S. DOT provision for re-classifying certain high flash point flammable liquids as “combustible liquids,” and allowing broad exceptions for these materials. Review the special Packing Group considerations for viscous liquids with high flash points and exceptions for those liquids which will not sustain combustion, will also be covered.

3.6 Is this Material Regulated for Transportation?

3.6.1 Is it already classified?

The first step is to see if this material has already been classified. For example, raw materials and sundry items have probably already been classified by the supplier. Although referring to a Safety Data Sheet (SDS) or contacting the supplier directly may be the easiest solution, one should always verify the supplier's information.

3.6.2 Classification Responsibility

Only those qualified individuals familiar with the regulatory requirements and having the scientific knowledge and expertise to apply the classification criteria should classify hazardous materials for transportation. Is there someone in the company who has the scientific knowledge and primary responsibility for analyzing materials and determining hazard classification for transportation? That person may be more qualified and experienced to classify materials properly. Further, in accordance with the 49 CFR training requirements, the person classifying hazardous materials for transport will need to have appropriate training.

3.6.3 Information Gathering

To proceed with the classification, one will need to obtain as much hazard information as possible about the product. In some cases, it may be necessary to perform laboratory tests to determine vital information, such as flash points and boiling points of liquids. An SDS may provide beneficial information, such as flash points, corrosive properties, toxicity, hazardous substances, marine pollutants, etc., and may guide in determining the probable hazard classes. A well-constructed SDS will provide a hazard classification, typically in Section 14 of the SDS. However, an SDS may not provide the level of detail needed to answer all questions. One may need to request and review formula information, discuss hazard characteristics, and obtain a laboratory analysis through its product safety department. The testing criteria for each hazard class are specified within the definition section for that class. DOT classifications of similar products may provide helpful guidance. One may need to know not only the components in the product, but also the intended use, and how it will be applied by the customer. Is it a paint, paint remover, thinner, cleaner, resin, additive, catalyst, etc.? Is it packaged as an aerosol? The optional package sizes in which it will be offered may also be necessary in order to evaluate some regulatory requirements fully and accurately.

3.6.3.1 Information Checklist

1. Look at the SDS for this Product and/or Similar Products
2. Obtain Formula Breakdown (recipe or ingredients)
3. Obtain or review existing laboratory analysis for all possible hazard classes
4. Determine all hazard class and packing group criteria
5. Obtain information on all container types, package sizes, capacity, and weight
6. Check DOT Classifications of Similar Products
7. Product Use (i.e. what is it and how is it used)

3.7 Determining the Hazard Class

Now you are ready to determine the hazard class or multiple classes into which the material may be categorized. Does this material meet the definition of one or more hazard classes? Although there are 9 hazard classes, the primary focus here will be on Class 3 (Flammable liquids) and Class 8 (Corrosive materials), since these are the most common hazard classes in the paint industry. Hazard Class 9 will also be discussed since some materials that do not meet the definition of any other hazard class (1 through 8) but still present hazards in transportation, such as hazardous substances, marine pollutants, and certain wastes are included in Class 9.

Keep in mind that particular products may also meet the definition of additional classes or divisions not discussed within this module, and a review of all hazard classes may be necessary. The hazard class table at the beginning of this module identifies those sections in the regulations where you will find each of the hazard class definitions. It's also important to remember that some single materials may meet the definition of more than one hazard class.

3.7.1 Packing Group

In addition to the hazard class, you will also need to determine which Packing Group, if any, applies to your material. The Packing Group is used to communicate the degree of danger and to determine the level of packaging which must be used to contain the material safely.

Packing Group I (PG I) - Great Danger

Packing Group II (PG II) - Moderate Danger

Packing Group III (PG III) - Minor Danger

We will examine the method for determining the packing group for materials common to our industry, such as flammable liquids. Other materials, such as Class 2 (gases) and Class 7 (Radioactive) do not have a packing group since their packaging is predetermined by their hazardous characteristics. The HMT shows the packing group(s) in Column 5 for those materials that are listed by their proper shipping names and have been assigned a packing group.

3.7.2 Class 3 – Flammable Liquids, §173.120 and §173.121

Class 3 - Flammable Liquids represent the most common hazard class of the materials used and shipped in the paint and coatings industry. Many paints, resins, and solvents are regulated flammable liquids. Although we will cover some of the more important points in this module, you should read and review the definitions for Class 3 materials in §173.120 and the packing group criteria in §173.121.

Definition: A flammable liquid is any “liquid having a flash point of not more than 60° C (140° F), or any material in a liquid phase with a flash point at or above 37.8° C (100° F) that is intentionally heated and offered for transportation or transported at or above its flash point in bulk packaging” (see §173.120). There are, however, some specific exceptions to this definition. The following liquids are not included within the definition of a flammable liquid:

1. A liquid with such a high vapor pressure that it meets the definition of a gas in §173.115.
2. A liquid mixture having one or more components with a flash point of 60 °C (140 °F) or higher that make up at least 99% of the total volume of the mixture and it is not heated and offered for transportation or transported at a temperature at or above its flash point.
3. A liquid with a flash point higher than 35 °C (95 °F) which does not sustain combustion (as tested in accordance with ASTM D 4206 or 49 CFR Part 173 Appendix H).
4. A liquid with a flash point higher than 35 °C (95 °F) and a fire point greater than 100 °C (212 °F) according to ISO 2592.
5. A liquid with a flash point higher than 35 °C (95 °F) which is a water- miscible solution with a water content of more than 90% by mass.

3.7.2.1 Packing Groups for Class 3

In addition to flash point, a flammable liquid is also subdivided into packing groups I, II, and III (see §173.121).

Packing Group	Flash Point	Boiling Point
I		≤ 35° C(95° F)
II	< 23° C (73° F)	> 35° C(95° F)
III	≥ 23° C (73° F) but ≤ 60° C (140° F)	> 35° C(95° F)

Based on the above table, you may classify the liquids in these examples and determine the correct Packing Group.

Example 1

Paint: Flash Point 21 °C (70 °F) and Boiling Point 55 °C (131 °F)
→Class 3 (Flammable Liquid), PG II

Example 2

Paint: Flash Point 29 °C (85 °F) and Boiling Point 55 °C (131 °F)
→Class 3 (Flammable Liquid), PG III

3.7.3 Class 8 – Corrosive Material, §173.136 and §173.137

Corrosive materials are found in the paint industry in products such as paint removers, cleaners, and catalysts. Corrosivity testing has historically been difficult, time consuming, and expensive. Previously, corrosivity was determined primarily through animal skin testing. However, DOT also authorizes “in vitro” (i.e. “test tube”) testing as a tool to classify corrosive materials and assign their packing groups. These tests are much quicker, can be done at a fraction of the cost, and avoid using laboratory animals for some tests. In any case, you will need some test data before classifying these materials. Although this module includes some of the basic information on classifying corrosive materials, read and review the definitions for Class 8 materials in §173.136 and the packing group criteria for Class 8 materials in §173.137 for more complete technical information.

Although pH testing is not a reliable measure for corrosivity, it can be used as a screening tool. Corrosivity test results of other similar product families may also provide informational guidance.

Definition: A corrosive material is a “liquid or solid that causes full thickness destruction of human skin at the site of contact within a specified period of time. A liquid, or a solid which may become liquid during transportation, that has a severe corrosion rate on steel or aluminum based on the criteria in §173.137(c)(2) is also a corrosive material” (see §173.136).

3.7.3.1 Packing Groups for Class 8

Corrosive materials are also subdivided into packing groups I, II, and III (see §173.137).

Packing Group I - Materials that cause full thickness destruction of intact skin tissue within an observation period of up to 60 minutes starting after the exposure time of 3 minutes or less.

Packing Group II - Materials, other than those meeting Packing Group I criteria, that cause full thickness destruction of intact skin tissue within an observation period of up to 14 days starting after the exposure time of more than three minutes but not more than 60 minutes.

Packing Group III - Materials, other than those meeting Packing Group I or II criteria, that cause full thickness destruction of intact skin tissue within an observation period of up to 14 days starting after the exposure time of more than 60 minutes but not more than 4 hours; or that do not cause full thickness destruction of intact skin tissue, but exhibit a corrosion rate on steel or aluminum surfaces exceeding 6.25 mm (0.25 in.) a year at a test temperature of 55 °C (130 °F).

3.7.4 Class 9 – Miscellaneous Hazardous Material, §173.140 and §173.141

Class 9 includes any “material which presents a hazard during transportation, but which does not meet the definition for any other hazard class” (see §173.140). In the paint and coatings industry, Class 9 might include CERCLA hazardous substances listed in Appendix A to §172.101. When these EPA regulated hazardous substances equal or exceed their reportable quantity in one package (e.g., as a component of a paint which does not meet the definition of any other hazard class), they would be classified as Class 9. It could also include those hazardous substances as raw materials used in the manufacturing of paints and coatings.

3.7.4.1 Marine Pollutants

Marine pollutants are components or raw materials which do not meet the definition of any other hazard class would also be included in Class 9. A regulated waste that does not meet the definition of the other hazard classes might also be classified as Class 9 when offered in transportation.

3.7.4.2 Hazardous Substances

Materials which have been identified as hazardous substances under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the designated “Reportable Quantity” (RQ) for each, are found in Appendix “A” to §172.101, following the HMT.

If the proper shipping name (technical name) for the material is found in Column (2) of the table and is also listed in Appendix A, and the quantity of that material per package meets or exceeds the RQ designated, it is a hazardous substance and will be identified by the proper shipping name in Column (2) of the HMT. However, if a material is not listed by technical name in the HMT but it is listed in Appendix A and meets or exceeds the RQ per package, and does not meet the definition of any other hazard class, you must use the proper shipping name “Environmentally hazardous substance, liquid or solid, n.o.s.”

If the proper shipping name of the hazardous substance does not include the name of the constituents making it a hazardous substance, the name or names of such constituents must be entered in parenthesis with the proper shipping name.

For example, if a drum of paint contains more than 10 Pounds of “Strontium Chromate,” (See Strontium Chromate in Appendix A), your basic shipping description must include the letters “RQ” in the description along with “Strontium Chromate” in parentheses at the end.

Example:
RQ, UN1263, Paint, 3, III (Strontium Chromate)

If your material does not meet the definition of any other hazard class such as Paint, the description would be:

For Liquids:

RQ, UN3082, Environmentally hazardous substance, liquid, n.o.s., 9, III (Strontium Chromate)

For Solids:

RQ, UN3077, Environmentally hazardous substance, solid, n.o.s., 9, III (Strontium Chromate)

Materials which meet the definition of a hazardous substance must be identified by the entry RQ in association with the proper shipping name on shipping papers and on non-bulk package markings. Spills of these materials must be reported to the authorities.

Hazardous Substance List in Appendix A

Hazardous Substance	Reportable Quantity (RQ) Pounds (Kilograms)
Acetone.....	5000 (2270)
Allyl alcohol	100(45.4)
Antimony ϕ	5000 (2270)
Ethylene dichloride.....	100 (45.4)
Ethyl methyl ketone @	5000 (2270)
Mercury.....	1 (0.454)
Strontium chromate	10 (4.54)
Toluene	1000 (454)
Vinyl chloride	1 (0.454)

Selected Entries from Appendix A to §172.101, Hazardous Materials Table

Footnotes:

ϕ The RQ for these hazardous substances is limited to those pieces of the metal having a diameter smaller than 100 micrometers (0.004 inches).

@ Indicates that the name was added by PHMSA because (1) the name is a synonym for a specific hazardous substance and (2) the name appears in the Hazardous Materials Table as a proper shipping name.

A material that is not listed in Column (2) of the HMT, but is listed in Appendix “A” to the table and does not meet or exceed the RQ per package, does not meet the definition of a hazardous substance and is therefore not regulated as a hazardous material in transportation.

3.7.4.3 Marine Pollutants

Some materials offered for transportation may be harmful to fish or aquatic plant life if released into a body of water and may therefore meet the definition of a marine pollutant. (See definition for “marine pollutant,” Appendix to this manual.) Appendix B to the HMT in §172.101, lists those substances which have been identified as marine pollutants.

S.M.P (Severe Marine Pollutant)	Marine Pollutant
(1)	(2)
.....	Allyl bromide
PP.....	Cadmium compounds
.....	Di-(2-chloroethyl) ether
.....	Lead acetate
.....	Isodecyl acrylate
.....	Tetrachloroethylene
PP.....	Yellow phosphorous, dry

Selected entries from Appendix B, §172.101

Those entries in Column 2 of Appendix B, which are preceded by the letters “PP” in Column 1, have been designated as severe marine pollutants and when 1% or more of any mixture or solution is made up of this pollutant, the entire mixture or solution must be identified as a marine pollutant. All entries in Column 2 with no corresponding entry in Column 1 have been designated as marine pollutants. Any mixture or solution which contains 10% or more of a listed pollutant must be identified as a marine pollutant for the entire mixture or solution.

Materials which are listed in Column 2 of the HMT by technical name, and which also appear in Column 2 of Appendix B, or materials listed in Appendix B that are present in the prescribed quantities in mixtures or solutions described by an “n.o.s.” entry, must be described on a shipping paper with the words “MARINE POLLUTANT” as an additional description.

Examples:

UN1897, Tetrachloroethylene, 6.1, III, MARINE POLLUTANT

UN1993, Flammable liquid, n.o.s., (Acetone, Allyl bromide) 3, II, MARINE POLLUTANT

Example:

If a bulk shipment of Paint with a flash point of 85° F contained more than 1 % of Cadmium, it would be described as below:

UN 1263, Paint, 3, III, Marine Pollutant (Cadmium)

Materials that are listed by technical name in Column 2 of Appendix B, but are not listed by technical name in Column 2 of the HMT in §172.101, may most accurately be described as “Environmentally hazardous substance, liquid, n.o.s.” or “Environmentally hazardous substance, solid, n.o.s.” and would properly be classified in Class 9. When a marine pollutant is present in a substance identified by an “n.o.s” entry and the technical name of the marine pollutant is not already part of the basic description, the technical name of the marine pollutant must be entered in parentheses as required for any other n.o.s. entry additional description.

Example:

A mixture which contained 11% Isodecyl acrylate (which is a listed marine pollutant) and does not meet the definition of any other hazard class would be described as:

UN3082, Environmentally hazardous substance, liquid, n.o.s., (Isodecyl acrylate), 9, III, MARINE POLLUTANT

Additional shipping papers and package marking requirements applicable to materials identified as marine pollutants are further explained in the appropriate chapters of this manual.

When it comes to shipping marine pollutants, significant exceptions are offered in 49 CFR §171.4.

1. Except when all or part of the transportation is by vessel, the requirements of the HazMat Regulations specific to marine pollutants do not apply to marine pollutants when transported in non-bulk packagings; and
2. For all transport modes, marine pollutants are not subject to the requirements of the HazMat Regulations when in single or combination packagings that do not exceed 5 L (liquids) or 5 kg (solids) in capacity. The packagings must conform to the general packaging requirements of §173.24 and §173.24a. This exception does not apply to marine pollutants that are also hazardous substances, hazardous wastes, or meet the definition of another hazard class.

3.7.5 Multiple Hazard Materials

Some hazardous materials in the paint and coatings industry may meet the definition of more than one hazard class. In other words, they may present multiple hazards. If a material meets the definition of more than one hazard class, you must identify the primary hazard class that would present the most serious hazards in transportation. The less serious hazards would be considered subsidiary hazard classes. Although there can be more than one subsidiary hazard class, there can only be one primary hazard class.

3.7.5.1 Precedence of Hazard

§173.2a in 49 CFR lists the hazard classes in a descending order of priority with the most serious hazards listed first and refers to the listing as the “Precedence of Hazards.” Those hazard classes listed in paragraphs (1) through (7) of §173.2a and prior to the Precedence of Hazard Table always take precedence over those hazard classes in the table. For classes 3, 8, Divisions 4.1, 4.2, 4.3, 5.1, and 6.1 (other than PG I Inhalation Hazards), use the Precedence of Hazard Table to determine the primary and subsidiary hazards.

Class	Hazard
Class 7	Radioactive
Division 2.3	Poison Gas
Division 2.1	Flammable Gas
Division 2.2	Non-Flammable Gas
Division 6.1, Packing Group I,	Toxic by Inhalation
Division 4.2	Pyrophoric Materials
Division 4.1	Self-Reactive Materials
Class 3, 8, 4.1, 4.2, 4.3, 5.1, 6.1	See Precedence of Hazard Table*
Combustible Liquids	Combustible Liquids
Class 9	Miscellaneous

*The Precedence of Hazard Table is found in 49 CFR Part 173.2a. The first column in the table and the horizontal header in the table contain a list of all these hazard classes with their packing groups. Select the appropriate hazard Class or Division and Packing Group from the first column of this Table and then select the appropriate hazard class and packing group from the horizontal column at the top of the table. The number that appears at the intersection of the horizontal and the vertical columns identifies the hazard class number of the primary hazard. The hazard class number not shown will be the subsidiary hazard.

Example: A material is tested and found to be a Class 3, Flammable liquid in packing group II (3, II). The same material also meets the definition of Class 8 Corrosive material in packing group III (8, III). The fact that it is a Class 3 indicates that the material is a liquid. On the left side of the table select the entry “3 II” and select the entry “8, III, liquid” at the top. Where the two columns intersect the number “3” appears. This means that in this case the Class 3 hazard takes precedence and is therefore the primary hazard. Class 8 is the subsidiary hazard. The packing group for the multiple hazard material is determined by the most stringent packing group for each hazard, thus the packing group for this liquid is PG II.

Precedence of Hazard Table															
[Hazard class or division and packing group]															
	4.2	4.3	5.1 I ¹	5.1 II ¹	5.1 III ¹	6.1, I dermal	6.1, I oral	6.1 II	6.1 III	8,I liquid	8,I solid	8,II liquid	8,II solid	8,III liquid	8,III solid
3 I (²)		4.3				3	3	3	3	3	(³)	3	(3)	3	(³)
3 II (²)		4.3				3	3	3	3	3	(³)	3	(3)	3	(³)
3 III (²)		4.3				6.1	6.1	6.1	3 4	8	(³)	8	(3)	3	(³)
4.1 II ²	4.2	4.3	5.1	4.1	4.1	6.1	6.1	4.1	4.1	(³)	8	(³)	4.1	(³)	4.1
4.1 III ²	4.2	4.3	5.1	4.1	4.1	6.1	6.1	6.1	4.1	(³)	8	(³)	8	(³)	4.1
4.2 II		4.3	5.1	4.2	4.2	6.1	6.1	4.2	4.2	8	8	4.2	4.2	4.2	4.2
4.2 III		4.3	5.1	5.1	4.2	6.1	6.1	6.1	4.2	8	8	8	8	4.3	4.2
4.3 I			5.1	4.3	4.3	6.1	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
4.3 II			5.1	4.3	4.3	6.1	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
4.3 III			5.1	5.1	4.3	6.1	6.1	6.1	4.3	8	8	8	8	4.3	4.3
5.1 I ¹						5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1
5.1 II ¹						6.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1
5.1 III ¹						6.1	6.1	6.1	5.1	8	8	8	8	5.1	5.1
6.1 I, Dermal										8	6.1	6.1	6.1	6.1	6.1
6.1 I, Oral										8	6.1	6.1	6.1	6.1	6.1
6.1 II, Inhalation										8	6.1	6.1	6.1	6.1	6.1
6.1 II, Dermal										8	6.1	8	6.1	6.1	6.1
6.1 II, Oral										8	8	8	6.1	6.1	6.1
6.1 III										8	8	8	8	8	8

¹ See § 173.127.

² Materials of Division 4.1 other than self-reactive substances and solid desensitized explosives, and materials of Class 3 other than liquid desensitized explosives.

³ Denotes an impossible combination.

⁴ For pesticides only, where a material has the hazards of Class 3, Packing Group III, and Division 6.1, Packing Group III, the primary hazard is Division 6.1, Packing Group III.

Once the primary hazard class and any subsidiary classes have been identified, go to the HMT in 49 CFR §172.101 to select the most appropriate generic proper shipping name and complete the basic shipping description for the material. For example, the multiple hazard material which we just classified as having a primary hazard class of Class 3 and a subsidiary hazard class of Class 8 might best be identified by the proper shipping name “Flammable liquid, corrosive, n.o.s.” in Column (2), with the hazard class “3” in Column (3), the identification number “UN2924” in Column (4), and the correct entry will show a packing group “II” in Column (5) of the HMT.

3.7.6 Non-Regulated Materials

If you have determined that your material does not meet the definition of any of the hazard classes 1 through 8 and does not meet the defining criteria for a hazardous substance, or a hazardous waste, or a marine pollutant, your product is not regulated for transportation within the United States. However, when intended for international transportation by air or water, always consult the regulatory codes applicable to the mode and the countries involved.

3.8 Choosing a Proper Shipping Name

3.8.1 Accurately Describe the Hazardous Material

The proper shipping name must accurately describe the hazardous material. Proper shipping names must be evaluated for accuracy in four ways:

1. Hazard class entry: The shipper must ensure that the hazard class shown in Column 3 of the Hazardous Materials Table matches the hazard class of the hazardous material. This is why it is important to characterize and classify the material before selecting a proper shipping name.
2. Packing group entry: The actual packing group of the hazardous material must be shown in Column 5 of the HMT for that proper shipping name.
3. Subsidiary hazard entry: If the proper shipping name indicates a subsidiary hazard (for example, with labeling instructions in Col. 6), the hazardous material must actually exhibit that subsidiary hazard.
4. Descriptive text: Any descriptive text shown in Column 2 must be consistent with the characteristics of the hazardous material being named (e.g. physical state, concentration, characteristics, etc.).

If the proper shipping name being considered for the hazardous material makes inaccurate statements in one or more of these four ways, use a proper shipping name (even a less specific one) that correctly describes the hazardous material.

3.8.2 Most Specifically Describe the Hazardous Material

Another requirement of the proper shipping name is that it must be the most specific name available for the material. In general, proper shipping names can be broken down into four types (one “specific” type and three “generic” types). The categories in decreasing specificity are:

1. Technical Names (e.g. Acetone, Acetyl bromide)
2. Generic Usage Names (e.g. Paint, Adhesives)
3. Generic Chemical Family Names (e.g. Alcohols, n.o.s. or Ketones, liquid, n.o.s.)
4. Generic Hazard Class Names (e.g. Flammable liquid, n.o.s. or Corrosive liquid, n.o.s.)

3.8.3 Common Paint and Coatings Products Listed in the HMT

Pure substances such as xylene or toluene are often transported within the paint and coatings industry. These materials may be listed by their technical name in the HMT. To determine the proper shipping name, consult the table and locate the technical name Xylene or Toluene in the table. If it's in the table, simply record the proper shipping name, class, UN Number, and Packing Group.

Some common examples found in the Table include:

Toluene	3	UN1294	PG II
Xylenes	3	UN1307	PG II OR PG III
Methyl Ethyl Ketone	3	UN1193	PG II
Methyl Isobutyl Ketone	3	UN1245	PG II
Ethanol	3	UN1170	PG II or PGIII
Acetone	3	UN1090	PG II
Allyl Alcohol	6.1 (3)	UN1098	PG I
Acetic Acid, Glacial	8 (3)	UN2789	PG II
Toluene Diisocyanate	6.1	UN2078	PG II

3.8.4 Materials Not Listed in the Hazardous Materials Table

Not all materials are listed by technical name in the HMT, since it would be impossible to list every chemical in the Chemical Abstracts Service registry or any other chemical substance database. If the material is not listed by its technical name in the HMT or if it is a mixture of several hazardous materials, a “generic” or “usage” name must be chosen from the HMT.

Common examples of generic usage names: adhesives aerosols, coating solution, paint, paint related material, resin solution.

Common examples of chemical family names: alcohols n.o.s., ketones liquid n.o.s., amines liquid corrosive flammable n.o.s., petroleum distillates n.o.s.

Common examples of generic hazard class names: corrosive liquid acidic organic n.o.s., flammable liquid n.o.s., flammable liquid corrosive n.o.s., corrosive liquid flammable n.o.s.

3.8.4.1 Technical Names for Generic and n.o.s. Entries

When a “G” appears in Column 1 of the HMT for a particular shipping name, the technical name(s) must be entered in parentheses after the proper shipping name or at the end of the “n.o.s.” description. If there are two hazard classes, the technical names for the material representing both hazards must be included. When more than two hazardous materials are present in a mixture or solution, only the two which most contribute to the hazard(s) are required.

3.8.4.2 Mixtures and Solutions

If a mixture or solution contains only a single hazardous component that is listed in the HMT, such as Methyl Isobutyl Ketone (80%) and water (20%), the word “solution” or the word “mixture,” as appropriate, must be added to the end of the proper shipping name. In the methyl isobutyl ketone and water example, the word “solution” is more appropriate. Keep in mind that the mixture or solution must have the same hazard class, packing group, and physical characteristics as the pure substance listed in the HMT.

3.9 Exceptions

Common Flammable Liquid Exceptions: Listed below are some of the more common exceptions and restrictions that may apply to flammable liquids in the paint industry. Since this is only a summary, you should refer to the regulation for exact details.

3.9.1 Combustible Liquid, §173.120(b)(2)

Combustible liquids include those liquids that do not meet the definition of any other hazard class and have a flash point of above 60 °C (140 °F) and below 93 °C (200 °F) and may include those flammable liquids which do not meet the definition of any other hazard class and have a flash point at or above 38 °C (100 °F) and have been reclassified as a combustible liquid. Exceptions for combustible liquids are found at §173.150(f) and include a total exception from all the regulations of 49 CFR for combustible liquids transported in non-bulk containers.

Combustible liquids in bulk containers are subject only to the shipping paper, marking, placarding, incident reporting, and general packaging requirements of 49 CFR. In other words, even a bulk packaging such as a cargo tank is not required to be a specification packaging when transporting a combustible liquid.

3.9.1.1 Exceptions for Combustible Liquids, §173.150(f)(2)

A Combustible Liquid is not regulated for ground transportation in the United States in non-bulk packaging (450 Liters or 119 Gallons) as long as it is not a hazardous substance, a hazardous waste, or a marine pollutant.

Example 1

Paint: Flash Point 57 °C (135 °F) and Boiling Point 82 °C (180 °F) shipped in 55 Gallon Drums: Reclassified as Combustible liquid and not regulated since FP the flash point is above 38 °C (100 °F) and the drum is less than 119 Gallons

Example 2

Paint: Flash Point 57 °C (135 °F) and Boiling Point 82 °C (180 °F) shipped in 250 Gallon Tote: Reclassified as combustible liquid but still subject to 49 CFR §173.150(f)(3) and must be described as: UN1263, Paint, Combustible Liquid, PGIII

3.9.1.2 Combustible Liquid Bulk, §173.150(f)(3)

Any liquid with a flash point greater than 60 °C (140 °F) but less than 93 °C (200 °F) shipped in a bulk container with a capacity of 450 liters (119 Gallons) or more must be classified and shipped as a regulated combustible liquid. This applies to both domestic shipments and U.S. import and export shipments.

3.9.2 Sustained Combustion, §173.120

A liquid with a Flash Point > 35 °C (95 °F) that does not sustain combustion according to Appendix H of Part 173 is not considered a flammable or combustible liquid and is therefore not regulated for transportation. This means, in more easily understood terms, that if the vapors ignite but burn out within a prescribed time period, the liquid will not sustain combustion. This exception also applies to IATA, IMDG, ADR Europe, and Mexico Transportation regulations. It is most often used with waterborne coatings and resins.

3.9.3 Viscosity Reclassification, §173.121(b)

Viscous Class 3 Flammable Liquids in Packing Group II with a flash point of less than 23 °C (73 °F) may be grouped in Packing Group III provided that they meet the additional criteria in §173.121 and the packaging is not more than 30 liters (7.9 gallons). The viscosity flow tests are based on the flash point of the liquid as specified. Changing the packing group will not only permit use of packing group III packaging but may also enable you to package larger quantities in each of the inner receptacles of a limited quantity shipment. This exception also applies to IATA, IMDG, ADR Europe, and Mexico's transportation regulations.

3.9.4 Limited Quantity

DOT recognizes that some hazardous materials in small packagings may present very limited hazards in transport. Therefore, the regulations provide exceptions to the regulatory requirements for these materials when certain specific conditions are met. These conditions include limiting the quantity per inner packaging and preparing the outer packaging according to specific guidelines. These "Limited Quantity" packages may be exempt from the UN specification packaging standards and the hazard class hazard labeling requirements and, for ground transport, the shipping paper requirements. To determine if the material you intend to ship is authorized as a limited quantity, first refer to Column (8A) of the HMT for the proper shipping name entry to be used. If the word "None" appears in Column (8A), the material is not authorized to be packaged and shipped as a limited quantity.

The entry "Paint" in Column (2) of the Table and showing Class 3 in Column (3) refers to §173.150 in Column (8A). Therefore, Paint as a flammable liquid is eligible to be shipped as a limited quantity as long as the conditions within the authorization are met. Paint in Class 3, PG II, could be packaged in inner receptacles of not over one liter net capacity each, packed in strong outer packaging, with a total weight of the completed package not exceeding 30 kg (66 lbs.).

Column (7) for the entry Paint, Class 3, PGII contains Special Provision 149. This special Provision, found in §172.102, states that if transported as a limited quantity or a consumer commodity, the net capacity of the inner packaging may be increased to 5 liters. All of the other requirements of §173.150 must be met.

If a material is shipped as a limited quantity, the shipping description must include the words “Limited Quantity” or abbreviation “Ltd. Qty.” at the end of the description, when a shipping paper is required (e.g., ocean and air transport).

Example:

“UN1263, Paint, 3, II, Limited Quantity”

OR

“UN1263, Paint, 3, II, Ltd. Qty.”

Test Evaluation – Hazard Classification

Read each of the following questions carefully. Select the MOST appropriate answer for each of the following questions and mark the corresponding space on the answer sheet provided. Only ONE answer per question may be marked on the answer sheet.

1. The regulations require that hazardous materials be assigned to a hazard class or division based upon their dangerous characteristics. The classification must be done by:
 - a. The initial carrier
 - b. The shipper
 - c. The U.S. government
 - d. None of the above

2. When blending a mixture of two hazardous materials from different hazard classes the proper hazard class of the mixture is determined by:
 - a. Estimating the percentages of each material in the mixture
 - b. Using either of the two hazard classes of the material
 - c. Conducting laboratory tests using the classification criteria in Part 173
 - d. Assigning the hazard class with the lowest class or division number

3. A "Paint" with a flash point of 70° C (158° F) that does not meet the definition of any other hazard class would meet the definition of a:
 - a. COMBUSTIBLE LIQUID
 - b. FLAMMABLE LIQUID
 - c. CORROSIVE LIQUID
 - d. TOXIC LIQUID

4. FLAMMABLE LIQUIDS are assigned to:
 - a. Class 8
 - b. Class 6
 - c. Division 2.1
 - d. Class 3

5. An "Aerosol" packaging containing a flammable "Paint" with a propane propellant is assigned to which of the following hazard classes or divisions by U.S. DOT?
 - a. Class 3
 - b. Division 2.1
 - c. Division 2.2
 - d. None of the Above

6. A series of laboratory tests demonstrates that a liquid meets the definition of a Class 3 in PG III and also a Class 8 in PG III. The primary hazard class of the material is:
 - a. Class 8
 - b. Combustible liquid
 - c. Class 3
 - d. None of the above

7. A one-half pint can of "Paint" with a flash point of 55° C (131° F) which is intended for distribution from a hardware store and is intended for use around the home would be classed as:
 - a. Class 3
 - b. COMBUSTIBLE LIQUID
 - c. Class 6
 - d. ORM-D

8. The defining criteria for hazard classification of a Class 3 is found in:

- a. §173.120
- b. §173.115
- c. §172.101
- d. §172.419

In order to describe a material by the proper shipping names "Paint" or "Paint related material" it must meet the definition of:

- e. Class 3
- f. Class 8
- g. Combustible liquid
- h. Anyone of the above

9. A material described as a "coating solution, undercoat" on the shipping paper and on the marking on a 55 gallon drum and having a flash point of 115° C (239° F) would be assigned to hazard class:

- a. Class 3
- b. COMBUSTIBLE LIQUID
- c. Division 2.1
- d. None of the above

10. A material described as a "coating solution, undercoat" on the shipping paper and on the marking on a 55 gallon drum and having a flash point of 115° C (239° F) would be assigned to hazard class:

- a. Class 3
- b. COMBUSTIBLE LIQUID
- c. Division 2.1
- d. None of the above

Answer Key: Test Evaluation – Hazard Classification

1. b.
2. c.
3. a.
4. d.
5. b.
6. c.
7. d.
8. a.
9. d.
10. d.

CHAPTER 4 – PACKAGING

4.1 Introduction

The regulations to ensure safe transportation of hazardous materials have evolved over many years and are based upon industry standards of good professional practice developed through actual experience in transportation techniques. This statement is especially applicable to the packaging standards which have incorporated the ever-changing technology for producing stronger and lighter weight materials for more efficient containerization, while not compromising the security of the package. Packaging, as defined in the hazardous materials regulations, falls within two distinct categories known as “non-bulk packaging” and “bulk packaging.” DOT also provides “exceptions” to the packaging specifications for non-bulk and bulk packaging for materials which may present limited hazards in transportation.

Hazardous materials transportation regulations in the United States were significantly changed when the DOT adopted the recommendations of the United Nations Committee of Experts on the Transport of Dangerous Goods for the purpose of harmonizing the domestic and international regulations. The most significant change in the hazardous material regulations in 49 CFR was the transition from US DOT Specification packaging to the UN Performance-oriented packaging standard.

The conversion to the UN standard is summarized in the following statements:

- Shippers have more flexibility in selecting packaging options rather than being bound to specific, detailed design and construction requirements.
- Enforcement officers will compare UN performance-oriented packaging standard markings with the packaging authorizations for the contents and ensure that the package is properly used. They will also check to be sure the package is performing its containment function and is in a secure condition.
- The shipper has greater responsibility to ensure that the packaging used is authorized, has been performance tested, and will perform to the level required. Any deviations from the packaging manufacturer’s directions on using, filling, and closing the package may void the authorization for using the packaging for hazardous materials. The most important determinant of the qualification of a package will be how well it performs under the specified test conditions.

4.2 Overview of Performance-Oriented Packaging

The packaging standards recommended by the UN are based on measuring the level of performance of a packaging rather than constructing each packaging to a rigid standard. Innovation is not only permitted, but is encouraged. Packaging design engineers are free to experiment with new and ever-changing technology, utilizing new materials and advanced techniques for producing stronger and lighter weight packaging for more efficient containerization.

However, in order to ensure that these packagings continue to provide safe and secure containment of hazardous materials, the UN recommended some specific testing procedures. The tests are designed to evaluate the containment performance of the completed package under conditions intended to replicate those experienced during transportation.

Recognizing that high-hazard materials might require some additional considerations, the testing criteria are based upon the degree of danger presented by the material in each hazard class. Hazardous materials are categorized in three groups called “packing groups” that are based on the degree of danger they present during transportation.

Packing Group I (PG I) - Great Danger

Packing Group II (PG II) - Moderate Danger

Packing Group III (PG III) - Minor Danger

Packaging which has successfully completed the testing specified for each packing group is marked with a symbol and a code to indicate that the packaging was designed, constructed, and tested to the UN standard applicable to that type of packaging. As long as the packaging user stays within the limitations marked on the package and completes the package, including filling, cushioning, and closing according to the manufacturer’s instructions, the packaging should perform satisfactorily during conditions normally experienced in transportation.

The sections in Part 173 that authorization are, for the most part, very generic. For example, one non-bulk packaging section (§173.202) authorizes packaging options for most Packing Group II liquids. Bulk packaging is treated similarly. In addition to these specific packaging authorizations, there are more general requirements applicable to all packagings included in Part 173.

4.3 Shipper Responsibilities, §173.22

Part 173 also specifies the shipper's responsibility for preparing hazardous materials to be offered in transport. The shipper has the regulatory responsibility for selecting a packaging which is designed to safely transport the hazardous material to be offered in transportation in the mode or multiple modes by which it will be transported. In order to select the most efficient authorized packaging, you must first analyze the product to be shipped and classify it according to the applicable hazard class and or division. The packaging standards set by DOT in the regulations are the minimum packaging requirements. Practicing product stewardship, you may actually choose to go beyond the regulatory requirements and use a packaging which will outperform the testing standard for the authorized packaging.

There are various criteria to consider when determining the size and type of packaging which might be best suited for transporting your hazardous materials. These criteria include the mode of transportation, the quantity to be shipped, and of course the customer's preference. Often, the return of the empty packaging may influence the decision on the type of packaging to be used in the paint and coatings industry.

4.3.1 Shippers Duty to Comply

Part 173, Subpart A, the General requirements, at §173.1, explains the purpose and scope of Part 173. This part includes definitions of the various hazard classes and the requirements to be observed in preparing hazardous materials for transportation by air, highway, rail, or water, or any combination thereof. The responsibility for inspection, testing, and retesting of packagings and the duties of those persons who conduct such activities are also included in Part 173. It is in this Part that DOT assigns the shipper the responsibility for preparation of hazardous materials and for training those employees who prepare them to ensure regulatory compliance. A shipment of hazardous materials that is not prepared in accordance with this subchapter may not be offered for transportation by air, highway, rail, or water. [49 CFR§173.1(b)]. This module will be beneficial in providing function-specific training for hazmat employees who package hazardous materials.

Provisions of the training rules allow the employer to train employees to other regulatory codes if those codes will be used for preparing and transporting hazardous materials. The DOT regulations specifically state, "In general the Hazardous Materials Regulations (HMR) in Subchapter C of 49 CFR are based on the Recommendations of the United Nations Committee of Experts on the Transportation of Dangerous Goods (UNCOE) and are consistent with the International Civil Aviation Organization (ICAO) Technical Instructions and the International Maritime Dangerous Goods (IMDG) Code. However, the HMR are not consistent in all respects, and compliance with the HMR will not guarantee acceptance by regulatory bodies outside the United States."

The DOT authorizes the use of only that packaging specified in Part 173 for transporting hazardous materials by air, highway, rail, or water entirely within the United States. However, packaging specified within the ICAO regulations or the IMDG Code may be authorized for import shipments as provided within §171.22. The packaging requirements apply to all modes of transportation unless the DOT provides specific exceptions elsewhere in the regulations.

4.4 Using UN Standard Packaging

The shipper relies on the manufacturer's required mark to determine the qualifications of the packaging. However, you have the responsibility for performing any packaging functions required by §§173.24, 173.24a and 173.24b for which the shipper is responsible and for following the instructions or conditions for use prescribed by the manufacturer. You are responsible for making sure that the package is assembled, closed or otherwise prepared for transport in full compliance with the specification standard under which the packaging was manufactured, including any conditions set forth by the manufacturer under the notification provisions of §178.2(c); (refer to §173.22).

If you assemble a package with all required components, fill it with only those hazardous materials as authorized, do not exceed the limitations as marked, close the package per the manufacturer's instructions, and do not otherwise depart from the manner in which the manufacturer has certified the package for use, you may assume the package is capable of meeting UN standards. Remember that the shipper cannot alter or amend a package design or specification without assuming full responsibility for doing so.

4.4.1 General Packaging Requirements for Shippers

In addition to the specific packaging authorizations and the requirements therein, Part 173 provides some general packaging requirements that apply to all packagings, both bulk and non-bulk, specification and non-specification, and new, reconditioned, or reused packagings. The following general packaging requirements in 49 CFR are particularly important to those who offer shipments of paint, coatings, and related products for transportation.

- §173.24: Specifies the requirements for packaging, in general. The items covered in this section include, but are not limited to, packaging compatibility, plastic packaging and receptacles, venting, and outage and filling limits. It is important to note that even though certain packagings may be authorized, the regulations state explicitly that it is nevertheless the shipper's responsibility to ensure that such packagings are compatible with their lading, particularly with respect to corrosivity, permeability, softening, premature aging and embrittlement.
- §173.24a: Describes additional requirements for non-bulk packagings. The items covered include the closures on inner packaging, friction, securing inner receptacles and closure on outer packaging, and vibration. This section also provides guidance on the circumstances when single or composite non-bulk packaging can be used for liquid materials.
- §173.24b: Describes additional requirements for bulk packagings. The items covered include outage and filling limits, the use of «equivalent steel» in the fabrication of tanks, and using air pressure to load and unload bulk packagings.
- §173.25: Describes the circumstances and conditions for using «overpacks,» which are defined in the regulations at §171.8 as «an enclosure that is used by a single consignor to provide protection or convenience in handling of package or to consolidate two or more packages.»
- §173.27: Provides the general requirements for packagings to be used for materials intended for transportation by aircraft, including packing group performance levels, limitations on capacities of inner packagings, pressure requirements, cushioning materials and absorbent materials for liquid contents.
- §173.28: Provides guidance on the inspection and use of reusable, reconditioned, and remanufactured non-bulk packagings, including checking the specification markings required.
- §173.29: Discusses the use of «empty» packagings containing residues. It is important to point out that empty packages containing residue of a hazardous material must be offered for transportation and transported in the same manner as when it contained the greater quantity of hazardous material. Unless exceptions are specified in this section, the empty packaging must remain marked, labeled, and closed, and a hazardous material shipping paper must accompany the empty packagings during transportation.
- §173.31: Specifies the conditions for use of an authorized tank car, including loading and unloading, safety systems and devices, and inspection procedures.
- §173.32: Describes requirements for the qualification, maintenance, and use of IM portable tanks, including accessories, fittings, testing and periodic retesting, marking, and record keeping.
- §173.35: Specifies the conditions for inspection, use, and filling limits for intermediate bulk containers (IBC's).

In addition to the general packaging requirements for bulk containers, Part 180 specifies the DOT requirements for continuing qualification, maintenance, and use of IBC's, cargo tanks, and rail tank cars.

4.4.2 Packaging Manufacturer Responsibilities

The DOT exercises regulatory authority over packaging manufacturers as well as shippers and carriers. The packaging manufacturer who provides the packaging intended for use in the transportation of hazardous materials must fully comply with all applicable regulations and indicate compliance by marking the packaging with a specified code. The marking required on a non-bulk packaging signifies that the manufacturer has designed, constructed, and tested that type of packaging in accordance with Part 178, Subparts L and M. DOT can trace the manufacturer through the symbol in the code to verify that the packaging is in compliance with the marked codes.

The manufacturer is responsible for notifying the shipper of all specification shortfalls or any steps the shipper must take to conform with the applicable specification. For example, the manufacturer should provide guidance on inner packaging components required, such as cushioning and absorbent materials, inner receptacles, and procedures to be followed when closing the package after filling, as required by §178.2.

The manufacturer is also responsible for performing any functions required by §173.24 or §173.24a for which the manufacturer assumes responsibility under contractual agreements with the shipper.

4.5 Specifications for Packagings, Part 178

Part 178 prescribes the manufacturing and testing specifications for packagings and containers used for the transportation of hazardous materials in commerce. Subparts within Part 178 that may be of particular importance to shippers of hazardous materials in the paint and coatings industry include:

- Subpart B - Specifications for Inside Containers and Linings
- Subpart H - Specifications for Portable Tanks
- Subpart J - Specifications for Containers for Motor Vehicle Transportation
- Subpart L - Non-bulk Performance-oriented Packaging Standards
- Subpart M - Testing of Non-bulk Packagings and Packages
- Subpart N - Intermediate Bulk Container Performance-oriented Standards
- Subpart O - Testing of Intermediate Bulk Containers

Note: Specifications for Tank Cars are codified in Part 179 of 49 CFR. Continuing Qualification and Maintenance of Packagings (Bulk) are codified in Part 180 of 49 CFR.

4.5.1 Definitions

Before examining the packaging specification, some packaging terms, nomenclature, and definitions are reviewed here. The definitions for packaging terms are found in §171.8 of 49 CFR.

4.5.1.1 Non-bulk Packaging

Non-bulk packaging is defined as a packaging which has a:

- maximum capacity of 450 liters (119 gallons) or less as a receptacle for a liquid;
- maximum net mass of 400 kilograms (882 pounds) or less and a maximum capacity of 450 liters or less as a receptacle for a solid; or
- water capacity of 454 kilograms (1,000 pounds) or less as a receptacle for a gas.

4.5.1.2 Bulk Packaging

Bulk packaging is a packaging, other than a vessel or a barge, including a transport vehicle or freight container, in which hazardous materials are loaded with no intermediate form of containment, and which has a:

- maximum capacity of more than 450 liters (119 gallons) as a receptacle for a liquid;
- maximum net mass of more than 400 kilograms (882 pounds) and a maximum capacity of more than 450 liters (119 gallons) as a receptacle for a solid; or
- water capacity of more than 450 kilograms (1,000 pounds) as a receptacle for a gas.

4.5.1.3 Packaging

Packaging means a receptacle and any other components or materials necessary for the receptacle to perform its containment function in conformance with the minimum packing requirements of the regulations. This means that the packaging is the specified container, cushioning and absorbent materials, closures, and other components, which are required to be a part of the minimum packaging required for each specific hazardous material.

4.5.1.4 Package

Package is defined as packaging plus its contents. In other words, it does not meet the definition of a package until the hazardous material has been put into the packaging and the preparation has been completed, so that the package of hazardous materials meets the minimum standards set out for transportation. Once the minimum packaging requirements have been met, the package can then be shipped.

4.5.1.5 UN Standard Package

UN standard packaging means a specification packaging conforming to the standards in the UN Recommendations on the Transport of Dangerous Goods. UN standard packaging, which is manufactured in the United States must conform to the applicable requirements in Subpart L, Subpart M, Subpart N, and Subpart O of Part 178 of 49 CFR. The markings on the package, preceded by the letters "UN" signify that the package has been constructed and performance-tested to the standards which are identified by the various characters in the code.

4.5.2 Performance Testing of Non-bulk Packagings

Packagings which have been constructed according to the packaging standards in Subpart L of Part 178 are then required to be performance-tested according to the criteria prescribed in Subpart M. Each packaging must be manufactured and assembled so as to be capable of passing the prescribed tests at all times while in transportation, in addition to meeting the general packaging requirements. The packaging manufacturer is responsible for conducting the prescribed performance tests to include design qualification testing and periodic retesting as defined in §178.601(c).

4.5.2.1 Design Qualification Testing

Design qualification testing means the performance of drop, leakproofness, hydrostatic pressure, and stacking tests, as applicable for each new or different packaging at the start of production of that packaging.

4.5.2.2 Periodic Retesting

Periodic retesting is the performance of the drop, leakproofness, hydrostatic pressure and stacking tests at intervals established by the regulations that are of sufficient frequency to ensure each package produced by the manufacturer is capable of passing design qualification tests. For more specific requirements, refer to §178.601.

4.5.2.3 Drop Test

The purpose of the test is to ensure that the package will remain intact and the contents will not leak or otherwise escape from the packaging in the event that it was accidentally or intentionally subjected to an impact as the result of being dropped during normal conditions of transport. For details on the requirements of this test, refer to §178.603.

4.5.2.4 Leakproofness Test

The purpose of this test is to ensure that the packaging will not leak or permit liquid product to escape accidentally from the packaging under conditions normally experienced during transport. The leakproofness test must be performed on all packages intended to contain liquids with the exception of the inner packagings of combination packagings. For details on the requirements of this test, refer to §178.604.

4.5.2.5 Hydrostatic Pressure Test

The purpose of this test is to ensure against the accidental release of liquids which may be subject to internal pressure within the packaging during normal conditions of transport. Liquids with high vapor pressures should only be packaged in containers which have been tested and marked to at least the highest pressure which may present during transport. For details on the requirements of this test, refer to §178.605.

4.5.2.6 Stacking Test

The purpose of this test is to ensure the ability of the packaging to remain rigid and secure and to safely contain the hazardous materials contents when other cargo in similar packagings might be stacked on top of it during normal conditions of transport. For details on the requirements of this test, refer to §178.606.

4.5.2.7 Vibration test

DOT requires this testing to replicate the conditions which might normally be experienced in a transport vehicle on the highway or rail systems. The package is subjected to a specified amplitude of vibration for a period of time which will ensure that the packaging materials will not fail as a result of fatigue from vibration during the course of transportation. The vibration test procedure is specified under §178.608.

4.5.3 Specification Non-bulk Packaging Marking

In order to determine if the packaging you wish to use is an authorized packaging, you will need to check the specification markings. Non-bulk packaging markings may be printed, embossed, or stenciled directly on the packaging surface. When specification packaging is required by the regulations, you must only use those packagings that have been tested and marked to indicate that they are an authorized packaging for the hazardous material that you intend to ship.

The markings which are displayed on the UN standard packaging indicate that the packaging is constructed to specifications and tested to ensure performance to a standard as published in the UN Recommendations on the Transport of Dangerous Goods. Each of the characters in the marking code identifies specific information which you will use to select the proper packaging authorized for the quantity of material in the appropriate hazard class and packing group. 49 CFR, Part 178, Subpart L, §178.502 specifies the identification codes to be used for designated types of non-bulk packagings.

To assist you in identifying the various types of packaging and to verify the level of performance testing to which it has been subjected and passed, each package is required to be marked with specific information appearing in a prescribed sequence. The markings required by Subpart L, §178.502 must be durable, legible, and placed in a location and size relative to the packaging so as to be readily visible. Reusable packagings that are authorized for reconditioning which may result in obliteration of the specification markings must have permanent type markings. For example, a drum which is authorized for reconditioning will usually be sandblasted and repainted in the reconditioning process, which would obliterate or remove a painted package marking. Therefore, drums that are authorized for reconditioning must be marked with a permanent mark, such as by embossing the code on the drum.

The marking may appear in a single line or in multiple lines provided they are in the correct sequence. The first item in the sequence is the “UN” symbol with the letters “u” over “n” appearing within a circle.



On embossed markings on metal receptacles the letters may appear as “UN” in place of the circular symbol. The UN symbol or letters serve as the manufacturer’s certification that the packaging is constructed to the standards and tested to the performance level with the capacity indicated as marked on the packaging. The first numerical character in the code identifies the type of packaging.

Package Type

- 1 - Drum
- 2 - Wooden Barrel
- 3 - Jerrican
- 4 - Box
- 5 - Bag
- 6 - Composite package
- 7 - Pressure receptacle

The second character in the code indicates the material of construction.

Material

- A - Steel
- B - Aluminum
- C - Natural wood
- D - Plywood
- F - Reconstituted wood
- G - Fiberboard
- H - Plastic
- L - Textile
- M - Multi-wall paper
- N - Metal other than steel
- P - Glass, porcelain, stoneware

Example:
Type 1A = Steel drum

The regulations require only the outer packaging code to be marked on combination packagings. For example, a fiberboard box with inner packagings of plastic would be identified as a “4G,” and a fiberboard box with inner packagings consisting of metal cans would also be identified by the code “4G.”

DOT authorizes packaging variations and provides for special markings to identify those variations in 49 CFR, §178.601(g) (2). The letter “V” entered next would indicate that the packaging met the requirements in Variation 2.

The next character identifies the category of the packaging within the type. For example, the code “1A1” identifies a non-removable head steel drum while a “1A2” identifies a removable head drum constructed of steel. Composite packagings, in addition to being identified by the “6,” would have two capital letters appearing in sequence, with the first letter indicating the material of construction of the inner receptacle, and the second letter indicating the material of construction of the outer packaging. For example, the code “6HA” would identify a plastic inner receptacle within an outer packaging constructed of steel as a composite packaging. A “6HA1” identifies a plastic inner receptacle within a steel drum. §§178.504 through 178.523 provide additional information on the categories associated with each type of packaging.

Each of the remaining letters and numbers within the packaging specification marking also provides specific information relative to the packaging, its use, and its strength, based upon performance testing, and further, provides a code to identify the packaging manufacturer and the country authorizing the manufacture of that packaging.

The code character in the sequence which follows the packaging type and category is the letter that identifies the performance standard to which the design type packaging was successfully tested. The letter “X” indicates it was successfully tested to Packing Group I level and is therefore suitable for use for materials in Packing Group I, II, or III.

The letter “Y” indicates the packaging was successfully tested to Packing Group II level and is therefore suitable for use for packaging materials in Packing Group II, or III. The letter “Z” indicates the packaging was successfully tested to Packing Group III level and is suitable only for packaging materials in Packing Group III.

X - PG I, II, and III

Y - PG II and III

Z - PG III only

The next character in the code identifies the specific gravity or the mass for which the packaging design type has been tested. A package without inner packagings which is intended to contain liquids, will show the specific gravity rounded down to the first decimal. This may be omitted if the specific gravity is 1.2 or less. A packaging intended to contain solids or inner packagings will show the maximum gross mass (total weight) in kilograms. The term “maximum gross mass” refers to the gross (total) weight of the package and includes the hazardous material, the container, the cushioning, the absorbent material and the outer packaging.

On single or composite packagings intended to contain liquids the next character in the code shows the hydrostatic test pressure in kilopascals, rounded down to the nearest 10 kPa, for the maximum pressure tested. Packaging intended to contain solids or inner packagings must be marked with the letter “S” in this position in the code.

The last two digits of the year of manufacture are displayed as the next character in the code. Plastic drums (1H) and plastic jerricans (3H) must also show the month of manufacture. The month and year of manufacture may be shown separately from the sequential items in the code.

The next character is the identification of the state (country) that authorized the allocation of that mark. Packaging authorized by the United States will display the letters “USA.”

The final characters in the code identify the manufacturer of the packaging. Packaging manufacturers and reconditioners registered with U.S. DOT have been authorized to construct, test, and mark packagings and will be allocated a symbol. The symbol begins with a “+” for third party testing facilities or an “M” for manufacturers who test their own packaging.

In addition to the UN packaging codes, DOT requires that metal or plastic drums or jerricans intended for reuse or reconditioning as single packagings or as the outer packaging of a composite packaging must have the thickness of the packaging materials marked in millimeters on the package in compliance with the nominal thickness determination in Section 178.503(a)(9) and (10).

Non-bulk Packaging Marking



In this example of a non-bulk packaging marking, the code indicates it is:

- a packaging constructed and tested to the UN standards for a non-removable head steel drum;
- tested to the performance level for Packing Group I, II, and III with a material having a specific gravity of 1.4;
- hydrostatically tested to an internal pressure of 250 kPa (rounded down to the nearest 10 kPa);
- manufactured in 2018, in the United States, by the manufacturer with the symbol +DD; and
- the package model or design number assigned by the manufacturer is 824.

Reconditioned Non-Bulk Packaging Marking



When a packaging is authorized for reuse and has been reconditioned, the markings on the packaging must identify the standards which it now meets, and the identity and registration of the reconditioner. The marking illustrated here identifies the type and category of packaging, the packing group level to which it has been tested, and all the other markings which were required when it was a new packaging. However, the letter “R” indicates that drum was reconditioned in 2019, and the letter “L” indicates it has been leak-proof tested. The reconditioner’s symbol and the country authorizing the display of the mark are also marked on each package. Since it is intended for reconditioning or reuse, the minimum thickness is also marked on the packaging in this case.

4.5.3.1 Remanufacture Non-bulk Packaging Marking

The regulations also provide for remanufacturing of packagings. If the specifications and testing level for a remanufactured drum remained the same as originally marked on the drum, the remanufacturer could mark the drum in a non-permanent manner (i.e. stencil) to indicate that the drum had been remanufactured. However, if any of the pertinent code designations were to change, the entire mark must be permanently marked on the drum to indicate the changed specification. For example, if a “1A1” non-removable head drum which had previously been constructed and tested to the UN standard for transporting liquids in Packing Group I, and no longer could successfully complete the testing for Packing Group I liquids, the drum might still have some useful purpose. A drum manufacturer might cut the head out of the drum, fit it with a removable head, test it to the performance level requirements for a “1A2” intended to contain solids or inner packagings in Packing Group II, and re-sell the drum. The marking required on the remanufactured drum would then be required to be permanently marked (embossed) on the drum to indicate the new specification.

4.5.4 Bulk Packaging Specifications

Bulk containers are quite different from non-bulk containers and for the most part, some of the testing conducted on non-bulk packagings could not be applied to these larger packagings. However, to qualify as an authorized packaging, bulk packagings must also be constructed, maintained, and periodically tested to ensure that they will perform satisfactorily when transporting hazardous materials.

4.5.4.1 Bulk Container Specification Marking

DOT requires that bulk packagings intended for transporting hazardous materials be manufactured to strict specifications and that the owner of the packaging conduct periodic inspection and testing to ensure that the bulk container continues to meet those specifications. Insulated tanks, lined tanks, and other such bulk containers where the inspector may not be able to perform a visual inspection, may require more stringent testing at more frequent intervals to ensure the integrity of the bulk container throughout its use.

4.5.4.2 Portable Tanks

Portable tanks are designed for mechanical handling and are used to transport bulk quantities of hazardous materials, often being transferred from carrier to carrier and even between modes. DOT specifications for the various types of portable tanks authorized for construction in the United States are codified in Subpart H of Part 178. There are several types of specification tanks currently authorized for construction including:

- Specification 51 steel portable tanks (49 CFR §178.245)
- Specification 60 steel portable tanks (49 CFR §178.255)
- Specification IM 101 and IM 102 steel portable tanks (49 CFR §178.270)

The specifications for portable tanks include requirements for design and construction including capacity, welding procedures, dimensions and location of openings, exterior surface finishes, materials used for heads or shells, minimum and maximum design pressures, tank mountings, tank linings, compartments, accessories and protective equipment. DOT requires that the manufacturer must permanently attach a manufacturer's name plate which identifies the tank by serial number and includes specific information regarding the specifications, capacity, tare weight, design pressure, design specific gravity, original test date and any retest dates which may be applicable.

Example: Metal Specification Plate. The owner of the tank must maintain the manufacturer's data report as the certificate of compliance and must maintain all subsequent repair, inspection, and test data for the entire time the tank is in use.

Manufactured by: _____
Serial No. _____ DOT Spec. _____
Nominal Capacity _____ Gallons
Tare Weight _____ Pounds
Design Pressure _____ p.s.i.
Date of Manufacture _____
Date Tested _____ Retest _____

4.5.4.3 Specifications for Containers for Motor Vehicle Transportation

Subpart J of Part 178 provides the specifications for construction of containers that will be used to transport hazardous materials by highway. Although this subpart addresses construction of vehicle bodies used for transporting liquid nitroglycerin, detonators, and other explosive materials, the primary motor vehicles addressed in this subpart are cargo tank motor vehicles.

DOT authorizes construction of several different types of cargo tanks, and each type is designed to safely transport hazardous materials with wide variety of physical characteristics and hazards. Some tanks are designed to withstand high internal pressures, such as those presented in the transportation of compressed gases, while others may be used to transport materials which develop no internal pressure but may be very heavy, such as acids which may weigh in excess of twenty pounds per gallon. Therefore, DOT prescribes unique specifications for each type of cargo tank within Part 178.

The metal certification plate which is permanently affixed to the cargo tank near the front of the left side provides the tank user with all specifications to which the tank was manufactured.

Cargo Tank Manufacturer :	_____
Date of Manufacture:	_____
DOT Specification:	_____
CT Certification Date:	_____
Nominal Capacity _____	Gallons
Maximum Weight of Lading _____	Pounds
MAWP: _____	p.s.i
Maximum Loading Rate: _____	GPM at _____ p.s.i.g.
Maximum Unloading Rate: _____	GPM at _____ p.s.i.g.
Lining:	_____
Design Temperature: _____	Maximum Density _____ lb./gal
Material Specification No.	_____
Weld Matl. _____	Surface Area _____ Sq. ft.
Mfd. Shell Thickness: Top _____	Side: _____ Bottom: _____

4.5.4.4 Periodic Retest and Inspection

The person responsible for filling the tank must further ensure that the tank owner has maintained the tank to specification and has conducted any periodic inspection and testing to ensure the continuing qualification of the tank as required by 49 CFR Part 180 Subpart E §180.405. The regulations provide that the person conducting the required inspection or testing verify the successful completion by marking the tank with the dates and codes in a conspicuous place on or near the specification plate.

Cargo tanks must also be tested and inspected at regular intervals to ensure their continued compliance with the original specification to which it was constructed. These tests include visual inspection, which means carefully checking the tank and its appurtenances to look for obvious signs of wear or damage. Internal inspection means to enter the tank and conduct a visual check of the barrel and heads and the liner if the tank is so equipped. Leakage testing involves introducing pressure into the tank and monitoring the tanks ability to hold such pressure. A pneumatic pressure test involves introducing air pressure only. A hydrostatic pressure test means that the tank is filled with water, and air pressure is introduced into the vapor portion of the tank. Thickness testing involves using a calibrated probe to measure the shell and head thickness at designated locations on the tank.

Upon successful completion of the test and inspection requirements, the cargo tank must be marked with the appropriate code to indicate compliance. The markings must be durably and legibly displayed in English in letters and numbers at least 32 mm (1¼ inches) in height, on the tank shell near the specification plate or on the front head of the tank. The type of test may be abbreviated as follows:

- V — for external visual inspection
- I — for internal visual inspection
- P — for pressure retest
- L — for lining test
- K — for leakage test
- T — for thickness test

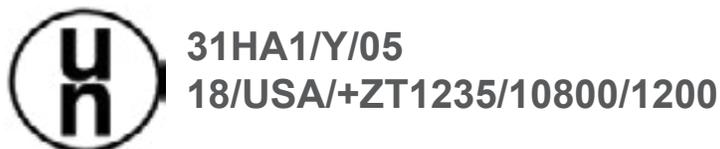
The letter code should be accompanied by the month and year when the test was successfully completed. For example, the marking “5 - 19 P, V, L” would indicate that the cargo tank successfully completed the pressure retest, external visual test, and lining test, in May 2019.

The cargo tank owner is responsible for maintaining the reports and records to verify continuing compliance and qualification of the tank. The person filling the cargo tank must also comply with the DOT requirements applicable to loading and filling of cargo tanks as specified in 49 CFR §173.33. The person filling the tank should always check the test date markings on the cargo tank prior to filling the tank. A tank which is due for inspection or retest and has passed the date of renewal should not be filled.

4.5.5 Intermediate Bulk Container Standards

The specifications and performance standards applicable to intermediate bulk containers (IBCs) manufactured in the United States are codified in Subpart N of Part 178. IBC's are intermediate size packagings which fill the niche between a drum and a tank. Some IBCs are somewhat similar in appearance and use to a portable tank. IBCs used in the paint and coatings industry are often called "totes" or "tote bins" and are usually a rigid packaging constructed of steel or plastic. The identification codes for the various authorized IBCs are found in §178.702 of 49 CFR.

The following illustration provides an example of the identification codes for an IBC commonly used in the paint and coating industry.



The marking in this example identifies a composite IBC with a rigid plastic inner receptacle within an outer steel body, intended for liquids in Packing Group II, manufactured in May of 2018, in the United States, and tested by a DOT-approved third-party testing laboratory, with a stacking test load of 10,800 kg and a maximum permissible gross mass of 1200 kg.

4.5.5.1 Testing of Intermediate Bulk Containers

As with the other packagings authorized for use in the transportation of hazardous materials, DOT prescribes certain minimum testing requirements to ensure that IBCs are able to withstand normal conditions of transportation. Each IBC must be manufactured and assembled to be capable of successfully passing these prescribed tests and must also comply with the general packaging requirements of the regulations as outlined in 49 CFR §178.801 and §173.24.

4.5.5.2 Qualification and Maintenance of IBCs

The person responsible for filling the IBC must also ensure that the IBC owner has complied with DOT requirements applicable to the continuing qualification and maintenance of IBCs as specified in 49 CFR, Part 180, Subpart D, §180.350. The periodic retest and inspection must be completed as required by Part 180, Subpart D, in order for the shipper to continue to fill the IBC.

4.6 Selecting an Authorized Packaging

Now that you have reviewed the basic information regarding packaging, you will find it easier to understand the procedure for selecting packaging that is authorized for use by the transportation regulations. This procedure requires consideration of some additional factors, such as the needs of the customer, mode of transportation to be used, as well as specific packaging options available. Exceptions for limited quantities, small quantities, excepted quantities, and consumer commodities are also factors which may influence selection of an appropriate container for the material. The determination of your packaging options is made on the basis of information obtained from the Hazardous Materials Table at §172.101.

4.6.1 Proper Shipping Name

The proper shipping name is the "key" element in the procedure to select a packaging for your hazardous material shipment. After you have identified the proper shipping name in Column (2) that will be used to describe the hazardous material to be packaged, you will use the corresponding Columns (3) through (8) to obtain the information needed to select an authorized packaging and mark and label that package. If the package is intended for domestic transportation by aircraft, you may also need to consult Column (9) regarding quantity limitations authorized by air.

4.6.2 Packing Group

The information you obtained through the classification process will now become useful in determining the packaging based on the packing group assigned to the material, if appropriate. The hazard class is identified by the Class or Division number in Column (3) with the packing group entered in Column (5). Some materials listed in the Table by technical name will show only one packing group in Column (5) while others may show a choice of two or more packing groups. Using the criteria in the “Classification” module identify the appropriate packing group for the material you intend to package.

The Packing Group is used to communicate the degree of danger and is used to determine the level of packaging which must be used to safely contain the material.

Packing Group I (PG I) - Great Danger

Packing Group II (PG II) - Moderate Danger

Packing Group III (PG III) - Minor Danger

The Hazardous Material Table shows the packing group(s) in Column (5) for those materials that are listed by their proper shipping names and have been assigned a packing group. If Column (5) is blank the material has not been assigned a packing group since its packaging is predetermined by the hazardous characteristics of the material, such as gases in Class 2 and ORM-D materials.

4.6.3 Packaging Authorizations – Column 8, §172.101(i)

Column (8) of the HMT provides the packaging authorizations that will be used to determine which packagings are permitted for the material and will allow the shipper to select the most efficient packaging to meet the customer’s needs. Keep in mind that each number which appears in Column (8) of the HMT is preceded by “§173” and a decimal point. For example, the number “150” would be read as Section 173.150. There are three Sub-columns under the heading of Column (8). They are Column (8A) for exceptions, Column (8B) for non-bulk packaging authorizations, and Column (8C) for bulk packaging authorizations.

4.6.4 Exceptions

Due to the limited hazards presented by some materials in small quantities or when packaged in special packagings, DOT provides some relief from the regulatory requirements as long as certain conditions are met. In some instances, this relief means that specification packaging is not required and labels are not required to be displayed on packages. In other cases, such as with combustible liquids, the relief means that certain size packagings may be totally excepted from the regulations. Many of these exceptions apply to materials manufactured and shipped in the paint and coatings industry and we will examine them in detail in this module.

4.6.4.1 Limited Quantity

Column (8A) provides authorization for “Exceptions” and is used to determine if the material is authorized for shipping under an exception, such as a limited quantity. DOT defines the term “limited quantity” as meaning “when specified as such in a section applicable to a particular material, the maximum amount of hazardous material for which there is a specific labeling or packaging exception.”

For example, the proper shipping name “Paint” with a flash point of 20 °C (68 °F) is a flammable liquid in Class 3, PG II, and the number “150” appears in corresponding Column (8A) indicating that the exceptions for this “Paint” will be found in “Section 173.150.”

§173.150 provides exceptions for Class 3 which includes flammable and combustible liquids. In this case the “Paint” is a flammable liquid. Paragraph (a) requires that an entry referencing this section must appear in Column (8A) of the Table. The reference to §173.150 is listed in Column (8A) for the proper shipping name Paint.

§173.150(b) states that Limited Quantities of Class 3 are not required to display labels unless offered for air transport, and are also not required to be packaged in specification packaging when packaged in compliance with this section. Limited quantities of flammable liquids are also excepted from the placarding requirements of Subpart F of Part 172 and, when transported via rail or highway, the shipping paper requirements of Subpart C of Part 172. The total weight of the completed package, including the hazardous materials, their inner receptacles, cushioning and absorbent materials, and the outer packaging must not exceed 30 kilograms (66 lbs.).

Paint is identified as a flammable liquid in Packing Group II, and §173.150(b)(2) applies. Paint as a limited quantity may be packaged in inner containers of not over one liter (0.3 gallon) net capacity each, which are then required to be packed in a strong outer packaging. The packaging does not have to be constructed to specifications of Part 178, but must meet the general packaging requirements of Part 173. The total number of inner packagings containing Paint is then only limited by the gross weight of the package, which must not exceed 30 kg (66 lbs.). Additional exceptions are listed in this section for Consumer commodities, Alcoholic beverages, Aqueous solutions of alcohol, retail products containing ethanol, and Combustible liquids.

Some materials may be too dangerous to ship as a limited quantity and may present extreme hazards in transportation in any quantity. If the word “None” appears in Column (8A) the material listed in Column (2) is not authorized to be shipped using an exception, and that material may not be shipped as a limited quantity. Only those packages authorized in Columns (8B) and (8C) may be used.

4.6.4.2 Combustible Liquids

Exceptions applicable to combustible liquids are also included in §173.150(f). Combustible liquids are defined in 49 CFR, §173.120(b) as any liquid that does not meet the definition of any other hazard class and has a flash point above 60° C (140° F) and below 93° C (200° F). Combustible liquids also include a flammable liquid that has a flash point at or above 38° C (100° F) and that does not meet the definition of any other hazard class and has been reclassified as a combustible liquid.

The hazardous materials regulations do not apply to combustible liquid in non-bulk packaging unless the combustible liquid is a hazardous substance, a hazardous waste, or a marine pollutant. This means that “Paint” as a combustible liquid is not regulated as a hazardous material when packaged in containers with a capacity of 450 Liters (119 gallons) or less as long as it is not shipped as a hazardous waste, and does not contain ingredients which would make it a hazardous substance or a marine pollutant.

Combustible liquids in bulk containers transported by highway or rail are subject only to the requirements for shipping papers, identification number markings, placards, and reporting of incidents. Paint as a combustible liquid may therefore be transported in a non-specification cargo tank as long as the tank is marked and placarded as required and a DOT shipping paper describing the load as a combustible liquid accompanies the shipment.

4.6.5 Selecting Non-bulk Packaging

Column (8B) of the HMT prescribes the authorized non-bulk packagings that shippers may use for containerization of hazardous materials. The entry “202” in Column (8B), for selecting an authorized non-bulk packaging for “Xylenes” in Class 3, PG II, should be read as “Section 173.202.” The packaging authorization for “Xylenes” at §173.202 states that “when Section 172.101 of this subchapter specifies that a liquid hazardous material in Packing Group II may be packaged under this section, only non-bulk packaging as prescribed by this section may be used.” In other words, the number “202” must appear in Column (8B) in order to use this section, and only those non-bulk packagings listed within this section may be used.

The regulations further specify that each package containing the “Xylenes” must conform to the general packaging requirements of Subpart B of Part 173 and to the requirements of Part 178 for Packing Group I or II performance packaging. In other words, the package must meet the general packaging requirements and must also be constructed, tested, and marked according to the specifications within Part 178. Since this section authorizes packaging for Packing Group II materials, a packaging which meets the standards for Packing Group I may also be used. §172.202 (b) provides a list of authorized outer packagings and inner receptacles which may be used to form a combination packaging. The shipper would then select the most efficient packaging for the material using an authorized outer packaging with authorized inner receptacles. For instance, the shipper may decide to put the “Xylene” into metal cans and to pack the metal cans into a fiberboard box.

If the customer had notified the shipper that it uses the “Xylene” in quantities of approximately 50 gallons per day, the shipper might offer the material in single, non-bulk packagings with a capacity of 55 gallons each. §172.202 (b) lists the authorized single packagings which may be used for all modes of transportation other than air. The shipper might select a 1A1 drum as a single packaging, if the shipment will not be transported by aircraft.

Using the proper shipping name “Paint related materials” in Class 3, packing groups II or III, the non-bulk packaging section is §173.173. When referencing §173.173, it refers to §173.202 for PG II and §173.203 for PG III materials using this proper shipping name. In addition, §173.173(b) provides an exception to the specification packaging requirements for glass packagings not over 1 liter capacity each in strong outer packaging or metal cans not over 5 liters each packed in strong outer packaging. In this case, the completed packages must comply with the general packaging requirements of Part 173, subpart B, including §§173.24 and 173.24a.

4.6.6 Selecting Bulk Packaging

If the customer were to order a bulk quantity of Paint in Class 3, PG II, with the intention of off-loading the material into a large storage tank when it arrived, the most efficient packaging in which to transport the Paint might be a cargo tank or a portable tank. If the customer’s facility was equipped with a rail siding, the shipper might decide to use a rail tank car. The authorizations for all of these bulk packaging are listed in Column (8C). The example, “Paint,” shows the entry “242” in Column (8C) indicating that “Section 173.242” is the section that the shipper would consult when checking the options for selection of a bulk packaging. Part 173, Subpart F, §173.242 lists a selection of rail tank cars at paragraph (a); a wide selection of cargo tanks in paragraph (b); and a selection of portable tanks in paragraph (c). Each of these paragraphs should be read carefully and in their entirety since conditions and limitations may be specified for any of these containers.

Shippers may also use an intermediate bulk container (IBC) to ship bulk quantities of hazardous materials when the end user intends to use the contents directly from the packaging. The “IB” Special Provisions in Column (7) of the HM Table identify the types of IBCs that may be used. The use of a particular IBC type may be further limited by “IP” codes in Column (7) and by conditions and limitations set out in §173.242(d).

4.6.7 Special Provisions

After selecting the most efficient authorized packaging from Column (8) of the Table, the shipper must check Column (7) to see if any additional packaging requirements or restrictions appear as “Special Provisions.” Shippers and carriers should always check Column (7), since these special provisions take precedence over the packaging authorization. When a code appears in Column (7), the corresponding special provision(s) will be found at §172.102. The following codes apply to special provisions appearing in Column (7).

A code consisting of numbers applies to all modes of transportation and all packagings (both bulk and non-bulk packagings).

- “A” codes apply only to transportation by aircraft.
- “B” codes apply only to bulk shipments, except intermodal (IM) portable tanks.
- “IB” or “IP” codes apply only to transportation in Intermediate Bulk Containers (IBCs).
- “N” codes apply only to non-bulk packagings.
- “R” codes apply only to transportation by rail.
- “T” or “TP” codes apply only to IM portable tanks.
- “W” codes apply only to transportation by water vessel.

For example, the code “B52” would apply to bulk packaging only and authorizes non-reclosing pressure relief devices on DOT 57 portable tanks transporting paint in Class 3, PG II.

For “Paint Class 3, PG II” Special Provision 149 applies as follows:

149 When transported as a limited quantity or a consumer commodity, the maximum net capacity specified in §173.150(b)(2) of this subchapter for inner packagings may be increased to 5 L (1.3 gallons).

This means that instead of being limited to 1 L per inner container shipped as a limited quantity, one may ship inner containers with a net capacity of up to 5 L, as long as the total gross weight of the package does not exceed 30 kg.

The number “1” appearing in Column (7) indicates that all packagings, transported by all modes are subject to the special provision. The number “1” in §172.102 indicates that the material listed in Column (2) is “Toxic by Inhalation in Hazard Zone A,” and must be packaged, labeled, marked, and described as a poisonous material with an inhalation hazard.

Example:

“UN1092, Acrolein, stabilized, 6.1(3), I, Toxic-Inhalation Hazard Zone A”

4.6.8 Packaging Limitations – Column 9

When offering hazardous materials shipments for transport by aircraft or passenger rail car, refer to the applicable “quantity limitations” in Column (9), and do not exceed the quantities per package as shown. For international transportation by aircraft, you will need to consult the [IATA Dangerous Goods Regulations](#) to determine additional packaging limitations and/or restrictions. Additional requirements for packaging hazardous for shipment by air within the United States can be found in §173.27.

4.7 Practical Application

Determining Packaging Options for Paint and Coatings

The following is the §172.101 Table for paint and related materials:

Symbol (1)	Hazardous Materials descriptions and proper shipping names (2)	Hazard class or Division (3)	Identification Numbers (4)	PG (5)	Label Codes (6)	Special provisions (7)	Packaging (§173.***)			(9) Quantity limitations		(10) Vessel stowage	
							Exceptions (8A)	Non-bulk (8B)	Bulk (8C)	Passenger aircraft/rail (9A)	Cargo aircraft only (9B)	Locations (10A)	Other (10B)
	Acetone	3	UN1090	II	3.....	IB2,T4,TP1	150...	202...	242...	5 L	60 L	B	
	Aerosols, flammable, (each not exceeding 1 L capacity)	2.1	UN1950		2.1...	153,N82	306...	None..	None	75 kg	150kg	A	48,87,126
	Aerosols, non-flammable, (each not exceeding 1 L capacity)	2.2	UN1950		2.2...		306, 307	None..	None	75 kg	150 kg	A	48,87,126
	Aniline	6.1	UN1547	II	6.1...	IB2,T7,TP2	None...	202...	243...	5 L	60 L	A	40
	Carbon dioxide, solid or Dry ice	9	UN1845	III	None		217	217	240	200 kg	200 kg	C	40
	Consumer commodity	ORM-D	None		None		156, 306	156,	None	30 kg gross	30 kg gross	A	
	Methanol	3	UN1230	II	3, 6.1	IB2,T7,TP2	150...	306	242...	1 L	60 L	B	40
	Methanol	3	UN1230	II	3	IB2,T7,TP2	150...	202...	242...	1 L	60 L	B	40
	Polychlorinated biphenyls, liquid	9	UN2315	II	9	9,81,140, IB7	155...	202...	240...	100 kg	200 kg	A	95
	Polychlorinated biphenyls, solid	9	UN2315	II	9	9, 81, 140, IB3,T4,TP1	155...	212...	241...	100 L	220 L	A	95
	Paint including paint, lacquer, enamel, stain, shellac solutions, varnish, polish, liquid filler, and liquid lacquer base.	3	UN1263	I	3...	T11,TP1, TP8	150...	202...	243...	1 L	30 L	E	
	Paint including paint, lacquer, enamel, stain, shellac solutions, varnish, polish, liquid filler, and liquid lacquer base.	3	UN1263	II	3...	149,B52, IB2,T4,TP1 ,TP8	150...	201...	242...	5 L	60 L	B	
	Paint including paint, lacquer, enamel, stain, shellac solutions, varnish, polish, liquid filler, and liquid lacquer base.	3	UN1263	III	3...	149,B52, IB2,T4,TP1	150...	173...	242...	60 L	220 L	A	
	Paint or Paint related material	8	UN3066	II	8	B2,IB2,T7, TP2	154...	173...	242...	1 L	30 L	A	
	Paint or Paint related material	8	UN3066	III	8	B52,IB3,T4 ,TP1	154...	173...	241...	5L	60 L	A	
	Paint related material including paint thinning, drying, removing or reducing compound	3	UN1263	I	3	T11,TP1, TP8	150...	173...	243..	1 L	30 L	E	
	Paint related material including paint thinning, drying, removing or reducing compound	3	UN1263	II	3	B2,IB2,T7, TP2	150...	201...	242...	5L	60 L	B	
	Paint related material including paint thinning, drying, removing or reducing compound	3	UN1263	III	3	B1,B52,IB3 ,T2,TP1	150...	173...	242...	60L	220 L	A	
	Solids containing flammable liquids, n.o.s.	4.1	UN3175	II	4.1	47,IB6,IP2	151	173...	240	15 kg	50kg	B	
	Xylenes	3	UN1307	II	3	IB2,T4,TP1	150...	212	242...	5 L	60 L	B	
	Xylenes	3	UN1307	III	3	B1,IB3,T2, TP1	150...	202...	242...	60 L	220 L	A	

Using the Table and the information it provides, the following is the step-by-step analysis to determine the packaging to use:

Example 1:

Proper shipping name from Column (2) is Paint including paint lacquer, enamel, stain, shellac solutions, varnish, polish, liquid filler, and liquid lacquer base, Flammable Liquid, UN1263

Step 1: Determine the material's Packing Group.

- a. This is done by referring to Column (5) of the Table.
- b. Column (5) indicates that materials which can properly be described as above qualify for Packing Group I, II and III.

Step 2: Determine the packaging options authorized.

- a. This is done using the subcolumns of Column (8). The number of subcolumns you'll need to refer to will depend on whether you intend to ship your material in bulk, or in non-bulk.

Non-bulk: "Non-bulk" means a packaging which has either: (1) a maximum capacity of no more than 450 Liters (119 Gallons) when used as a receptacle for liquids; (2) a maximum net mass of no more than 400 Kilograms (882 pounds) when used as a receptacle for solids; or a water capacity of no more than 454 kg (1000 pounds) as a receptacle for a gas. Refer to §171.8. For non-bulk packaging shipments, the following analysis should be made.

Step 1: Refer to subcolumn (8B) to determine which section of Part 173 you must consult to identify your non-bulk packaging options. Note that subcolumn 8B refers you to §173.173 for paint and coating materials meeting the flammable liquid UN 1263 shipping description.

Step 2: Refer to §173.173.

- a. General Rule: When you turn to §173.173, you will see that §173.173(b)(1) directs you to two other sections of Part 173 to identify your packaging options. Which of these two sections you will use depends on the packing group of the material. If your material will be shipped as a Packing Group II material, §173.173(b) directs you to §173.202. For Packing Group III materials, you're referred to §173.203. Note that packagings selected from either §§173.202 or 173.203 must meet the design qualification tests and other applicable requirements of Part 178.
- b. Exception: §173.173(b)(2) provides an exception from compliance with the requirements of Part 178, for individual inner metal packagings of 5 Liters (1 gallon) capacity or less, and individual inner glass packagings of 1 Liter (0.3 gallon) capacity or less, as long as the inner packaging is packed in a "strong outer packaging." Note, however, that packagings used under this exception must nonetheless meet the general packaging requirements of §§173.24 and 173.24a, including passing the vibration test.

Step 3: Refer to subcolumn (8A) to determine whether a non-bulk shipment of a paint product meeting this shipping description qualifies for the "limited quantity" exception. Qualified materials when shipped in limited quantities are not subject to the specification packaging requirements of Part 178. Note that for materials meeting this shipping description, Subcolumn 8A refers to §173.150, denoting that the exception does apply.

Step 4: Refer to Column (7) to determine whether there are any applicable “special provisions” for this material when being transported in non-bulk. Note that special provision codes are designated for the material, when assigned to Packing Group I, II or III.

a. For Packing Group II, the codes are:

149	IB2
367	T4
383	TP1
B52	TP8
B131	TP28

b. For Packing Group III, the codes are:

367	IB3
B1	T2
B52	TP1
B131	TP29

c. §172.102: By referring to the §172.102 for an explanation of the special provision codes noted for both Packing Group II and III for this material, you will see that the only special provision for shipments of paint and coating materials meeting the flammable liquid UN 1263 shipping description when being shipped in non-bulk packaging is “149” associated with Paint in PGII.

d. Special Provision 149, allows “Paint, PGII” to be shipped as a limited quantity in inner packagings of up to 5 liters net capacity. This is a significant increase from the 1 liter allowed for most flammable liquids in §173.150(b)(2).

Bulk: Conduct the following analysis if the material will be shipped in bulk.

Step 1: Refer to subcolumn (8C) to determine which section of Part 173 you must consult to identify your bulk packaging options. Note that subcolumn (8C) refers you to §173.242 for paint and coating materials meeting this shipping description and hazard class.

Step 2: §173.242 specifies the bulk packaging options and requirements for liquids and solids presenting a medium hazard. When you refer to this section, you will see packaging options and requirements for railcars, cargo tanks, and portable tanks.

Step 3: Refer to Column 7 to determine whether there are any applicable “special provisions” for this material when being transported in bulk. You will note that provisions codes are designated for the material, when assigned to both Packing Group II and Packing Group III.

a. For Packing Group II, the codes are:

149	IB2
367	T4
383	TP1
B52	TP8
B131	TP28

b. For Packing Group III, the codes are:

367	IB3
B1	T2
B52	TP1
B131	TP29

c. Refer to §172.102 for further details on each of the codes cited.

Example 2:

Column (2) using Paint or Paint related material, Corrosive, UN3066

1. Determine the material's Packing Group.
 - a. This is done by referring to Column (5) of the Table.
 - b. Column (5) indicates that materials which can properly be described as above qualify for both Packing Group II and Packing Group III. Based on testing criteria, you may determine the appropriate packing group.
2. Determine the packaging options authorized.
 - a. This is done using the subcolumns of Column (8). The number of subcolumns you'll need to refer to will depend on whether you intend to ship your material in bulk, or in non-bulk.

Non-bulk: The following analysis should be made for non-bulk shipments.

Step 1: Refer to subcolumn 8B to determine which section of Part 173 you must consult to identify non-bulk packaging options. Note that when materials meet this shipping description and are assigned to Packing Group II or Packing Group III subcolumn (8B) refers you directly to §173.173

Step 2: Refer to §173.173.

- a. General Rule: When you turn to §173.173, you will see that §173.173(b)(1) directs you to two other sections of Part 173 to identify your packaging options. Which of these two sections you will use depends on the packing group of the material. If your material will be shipped as a Packing Group II material, §173.173(b) directs you to §173.202. For Packing Group III materials, you're referred to §173.203. Note that packagings selected from either §§173.202 or 173.203 must meet the design qualification tests and other applicable requirements of Part 178.
- b. Exception: §173.173(b)(2) provides an exception from compliance with the requirements of Part 178, for individual inner metal packagings of 5 Liters (1 gallon) capacity or less, and individual inner glass packagings of 1 Liter (0.3 gallon) capacity or less, as long as the inner packaging is packed in a "strong outer packaging." Note, however, that packagings used under this exception must nonetheless meet the general packaging requirements of §§173.24 and 173.24a, including passing the vibration test.

Step 3: Refer to subcolumn 8A to determine whether a non-bulk shipment of a paint product meeting this corrosive shipping description qualifies for the "limited quantity" exception. Qualified materials when shipped in limited quantities are not subject to the specification packaging requirements of Part 178. Note that for materials meeting the paint corrosive UN 3066 shipping description, Subcolumn 8A refers to §173.154, denoting that the exception does apply. Check §173.154 to determine the applicable exceptions and the size of packagings that are authorized.

Step 4: Refer to Column (7) to determine whether there are any applicable "special provisions" for paint and coating materials meeting the corrosive UN3066 shipping description when being transported in non-bulk. Note that provisions codes are designated for the material, when assigned to both Packing Group II and Packing Group III.

- a. For Packing Group II, the codes are:

367	T7
B2	TP2
IB2	TP28

- b. For Packaging Group III, the codes are:

367	TP1
B52	TP29
IB3	
T4	

- c. §172.102: By referring to the §172.102 for an explanation of the special provision codes noted for both Packing Group II and III for this material, you'll see no special provisions apply to this material when shipped in non-bulk packaging.

Bulk: Conduct the following analysis if the material will be shipped in bulk.

Step 1: Refer to subcolumn (8C) to determine which section of Part 173 you must consult to identify your bulk packaging options. Note that subcolumn 8C refers you to §173.242 for paint and coating materials meeting the paint corrosive UN 3066 shipping description in Packing Group II and to §173.241 for paint and coating materials meeting the paint corrosive UN 3066 shipping description in Packing Group III.

Step 2: §173.241 specifies the bulk packaging options and requirements for liquids and solids presenting a low hazard. When you refer to this section, you will see packaging options and requirements for railcars, cargo tanks and portable tanks.

Step 3: Refer to Column (7) to determine whether there are any applicable “special provisions” for this material when being transported in bulk. You’ll note that provisions codes are designated for the material, when assigned to both Packing Group II and Packing Group III.

a. For Packing Group II, the codes are:

367	T7
B2	TP2
IB2	TP28

b. For Packaging Group III, the codes are:

367	T4
B52	TP1
IB3	TP29

c. Refer to §172.102 for further details on each of the codes cited.

Test Evaluation – Packaging

Read the following questions. For each question, choose the ONE most correct answer.

1. The term package means:
 - a. an outside packaging
 - b. an outside packaging and required markings
 - c. a packaging plus its contents
 - d. a packaging plus required labels

2. Damaged or leaking packages of hazardous materials may be placed in a(n):
 - a. plastic bag
 - b. overpack
 - c. strong outer packaging
 - d. salvage drum

3. If a carrier repackages a paint that is a hazardous material, for any reason, the packaging must be:
 - a. approved by the shipper
 - b. repackaged in accordance with the HMR
 - c. inspected by the DOT prior to the offering of the package
 - d. none of the above

4. The packaging code “1A2” on a paint container indicates that:
 - a. it is a plastic hurricane
 - b. it is a removable head drum constructed of aluminum
 - c. it is a removable head drum constructed of steel
 - d. it is a non-removable head drum constructed of steel

5. Which of the following is not a DOT performance testing requirement for non-bulk packagings?
 - a. drop test
 - b. stack test
 - c. stress test
 - d. leakproofness test

6. Specification packaging is not required for domestic transportation of:
 - a. corrosive liquid paints in non-bulk packaging
 - b. flammable liquid paints in non-bulk packaging
 - c. flammable liquid paints in bulk packaging
 - d. combustible liquid paints in non-bulk packaging

7. A limited quantity bottle of touch-up paint which is classified as a flammable liquid is identified by the marking “Consumer Commodity” on the shipping box. Which of the following is true?
 - a. the box must be marked “Paint UN1263”
 - b. a class 3 label must be displayed on the box
 - c. the box must be marked “limited quantity”
 - d. none of the above

8. A combustible liquid paint is defined as a liquid that:
 - a. does not meet the definition of any other hazard class
 - b. has a flash point above 140°F and below 200° F
 - c. has a flash point at or above 100°F and has been reclassified as a combustible liquid
 - d. a. and b. above or a. and c. above

9. Limited quantities are excepted from:
- labeling requirements, unless offered for transportation by aircraft
 - specification packaging
 - placarding
 - all of the above
10. A paint as a combustible liquid is not regulated as a hazardous material when:
- in bulk packagings
 - shipped as a hazardous waste
 - in containers with a capacity of 119 gallons or less
 - containing ingredients which would make it a hazardous substance or marine pollutant
11. Combustible liquid paint in bulk containers transported by highway or rail is only subject the requirements for:
- shipping papers and identification number markings
 - placards
 - reporting of incidents
 - all of the above

For questions 12 – 16, refer to the following code:



4G/Y10/S/03/USA/+GH0348

12. What does the “Y” in the code signify?
- the packaging is approved for PGI, II and III
 - the packaging is approved for PGII and III
 - the packaging is approved for PGIII only
 - the packaging was manufactured in Yugoslavia
13. What does the “10” in the code signify?
- you can stack up to 10 of these packagings
 - the maximum the package can hold is 10 gallons
 - the maximum gross weight of the package is 10 kg
 - the maximum gross weight of the package is 10 pounds
14. What does the “S” in the code signify?
- the packaging is intended to contain solids or inner packagings
 - the packaging is for solids only
 - the packaging was manufactured in Sweden
 - the packaging is a “Special” packaging
15. Which section of the regulations would help you determine if the above packaging is authorized for shipping acetone?
- 172.301
 - 173.202
 - 172.202
 - 177.202
16. The “4G” signifies that the packaging is:
- a steel drum
 - a fiber drum
 - a fiberboard box
 - a paper bag

The following statements are either True or False. Select one.

17. The shipper may choose to go beyond the regulatory requirements and use authorized packaging which will outperform the testing standard required for the packing group of the material.
 - a. True
 - b. False

18. When using UN standard packaging it is acceptable to depart from the manufacturer's packaging assembly instructions.
 - a. True
 - b. False

19. A letter "X" in the packaging specification marking indicates that the packaging was successfully tested to the Packing Group I level, and is also suitable for use for materials in Packing Group II and III.
 - a. True
 - b. False

20. For limited quantity shipments via ground, a shipper may package as many 1 gallon cans of paint identified as a flammable liquid in Packing Group II or III as he/she would like, as long as the gross weight of the package does not exceed 66 pounds and the cans are packed in a strong outer packaging.
 - a. True
 - b. False

Answer Key: Test Evaluation – Packaging

1. c.
2. d.
3. b.
4. c.
5. c.
6. d.
7. d.
8. d.
9. d.
10. c.
11. d.
12. b.
13. c.
14. a
15. b.
16. c.
17. a.
18. b.
19. a.
20. a.

CHAPTER 5 – MARKING AND LABELING

5.1 Introduction

In order to provide uniformity in the identification of hazardous materials and the categories of the dangers which might present themselves in the event of an accidental release, the hazardous materials regulations (HMR) require specific visual, pictorial, and written methods for communicating these hazards.

Emergency responders, such as fire fighters, police, medical technicians, and carrier employees of all modes, including those who load, unload, and operate trucks, trains, ships, and planes are trained to recognize and interpret the various hazard communication tools.

This module will discuss various parts of the regulations dealing with marking and labeling; the parts and sections of the regulations will be referenced for your review.

A work project is enclosed at the back of this module. You will be required to prepare containers for shipment by marking and labeling them.

A current copy of 49 CFR should be at your disposal for use while working on this module.

5.2 Marking

The marking requirements are codified in 49 CFR at Part 172, Subpart D. The term “marking,” as used in the regulations means a descriptive name, identification number, instruction, caution, weight specification, UN mark or a combination thereof required by the regulations to be displayed on the outer packaging of hazardous materials. The package marking requirements are an essential element in the hazard communication system and are intended to communicate information regarding the hazards to the person who is observing that package. The marking requirements apply to both bulk and non-bulk packagings. Package markings provide valuable information which may be used to identify the contents of the package. These markings include the description by name and identification number of the hazardous material plus any additional required instructions and/or cautions.

Each person who “offers” a hazardous material for transportation must mark each package, freight container and transport vehicle as prescribed in the regulations. Additionally, when required, each “carrier” shall mark each package, freight container and the transport vehicle, as prescribed. (§172.300)

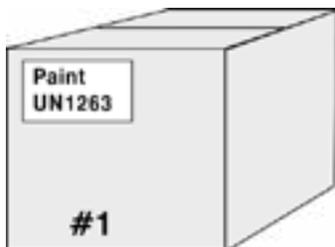
5.2.1 General Marking for Non-bulk Packagings, §172.301

The regulations require that each person who offers hazardous materials in a non-bulk packaging shall mark the package with the proper shipping name and identification number including the prefix UN or NA. The proper shipping name marked on the packaging must be the same as the proper shipping name on the shipping paper and is found in Column (2) of the §172.101 Table. The identification number is found in the corresponding Column (4) of the Table.

The proper shipping name and UN number provide essential information in the event of a transportation emergency. Emergency responders often cross- reference the UN identification number in the North American Emergency Response Guidebook (ERG) to ensure accurate identification of the material. Any material that requires the additional technical name to be added with the proper shipping name on the shipping paper requires the same information with the shipping name to be marked on the package.

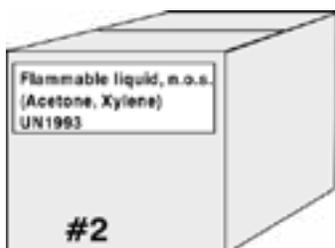
Example #1

The shipping paper describes the material as “UN1263, Paint, 3, II”



Example #2

The shipping paper description is “UN1993, Flammable liquids n.o.s. (Acetone, Xylene), 3, II”



Note that although it is not required to mark the entire shipping description (for example, UN1263, Paint, 3, PGII) on the package, it is acceptable to do so.

Some packagings of hazardous materials also require a DOT specification marking or packaging marking(s) as specified in §178.500 and illustrated in the “Packaging” module of this manual. This marking is applied by the packaging manufacturer, not by the shipper.

5.2.1.1 Exception

The identification number marking in association with the proper shipping name is not required on packages containing materials shipping under the limited quantity exception via ocean or ground transport. Special requirements for marking “limited quantities” will be discussed later in this module.

5.2.1.2 Non-bulk Packaging for Hazardous Waste, §172.301(a)(2)

If a package of hazardous waste has the required EPA marking, the word “waste” need not be repeated on the package. The EPA marking is actually a sticker-type label with all the EPA and DOT required information entered directly on the marking. Without this EPA marking, the word “waste” is required to be marked on the package before the proper shipping name.

5.2.1.3 Large Quantities of Hazardous Materials in Non-bulk Packages, §172.301(a)(3)

In order to identify vehicles transporting large shipments of the same hazardous material in non-bulk packagings that are loaded at a single loading point, the regulations require the vehicle to be marked with the identification number for the material. A transport vehicle or freight container that is loaded at one loading facility with 4,000 kg (8,820 pounds) or more aggregate gross weight of a hazardous material in non-bulk packagings, and all the hazardous materials in the vehicle have the same proper shipping name and identification number, must be marked with that ID number on each side and each end. This marking requirement does not apply if the packages are identified as a limited quantity or a Consumer Commodity, ORM-D. It also does not apply if any other material, hazardous or otherwise, is already on the vehicle, or placed on the transport vehicle at the loading facility.

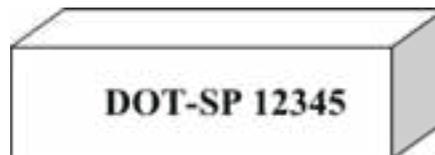
Example:

If you load 4,000 kgs. or more of Paint in Class 3, all identified by the identification number UN1263, into one vehicle at a single manufacturing facility, warehouse, or interlining carriers terminal, and no other materials, hazardous or otherwise, were loaded on that vehicle, you must display the identification number “1263” on an orange panel, a white square-on-point configuration or on a white panel directly on the Class 3 placard.



5.2.1.4 Special Permit Packaging

DOT permits the use of packagings which differ from the specification packaging authorized within the regulations when they have been proven to provide an equivalent level of safety. The shipper must apply to DOT for a “Special Permit” to use this packaging. If the Special Permit is approved by DOT, they issue a Special Permit number to the shipper and require that each time the packaging is used as authorized, that packaging must be marked with the Special Permit number preceded by the letter “SP.” The shipping paper must also have the entry “SP” followed by the Special Permit number in association with the appropriate entry describing the material in the exemption packaging.



5.2.1.5 Name and Address, §172.301(d)

Each non-bulk package must be marked with the name and address of the consignor or the consignee.

5.2.2 General Marking for Bulk Packagings, §172.302

The marking requirements for bulk packagings are different than those for non-bulk packagings. No person may offer for transport or no person may transport a hazardous material in a bulk packaging unless the packaging is marked with the identification number as assigned in Column (4) of the Table. The letters “UN” must be displayed on the placard, orange panel or white square-on-point configuration displaying the four digit number on a bulk packaging.

The ID number marking is required to be displayed on:

- each side and each end of a bulk packaging with a capacity of 3,785 liters (1000 gallons) or more
- two opposite sides if the capacity is less than 3,785 liters (1,000 gallons). The size of the required markings must be:
 - 6 mm wide and 100 mm high (approximately 1/4 in. by 4 in.) on a rail car
 - 4 mm wide and 25 mm high (0.16 in. by 1 in.) on a portable tank with a capacity of less than 3,785 liters (1,000 gal.)
 - 6 mm wide and 50 mm high (1/4 in. by 2 in.) on cargo tanks and other bulk packagings

5.2.3 Marking for All Packagings, §172.304

All required markings must be:

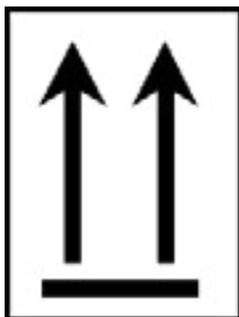
- durable
- in English
- printed on or affixed to the surface of the package or on a label, tag or sign
- printed or placed on a background of sharply contrasting color
- unobscured by labels or attachments
- located away from any other markings, such as advertisements, which could reduce the effectiveness of the required markings.

In general, abbreviations of proper shipping names are not allowed, unless authorized.

Packages that do not contain hazardous materials must not display hazard markings. This is important in cases of emergency to prevent emergency responders from falsely responding to a hazmat incident when no hazardous materials are present.

5.2.4 Orientation Markings

Packages containing liquids are more apt to leak during transportation if not transported with the closure end in an upward position. For the person packing the packages in a cargo transport unit to be able to determine the proper orientation of the package, orientation markings must be displayed on two opposite vertical sides, on the outside of combination packaging with inner receptacles containing liquid hazardous materials. You should observe packages and be cognizant of the upward orientation when handling, loading, storing, or transporting packages marked with these orientation arrow markings.



The wording “THIS END UP” or “THIS SIDE UP” is optional but not required.

There are exceptions from displaying this mark, including:

- A non-bulk package with inner packagings which are cylinders (aerosols included).
- Except when offered or intended for transportation by aircraft, packages containing flammable liquids in inner packagings of 1 L or less prepared in accordance with LTD QTY or ORM-D exceptions.
- When offered or intended for transportation by aircraft, packages containing liquid hazardous materials in inner packagings of 120 mL (4 fluid oz.) or less when packed with sufficient absorption material between the inner and outer packagings to completely absorb the liquid contents.
- Liquids contained in manufactured articles (e.g., alcohol or mercury in thermometers) which are leak-tight in all orientations.
- A non-bulk package with hermetically sealed inner packagings not exceeding 500 mL each.
- Packages containing liquid infectious substances in primary receptacles not exceeding 50 mL (1.7 oz.).
- Class 7 radioactive material in Type A, IP-2, IP-3, Type B(U), or Type B(M) packages.

5.2.5 Materials Poisonous by Inhalation, §172.313(a)

A material which meets the definition of poisonous by inhalation in §171.8 must be marked with the words “Inhalation hazard” in association with the labels on a non-bulk packaging or the placards on a bulk packaging, as appropriate. When required on a bulk packaging, this mark must be displayed on two opposite sides of the packaging.

5.2.5.1 Exception

If you use labels or placards, with the words “Inhalation Hazard” printed on the label or placard, the INHALATION HAZARD marking is not required.



5.2.5.2 Vehicles Transporting Large Quantity of PIH Materials, §172.313(c)

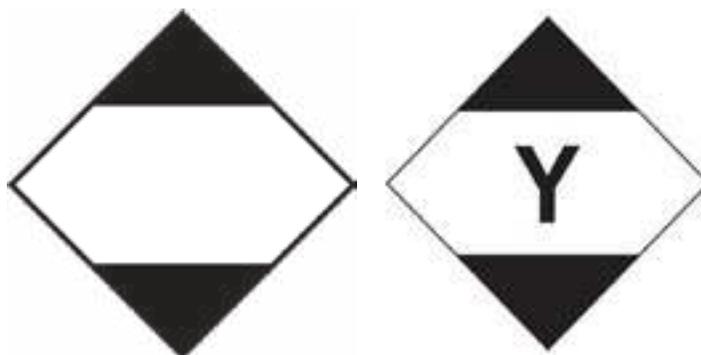
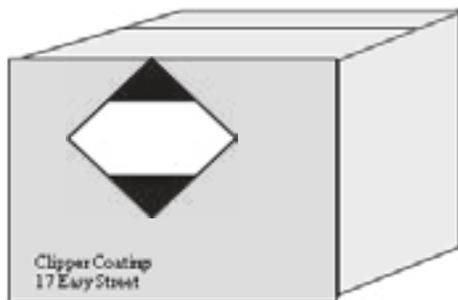
A freight container or transport vehicle loaded with more than 1,000 kg (2,205 lbs.) total gross weight of non-bulk packages (< 119 gallons) containing a material poisonous by inhalation must be marked on each side and each end with the identification number for the material either on an orange panel, a white square-on-point configuration or on the primary hazard class placard.

When using the INHALATION HAZARD placard, the ID number cannot be displayed on the placard with the text. You must display the number on an orange panel or on a white square on point configuration adjacent to the placard. Alternatively, the ID number may be displayed on the placard and the words “INHALATION HAZARD” may be marked in association with the placards.



5.2.6 Marking Packagings for Limited Quantities, §172.315

A package containing a hazardous material prepared as a “limited quantity” must be marked with the limited quantity mark. There are two marks currently recognized. The mark on the left is used for ground and ocean transport of limited quantity packages. The mark on the right hand side, with the “Y” in the center, is appropriate for air transport. The “Y” LTD QTY mark certifies that the package is in compliance with IATA, ICAO, and applicable 49 CFR air requirements – including inner and outer packaging limitations. A package bearing the “Y” LTD QTY mark may be transported by ocean or ground, however, the regular LTD QTY mark (left) may not be used for packages going via air transport.



5.2.7 Marine Pollutant Markings, §172.322

The MARINE POLLUTANT mark is used to identify materials which are known to be harmful to fish or aquatic plant life. You will find the list of materials identified as marine pollutants at Appendix “B” of §172.101. The MARINE POLLUTANT mark for non-bulk packaging has a dimension of about 4 inches per side and must be displayed as shown in the example below. The bulk package marking is about 10 inches per side, and the colors and symbols should be the same colors as the smaller marking. The marking is only required on non-bulk packaging containing marine pollutants which are intended for transportation by water (note the previously mentioned exception for quantities less than 5 L or 5 kg.). However, any bulk packaging containing a marine pollutant which does not display a hazard class placard must display the bulk marine pollutant mark for transportation by any mode.



5.2.7.1 Exceptions, §172.322(d)

The MARINE POLLUTANT mark is not required on combination packaging which contains a marine pollutant if each inner packaging contains 5 liters or less (which is 1.3 gallons or less net capacity for a liquid) or 5 kilograms or less (which is 11 pounds or less net capacity for a solid). These exceptions apply to non-bulk packagings for all modes, including those intended for water transportation.

5.2.8 Non-bulk Packaging for Hazardous Substances, §172.324

A non-bulk packaging containing a hazardous substance, as defined in §171.8 of 49 CFR and in the “Classification” module of this manual, must have the letters “RQ” entered in association with the proper shipping name. If the hazardous material is a mixture or solution that is identified by a generic proper shipping name, and the material which causes the mixture or solution to meet the definition of a hazardous substance is not identified, you must enter the name(s) of those substances as listed in Appendix A of §172.101 in parentheses with the proper shipping name. If the mixture or solution contains two or more hazardous substances, you will enter the names of at least the two ingredients with the lowest reportable quantities. As an alternative, the regulations authorize using the waste code when appropriate to identify a hazardous substance as a waste.

Example:

Benzene is listed in the HM Table and in Appendix A.
RQ, Benzene UN 1114

Example:

To describe Paint with a reportable quantity of Cadmium powders as an ingredient.
RQ, Paint (Cadmium) UN1263

5.2.9 Bulk Packaging Markings

Since bulk packagings present hazards in transportation that are different in some respects to those presented by non-bulk packaging, the bulk package marking requirements are also different. Some materials also possess more hazardous characteristics when transported in bulk quantities, and therefore DOT requires additional markings.

5.2.9.1 Elevated Temperature Materials

Elevated temperature materials are defined in §171.8 and include liquids and solids which are intentionally heated and transported at very high temperatures but only when they are transported in bulk packagings. To communicate the special hazards associated with these elevated temperature materials, a unique marking must be displayed on bulk packagings. The elevated temperature material marking in the United States is either the square-on-point configuration having the same dimensions as a placard with the word "HOT" across the face of it; or the square on point configuration having the same dimensions as a placard with the identification number displayed in the center and the word "HOT" in the upper corner. For international transport by sea, the mark required is a red triangle with an illustration of a thermometer in the center.

Example:

Elevated temperature liquid, n.o.s., UN3257



Domestic Elevated Temperature Mark



International Elevated Temperature Mark

5.2.9.2 Portable Tank Markings

The marking requirements applicable to portable tanks are contained in §172.326. No person may offer for transportation or transport a portable tank containing a hazardous materials unless it is legibly marked on two opposing sides with the proper shipping name specified for the materials in the §172.101 Table. You must also be sure that the name of the owner or lessee, as applicable, is marked on a portable tank that contains a hazardous material. Remember, a portable tank with a capacity of 3,785 L (1,000 gal) or more must also be marked with the ID number on each side and each end and a tank with a capacity of less than 3,785 L (1,000 gal) must be marked with the ID number on at least two opposite sides.

If the identification number markings required to be displayed on a placard, orange panel or white square-on-point configuration on a portable tank are not visible from the outside of the transport vehicle or freight container used to transport the portable tank, you must also mark the transport vehicle or freight container on each side and each end with the identification number for the hazardous material. Note that an identification number is not permitted on a white square-on-point configuration for international transportation by sea using the IMDG Code.

5.2.9.3 Cargo Tank Markings

The marking requirements for cargo tanks are slightly different than those for portable tanks and are codified within §172.328. When offering a hazardous material to a motor carrier for transportation in a cargo tank, you must provide the motor carrier with the appropriate identification number on the placards or an orange panels prior to or at the time you offer the material to the carrier for transportation. This responsibility is assigned to the shipper who is offering the hazardous materials which will be loaded into the cargo tank.

If you offer a cargo tank containing a hazardous material for transportation, you must affix the required identification numbers on orange panels or on the placards prior to or at the time you offer the cargo tank for transportation. This responsibility is assigned to the shipper who offers the loaded cargo tank for transportation.

5.2.9.4 Tank Car Markings

§172.330(a)(1) specifies the special marking requirements which apply to rail tank cars. For the materials listed in §172.330(a)(1), mark the tank car on each side with the proper shipping name from Column (2) of the Table, or with a common name that is authorized within 49 CFR. The tank car must also be marked on each side and each end with the identification number specified in Column (4) of the Table.

5.2.9.5 Special Provisions for Marking Identification Numbers

DOT authorizes several options for displaying the required identification numbers on bulk packaging. Special provisions for display of identification numbers are provided in §172.336, which permits identification numbers to be displayed even if not required by the regulations as long as the numbers represent the materials actually being transported and are not prohibited for display. When a placard and an identification number are required, you may find it advantageous to use the placards with the white panel showing the ID number. However, you may also choose to display the identification number on an orange panel or on a white square-on-point configuration with the same dimensions as a placard, adjacent to the correct hazard class placard.



For those hazard classes listed in §172.334 on which the display of numbers is forbidden on the placards, the identification number must be displayed on an orange panel or white square-on-point configuration.



5.2.9.6 Multiple Compartmented Portable Tank, Cargo Tank, or Tank Car

When transporting hazardous materials with different identification numbers in a tank with multiple compartments, you do not need to display the identification numbers for each material on the front and rear of the tank, as long as the appropriate ID numbers are displayed on both sides of the tank in the sequence in which they are loaded in the compartments. The placards for each hazard class, without any numbers, would then be displayed on the front and rear of the tank. For example, if you offer a tank containing Acetone in the front compartment, Isopropanol in the middle compartment, and Paint related material in the rear compartment the ID numbers on the side of tank would read “1090” toward the front, “1219” in the middle, and “1263” toward the rear. As long as this sequence is followed the numbers can be displayed anywhere along the side of the tank. A class 3 placard without ID numbers would be displayed on the front and on the rear of the tank.

5.3 Labeling the Package

A label might best be defined as a uniform method of hazard communication by which a specification size sign, of a specific color, with a visual symbol, and a unique Class or Division number is displayed for the purpose of notifying anyone who might come into contact with a package, that the particular package contains a hazardous material of a certain assigned category. Each of the unique colors, symbols and numbers identifies specific dangers associated with the package. Often labels are affixed by means of a sticker-type configuration, placed on the outside surface of the package. However, some shippers who offer hazardous materials in dedicated packaging may actually purchase the packaging with the hazard class labels printed directly on the package, or may have special company and/or product labels which have the hazard class label as a part of that larger label.

Labels must be at least 100 mm. x 100 mm. (3.9 inches) on a side. Labels are applied to the outside of shipping containers of hazardous materials. Labels identify the primary and secondary hazards specific to materials and may give information about handling precautions and prohibitions, as well. (§172.407)

Each person who offers for transportation or transports a hazardous material in any of the following packages or containment devices shall label that package or containment device with the label or multiple labels, as specified for the material in Column (6) of the Table and in Subpart E.

- A non-bulk package
- A bulk package with a capacity of less than 18 meters cubed (640 cubic feet), unless placarded in accordance with Subpart F.
- A portable tank with a capacity of less than 3,785 liters (1,000 gallons) can be labeled or placarded on two opposing sides.
- An overpack, freight container, or unit load device of less than 18 meters cubed (640 cu. ft.) which contains packages for which labels are required, and the labels are not visible from the outside (unless it is placarded as authorized in §172.512).

Column (6), Hazardous Materials Table

The first procedure in determining labeling requirements for a package containing hazard materials is to consult the Hazardous Material Table in §172.101. Column (6) of the Table specifies the code(s) identifying the label(s) which is required for each package shipped under the corresponding proper shipping name in Column (2). If the word "None" appears in Column (6), no label is required. When more than one label is specified in Column (6) for the corresponding proper shipping name, the first label shown indicates the primary hazard class and additional labels represent subsidiary hazard classes for that entry. All labels listed in Column (6) must be affixed to the package.

Example:

Methyl chloroformate

Primary Hazard class label - Poison (Toxic)

Subsidiary hazard class labels - Flammable liquid and Corrosive

The codes in Column (6) correspond to the label names and designs as shown in §172400(b) and illustrated below.

Label Design (Amended to show classes common to paint & coatings industry)

Hazard Class or Division	Label Name	§ Section Reference
2.1	FLAMMABLE GAS	172.417
2.2	NON-FLAMMABLE GAS	172.415
3	FLAMMABLE LIQUID	172.419
3	COMBUSTIBLE LIQUID	(none)
4.1	FLAMMABLE SOLID	172.420
4.2	SPONTANEOUSLY COMBUSTIBLE	172.422
4.3	DANGEROUS WHEN WET	172.423
5.1	OXIDIZER	172.426
5.2	ORGANIC PEROXIDE	172.427
6.1 (Inhalation hazard, Zone A or B)	POISON INHALATION HAZARD	172.429
6.1 (Inhalation hazard other than Zone A or B)	TOXIC/POISON	172.430
8	CORROSIVE	172.442
9	CLASS 9	172.446

5.3.1 Exceptions from Labeling, §172.400a

In general, anyone offering for transportation a package or overpack or freight container of hazardous material must label it, unless otherwise provided. There are some instances when the regulations provide specific exceptions to the labeling requirements. No labels are required to be displayed on:

- Limited quantity packages, unless transported by air
- An overpack if labels representing all the hazard classes in the overpack are visible
- Packages shipped using the small quantity exception in §173.4 or the excepted quantity exception of §173.4a
- Special packagings as authorized for specific classes and quantities by §173.13
- A package containing a Class 8 (Corrosive) material with a subsidiary hazard of Class 6.1 (Toxic) if the toxicity is caused only by the corrosive destruction of tissue rather than by systemic poisoning is not required to display the subsidiary hazard label

When offering a material classed as 6.1 in PG III, you may use a Class 6.1 label worded with “PGIII” instead of “POISON” or “TOXIC.” A label worded “PGIII” is not recognized internationally. Alternatively, you may mark “PGIII” on the package next to the label.

Unless excepted, no package of hazardous material may be offered or transported unless properly labeled with all the labels specified.

5.3.2 Additional Labeling Requirements

In addition to Column (6) of the Table, if a material meets the definition of more than one hazard class, the following table must be used to determine if a subsidiary hazard class label is required. You may use this table to determine subsidiary labeling requirements for mixtures and solutions described by generic proper shipping names.

SUBSIDIARY HAZARD LABELS (Section 172.402)

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	*	X	X	X	X	X	X

- X Required for all modes
- * Required for all modes except for a material with a flash point at or above 38° C (100° F) transported by rail or highway.
- *** Impossible as subsidiary hazard

Example:

A material with a subsidiary hazard class in Class 3

Packing Group I - Subsidiary Flammable liquid label required for all modes

Packing Group II - Subsidiary Flammable liquid label required all modes

Packing Group III - If the flashpoint of the liquid is 38° C (100°F) or above, a subsidiary Flammable liquid label is not required for highway or rail transport, but a Flammable liquid subsidiary label is required for transportation by aircraft or water vessel.

5.3.2.1 Prohibited Labeling, §172.401

Any hazard class label(s) displayed on a package must accurately represent the hazard of the material in that package. Do not display U.S. DOT hazard class warning labels on packages unless they contain the hazardous material identified by the label.

No person may offer for transportation and/or no carrier may transport a package of hazardous material that displays markings or labels that could:

- be confused with, or
- be in conflict with label(s) prescribed by the hazardous materials regulations.

DOT has, for the most part, adopted the UN hazard class label specifications. However, the INHALATION HAZARD labels prescribed in 49 CFR for 6.1, Inhalation hazard Zone A or B, have not been adopted by all other codes governing international transportation, and these labels may not be recognized by those codes. When offering hazardous materials for export, or for transportation by air or water, you should always check the current version of the applicable codes to determine the labeling requirements.

Since the UN standard for labels does not include text on labels for hazard classes 1, 2, 3, 4, 5, 6, and 8, the DOT labels for these classes also do not require text, as long as the appropriate Class or Division number is displayed on the primary and subsidiary hazard class label. You may use either the Class 3 label with the word FLAMMABLE LIQUID and the 3 at the bottom, or you may use a Class 3 label with no words and just the 3 at the bottom.

Labels may be affixed to packages even when not required by the regulations, provided each label accurately represents an actual hazard of the hazardous material within the package.

5.3.2.2 Subsidiary Hazard Class Labels, §172.402(a) and (b)

Additional labels are sometimes required to be displayed on a package to communicate the fact that more than one hazard is present in the package or to identify special circumstances which may apply. The primary and subsidiary hazard class label must display the hazard class in the lower corner of the label.

Labels for Class 5 must also indicate the Division number as “5.1” or “5.2” to differentiate between an Oxidizer and an Organic Peroxide, since both have similar properties, but each have entirely different emergency response procedures. Other than Class 5, no Division numbers should appear on the labels.

Example:

For the entry “Allyl acetate,” Column (6) shows the label codes “3” listed first and “6.1” listed next, indicating the primary hazard is FLAMMABLE LIQUID and the subsidiary hazard is TOXIC (or POISON). A package containing this material would display the labels shown below.



5.3.2.3 Labels for Mixed or Consolidated Packaging, §172.404

Sometimes two or more hazardous materials are placed in the same outside container or overpack. When this is done, the outside container or overpack must be labeled with the labels required for each class of material contained. The first step, however, is to be sure that all materials in those hazard classes which are in the inner receptacles are compatible and will not react with each other or the packaging during transportation. It is not necessary to display subsidiary hazard class labels for a material if a primary hazard class label is already displayed for another material in the package. And remember, the marking requirements for each of the contents of the outer packaging must also be met.

5.3.2.4 Cargo Aircraft Only Label

If you offer a package for transportation by air, and the quantity of hazardous material in the package exceeds the quantity per package as authorized in Column (9A) of the Table, but is within the limitations as specified in Column (9B) of the Table, you must label the package with the CARGO AIRCRAFT ONLY label as specified in §172.448.



5.3.2.5 Placement of Labels

When labels are required to be displayed, they must be:

- displayed on any surface other than the bottom of the package or containment device
- printed on or affixed to the package surface
- on the same surface and near (i.e. within 6 inches) the proper shipping name, if the package is large enough

However, if the surface of the package is such that a label cannot be displayed in the manner required, you may affix the label(s) to a tag, and securely attach that tag to the package.

When primary and subsidiary labels are required, they must be:

- displayed next to each other and not more than 150 mm (6 inches) apart.
- printed on or affixed to a background of contrasting color or must have a dotted or solid line outer border
- duplicated on at least two sides or ends, other than the bottom of, when you have:
 - a package with a volume of 1.8 meters cubed (640 cu. ft.) or more
 - a portable tank with a capacity of less than 3,785 liters (1000 gal.)
 - a freight container or aircraft unit load device with a volume of 1.8 meters cubed (64 cu. ft.) or more but less than 18 meters cubed (640 cu. ft.). One of each required label must be displayed on or near the closure of the container

MARKING: PORTABLE TANK EXAMPLE

- Letters must be at least 1 inch (25 mm) in height for portable tanks with capacities less than 1,000 gallons (3,785 liters).

§172.302(b)(2)

- Letters must be at least 2 inches (50 mm) in height for tanks of 1,000 gallons (3,785 liters) or more.

§172.330(a)(2)

- Shipping name must appear on two opposing sides.

§172.330(a)

- Tank capacity of 1,000 gallons (3,785 liters) or more — identification number must be on both sides and both ends.

§172.302(a)(1)

- Tank capacity of less than 1,000 gallons (3,785 liters) — identification number must be on both sides with the shipping name.

§172.302(a)(2)

- The name of the tank owner (or lessee) must be displayed on a tank containing a hazardous material.

§172.326(b)

MARKING: CARGO TANK EXAMPLE

- Letters must be at least 2 inches (50 mm) in height.

§172.328

- Always — ID number must appear on each side and each end.

§172.302(a)

- Sometimes — Shipping name may appear on each side and each end.

Example: Refrigerant Gas

§172.330(a)(1)(ii)

- ID number may be on the tank, on an orange panel, on a placard or a plain white square-on-point display configuration.

§172.332

Test Evaluation – Marking and Labeling

You are required to complete the four assignments in this section. To assist you in this task, a check list has been prepared for your use. You may also use the module you have worked with, along with a copy of 49 CFR.

There is very little difference between marking and labeling. They both do the same thing: communicate information about the material in the package. The difference is not what they do, but how they do it.

Marks & Labels		
1.	Proper Shipping Name	<input type="checkbox"/>
2.	Technical Rule (n.o.s.)	<input type="checkbox"/>
3.	Hazard Class	<input type="checkbox"/>
4.	Subsidiary Hazard	<input type="checkbox"/>
5.	Packing Group	<input type="checkbox"/>
6.	ID Number (NA/UN)	<input type="checkbox"/>
7.	Hazardous Substance (RQ)	<input type="checkbox"/>
8.	Inhalation Hazard	<input type="checkbox"/>
9.	Waste	<input type="checkbox"/>
10.	Marine Pollutant	<input type="checkbox"/>
11.	ORM-D	<input type="checkbox"/>
12.	Limited Quantity	<input type="checkbox"/>
13.	Small Package	<input type="checkbox"/>
14.	Address (Shipper)	<input type="checkbox"/>
15.	Address (Consignee)	<input type="checkbox"/>
16.	Orientation Labels	<input type="checkbox"/>

Mode	
Highway	<input type="checkbox"/>
Rail	<input type="checkbox"/>
Ocean	<input type="checkbox"/>
Air	<input type="checkbox"/>

Container	
Bulk	<input type="checkbox"/>
Non-Bulk	<input type="checkbox"/>

Packaging	
Combination Package	<input type="checkbox"/>
Fiberboard	<input type="checkbox"/>
Drum	<input type="checkbox"/>

Prior to preparing your shipment, use the above checklist to ensure you have not missed a marking, label or exception.

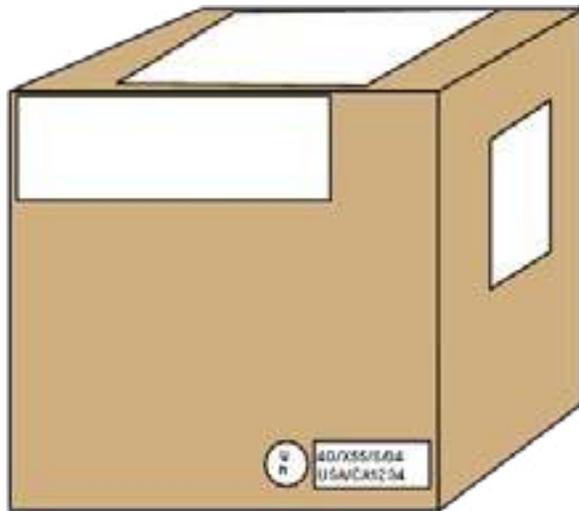
Test Evaluation 1 – Marking and Labeling

The M & L Chemical Company of 333 Carroll Lane, Grand Rapids, MI 49503, is shipping to the Martin Manufacturing Company of Atlanta, GA, 300 lbs of “benzyl chloride,” a poisonous, corrosive material which is also a hazardous substance. The shipment will be transported by highway and will be transferred from one motor carrier to another. On the drum below, write in all required markings and labeling for this material.



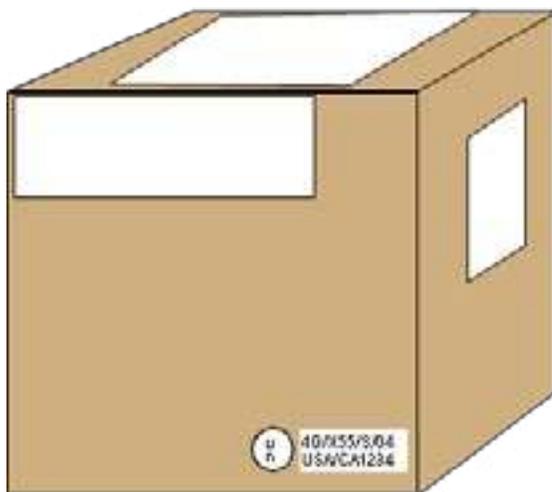
Test Evaluation 2 – Marking and Labeling

The Superior Products Company of 889 Chestnut Street, Los Angeles, CA 90040, is shipping to the Guildron Chemical Company of Denver, CO, a fiberboard box containing a 2 liter can of paint thinner identified as a flammable liquid in Packing Group I and 2 plastic bottles of 1 liter each containing Ethylene dichloride. The shipment will be transported by ABC Truck Lines, Inc., and transferred to Interstate Truck Systems for delivery. On the box shown below, write in all required markings and labels for the shipment.



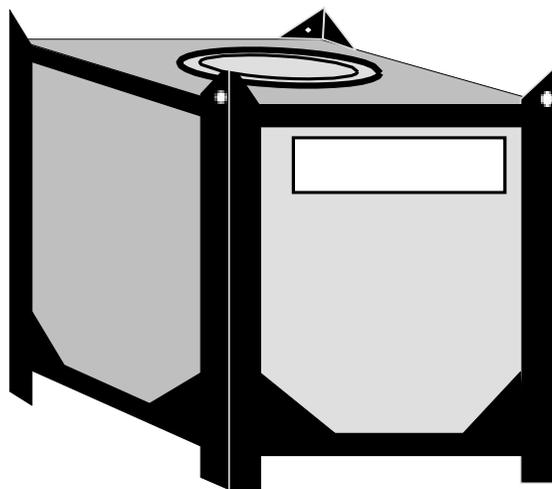
Test Evaluation 3 – Marking and Labeling

The L.D. Frost Company of 123 Cowboy Road, Dallas, TX 75215, is shipping to the General Electric Company of Kansas City, MO, a fiberboard box containing two containers of “Methyl alcohol,” a flammable liquid. The shipment will be transferred from one motor carrier to another and will then be shipped by General Electric to their plant in Munich, Germany. On the box below, write all required markings and labels for the shipment.



Test Evaluation 4 – Marking and Labeling

The ABC Paint Co., of 6 Elm Street, Willard, KS, is shipping to the Apex Mfg. Co. of 20 Oak Street, St. Louis, MO, 600 gallons of white enamel paint with a flash point of 73 °F (23 °C) in an intermediate bulk container. The shipment will be transported by highway, and may be handled by two or more carriers. On the portable tank shown below, write all the required markings and labels for the shipment described.

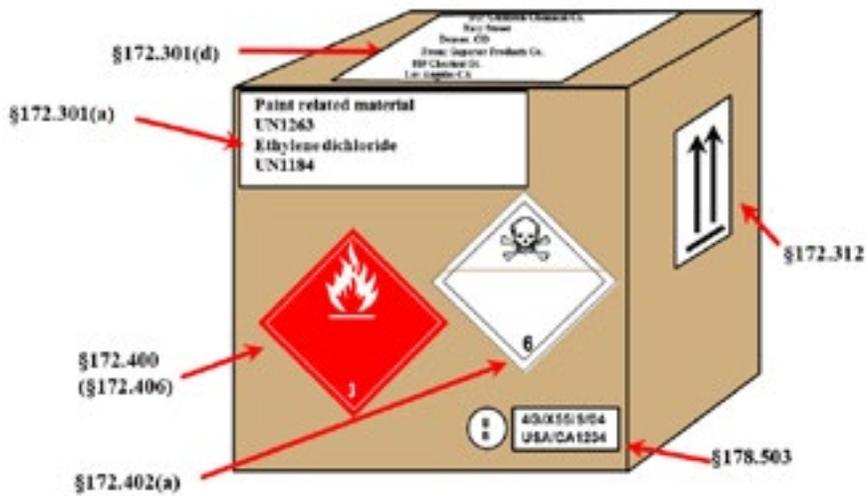


Answer Key: Test Evaluation – Marking and Labeling

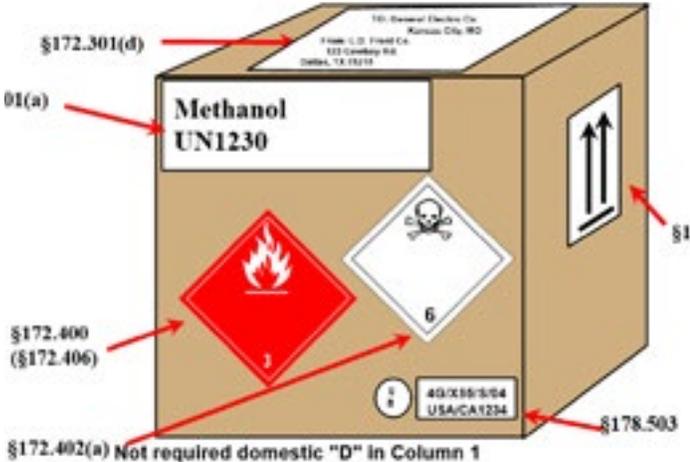
Answer: Test Evaluation 1



Answer: Test Evaluation 2



Answer: Test Evaluation 3



Answer: Test Evaluation 4



Could have FLAMMABLE placard on two opposing sides and UN identification number displayed on the placard or on an orange panel adjacent to the placard.



CHAPTER 6 – SHIPPING DOCUMENTS

6.1 Defining the Shipping Paper

The hazardous material shipping paper is a very important part of the communication process for identifying the material, communicating its dangerous properties, and describing the degree of hazard for materials which are offered in transportation. When properly prepared, they also provide vital information for emergency response personnel in the event of an accident. DOT therefore requires that you must make accurate, concise, legible entries which are entered in a uniform sequence to enable quick and accurate recognition of the material and its hazards. Except when transporting hazardous wastes, DOT does not require the use of any specific form as a shipping paper. As long as all required entries are complete and in proper sequence any bill of lading, manifest, way bill, or other document used in the normal course of business is acceptable. Pre-printed forms with marked columns for the required entries may assist you in ensuring that all basic description entries are on the paper and are in the proper sequence.

6.2 Preparing a Hazardous Material Shipping Paper

When hazardous materials are being described on a shipping paper which will accompany a shipment during transportation the entries required by the regulations must be:

- legible
- printed manually or mechanically
- in English

Abbreviations, unless specifically provided for in the regulations, are never permitted in the required entries.

If hazardous materials and non-hazardous materials are described on the same shipping paper, the hazardous materials entries must be easily recognizable. The regulations require that the hazardous materials entries be:

- entered first on the shipping paper; or
- entered in a contrasting color or highlighted with color; or
- may be marked with an “X” in a column marked with the header “HM” which precedes the proper shipping name. (If a material meets the definition of a hazardous substance, the letters “RQ” may be substituted for the “X” in the HM column.)

If a shipping paper consists of more than one page, each page should be continuously and consecutively numbered, and the first page must have a notation showing the total number of pages, e.g., Page 1 of 4.

6.3 Basic Description Requirements

There is specific information required to be entered on every shipping paper, and these entries are called the basic description. The information required to complete the basic description can be found in the Hazardous Material Table in §172.101. Every shipping paper used to accompany a shipment of a hazardous material offered for transportation must include the following basic description entries in the sequence as shown below:

1. Identification number from Column (4) of the Table. The UN or NA prefix, as appropriate, must precede the four digit number.
2. Proper shipping name from Column (2) of the Table. Only those proper shipping names in Roman print are acceptable.
3. Hazard class or Division number from Column (3) of the Table. The subsidiary class (if any), shown in Column (6), must be entered in parenthesis after the primary hazard. The words “class” or “division” may be entered before the primary or subsidiary class or division.
4. Packing group if listed in Column (5) of the Table. Some hazard classes and divisions do not have assigned packing groups. (Roman numerals MAY be preceded by the letters “PG.”)

Example:
UN1263, Paint, 3, II

The shipping description must be in the "ISHP" format as follows:

- I - Identification number
- S - Shipping name
- H - Hazard class
- P - Packing group

The shipping description must be shown in the authorized sequence, (ISHP) with no additional information breaking the sequence, except as permitted by the regulations.

The total quantity of hazardous material described in each entry must also be entered either before or after the required sequential entry. You may enter the total quantity either by weight or volume. Empty packagings do not require an entry for quantity by the DOT regulations; however, you may add the additional information "Residue, last contained ..." in front of the proper shipping name.

The type of packaging and number of packages must be shown either before or after the required entries.

Abbreviations may be used to describe units of measure (such as "L" for Liters, "kg" for kilograms) and packaging types (such as "dr" for drum, "TT" for tank truck).

Packaging types may also be shown by using the UN specification code, for example, 4G or 1A1. (See the Packaging section in this guide for more information on specification codes.)

Example:
UN1219, Isopropanol, Class 3, PGII, 4-1A1, 225 liters

Since the hazard class is part of the proper shipping name the hazard class need not be entered when in the basic description for "Combustible liquid, n.o.s."

6.4 Additional Descriptions Required, §172.203

In addition to the basic description, some materials require further clarification to describe their unique characteristics or environmental hazards. Generic shipping descriptions for corrosive materials should include additional entries to identify whether the material is an "acid" or a "base." Certain materials described by "n.o.s." shipping names require further identification as "organic" or "inorganic" material.

6.4.1 Technical and Chemical Group Names

Hazardous materials which are described by a generic or "n.o.s." entry may require additional information to describe the material more accurately. All those entries with a "G" in Column (1) of the HM Table must have the technical name of the hazardous material ingredient or, in the case of multiple hazardous material ingredients, the two most predominant materials contributing to the hazard class(es) entered in parentheses in association with the shipping description. DOT allows the technical name to be entered either directly after the "n.o.s." or immediately following the basic description. Technical and chemical group names are the only entries which are permitted within the sequence of the four entries listed above. Since DOT permits it, and in order to comply with international regulations, it is a good idea to enter those technical names in parentheses between the proper shipping name and hazard class when required.

Example:
"UN1993, Flammable liquids, n.o.s., (Xylene), 3, II"

If the material is a mixture of two or more hazardous materials, the technical names of at least the two most predominant materials contributing to the hazard must be shown in parentheses following the “n.o.s.” shipping name or following the basic description. If the material meets the definition of multiple hazard classes, the technical name entries should describe the predominant material in each hazard class.

Examples:

“UN2924, Flammable liquid, corrosive, n.o.s., (Toluene, Acetic Acid), 3(8), II”

“UN1564, Barium compounds, n.o.s. (ADD TECHNICAL NAME), 6.1, II”

6.4.2 Exemptions

Each shipping paper which describes a shipment being made in conjunction with a DOT Special Permit must have the entry “DOT-SP ****” with the **** replaced with the Special Permit number. This notation must be in association with the hazardous material description to which it applies if more than one material is entered on the shipping paper.

6.4.3 Limited Quantity

Materials being offered for transportation as “Limited Quantities” must have the words “Limited Quantity” or “Ltd Qty” entered following the basic description, when shipping papers are required (e.g. for air and ocean transport). Additional information on limited quantity authorizations may be found at the “Use of the Table” Module and the “Packaging” module of this manual.

Example:

“4 Qts. UN1263, Paint, 3, III, Ltd Qty”

6.4.4 Hazardous Substances

Hazardous substances require the additional entry of the letters “RQ” either immediately before or immediately after the required description. If the proper shipping name does not identify the name of the material(s) which make it a hazardous substance, the name(s) of the hazardous substance(s), or the waste stream number if applicable, as shown in Appendix A to §172.101, must be entered in parentheses in association with the basic description.

Examples:

“RQ, UN 1145, Cyclohexane, Class 3, II” “RQ, UN1263, Paint, 3, PGII, (Cadmium)”

“UN1263, Paint Related Material, 3, PG II, RQ (Xylene)”

“UN3077, Environmentally hazardous substance, solid, n.o.s., (Cadmium), 9, III, RQ”

6.4.5 Empty Containers

If you are shipping empty containers that still contain the residue of hazardous material, you may include the words “RESIDUE: last contained” before the basic descriptions.

Example:

5 Portable Tanks, RESIDUE: Last contained UN1263, Paint, 3 III

The shipping paper for a rail tank car that still contains the residue of a hazardous material, must include the words “RESIDUE: LAST CONTAINED”

Example:

1 Tank Car, RESIDUE: LAST CONTAINED UN1263, Paint, 3, II

6.4.6 Air Transportation

The shipping paper for packages intended for transport by aircraft which contain quantities which exceed the limitations shown in Column (9A) of the table, must have the words “Cargo aircraft only” entered in association with the basic shipping paper description. Be aware that air carriers operating under ICAO/IATA regulations will require the use of a specific form, called the Shipper’s Declaration for Dangerous Goods.

6.4.7 Water Transportation

When intended for transportation by water, the following additional entries must be included on the hazardous materials shipping paper:

- an entry with the name of the shipper.
- minimum flash point in degrees C for any material with a flash point of 60° C (140° F) or less (required by IMDG Code)

Ocean shipments of dangerous goods packed in freight containers may require a Container Packing Certificate. You should consult the IMDG Code regulations before offering shipments for ocean carriage.

A sample IMDG Code Dangerous Goods Declaration is included in the module. A sample Container Packing Certificate is included in the module.

6.4.8 Marine Pollutants

If the proper shipping name for the material does not identify the substance which makes the material a marine pollutant, the technical name from column (2) of Appendix “B” must be entered in parentheses in association with the basic description. If two or more substances which are in a mixture or solution are marine pollutants, the technical names of at least the two most predominant substances must be listed in parentheses as an additional description.

The words “MARINE POLLUTANT” must be entered in association with the basic description when a material identified as a marine pollutant is described on the shipping paper.

Example:

UN2570, Cadmium compounds, 6.1, II, MARINE POLLUTANT

6.4.9 Poisonous Materials

Poisonous material, Division 6.1, PG I or II, which require a poison label to be displayed on a non-bulk package, must have the word “Poison” entered in association with the basic description unless poison is already included in the basic description. The basic description entries could have the word “poison” as part of the proper shipping name, or could have the division “6.1” as the class number, in which case the word “poison” is not required to be repeated with the basic description.

Note: The words “poison” and “toxic” are interchangeable and either may be used to meet the 49 CFR requirements.

6.4.10 Inhalation Hazard

Division 2.3 materials and 6.1, Packing Group I materials, which are toxic by inhalation must have the words “Poison-Inhalation Hazard” entered immediately following the basic description. (The word “Poison” does not have to be repeated if it is already part of the basic description.)

The Hazard Zone for Division 2.3 and Division 6.1 materials must be determined by consulting Column (7) of the HM Table and if the numbers “1”, “2”, “3”, or “4” appear the appropriate Special Provision at §172.102 applies.

- 1 = Hazard Zone A
- 2 = Hazard Zone B
- 3 = Hazard Zone C
- 4 = Hazard Zone D

The words “Hazard Zone A,” “Hazard Zone B,” “Hazard Zone C,” or “Hazard Zone D,” for Division 2.3 (gases) and the words “Hazard Zone A” or “Hazard Zone B” for Division 6.1 (liquids), as appropriate, will then be entered following the words “Poison-Inhalation Hazard.”

Example:

“UN1092, Acrolein, stabilized, 6.1, I, Toxic-Inhalation Hazard Zone A”

6.4.11 Elevated Temperature Materials

Elevated temperature materials include liquids heated and shipped in bulk containers at a temperature of 100° C (212° F) or having a flash point of 37.8° C (100° F) and heated and shipped at a temperature at or above the flash point, and solids heated and shipped at a temperature at or above 240° C (464° F). When packaged in bulk containers, elevated temperature materials other than molten sulfur or molten aluminum, must have the word “HOT” entered on the shipping paper immediately in front of the proper shipping name, unless the fact that the material is at an elevated temperature is already part of the proper shipping name.

6.4.12 Non-required Additional Information

Additional information which is not inconsistent with the required description may be included on a shipping paper following the required entries, if it may provide further clarification. For instance, some shippers may want to enter the trade name for their product to assist their customer with identification of products ordered.

6.5 Shipping Paper Certification

The person who first offers a hazardous material for transportation is responsible for certifying that the material is properly classified in the proper hazard class, described by the most appropriate shipping description, packaged in an authorized packaging, marked and labeled as required, and that the package is in proper condition for transportation. The certification is required by §172.204 of 49 CFR, and must be printed on the shipping paper in the format and language as stated in that section and indicated below. One of the two paragraphs must be used for the shipper’s certification:

“I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations.”

OR

“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.”

6.5.1 Hazardous Waste Manifest Certification

The generator offering a hazardous waste for transportation must further provide a Generator’s Certification for Hazardous Waste Manifest:

“I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations.

If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.”

6.5.2 Certification for Air Transportation

Hazardous material shipments intended for air transportation may use the same certification statement as required by 49 CFR.

When offering a hazardous material for air transportation, two copies of the required certification must be provided to the air carrier.

The Transport Details section of the declaration must include the words “This shipment is within the limitations prescribed for passenger aircraft/cargo aircraft only.” The words “passenger aircraft” or “cargo aircraft” should be obliterated as appropriate. In other words, if the quantity of the material in the packages offered, exceeds the quantity specified in Column (9A) of the §172.101 table, the words “passenger aircraft” would be stricken by drawing a line through them on the certification.

6.5.3 Signatures Required on Shipping Paper Certification

The certification on a hazardous material shipping paper must be legibly signed by a principal, officer, partner, or employee of the shipper or an authorized agent. In other words, it must be signed by a person with the authority to certify that the statement is true. The signature that is required does not have to be a hand written signature and it may be signed manually or with a typewriter, rubber stamp, or other mechanical means.

However, all signatures required on a Hazardous Waste Manifest (EPA 8700-22 and EPA 8700-22A), including the certification statement, are required to be hand written. No mechanical signatures are allowed.

6.5.4 Certification Exceptions

The shipper’s certification is not required on shipping papers for hazardous materials which are offered for transportation by motor vehicle:

- in a cargo tank supplied by the carrier
- when a private carrier uses only their own vehicles and the materials will not be transported by any other carrier.

The shipper’s certification is not required on a shipping paper accompanying a rail car which has been emptied and is being returned but has not been cleaned and purged.

Since the certification is only required on the shipping paper provided by the original shipper who offers the material for transportation, any subsequent shipping papers which may be prepared by interlining carriers might not include the certification statement and signature.

6.6 Shipping Paper Exceptions Examples

Unless the material is a hazardous waste or a hazardous substance (see definitions), a shipping paper is not required for any material which is:

- identified by the letter “A” in Column (1) of the Table and is not intended for air shipment.
- identified by the letter “W” in Column 1 of the Table and is not intended for water shipment.
- Shipped as a limited quantity and not intended for air or ocean shipment.

6.7 Emergency Response Information

Part 172, Subpart G, 49 CFR, prescribes requirements for providing and maintaining emergency response information during all phases of transportation, including loading, carrying, storing, or otherwise handling such materials, and applies to all persons with such duties. The required information must be immediately available for use at any time the hazardous material is present and is required to be immediately available to a government agency representative responding to the scene of an accident or incident or who is conducting an investigation.

Every hazardous material shipping paper which accompanies a hazardous materials shipment must contain sufficient information to provide the most effective mitigation of an incident and at a minimum requires the following information:

- the basic description entries
- immediate hazards to health
- risk of fire or explosion
- immediate precautions in the event of an accident or incident
- immediate methods for handling fire
- initial containment of leaks or spills
- preliminary first aid measures

This information must be legibly printed in English and available for use away from the package which means it should not be attached to the package. The information may be provided:

- on a shipping paper; or
- on a Safety Data Sheet (SDS) which also includes the basic DOT required description; or
- in conjunction with the required shipping paper, by providing an emergency response guidebook (ERG) or the proper page(s) from such guidebook which cross references the required DOT description.

The emergency response information will then be maintained by the transporter in the same manner as the shipping paper, and must be immediately accessible. At a manufacturing facility, truck terminal, loading dock, warehouse, or other facility, the information must be maintained in a location where it is immediately accessible to facility personnel in the event of an incident.

6.7.1 Emergency Response Telephone Number

A person who offers a hazardous material for transportation is required to provide and maintain an emergency response telephone number that is monitored at all times the material is in transportation (likely 24-hours per day), including the area code or international access code. The telephone number should be entered on the shipping paper immediately following the entry to which it corresponds or, if the same emergency response telephone number applies to all hazardous materials described on the shipping paper, the number should be conspicuously entered and identified as the emergency contact number in one location on the shipping paper.

The person who answers the phone at the listed emergency contact number is required to:

- be knowledgeable of the hazards and characteristics of the materials and have comprehensive knowledge of the proper emergency response and mitigation action to be taken; or
- have immediate access to a person who does have the required knowledge of the material and who knows the emergency response procedures.

6.7.2 Exceptions to the Emergency Response Information Requirements

DOT has provided exceptions at §172.604(c) for the requirement to furnish the emergency response telephone number for certain materials that are low hazard materials and articles.

The regulations allow shippers to contract with outside agencies such as CHEMTREC and others to provide emergency response contact. However, if you use these contractors as your emergency response information providers, you are responsible for supplying them with all SDS's or any additional information that may be required in an emergency. In addition, if using a third-party agency, you must indicate you contract number or other unique identifier that will allow regulators to confirm you have an active contract with the emergency response phone provider.

The sample shipping papers illustrated in this section demonstrate examples of recommended format, design, and content for preparing shipping papers to accompany shipments of hazardous materials for selected modes of transportation.

6.8 Hazardous Waste Manifest Requirements

Hazardous waste shipments MUST be accompanied by a hazardous waste manifest as required in 49 CFR, §172.205. The manifest (EPA Form 8700-22) and when required, the continuation sheet (EPA Form 8700-22A) MUST include the DOT shipping description and additional entries as required by Title 40 CFR, Part 262, §262.20. The hazardous waste manifest is then considered to be the hazardous material shipping paper and is subject to all the transportation regulations which apply to shipping papers in 49 CFR.

6.9 Air Transportation

Although there are many similarities, there are also some differences for shipping papers for transport by air. Special training is required for air shipments. This exhibit is presented as a reference guide. The most current edition of the ICAO Technical Instructions and/or the IATA Dangerous Goods Regulations should always be consulted when offering paint and coatings products that meet the definition of dangerous goods for air transportation. Section 8 of IATA provides guidance on the specifications for the documents required to be used and requires that the shipper's declaration for dangerous goods must be prepared and offered to the air carrier in duplicate.

Only proper shipping names authorized in the IATA List of Dangerous Goods at Section 4.2 may be used when using the IATA regulations. Detailed instructions on preparation of the shipper's declaration are codified at Section 8.1.6 of IATA.

A sample declaration is attached and the numbers shown below correspond to the numbered areas of the Shipper's Declaration for Dangerous Goods on the air declaration.

1. Shipper's name and location
2. Air Waybill No. and number of pages
3. Consignee
4. Emergency Contact Number
5. Here you must delete Passenger and Cargo Aircraft or Cargo Aircraft only depending on which packing instruction you have used.
6. Airport of Departure
7. Delete either non-radioactive or radioactive, whichever does not apply.
8. Airport of Destination
9. UN or ID No, Proper Shipping Name, Class or Division, Packing Group, Subsidiary Risk - these are all in the same sequence as shown in the domestic shipping paper module and are referred to as the "first sequence."
10. Quantity and Type of packing - This is referred to as the "second sequence" and here the shipper must indicate the number of packages (of same type and content), their type of packaging (either in full or by use of the UN Packing Specification Code). Example: 1 Fiberboard Box x 6 liters
11. When an overpack is used, the wording "Overpack Used" must be inserted on the declaration immediately after all entries relating to the packages within the overpack.
12. Packing Instruction is the "third sequence." The number of the applicable Packing Instruction as shown in the current version of IATA or ICAO must be entered.
13. Authorizations is the "fourth sequence." An example of authorizations which must be entered would include if certain Special Provisions, as shown in Column (M) of the dangerous goods list, are used. Special Provisions are explained in Section 4.4, and the Special Provision number will be entered in the fourth sequence. Competent authority approvals should also be entered in this sequence when applicable.
14. Shippers' declaration - For Air, the declaration must be signed by the shipper. The signature may be written by hand, or it may be in the form of a facsimile reproduced by printing or stamping. A typewritten signature is not acceptable. The declaration form must not, in any circumstances, be completed and/or signed by a consolidator. The declaration must contain an additional statement, "I declare that all of the additional air transport requirements have been met."

Note: IATA also authorizes the use of a shippers' declaration that does not have columns in the center to facilitate the entry of the required information. If a declaration form without the columns is used, the information required in each "sequence" must be separated, either by two oblique lines (//) or by placing the information required in each sequence on a separate line. The information within a sequence must be separated by commas.

6.9.1 Air Waybill

In addition to the shippers' declaration for dangerous goods, you must also prepare an air waybill as described in IATA, Section 8.2, which describes the "handling information" by a prescribed statement and further describes the nature and quantity of the dangerous goods. The purpose of the air waybill is to provide billing information regarding rate classification and weight, and to inform the carrier that either a dangerous goods declaration accompanies the air waybill, or that dangerous goods are included in the consignment but do not require a shipper's declaration for dangerous goods.

6.10 Ocean Shipments

Shipping documents required for ocean shipments are similar to those required by DOT, and with a few conditions and limitations as specified in 49 CFR §171.23, 171.24, or 171.25, these documents may continue to be used for the highway and rail portions of transportation in the US for the consignment.

Chapter 5.4 of the IMDG Code specifies the requirements for documents required to be presented to the ocean carrier at the time the cargo is offered. Although no specific form is required, the IMDG Code provides a recommended format called the “Multimodal Dangerous Goods Form.” A previously recommended form, the “IMO Dangerous Goods Declaration” (DGD) is also widely used. This information then becomes a part of the Dangerous Cargo Manifest (DCM) that will accompany the ship to show the type and location of the dangerous goods on-board at any given time during that voyage. The basic information required on the DGD includes:

- The UN identification number
- The proper shipping name as listed in upper case letters in Column (2) of the “Dangerous Goods List”
- The hazard class or division of the goods (from Column (3)) which may be preceded by the word “class” or “division.” Any assigned subsidiary class or division (from Column (4)) must be entered in parenthesis after the primary hazard class
- The packing group when assigned in Column (5). The packing group may be preceded by the letters, “PG”

In some cases, the basic description is required to be supplemented with additional information as follows:

- The shipping name must be supplemented with technical name if Special Provision “274” appears in Column (6) of the Dangerous Goods List for the proper shipping name. This requirement is similar to the “G” in Column 1 of the HazMat Table in 49 CFR.
- Empty packages should be indicated by the additional entry “RESIDUE-LAST CONTAINED” or “EMPTY UNCLEANED” before or after the proper shipping name.
- Regulated hazardous wastes should include the entry “Waste” preceding the proper shipping name.
- The number and kind of packages and the total quantity of dangerous goods described in each entry.
- The minimum flash point in degrees C for any material with a flash point of 60° C or less.
- Any material that meets the definition of a marine pollutant must have the words “MARINE POLLUTANT” and must identify the technical name of the marine pollutant.
- Any Class 4.1 self-reactive substance or Class 5.2 requiring temperature control during transport must include the control temperature and the emergency temperature when applicable.
- Dangerous goods packagings which have been found to be damaged or leaking, or the dangerous goods recovered from the leaking package may be packed in salvage packaging; however, the entry “SALVAGE PACKAGING” must be entered in association with the entry describing that material.

The shipping document must also contain the name and address of the shipper and the consignee, and the date the shipping document was prepared or given to the initial carrier.

6.10.1 Container Packing Certificate

The IMDG Code requires that a “container packing certificate” must accompany every freight container containing dangerous goods when offered to a water carrier for loading aboard a vessel. When offering a vehicle for transportation aboard a “roll- on/roll-off” vessel, the same certificate is called a vehicle packing declaration. The certificate is prepared by the person packing the dangerous goods into the freight container and must include all of the items stated in Section 5.4.2. of the IMDG Code.

The signature on the certificate should be that of the person responsible for ensuring that all of the statements on the certificate are true. If you as a shipper load packages of paint and coatings products or other dangerous goods into a freight container and offer that freight container for transportation, any portion of which will be by sea, you must prepare and sign the certification. If you offer dangerous goods as a “less than containerload” lot to be packed into the container by a forwarder, consolidator, or other person, that individual has responsibility for preparing and signing the container packing certificate. In most cases, the signature on the container packing certificate will probably be a different signature than that appearing on the shipping papers prepared by the shipper of the package. A sample container packing certificate is included in this manual. The packing certificate may be combined with the shipping document. See the attached Multimodal Dangerous Goods Form.

Test Evaluation – Shipping Documents (1)

Please answer True or False to each of the following questions.

1. Hazardous Materials must always be entered first on a shipping document.
 - a. True
 - b. False

2. Multiple pages on a bill of lading must be numbered.
 - a. True
 - b. False

3. The identification on a shipping paper must always be preceded by the letters UN, ID, or NA.
 - a. True
 - b. False

4. You may abbreviate the proper shipping name if you run out of space.
 - a. True
 - b. False

5. Shipping papers are required for empty containers still containing a residue of a hazardous material.
 - a. True
 - b. False

6. When shipping under the Limited Quantity exception, you need to note 'Ltd.Qty.' OR "Limited Quantity" on the shipping paper.
 - a. True
 - b. False

7. The n.o.s. shipping names must always include the technical name of the components.
 - a. True
 - b. False

8. When you ship a hazardous substance, the letters "RQ" may be entered either before or after the basic description.
 - a. True
 - b. False

9. A Shipper's Certification is always required on a shipping paper.
 - a. True
 - b. False

10. Shippers are required to supply emergency response information with all hazmat shipments.
 - a. True
 - b. False

Answer Key: Test Evaluation - Shipping Documents (1)

1. b.
2. a.
3. a.
4. b.
5. a.
6. a.
7. b.
8. a.
9. b.
10. b.

Test Evaluation – Shipping Documents (2)

Please fill in the blanks.

1. Hazardous materials may be shown in any one of three ways on a shipping paper:

They may be entered first

They may be in a contrasting color or

2. If a shipping paper consists of more than one page, the pages must be _____

3. The basic description consists of:

UN/NA _____

The Proper Shipping Name

The _____

Packing Group

4. If you are shipping under a DOT Special Permit, you must show the notation _____ followed by the number.

5. If you are shipping under the limited quantity exception, you must show the words _____ or

6. If your shipping name is a generic (n.o.s.) shipping name with a “G” in Column (1) of the HM Table, you must include the _____ in parentheses.

7. If your material is a hazardous substance, the letters _____ are required in association with the description.

8. If the name of the hazardous substance is not part of the shipping name, you must show it in parentheses after the

9. Shippers of other than limited quantity or consumer commodity shipments must also provide an emergency response _____ in case of an incident during transportation.

10. For ground transport, shipping papers are not required to accompany consignments of hazardous materials under the limited quantity exception as well as those intended for retail sales for home use if marked _____ and _____ on the package.

Answer Key: Test Evaluation – Shipping Documents (2)

1. They may have an “X” in the HM column
2. continuously and consecutively numbered
3. Identification number (and) Hazard Class
4. DOT SP
5. Limited Quantity or LTD. QTY.
6. technical name(s) (Two most contributing to the hazards)
7. “RQ”
8. proper shipping name or after the Basic description
9. telephone number
10. Consumer commodity (and) ORM-D

Test Evaluation – Shipping

Read each of the following questions carefully. Select the MOST appropriate answer for each of the following questions and mark the corresponding space on the answer sheet provided. Only ONE answer per question may be marked on the answer sheet.

1. When completing a shipping paper to accompany a shipment of aerosol by air containing “Aerosols, flammable,” the correct packaging group to be included in the basic description is:
 - a. I
 - b. II
 - c. III
 - d. None of the above

2. A shipment described as “UN1263, Paint, Class 3, III “ in 55 gallon drums packed in a freight container, offered for international transportation by sea must have the following information entered on the shipping paper:
 - a. the total quantity
 - b. the number and type of packages
 - c. The flash point for the Paint
 - d. All of the above

3. The proper sequential order for the basic description on a shipping paper for a hazardous material is:
 - a. Proper shipping name, Identification number, Hazard class, Packing group
 - b. Proper shipping name, Hazard class, Identification number
 - c. Proper shipping name, Packing group, Hazard class, Identification number
 - d. Identification number, Proper shipping name, Hazard Class, Packing Group

4. When offered for water vessel carriage, a Container Packing Certificate is NOT required for:
 - a. only 16 drums containing Class 8, packed in a freight container
 - b. 4 IBC’s containing Class 3, packed within a freight container
 - c. 10 small boxes labeled with various hazard class labels packed into a freight container
 - d. a 24,000 liter portable tank (ISO tank) offered for cellular stowage

5. When offering a semi-trailer packed with 55 gallon drums containing “Flammable liquids, n.o.s.” for rail carriage from Cleveland, OH, to Miami, FL the shipping papers:
 - a. must include the emergency contact telephone number
 - b. must include the technical name(s) of the flammable component(s) in the liquid
 - c. must include a shipper’s certification
 - d. ALL of the above

6. Materials which display the letters "PP" in front of the name of the article or substance in Appendix "B" of §172.101:
 - a. are considered to be "pretty poisonous" and MUST be so described on a shipping paper
 - b. are "severe marine pollutants" and MUST have the entry MARINE POLLUTANT on the shipping paper in association with the basic description
 - c. are considered to be "probable pollutants" and are forbidden for transport
 - d. None of the above

7. The proper shipping name, I.D. number, and packing instruction to be used for offering 5 gallons (18.9 L) of paint thinner in Class 3, PG I, in a jerrican (3A1) by aircraft is:
 - a. "UN1263, Paint" Packing Instruction 303
 - b. "UN3066, Paint related material" Packing Instruction 812
 - c. "UN1263, Paint related material" Packing Instruction Y305
 - d. "UN1263, Paint related material" Packing Instruction 303

8. Any hazardous materials which are being shipped as a "waste" material, MUST:
 - a. be accompanied by a hazardous waste manifest within the United States
 - b. Include the word "waste" preceding the proper shipping name
 - c. include the basic description entries required for hazardous materials
 - d. ALL the above

9. A mixture of 50% ACETONE and 50 % XYLENE would MOST appropriately be described using the proper shipping name:
 - a. ACETONE SOLUTIONS
 - b. ACETYLENE N.O.S.
 - c. FLAMMABLE LIQUIDS, N.O.S.
 - d. FLAMMABLE SOLUTIONS

10. When intended for transportation by highway only in the United States, shipping papers are NOT required for:
 - a. a material described as a CONSUMER COMMODITY or LTD QTY
 - b. a 55 gallon drum of acetone
 - c. a cargo tank containing only residue of a hazardous material
 - d. ALL of the above

The following statements are either TRUE or FALSE. Mark the appropriate space on the answer sheet provided to indicate a.) for TRUE or b.) for FALSE.

11. A shipping paper intended to accompany a consignment offered for transportation by aircraft must be provided in duplicate by the shipper.
 - a. True
 - b. False

12. Shipping papers are not required to accompany consignments described as "Limited quantity" by any mode of transport.
 - a. True
 - b. False

13. The shippers declaration for transporting dangerous goods by air must indicate that the shipment is within the limitations for Passenger and Cargo Aircraft or Cargo Aircraft Only
 - a. True
 - b. False

14. When offering Dangerous Goods as an "Excepted Quantity," the Air Waybill MUST display the entry "Dangerous Goods in Excepted Quantities" in the box describing Nature and Quantity of Goods.
 - a. True
 - b. False

15. Part 172, Subpart H, Training requirements for "hazmat employees" requires that employees who only prepare hazardous materials shipping papers must be trained within 90 days of employment for such work.
 - a. True
 - b. False

Answer Key: Test Evaluation – Shipping

1. d.
2. d.
3. d.
4. d.
5. d.
6. b.
7. d.
8. d.
9. c.
10. a.
11. a.
12. b.
13. a.
14. a.
15. a.

CHAPTER 7 – PLACARDING

Placards may be described as large labels, since they are very similar in color and content. Each hazard class placard is unique and is readily identifiable by its color, symbol, and Class or Division number. Placards are used to communicate the hazards associated with hazardous materials as contents within a bulk packaging, or as packaged hazardous materials within a cargo transport unit such as a truck, semi-trailer, freight container, rail car, or unit load device. Emergency responders rely on hazard class placards to provide a visual warning of the hazards which are present at the scene of a transportation incident involving hazardous materials. The responsibility for providing placards, for affixing placards, and for maintaining placards during transportation is clearly delineated in the regulations at Part 172, Subpart F.

You may find it beneficial to keep a current copy of 49 CFR at your disposal for use while working on this module.

7.1 Applicability, §172.500

The regulations regarding placards begin at §172.500, which states that each person who offers for transportation or transports any hazardous materials subject to this subchapter shall comply with the applicable placarding requirements of this subpart, meaning Subpart F. In other words, the person who offers the hazardous material must comply with the placarding requirements applicable to the shipper, and the person who transports the hazardous material must also comply with the placarding regulations as they apply to carriers.

7.1.1 Exceptions

Due to the limited hazards in transportation presented by some types of hazardous materials, DOT provides exceptions from the requirement to display placards.

Placards are not required to be displayed on vehicles or other cargo transport units when transporting:

- Infectious substances
- Shipments described as a “Limited Quantity”
- Materials prepared and marked according to §173.13 as special packaging
- Materials packaged and marked as “small quantities” according to §173.4 and “excepted quantities” according to §173.4a
- Combustible liquids in non-bulk packaging
- Class 9 materials in domestic transportation

7.1.2 Prohibited Placarding

Emergency responders rely on placards as an initial warning that hazardous materials are on board a vehicle or rail car. Often, they may even delay their response while waiting for the arrival of response equipment to properly protect themselves and others on the scene. Therefore, it is very important that the correct placard be displayed and that no placards be displayed if no hazardous materials are present. The regulations in §172.502 state that no person may affix or display on a packaging, freight container, unit load device, motor vehicle or rail car, any placard described in this subpart unless the material being offered or transported is a hazardous material and the placard displayed represents a hazard of that hazardous material being offered or transported. This means that when the hazardous materials are unloaded from a vehicle you should also remove the placards which correspond to those hazards immediately.

Placards displayed in accordance with the IMDG Code for shipments intended for transportation by sea, or placards displayed in accordance with the regulations of Transport Canada for transborder shipments of dangerous goods, are permitted to be displayed in the United States; however, certain materials may require DOT placards in the United States.

Placards may be displayed on a transport vehicle with hazardous materials aboard even though they are not required by the regulations, as long as the placards represent a hazard class actually on board the vehicle.

Any placards that are displayed must conform to all the requirements and specifications of Subpart F.

7.2 General Rules for Placarding, §172.504

Unless excepted by 49 CFR, each transport vehicle, unit load device, and portable tank containing any quantity of a hazardous material must be placarded on both sides and both ends, for a total of four placards. If more than one placard is required to be displayed, they must also be displayed on both sides and both ends of the unit.

7.2.1 Selecting the Proper Placard(s)

Since a placard may be described as an enlarged label, you may find it beneficial to check the labels on packages that are to be loaded into a cargo transport unit and to cross-reference the placards that are displayed on the cargo transport unit. The methods used for selecting labels and placards are quite similar. Keep in mind though, that labels are always applied for both the primary and subsidiary hazards, while placards, in general, are only affixed for the primary hazard.

You will first identify the proper shipping name that has been used on the shipping paper and/or on the package marking as appropriate. Consult the Hazardous Materials Table at §172.101 and look up that proper shipping name in Column (2). The Hazard Class or Division as shown in Column (3) will identify the placards that are to be displayed on the bulk packaging or cargo transport unit unless an exception applies. The primary hazard class labels that are listed first in Column (6) also identify the placards required to be displayed on a package, unless excepted.

After identifying the hazard class of the material you are offering for transportation, check §172.504 Table 1 and Table 2 to determine in which of the Tables that Hazard Class or Division is listed. The Hazard Class or Division is listed in the first column, the placard name appears in the second column, and the section in 49 CFR that provides the design specifications for that placard are listed in the third column.

Table 1 identifies those Hazard Classes or Divisions that are acutely hazardous. In other words, these materials are the most dangerous in transportation, and you must placard for any quantity of material listed in a Class or Division in Table 1.

Table 1

Category of Material (Hazard class or division number and additional description, as appropriate)	Placard Name	Placard Design Section Reference (§)
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
5.2 (organic peroxide Type B, temperature controlled) -----	ORGANIC PEROXIDE -----	172.552
6.1 PG I (inhalation hazard, Zone A or B) -----	POISON INHALATION HAZARD ----	172.555
7 (Radioactive Yellow III label only)	RADIOACTIVE -----	172.556

Table 2 lists those hazard classes that present hazards that are less dangerous in transportation with the placard name and specifications also included in the table.

Table 2

Category of material (Hazard class or division number and additional description, as appropriate)	Placard Name	Placard Design Section Reference (§)
1.4 _____	EXPLOSIVE 1.4 _____	172.523
1.5 _____	EXPLOSIVE 1.5 _____	172.524
1.6 _____	EXPLOSIVE 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 (Other than Type B in table 1 above) _____	ORGANIC PEROXIDE _____	172.552
6.1 (PG I OR II, other than PG I inhalation hazard)	POISON _____	172.554
6.2 _____	(none) _____	
8 _____	CORROSIVE _____	
9 _____	CLASS 9 _____	172.558
ORM-D	(none) _____	172.560

Remember, the general rule or standard is to placard any quantity of hazardous materials. However, for domestic ground transportation, DOT has provided exceptions to that general rule for materials in those Hazard Classes or Divisions listed in Table 2, when certain conditions are met.

7.3 Placarding Exceptions

Placards are not required for highway and rail shipments when transporting non-bulk packagings containing materials of those Hazard Classes or Divisions listed in of Table 2 when the total gross weight of all such packagings is less than 454 kg (1,001 pounds).

Example:

A truck is transporting:

- a shipment of 2 fiberboard boxes weighing 40 kg each of Paint in Class 3
- a shipment of 3 batteries weighing 15 kg each and labeled Class 8
- 1 drum containing 53 gallons of Xylene, labeled Class 3 and weighing 180 kg
- total weight of the three shipments is 305 kg and all are in Table 2, no placard required

7.3.1 Non-bulk Packagings Containing Residue

It is not necessary to include the weight of empty non-bulk packagings containing only the residue of a hazardous material covered by Table 2 when determining the total weight for the placarding requirements.

Example:

For a truck transporting a load of “empty” 55-gallon drums containing residue of Paint in Class 3 and weighing in excess of 454 kg., no placard is required. However, remember that the labels and markings must remain on the drums until they have been cleaned of residue and purged of vapors or refilled with a non-hazardous material.

Note: Even though placarding is not required for the shipments in the examples above, you are permitted to display placards that correspond to the hazards if you choose to do so.

The 454 kg or “1,001 Pound Rule” does not apply to Table 1 materials, and does not apply to shipments of non-bulk packagings intended for air or water transportation, or to shipments in bulk packagings, portable tanks, cargo tanks, and tank cars or to those materials which require subsidiary hazard class placards as described in §172.505.

7.3.2 Use of the DANGEROUS Placard

When transporting non-bulk packages containing two or more Hazard Classes or Divisions listed in Table 2, the vehicle or rail car may be placarded for each category, or a DANGEROUS placard may be used instead.

Example:

A truck is loaded with 4 drums containing Paint in Class 3 with a total weight of 640 kg and is also transporting a shipment of boxes containing Paint related material that display Class 8 labels and have a total weight of 250 kg.

The truck may be placarded on both sides and both ends with FLAMMABLE and CORROSIVE placards or may display a DANGEROUS placard on each end and each side.



OR



However, when 1000 kg (2,205 pounds) or more total weight of one category of material is loaded at one facility, the placard specified for that Hazard Class or Division in Table 2 must be displayed.

Example:

A truck is loaded with 8 drums containing Paint in Class 3 with a total weight of 1280 kg and is also transporting a shipment of boxes containing Paint related material that display Class 8 labels and have a total weight of 250 kg.

The truck must be placarded on both sides and both ends with FLAMMABLE and CORROSIVE placards.



Both classes are listed in Table 2. If a vehicle contains more than 454 kg of Table 2 hazard classes, it must be placarded for all of the Table 2 hazards that are present. The FLAMMABLE placard must be displayed, since more than 1,000 kg of that class was loaded at one facility. This means the DANGEROUS placard is not an option, since it must substitute for two or more required placards. Therefore, the CORROSIVE placard must also be displayed.

Example:

A truck is loaded at a warehouse with non-bulk packages containing:

- 683 kg (1,500 pounds) of Acetone which is a Class 3 material;
- plus 454 kg (1,000 pounds) of Paint which is a Class 3 material;
- plus 1,365 kg (3,000 pounds) of Paint related material which is a Class 8 material;
- plus 2,724 kg (6,000 pounds) of Nitrogen, compressed which is a Division 2.2 material.



Placards must be displayed for each hazard class since each category exceeds the 1000 kg (2,205 pounds) and it was loaded at a single loading facility.

The DANGEROUS placard may never be displayed on a cargo tank, portable tank, or tank car, or on a transport vehicle, freight container, or unit load device containing a portable tank or bulk packaging which requires placarding. It cannot be used in place of placards required by Table 1. The DANGEROUS placard is also not recognized for international transportation. When placarding vehicles or freight containers intended for transportation by sea, the IMDG Code requires that placards be displayed for each hazard class label (primary and subsidiary) that is displayed on the packages in the freight container, vehicle, or other transport unit.

Whenever hazardous materials from more than one hazard class or division are to be loaded in the same transport vehicle, freight container, bulk packaging, rail car, or unit load device, the compatibility, stowage, and segregation requirements for the intended mode of transportation should be checked before loading.

7.3.3 Additional Placarding Exceptions

The DOT has authorized additional exceptions and placard substitutions which are listed in §172.504(f). This module will address only those additional exceptions which might apply to shipments offered by shippers of paint and coatings products.

When offering a bulk packaging such as a cargo tank or portable tank containing a material classified as a combustible liquid and requiring the display of a COMBUSTIBLE placard as specified in §172.544, you may display FLAMMABLE placards as described in §172.542 instead of the COMBUSTIBLE placards.

When offering a multi-compartmented tank car containing both a combustible liquid and a flammable liquid, you may display FLAMMABLE placards as described in §172.542 and you do not need to display COMBUSTIBLE placards.

A vehicle transporting both Non-flammable gases in Division 2.2 and Flammable gases in Division 2.1 need only display the FLAMMABLE GAS placards.

When engaged in domestic transportation only, a vehicle transporting a Class 9 material is not required to display the CLASS 9 placard. A bulk packaging, such as a portable tank, cargo tank, or tank car, must however display the UN identification numbers on orange panels or on a white square-on-point similar to a placard.

Vehicles transporting materials in Class 6.1, PG III, in domestic transportation may display “PGIII” on the placard in place of “POISON” or “TOXIC”.

7.4 Identification Number on the Placard

In some instances, you may find it convenient to display the identification number directly on the primary hazard class placard as authorized in §172.334. Remember, however, that once the identification number is displayed on a placard, that placard only applies to those materials on the vehicle which have the same identification number. For example, if you were to load into an enclosed truck an intermediate bulk container (IBC) sometimes referred to as a “tote bin” or “tote,” and filled with “Paint, UN1263” in Class 3, you would be required to display the identification number “1263” on the exterior of the truck. If you were to display the identification number directly on the flammable placard, that placard would apply only to that material. If you were to then load some drums containing Acetone on the truck, you would need to display another FLAMMABLE placard on both sides and the front and rear of the truck.



However, if you were to display the identification number “1263” on an orange panel, adjacent to the placard, the FLAMMABLE placard would apply to all class 3 materials on the truck, including the Acetone in the drums as well as the Paint in the IBC.



7.5 Placarding Subsidiary Hazards

Under certain circumstances, more than one placard may be required to be displayed on each side and each end of a transport vehicle, freight container, portable tank, IBC, or unit load device used to transport hazardous materials. These multiple placards may be required to represent the presence of two or more materials with separate hazard classes or the presence of one material with a primary and subsidiary hazard class. Primary and subsidiary hazard class placards must display the hazard class or division number in the lower corner of the placard.

**Class 6.1
TOXIC Primary Placard**



**Class 6.1
TOXIC Subsidiary Placard**



There are only a few instances when subsidiary hazard class placards are required to be displayed on vehicles or freight containers engaged in domestic transportation of hazardous materials. In the paint and coatings industry it is unlikely that you would offer for transportation or transport materials requiring subsidiary hazard class placards unless you were to ship a material with a subsidiary hazard class in Division 4.3, requiring DANGEROUS WHEN WET placards for any quantity, or a material which has been identified as poisonous by inhalation and requiring display of the POISON INHALATION HAZARD or POISON GAS placard as appropriate for any quantity.

Although not recognized by the United Nations for international use, DOT has implemented placards and labels to better communicate the inhalation hazard. The placards are described by specifications in §172.540 for a poison gas in Division 2.3 and in §172.555 for 6.1 material in Hazard Zone A or B. Only those materials listed in Column (2) and displaying the number “1” or “2” in Column (7) of the Hazardous Materials Table in §172.101 meet the definition of Hazard Zone “A” or “B”.

Example:

Methyl isocyanate shows the entry 6.1 in Column (3), PG I in Column (5) and has the entry “1” in Column (7) indicating it is 6.1 in Hazard Zone A. The POISON INHALATION HAZARD placard in Table 1 of §172.504 is required to be displayed on a vehicle transporting any quantity of this material.



If non-worded placards are used, the words “INHALATION HAZARD” must be marked in association with the required placards. A bulk packaging must display this marking on two opposite sides.

A POISON INHALATION HAZARD subsidiary placard is also required on the transportation vehicle, unit load device, or portable tank when the material is described on the shipping papers is classified in another primary hazard class and is a “poison inhalation hazard” as a subsidiary hazard.

Example:

Sulfur chloride shows the entry “8” in Column (3) and “1” in Column (7) of the HM Table. The labels in Column (6) indicate that the material is classified as a Class 8 primary and 6.1 subsidiary. A truck transporting a non-bulk package of any quantity would display placards as illustrated.



7.6 Multi-Compartmented Tanks

When two or more materials from different hazard classes are loaded into a multiple compartmented cargo tank, portable tank, or tank car, the placard for each hazard class must be displayed.

Example:

2500 gallons Paint related material, Class 3

2100 gallons Acetone, Class 3

2450 gallons Paint related material, Class 8



7.7 Residue in Bulk Packaging, §172.514

Each bulk packaging, including a cargo tank, portable tank, or tank car must remain placarded with the original placards representing the previous contents, even when emptied, until it is:

- cleaned of residue and purged of vapors; or
- refilled with a material requiring different placards; or
- refilled with a non-regulated material to the extent that the hazards are nullified.

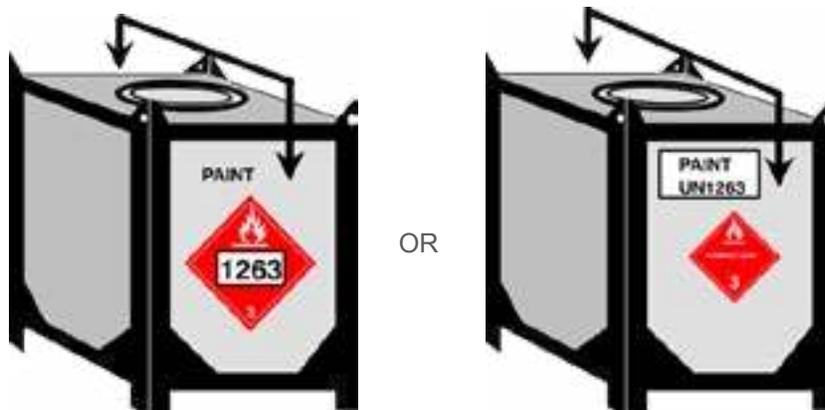
All bulk packaging markings which were required when the bulk packaging contained the hazardous material must also continue to be displayed when it is empty and contains residue. Additional information can be found in the “Marking” module of this manual.

The description on the shipping paper may include the words “RESIDUE: Last contained” preceding the basic description of the hazardous material previously transported in the tank. The description on the shipping paper for a tank car containing the residue of a hazardous material must include the words “RESIDUE: Last contained” preceding the basic description.

7.8 Labels in Place of Placards

Bulk packaging must display placards on both side and both ends. However, the regulations provide an option for displaying placards on smaller bulk packaging and allow either placards or labels to be displayed on two opposite sides of:

- a portable tank with a capacity of less than 3,785 L (1,000 gal)
- a DOT 106 or 110 multi-unit tank car tank (“tonner”)
- a bulk packaging other than a tank with a volumetric capacity of less than 18 m³ (640 cu. ft.)
- an intermediate bulk container (IBC)
- A large packaging (as defined in §171.8).



7.9 Placard Display and Visibility

Each placard must be securely attached or in a holder. The placard must be located away from ladders, doors, tarps, or other devices which could block visibility, and at least 3 inches away from any marking or advertising.

Placards must be maintained in a condition so that the placard is not faded or dirty, which could reduce the visibility of the placard. The colors must be sharp and bright.

The placard must be displayed square-on-point with words or numbers reading horizontally left to right, and visible from the direction it faces except from the direction of another motor vehicle or rail car to which it is attached.

Test Evaluation – Placarding

Read each of the following questions carefully. Select the MOST appropriate answer for each question. There is one correct answer for each question.

- Which of the following shipments of “UN1263, Paint, 3, PG III”, is NOT required to display placards?
 - 1,050 pounds, in non-bulk packages
 - 5,000 pounds, in non-bulk packages
 - 300 pounds, in non-bulk packages
 - Placards are always allowed for this shipping paper entry
- Why are placards part of the hazard communications system?
 - To alert workers
 - To alert the general public
 - To provide critical information to emergency response personnel
 - All of the above
- Which of the following is NOT excepted from placarding?
 - Paint in spray cans classified as “Consumer commodity” ORM-D”
 - Paint in five-gallon containers with a flash point of 150° Fahrenheit
 - 1500 pound shipment of paint with a flash point of 50° Fahrenheit in 55-gallon drums
 - None of the above
- Select the placard that could be displayed to meet the DOT requirements on a truck transporting 2,000 pounds of UN1263, Paint, 3, PG III and 1,000 pounds of UN3066, Paint related material, 8, PG III, in non-bulk packages.
 - Class 3 (flammable) only
 - Class 8 (corrosive) only
 - DANGEROUS placard
 - None of the above
- The DANGEROUS placard may not be used on?
 - Cargo tanks
 - Portable tanks
 - Tank cars
 - All of the above
- Select the correct placard or placards for the following shipment loaded at a single warehouse facility: 6,000 pounds of UN1263, Paint, 3, PG II and 7,000 pounds of UN3066, Paint related material, 8, PG II.
 - a DANGEROUS placard and a Class 8 (CORROSIVE)
 - a DANGEROUS placard
 - a Class 8 (CORROSIVE) placard
 - A FLAMMABLE placard and a CORROSIVE placard
- At what weight are placards required for a Table 2 entry, such as “UN1263, Paint, 3, PG III”?
 - One (1) pound
 - Five hundred (500) pounds
 - One thousand and one (1,001) pounds
 - No placards required
- Who is required to provide the placards when needed for a highway shipment of a placardable quantity of non-bulk packages containing hazardous materials?
 - The shipper
 - The carrier
 - The driver
 - The government

9. The placards for a shipment of "Xylene" in a cargo tank should:
- be black in color with the number "8" at the bottom, and "1307" in the center
 - be red in color with the number "3" at the bottom, and "1307" in the center
 - be red in color with the number "3" at the bottom
 - be red and white striped with the number "4" at the bottom
10. Which of the following must display a Class 3 FLAMMABLE placard?
- A tractor trailer loaded with two 55 gallon drums (total weight 750 lbs.) of "Paint" displaying FLAMMABLE LIQUID labels.
 - A tractor trailer transporting 40,000 lbs of packages marked "consumer commodity" "ORM-D" and known to contain small cans of enamel.
 - A rail car with a shipment of Acetone (Class 3) packed in accordance with the Limited Quantity exception
 - Enclosed van truck transporting a 500 gallon IBC marked "Paint, UN1263"
11. Select the correct placards to be displayed on a cargo tank transporting Paint with a flash point of 70° C (158°F)
- Class 3 (FLAMMABLE)
 - No placards are required
 - COMBUSTIBLE LIQUID
 - Either A. or C. above is authorized
12. Which of the following statements is NOT true?
- Placards are not required to be affixed to both the front of semi-trailer and the truck-tractor.
 - A portable tank with a capacity of 800 gallons containing a flammable liquid only requires placards to be displayed on two opposite sides.
 - A truck transporting a 5 pound package of a material in Class 4.3 requires placards.
 - A tractor trailer transporting 55,000 lbs of combustible liquids in 5 gallon pails does not require COMBUSTIBLE placards to be displayed.
13. When are you required to offer placards for hazard classes in Table 2?
- When offering a mixed shipment, only if the quantity of any one class exceeds 1,001 pounds, regardless of the total quantity.
 - When offering any amount of Table 2 hazard classes.
 - When offering 1,001 pounds or more of any combination of Table 2 hazard classes.
 - Only when offering more than 1,000 kg of Table 2 hazard classes.
14. What placard or placards are required for a shipment of one box (3 pounds) of a material in Class 4.3 and one drum of Paint, class 3 (400 pounds)?
- None
 - Dangerous
 - Division 4.3
 - Class 3 and Division 4.3

Answer Key: Test Evaluation – Placarding

1. d.
2. d.
3. c.
4. c.
5. d.
6. d.
7. c.
8. a.
9. b.
10. d.
11. d.
12. b.
13. c.
14. c.

CHAPTER 8 – LOADING AND UNLOADING

This module addresses HMR training regulations pertaining to the loading, unloading and transportation of hazardous materials by motor vehicle, rail car, or freight container.

For an authorized packaging to perform at the level to which it has been tested and marked, the shipper and the carrier must ensure that packages in transportation will not be subjected to physical forces not usually expected under normal conditions. To prevent packages from being subjected to impact through bouncing, rolling, or tumbling about inside a transport vehicle, the regulations require that certain steps must be taken to secure all cargo. This means that not only hazardous materials packages but also those packages containing non-regulated materials which could damage the hazardous materials packages must be securely packed. Recognizing that some hazard classes may be more dangerous than others when transported in commerce and that each mode may present unique physical forces, the regulations provide specific guidance on packing and securing these cargoes.

When offering hazardous materials for transport in different modes the following regulations should be consulted:

Rail	49 CFR, Part 174
Air	49 CFR, Part 175 and IATA Dangerous Goods Regulations
Water	49 CFR, Part 176 and IMDG Code
Highway	49 CFR, Part 177

This module will focus on the loading and unloading requirements applicable to surface transportation of those materials commonly offered in the paint and coatings industry. A current copy of 49 CFR should be at your disposal while working on this module.

In addition, the Federal Motor Carrier Safety Regulations (FMCSR) specify qualification, handling, monitoring, and load securement requirements applicable to drivers operating vehicles transporting hazardous materials. Part 177 specifies the requirements that apply to those individuals responsible for loading and transporting hazardous materials intended for transportation by highway.

8.1 General Requirements

Part 177 specifies the requirements that apply to those individuals responsible for loading and transporting hazardous materials intended for transportation by highway.

8.1.1 Securing Packagings in Vehicles, §177.834(a)

The regulations require that packages must be secured within a vehicle to prevent unnecessary and dangerous movement of packages containing hazardous materials. Any tank, barrel, drum, cylinder, or other packaging, not permanently attached to a motor vehicle, which contains a hazardous material must be secured against movement within the vehicle on which it is being transported, under conditions normally incident to transportation. The packages must also be secured to prevent relative motion between packages within the vehicle. This means that the packages should be adequately blocked and braced or otherwise secured to prevent their moving about within the vehicle under conditions which might normally be anticipated while a vehicle is moving on the highway. Normal conditions might include, sharp turns, sudden stops, vehicle acceleration, rail road grade crossings, bumps or potholes in the pavement, and vibration. When packing a vehicle with packages containing hazardous materials you should also keep in mind that movements may be significantly amplified at the rear of a combination of vehicles, such as a tractor and semi-trailer.

Containers such as intermediate bulk containers (IBC's), portable tanks, or other such receptacles must be loaded in a manner that will minimize the likelihood of damage to the valves or fittings during transport. In other words, the valves and fittings should be protected from damage by other freight carried in the vehicle or by handlers entering the vehicle with additional cargo.

8.1.2 No Smoking and Avoiding Fire, §177.834(c) and (d)

In order to prevent accidental ignition of flammable or explosive materials the regulations specify that smoking is forbidden on or near any motor vehicle while loading or unloading explosives (Class 1), flammable liquid (Class 3), flammable solid (Class 4), oxidizing (Class 5) or flammable gas (Division 2.1) materials. Extreme care should be taken to keep fire away while loading or unloading of explosives (Class 1), flammable liquids (Class 3), flammable solid (Class 4), oxidizing (Class 5), or flammable gas (Class 2.1) materials into or from any motor vehicle and to prevent persons in the vicinity from smoking, lighting matches, or carrying any flame or lighted cigar, pipe or cigarette.

8.1.3 Handbrake Set, §177.834(e)

No hazardous materials may be loaded or unloaded from any motor vehicle unless the handbrake is securely set and all other reasonable precautions are taken to prevent motion of the motor vehicle during the loading and unloading process. This could include the use of dock-locks and wheel chocks to prevent the movement of a vehicle during loading or unloading operations.

8.1.4 Use of Tools, §177.834(f)

No tools should be used which could result in damage to a package or the closure of a package containing a hazardous material or dangerous article. Tools which should be avoided include hooks, metal bars, or any other device which could puncture or crush the package.

8.1.5 Precautions During Transit, §177.834(h)

Precautions should be taken to ensure that the vehicle and its contents are not subjected to high temperatures during transport. This means packages should be protected from hot surfaces and that enclosed vehicles in hot climates should not be subjected to unnecessary solar radiation (direct sunlight) particularly on dark exterior surfaces. Some flammable liquids and most gases are very sensitive to heat and their containers may be susceptible to extreme increases in pressure when heated. You should never open a package and discharge its contents while that package is on the vehicle during transportation. Packages should never be opened or discharged prior to reaching their intended destination. The exception to this rule would be to discharge liquids from a cargo tank while it is attached to the vehicle.

8.1.6 Attendance Requirements for Cargo Tanks, §177.834(i)

The person responsible for loading a cargo tank is responsible for ensuring that the cargo tank is attended by a qualified person at all times during the loading operation. The term "attended" means the person is awake and has an unobstructed view of the tank and is within 7.62 meters (25 feet) of the cargo tank. A person is defined as "qualified" if they have been made aware of the nature of the hazardous material to be loaded or unloaded, has been instructed on the procedures to be followed in an emergency, is authorized to move the cargo tank, and has the means and capability to move it if required. When leaving a loaded cargo tank at the customer's facility, the carrier's obligation to monitor the unloading ceases when the tractor has been disconnected from the cargo tank and leaves the premises.

8.1.7 Cargo Tank Manholes and Valves Closed, §177.834(j)

A cargo tank that contains any quantity of hazardous materials, including a residue, may not be operated unless all manhole closures are closed and secured and all valves and closures in the discharge system are closed and free of leaks.

8.1.8 Cargo Heaters, §177.834(l)

Some materials, including certain flammable liquids transported in the paint and coating industry must be protected from freezing during transport. When heaters are used to heat the cargo space of the transport unit, they must comply with the specifications in §177.834(l).

8.1.9 Portable Tanks on Vehicles, §177.834(m) and (n)

Specification 106A or 110A tanks when authorized for highway transportation must:

- be securely chocked or clamped on the vehicle to prevent movement
- be handled by suitable equipment when placing them on or off a vehicle
- have not more than two cargo carrying vehicles in the same combination
- not be loaded in a rail car with a lighted combustion or automatic heater if the tank is transporting Class 2.1 (Flammable gas)

Specification 56, 57, IM 101, and IM 102 portable tanks, when loaded, may not be stacked on each other or placed under other freight when transported on a motor vehicle.

8.2 Loading and Unloading Flammable Liquids

Due to the unique hazards presented by flammable liquids during transportation, the regulations specify certain handling requirements to prevent the accidental ignition of these liquids and their flammable vapors.

8.2.1 Vehicle Engine Stopped, §177.837(a)

Unless the engine of the vehicle is to be used for the operation of a pump to be used in the loading or unloading process, no flammable liquid (Class 3) materials shall be loaded into, on or unloaded from any motor vehicle while the engine is running.

8.2.2 Bonding and Grounding, §177.837(b) and (c)

Static electricity can be generated by the movement of a vehicle over the highway or even by the movement of a liquid through a discharge hose. When this electrical charge is discharged without controls it may produce a spark which could result in ignition of flammable vapors. To control the discharge of the static electricity, the regulations require that containers or tanks must be connected to each other by means of a metallic conductor, prior to beginning the loading or unloading procedure. The connection should first be made to the container to be filled and then should be followed by the connection to the container from which the liquid will be discharged. A ground connector will ensure that static charges are neutralized to the earth.

Cargo tanks must also be bonded or grounded when filling or discharging their liquid load. In most cases, modern cargo tanks, including those with vapor recovery systems, are equipped with a metallic conductor in the discharge hoses. Those individuals with responsibility for loading and unloading cargo tanks, portable tanks, or tank cars used for the transportation of flammable or combustible liquids offered in the paint and coatings industry should be thoroughly familiar with the operating procedures applicable to each tank to ensure that the regulatory requirements are followed.

8.2.3 Segregation of Reactive Materials, §177.848(a)

Some hazardous materials are capable of producing a dangerous chemical reaction if they come into contact with other hazard classes. In order to ensure that these materials will not come in contact with each other should their packaging fail during transportation, the regulations require that minimum distances must be maintained between them or that they be totally restricted for transportation in the same vehicle.

There are very few restrictions that apply to shipments offered solely by the paint and coatings industry. However, there are raw materials and sundries that you may ship that may require the use of the Segregation Table for Hazardous Material in §177.848 for highway transportation. You may also offer shipments of paint or paint related materials for transportation by a common carrier that might require that carrier to consult the Segregation Table for additional freight on board the vehicle. These segregation requirements only apply to packages which require labels in accordance with Part 172 of 49 CFR. This means that packages that do not require labels, such as those prepared as "Limited Quantities" do not require segregation.

Segregation Table for Hazardous Materials

Class or Division		Notes	1.1. 1.2	1.3	1.4	1.5	1.6	2.1	2.2	2.3 Gas Zone A	2.3 Gas Zone B	3	4.1	4.2	4.3	5.1	5.2	6.1 Liquids Zone A	7	8 Liquids Only
Explosives	1.1/ 1.2	A	*	*	*	*	*	X	X	X	X	X	X	X	X	X	X	X	X	X
Explosives	1.3		*	*	*	*	*	X		X	X	X		X	X	X	X	X		X
Explosives	1.4		*	*	*	*	*	O		O	O	O		O				O		O
Explosives	1.5	A	*	*	*	*	*	X	X	X	X	X	X	X	X	X	X	X	X	X
Explosives	1.6		*	*	*	*	*													
Flammable Gases	2.1		X	X	O	X				X	O							O	O	
Non-flammable Gases	2.2		X			X														
Poisonous Gas Zone A	2.3		X	X	O	X		X				X	X	X	X	X	X			X
Poisonous Gas Zone B	2.3		X	X	O	X		O				O	O	O	O	O	O			O
Flammable liquids	3		X	X	O	X				X	O					O		X		
Flammable solids	4.1		X			X				X	O							X		O
Spontaneously combustible materials	4.2		X	X	O	X				X	O							X		X
Dangerous when wet materials	4.3		X	X		X				X	O							X		O
Oxidizers	5.1	A	X	X		X				X	O	O						X		O
Organic Peroxides	5.2		X	X		X				X	O							X		O
Poisonous liquids PG I Zone A	6.1		X	X	O	X		O				X	X	X	X	X	X			X
Radioactive Materials	7		X			X		O												
Corrosive liquids	8		X	X	O	X				X	O		O	X	O	O	O	X		

Instructions for using the above table:

- Select the appropriate hazard class or division in the vertical column to the left.
- Select the hazard class or division to be compared for compatibility from the horizontal column at the top of the Table.

The absence of any hazard class or division or a blank space in the table indicates that no restrictions apply.

The letter “X” indicates that these materials could be reactive and may not be loaded, transported, or stored together in the same transport vehicle or storage facilities during the course of transportation.

The letter “O” indicates that these materials must be separated to prevent contact and may not be loaded, transported, or stored together in the same transport vehicle or storage facilities during the course of transportation, unless they are separated in a manner that in the event leakage from packages under conditions normally incident to transportation, commingling of hazardous materials would not occur.

The “*” applies only to Class 1 and indicates that segregation among different explosive materials is governed by the table located in §177.848(f).

A carrier may not transport a package bearing a POISON (or TOXIC) label, a POISON GAS label or a POISON INHALATION HAZARD label in the same motor vehicle with materials that are marked as or known to be foodstuff, feed or any edible material intended for consumption by humans or animals unless the inside package is overpacked in a liquid-tight and dust-proof container. Packages displaying these labels are also forbidden from transport in the driver's compartment. A package displaying a POISON label bearing the text "PGIII", or bearing a "PGIII" mark adjacent to the POISON label, must be kept separated from foodstuffs, feed, or edible material to prevent contamination during transport.

8.3 General Handling and Loading Requirements for Rail

Rail transportation introduces even more unique physical forces during transportation. While most of the forces result from rapid acceleration and deceleration forward and aft in the rail car, there are also harmonic vibrations which may result from the rapid movement over the rails.

8.3.1 Packaged Hazardous Materials in Rail Cars, §174.55

In addition to properly blocking and bracing packages to prevent their movement during transportation, the person placing combination packages marked with orientation arrows must only load the packages with the arrows in the upright position. Heavy packages may only be loaded using the proper equipment to safely handle the package. Hazardous materials must be stored in a safe and secure location with no public access while awaiting loading or delivery.

Rail cars must be properly marked and placarded as required before being transported.

Those persons unloading rail cars are responsible for removing placards or markings when packages are removed.

Portable tanks, trailers, freight containers, and other bulk packagings must be secured to the rail car or flat car to prevent shifting during transportation and must be protected against damage or rupture.

8.3.2 Tank Car Unloading, §174.67

When unloading tank cars, the following rules must be followed:

- Unloading operations should be performed only by reliable persons, properly instructed, and made responsible for careful compliance with the regulations.
- Car brakes must be set and wheels blocked
- Caution signs must be placed on the tracks to give necessary warning to persons approaching the car from the open end of a siding, and must be left in place until the tank car is completely unloaded and disconnected from the discharge connection. The signs must be made of metal or of a comparable material, and at least 30 cm by 38 cm (12" by 15") with white letters on a blue background at least 10 cm (3.9 in.) high stating "STOP", and additional letters at least 5 cm (2 in.) stating "TANK CAR CONNECTED" or "MEN AT WORK."
- Before a manhole cover or outlet valve cap is removed from a tank car, the car must be relieved of all interior pressure by cooling the tank with water, or by venting the tank by raising the safety valve or opening the dome vent at short intervals. If venting will release a dangerous amount of vapor, venting must be deferred until pressure is reduced by cooling the car contents. These precautions are not necessary when the car is equipped with a manhole cover which hinges inward, or with a manhole cover which does not have to be opened to unload the car, and when pressure is relieved by piping vapor into a condenser or storage tank.

Specific instructions for removal of manhole covers, opening of discharge valves, and connecting of discharge lines are also provided within §174.67.

8.4 Special Provisions for Specific Hazard Classes

Various Subparts within Part 174 specify the special requirements applicable to certain hazard classes of cargo. Personnel employed in the paint and coatings industry must be aware of the special provisions which apply to those hazard classes offered for transportation by rail.

8.4.1 Subpart F – Class 2 (Gases), §174.200

- Division 2.1 (Flammable gases) must be protected from sources of heat or ignition and may not be loaded on rail cars with certain heating devices, refrigeration apparatus, electrical equipment which is not intrinsically safe (non-sparking), internal combustion engines, or other possible ignition sources.
- Cylinders containing Class 2 must either be loaded and securely lashed in an upright position, or loaded into racks securely attached to the rail car, or packed in boxes or crates which are of sufficient dimensions to prevent overturning, or loaded in a horizontal position if authorized.
- Class 2 materials may only be unloaded from a tank car when it is consigned for delivery and unloaded on a private track, or when permitted on other than a private track under special conditions.
- Rail cars, piggy back vehicles, or freight containers, which have been fumigated with a flammable gas or liquid must be ventilated to remove flammable vapors.
- Rail cars, freight containers, and piggy back vehicles which have been fumigated with Division 6.1 poisons or Division 2.3 poisonous gases must be marked with the applicable fumigation marks (see §173.9) on each door or entry way.
- Materials which meet the definition of a poison inhalation hazard Divisions 2.3 Hazard Zone A or Division 6.1 Hazard Zone A are subject to special packaging, escorting, loading, and unloading requirements as specified in Section 174.290.

8.4.2 Subpart G – Class 3 (Flammable Liquids), §174.300

Class 3 (flammable liquids) may not be loaded, transported, or stored in a rail car which is equipped with any type of lighted heater or open flame device, or any device which uses an internal combustion engine in its operation.

Truck bodies or trailers containing Class 3 materials loaded on a rail car are not permitted to have any heater or refrigeration device in operation unless the:

- lading space is equipped only with non-sparking or explosion proof electrical apparatus, if any; and
- there is no combustion apparatus in the cargo space; and
- there is no air return from the cargo space to the combustion apparatus; and
- the heating system conforms to FMCSR 393.77, and does not heat any cargo to a temperature over 54 °C.

Metal drums containing Class 3 materials may be transported in a steel gondola, flat car, or stock car, but may not be transported in a hopper bottom car.

A tank car containing a Class 3, other than road asphalt or tar, may not be transported by rail unless it is originally consigned or subsequently re-consigned to a party having a private track on which it is to be unloaded, or to a party using railroad siding facilities which are equipped for piping the liquid from the tank car to permanent storage tanks of sufficient capacity to hold the entire contents of the tank car.

8.4.2.1 Segregation Within Rail Cars, §174.680

Any Class 3 material which requires a subsidiary label of Class 6.1 (POISON) may not be loaded into the same rail car as materials marked or known to be foodstuffs, feed, or edible materials intended for consumption by humans or animals. Class 3 materials bearing a POISON label bearing the text “PGIII,” or bearing a “PGIII” mark adjacent to the POISON label must be separated from such edible materials in a manner that in the event leakage from packages under conditions normally incident to transportation, commingling of hazardous materials would not occur.

8.5 Examples of Methods Which May Be Used to Secure Packages in Cargo Units

The following illustrations are provided to assist you in determining those methods which may be used to satisfy the cargo securement requirements. It should be noted that commercially available cargo restraint systems may not meet the requirements for all modes of transportation without additional materials such as toe boards and other anchoring devices. The interior surfaces of each cargo transport unit must be considered when utilizing anchoring or adhesive restraint systems. When using such systems always follow the manufacturer’s recommendations for installation. Personnel who construct blocking and bracing for cargo should be aware that most semi- trailers and freight containers are their strongest at the corners, sills, and floors. Doors and side walls may not provide an adequate level of securement without additional barriers such as gates, dividers, and side reinforcements. The illustrated examples may not be adequate for all materials and packages and you should plan your load and restraints systems to meet each unique scenario.

Test Evaluation – Loading and Unloading

Read each question and supply the appropriate answer in the blank space.

1. Is smoking a pipe allowed when loading/unloading materials which are described as “Paint, 3, UN1263, PG II”?
2. What should you do to prevent motion of the vehicle while loading/unloading?
3. Can you load flammable liquids and oxidizing materials on the same vehicle?
4. Must hazardous materials loaded on a motor vehicle be properly secured and braced against movement?
5. What must a person know to be “qualified” to load/unload a cargo tank vehicle?
6. If you are loading/unloading liquid hazardous materials, and a package falls from your forklift and spills on the trailer or warehouse floor, what should you do?

Answer Key: Test Evaluation – Loading and Unloading

1. No.
2. Set brakes and/or chock trailer wheels.
3. Yes.
4. Yes.
5. The nature of the hazardous material being transferred, instructions for emergency procedures, and have authorization and the means to move the cargo tank.
6. Shut off forklift and inform supervisor and/or isolate area, locate material safety data sheet, and follow instructions for personal protection and cleanup.

CHAPTER 9 – PAINT AND PAINT-RELATED MATERIAL IN AEROSOL CONTAINERS

9.1 Preface

'Aerosols' are defined by U.S. DOT as "any non-refillable receptacle containing a gas compressed, liquefied or dissolved under pressure, the sole purpose of which is to expel a nonpoisonous (other than Division 6.1 PG III material) liquid, paste or powder, and fitted with a self-closing release device allowing the contents to be ejected by the gas." The proper shipping names for "Aerosols" further describes them as "each not exceeding 1 L capacity," thereby limiting the maximum capacity per receptacle for any material described as an aerosol.

Metal aerosol containers having a capacity of one liter or less are the industry norm, at least in the paint, coatings and adhesives industry. Propellants most commonly used may include flammable gases. The weight of the completed package does not exceed 30kg (66 pounds). The content of this module is consistent with these assumptions. Due to the limitations on capacity, it would be highly unlikely that an ingredient in an aerosol receptacle would be present in a reportable quantity. This module does not address hazardous substances or marine pollutants as aerosols.

9.2 Domestic Ground Transportation

The regulations applicable to domestic transportation of aerosol packagings are slightly different than those applicable to air or water transportation. The irregularities between modes, including the differences in defining aerosols, will be explained in this module.

9.2.1 Classification

The Hazardous Materials Table §172.101, lists five individual entries for "Aerosols" as a proper shipping name in column 2.

Each entry describes an aerosol with different hazardous characteristics. Regardless of the hazard class, the same identification number, UN1950, applies to all entries.

In the paint, coatings and adhesives industry, most aerosol products will be classified as "Aerosols, corrosive Packing Group II or III; Aerosols, flammable; or Aerosols, non-flammable." To select the correct entry from Column (2) and determine the hazard class of the aerosol, you will need to know the hazardous characteristics of the contents and the propellant.

9.2.2 Packaging Authorizations for Aerosols – Limited Quantities and Consumer Commodities

Aerosol packaging used for the transportation and application of products manufactured and distributed by the paint and coatings industry should only be used as authorized in Column (8A) of the HM Table. Note that, with one exception, there are no authorized non-bulk packagings for aerosols (the word "none" appears in Column 8B). Generally speaking, paints and paint related materials in a liquid, paste, or powder form, when containerized within a non-refillable receptacle, and charged with a gas for the purpose of expelling the paint or paint related material, qualify as an aerosol under the limited quantity exception or ORM-D Consumer Commodity exception in §173.306.

As a limited quantity or ORM-D, these packagings may be excepted from the specification packaging, labeling (except for air transport), shipping papers (ground transport only), and placarding requirements of the regulations. These exceptions will be detailed in this module.

9.2.3 Limited Quantities – Requirements for Packaging – Inner Container

Limited quantities of compressed gases meeting the definition of an aerosol are excepted from the labeling requirements of the regulations, except when transported by aircraft, the shipping paper requirements, except when transported by aircraft or international vessel, and from the DOT packaging specification requirements unless specification packaging is required as a condition of the exception. However, to qualify they must be:

- in containers of not more than 4 fluid ounces capacity (7.22 cubic inches)
- in metal containers for the sole purpose of which is to expel a nonpoisonous (other than Division 6.1 PG III material) liquid, paste or powder provided all the following conditions are met:
 - Capacity must not exceed one liter (61 cu. in.)
 - pressure in the container must not exceed 140 psig at 130° F OR if the pressure exceeds 140 psig at 130° F, but does not exceed 160 psig at 130° F, a specification DOT 2P (§178.33) inside metal container must be used; if pressure exceeds 160 psig at 130° F, but does not exceed 180 psig at 130° F, a specification DOT 2Q (§178.33a) inside metal container must be used. If the pressure exceeds 180 psig at 130° F, but does not exceed 210 psig at 130° F, a specification DOT 2Q1 must be used (this pressure range is only allowed for non-flammable aerosols). In any event, the inside metal container must be capable of withstanding without bursting a pressure of 1.5 times the equilibrium pressure of content at 130° F.
 - Liquid content of material and gas must not completely fill container at 130° F.
 - Containers must be packed in strong outside packagings.
 - Each container must be subjected to a test performed in a hot water bath; the temperature of the bath and the duration of the test must be such that the internal pressure reaches that which would be reached at 55° C (131° F) (50° C (122° F) if the liquid phase does not exceed 95% of the capacity of the container at 50° C (122° F). If contents are sensitive to heat, the temperature of the bath must be set between 20° C (68° F) and 30° C (86° F) but in addition, one container in 2000 must be tested at the higher temperature. No leakage or permanent deformation of a container may occur.

9.2.4 Labeling and Placarding

Aerosols prepared according to the packaging authorization in §173.306 do not require labels unless you intend to ship them by aircraft. Aerosols not meeting the definition of a limited quantity or in any quantity intended for air transportation would be required to display labels for the appropriate Division as listed in Column (6) of the HM Table.

No placards are required on vehicles or freight containers transporting aerosol packages for which no hazard class labels are required. However, when transporting packages displaying labels, the appropriate placards must be displayed on the transport unit. The module entitled “Placarding” in this manual will assist you in determining the proper placards to be displayed.

9.2.5 Proper Shipping Names for Shipping Paper Descriptions

The proper shipping name to be used for Paint and Paint Related Material that are packaged in containers meeting the definition of an “aerosol” in §171.8 is “Aerosols” and the appropriate entry to be selected will be based on the hazardous characteristics of the contents.

If the aerosol is shipped as a Limited Quantity or a “Consumer commodity” as defined in §171.8 and is authorized in §173.306(h), there is no requirement to prepare a hazardous material shipping paper for ground transport. On a bill of lading to provide the carrier with added information, an appropriate description of the consignment would be “Aerosol Paint or Related Material, consumer commodity.” No UN Number is necessary.

Remember, however, that the proper shipping name “Consumer commodity” in Column (2) of the HM Table is preceded by the letter “D” in Column (1), indicating that this proper shipping name is authorized for domestic transportation but may not be acceptable for international transportation.

9.3 International Ocean Transportation

9.3.1 Definition of Aerosols

When intended for ocean transportation and prepared according to the IMDG Code, the definition of “aerosols” is slightly different from the DOT definition. The IMO has adopted the UN definition which states “aerosols or aerosol dispensers means non-refillable receptacles meeting the provisions of 6.2.2, made of metal, glass, or plastics and containing a gas compressed, liquefied, or dissolved under pressure, with or without a liquid, paste, or powder, and fitted with a release device allowing the contents to be ejected as solid or liquid particles in suspension in a gas, as a foam, paste or powder, or in a liquid state, or in a gaseous state.”

When importing aerosols into the United States, you must carefully examine the type of aerosol container and the contents of the aerosol container. 49 CFR, §171.23 authorizes the continuing transportation in the United States of only those imported aerosols that meet the definition of an aerosol in §171.8. Therefore, if you were to import an IMDG Code authorized aerosol that contained only a gas, with no liquid, paste, or powder contents, it would not meet the U.S. DOT definition and could not be transported as an aerosol. It might, however qualify as a limited quantity of the gaseous contents.

9.3.2 Classification

Aerosols are classified within the IMDG Code as Class 2, with the Division number assigned based on the contents and characteristics of the components. For aerosols shipped as “Limited Quantities”, no division is assigned. The identification number UN1950 is assigned to all aerosols regardless of their hazardous characteristics.

Paint, paint related material, and coatings when filled in aerosol containers and transported by sea are subject not only to the requirements of the country of origin, but also to the provisions of International Maritime Dangerous Goods Code and to the requirements of the countries to which shipments are consigned. Most countries accept shipments conforming to IMDG provisions but some exceptions do exist.

The name “Aerosols” is listed in the Dangerous Goods List of the IMDG Code and is an authorized proper shipping name. The Dangerous Goods List also provides information on authorized packaging, labeling, marking, stowage and segregation for aerosols. Specific exceptions to the IMDG Code are included as Special Provisions and include a provision that the code does not apply to aerosols with a capacity of less than 50 cm³.

9.3.3 Labels

Labels should be displayed on the outer packaging containing aerosols according to the dangerous properties of the contents. A Division 2.1, FLAMMABLE GAS label is required to be displayed on a package containing flammable aerosols.

9.3.4 Placards

A freight container or vehicle that is loaded with any package of any quantity that is required to display a label must display the placard for the same hazard class(es) or division(s) as labeled. Aerosols which do not require labels do not require placards to be displayed on the cargo transport unit.

When loading with other hazard classes, Aerosols are segregated in the same manner as if they were in Class 9.

9.3.5 Limited Quantity

Aerosols are authorized as a limited quantity if they comply with the requirements of Chapter 3.4 of the IMDG Code. Aerosols in containers with a capacity of 1000 ml or less (120 ml if they contain toxic substances) may be shipped as a limited quantity. As a limited quantity, no packaging specifications apply other than the general packing requirements in sections 4.1.1.1, 4.1.1.2 and 4.1.1.4 through 4.1.1.8. No segregation requirements apply to limited quantities in relation to each other or to other dangerous goods not in a limited quantity.

Limited quantities of aerosols are not required to be marked with the proper shipping name. They also are not required to display hazard labels or the marine pollutant mark. They must, however, be marked with the Limited Quantity mark:



The outside of the freight container containing dangerous goods in only limited quantities must be marked on all four sides with a larger version of the Limited Quantity mark, with dimensions not less than 250 mm x 250 mm. No placards are required.

For Limited Quantity shipments by ocean, shipping papers are still required. All shipments of aerosols must be described on the dangerous goods declaration. Aerosols as limited quantities, including those intended for personal care or household use, must be described on the declaration as a limited quantity shipment. The use of ORM-D Consumer Commodity is not authorized under IMDG Code rules.

9.3.6 Shipping Paper Description

When offering consignments meeting the IMDG Code definition for “aerosols” the proper description is entered as shown below.

Example:
“UN1950, Aerosols, 2.1”

As a limited quantity would include an indication that the material is packaged as a limited quantity.

Example:
“UN1950, Aerosols, 2.1, Limited Quantity.”

9.4 Air Transportation

Because many carriers operate under the international standards – even for U.S. domestic flights – the same rules and regulations apply regardless of whether the origin and/or destination are domestic or international. The International Civil Aviation Organization Technical Instructions (ICAO TI) apply.

Most air carriers use the IATA Dangerous Goods Regulations which include the ICAO Technical Instructions plus additional requirements.

9.4.1 Classification

Section 4.2 of the IATA Dangerous Goods Regulations reflects 18 descriptions for aerosols. All are assigned UN1950.

9.4.2 Packaging

The primary packaging authorizations for aerosols ordinarily shipped by the paint and coatings industry are codified at Packing Instruction “203” for both passenger aircraft and cargo aircraft. Inner metal receptacle requirements are the same as stated for domestic ground transportation. The outer packaging however, must be a performance tested box constructed of wood, plywood, reconstituted wood, fiberboard, or plastic.

The packaging authorized for limited quantities of aerosols ordinarily shipped by the paint and coatings industry is codified at Packing Instruction “Y203” and apply to both passenger aircraft and cargo aircraft. Specification outside packaging is not required for an aerosol described as a Limited Quantity. However, the general packaging requirements for all packagings must be met as specified in the Packing Instruction and the limited quantity package testing requirements of Section 6.7 for the drop test and stacking tests.

In addition to the general packaging requirements in 49 CFR, all packaging for hazardous materials intended for transportation by aircraft must meet the requirements of §173.27.

9.4.3 Marking

Each outside package containing aerosols must be marked with the proper shipping name, UN identification number, and the Limited Quantity mark with the “Y” in the center. The name and address of the consignee and the shipper must also be marked on each package or overpack.



IATA also requires that, for shipments of multiple packages, each package be marked with the net weight, in kg.

9.4.4 Labeling

Column E of the List of Dangerous Goods in Section 4.2 of IATA specifies the appropriate label or multiple labels which must be displayed on packages containing aerosols. The appropriate label for the Division in Class 2, plus any subsidiary hazard class labels as listed, must be displayed to correspond with each entry.

Labels must be displayed on packages containing aerosols by affixing them:

- so they are readily visible and legible and not obscured
- on the same face of the package as the proper shipping name, if the package is large enough
- on a background of contrasting color or have a contrasting border
- so they are not folded over any corner and appear entirely on one side of the package
- on a packaging of adequate size to affix all required labels
- on a tag securely attached to the package if the surface is too irregular to directly affix the label

All required labels should be displayed on the same panel or in as close proximity as possible to the shippers or consignees address on the package. When required, subsidiary hazard class labels should be displayed adjacent to the primary hazard class label.

If the labels on inner packages within an overpack are not visible from the exterior of the overpack, you should display the same labels on the outside of the overpack.

9.4.5 Shipping Paper Description

The appropriate proper shipping name must first be selected from those entries listed in IATA, Section 4.2, List of Dangerous Goods. The most common shipping description to be entered on the shipper's declaration for dangerous goods as the air shipping paper for aerosol products offered by the paint and coating industry is:

“UN1950, Aerosols, flammable, 2.1,”

The shipper's declaration for dangerous goods will also include the Packing Instruction as “203.”

When offering these same aerosols in a limited quantity the description would be:

“UN1950, Aerosols, flammable, 2.1,” and the Packing Instruction is entered as “Y203.” The “Y” in the Packing Instruction is what alerts carriers and supply chain personnel that the package is being transported under the limited quantity exception.

Example:

“UN1950, Aerosols, flammable, 2.1//
1 fiberboard box x 0.2 kg//Y203”

As with all dangerous goods intended for air transportation, the shipper's declaration for aerosol consignments must be provided in duplicate to the air carrier and must be accompanied by the appropriate air way bill. Additional information will be found in the “Documentation” Module of this manual.

Test Evaluation – Paint and Paint-Related Material in Aerosol Containers

Select the most correct answer for each of the following questions.

1. Materials described as Aerosols might include:
 - a. Flammable spray paint in a plastic receptacle of 2 Liters.
 - b. Propane in a small cylinder used for a home torch kit
 - c. Non-flammable spray paint in a pressurized metal receptacle
 - d. Corrosive paint stripper in a two quart can

2. When aerosol cans of paint are offered in a limited quantity and are intended for sale to consumers in a hardware store, the most appropriate proper shipping name would be:
 - a. Paint
 - b. Consumer commodity
 - c. Paint related material
 - d. None of the above

3. When described as a “Consumer commodity” on the shipping paper or a bill of lading, aerosol cans containing a non-flammable liquid with a non- flammable gas propellant intended for shipment by highway should be labeled with:
 - a. a green label with a “9” at the bottom
 - b. a black and white label with a “9” at the bottom
 - c. a green label with a “2” at the bottom
 - d. None of the above

4. The shipping paper description to be provided to a water carrier describing a consignment of aerosol dispensers containing flammable paint should be:
 - a. UN1950, Aerosols, Class 2, II
 - b. Aerosols, Class 3, UN1950, III
 - c. UN1950, Aerosols, 2.1,
 - d. None of the above

5. When offering a 50 kg package of aerosol cans of spray paint of less than 1 liter capacity each for transportation by aircraft and the SDS states that the material meets the definition of “flammable,” the outer packaging should display the following:
 - a. proper shipping name “Aerosols, flammable”
 - b. the identification number “UN1950”
 - c. a FLAMMABLE GAS label of Division 2.1
 - d. all of the above

6. Shipping papers are not required to be provided by the shipper when offering aerosol packagings:
 - a. as a limited quantity by any mode
 - b. containing non-flammable gas by air
 - c. in packages marked "Consumer commodity, ORM-D" by highway
 - d. All of the above

7. Which of the following items is authorized for importing into the United States:
 - a. Metal aerosol containers filled with an adhesive with a flammable propellant
 - b. Plastic aerosol container containing a powder with a non-flammable propellant
 - c. An aerosol container filled with a poisonous liquid in packing group III
 - d. All of the above

8. How many aerosol containers of paint can be packed into a box marked "consumer commodity, ORM-D" and intended for retail distribution?
 - a. a maximum of 12
 - b. as many as it will hold up to 400 kg
 - c. whatever number it will hold without exceeding total package weight of 30 kg.
 - d. No limit for Consumer commodity consignments

9. When packaging aerosols, flammable, for transportation within the United States you will find the packaging authorization at:
 - a. §173.150
 - b. §173.306
 - c. §173.173
 - d. §173.202

10. Which of these vehicles requires placards to be displayed?
 - a. Tractor trailer transporting 35,000 pounds of aerosol cans of flammable paint described as "limited quantity"
 - b. Pick up truck transporting 1500 pounds of aerosols as "Consumer commodity"
 - c. Rail car transporting 70,000 pounds of aerosol cans filled with non- flammable paint related material described as "limited quantity"
 - d. None of the above

Answer Key: Test Evaluation – Paint and Paint-Related Material in Aerosol Containers

1. c.
2. b.
3. d.
4. c.
5. d.
6. c.
7. d.
8. c.
9. b.
10. d.

CHAPTER 10 – OSHA HAZARD COMMUNICATION STANDARD (HCS) GUIDANCE

10.1 Introduction

In 2012, the Occupational Safety and Health Administration (OSHA) amended its Hazard Communication Standard (HCS) to better align it with the principles of the United Nation's Globally Harmonized System of Classification and Labeling of Chemical (GHS), which are published in a manual referred to as the "Purple Book." Though people will often refer to "GHS requirements," in the United States it is OSHA's Hazard Communication Standard Regulations of 29 CFR 1910.1200 that are in force. These requirements include classification procedures, product labeling, and chemical safety information in the form of a Safety Data Sheet (SDS; formerly known as a Material Safety Data Sheet (MSDS)). OSHA revised its regulations not only to harmonize with global regulations, but to implement a system designed to give workers a better understanding of the hazards posed by the chemicals around them in the workplace.

Those who manufacture, distribute or import chemicals must assess their hazards, as well as create labels and safety data sheets (SDS) that inform their customers of the potential dangers. Workplaces that contain hazardous chemicals must have clearly displayed labels and supply the SDS to employees who may encounter them. Employees must also be trained on proper handling of hazardous chemicals.

This guidance is intended to give readers an overview of OSHA HCS requirements that may affect their operation, with a specific focus on how the regulations may apply to paint manufacturers and users. It is by no means a comprehensive report on all OSHA requirements that may apply. As such, always be sure to consult Department of Labor regulations and your internal EHS professionals to better understand how OSHA regulations may impact your business. OSHA requirements are set by statute, standards, and regulations. OSHA publishes interpretation letters that explain the requirements and how they apply to particular circumstances. OSHA's HCS website provides significant information on complying with the HCS standards. For instance, to learn about the history of GHS go to: <https://www.osha.gov/dsg/hazcom/global.html>.

10.2 Training

The first deadline for training employees on HCS rules was fully implemented on June 1, 2015. The HCS is a performance-oriented standard and the goal of the training provisions is to ensure that employees are trained according to those provisions. OSHA has stated that employee training can be provided by the current employer, a past employer, an employee union, or any other entity. HCS training is to be given to workers at the time of their initial assignment and if new chemical hazards are found in the workplace that were not addressed in previous training. Retraining is also given when a worker has exposure to new chemical hazards through a change in job duties or work area. From an enforcement standpoint, OSHA field personnel will evaluate an employer's compliance with the training and information provisions of the HCS. If it is determined that an employee has not received training or is not adequately trained the current employer will be held responsible regardless of who trained that particular employee. An employer, therefore, has a responsibility when hiring a new employee that has been previously trained by someone other than the current employer to evaluate the employee's level of knowledge against the training and information requirements of the standard.

So, what should HCS training include? OSHA stipulates a comprehensive list pertaining to HCS training requirements, which include:

- Requirements and purpose of the Hazard Communication Standard
- Operations in the employees' work areas where hazardous chemicals are present
- Location, purpose and availability of the Written Hazard Communication Program, as well as the list of hazardous chemicals, and SDS
- How to detect releases or presence of hazardous chemicals in the work area (such as odor, appearance of fumes or mist)
- The physical and health hazards of chemicals found in the workplace, including hazard classifications, and associated pictograms, signal words, and terminology
- Measures employees can use to protect from chemical hazards, such as PPE, ventilation, administrative or engineering controls, etc.
- Details and explanation of labels on shipped containers, workplace labeling and SDS

Compliance with OSHA's HCS requirements specifies that companies need a written compliance program. The program must spell out the criteria for employee training, including the following:

- Designation of persons responsible for conducting training
- The format of the program to be used (e.g., audiovisuals or classroom instruction)
- The elements of the training program—if the written program addresses how the duties outlined in the regulation will be met
- Procedures to train new employees at the time of their initial assignment and train employees when a new hazard is introduced into the workplace
- Procedures to train employees regarding new hazards to which they may be exposed when working on or near another employer's worksite (e.g., hazards introduced by other employers)

Information and training must be specific to the kinds of hazards in the workplace and the protective equipment, control measures, and procedures that are necessary. Training can be accomplished in various ways, including audiovisuals, classroom instruction, and interactive video.

10.3 Classification

Proper classification of chemicals is the first, and most vital, step in complying with HCS rules. OSHA regulations establish two types of hazards: health hazards and physical hazards. Health hazards present dangers to human health (i.e. breathing or vision) while physical hazards cause damage to the body (like skin corrosion). Environmental hazards are not within OSHA's jurisdiction. There are 16 physical hazards and 10 health hazards; each hazard is then further divided according to different severity levels. Health hazards are chemicals that pose hazardous effects such as acute toxicity, skin corrosion, eye damage, or carcinogenicity. Physical hazards, on the other hand, are chemicals that pose hazardous effects including explosion, flammability, oxidizing properties, or gases under pressure. A complete list of both health and physical hazards is provided below.

Health Hazards (as set forth in Appendix A to 29 CFR §1910.1200):

Hazard Class	Associated Hazard Category
Acute toxicity	Categories 1-4 (with 1 being the most dangerous)
Skin corrosion	Categories 1A, 1B, 1C, and 2
Skin irritation	Categories 1A, 1B, 1C, and 2
Eye Effects	Categories 1, 2A, and 2B
Sensitization (Skin or Eye)	Category 1A and 1B
Germ cell mutagenicity	Categories 1A, 1B, and 2
Carcinogenicity	Categories 1A, 1B, and 2
Reproductive toxicity	Categories 1A, 1B, 2, and additional category for effects on or via lactation
Target organ systemic toxicity: single and repeated exposure	Single: Categories 1-3 Repeated: Categories 1 and 2
Aspiration toxicity	Category 1 and 2

Physical Hazards (as set forth in Appendix B to 29 CFR §1910.1200):

Hazard Class	Associated Hazard Category
Explosives	Divisions 1.1-1.6 (with 1.1 being the most hazardous, 1.6 the least hazardous)
Flammable gases	Categories 1 and 2
Flammable aerosols	Categories 1 and 2
Oxidizing gases	Category 1
Gases under pressure	4 Groups include: Compressed gas, Liquefied gas, Dissolved gas, and Refrigerated liquefied gas
Flammable liquids	Categories 1 - 4
Flammable solids	Categories 1 and 2
Self-reactive substances	Types A-G
Pyrophoric solids	Category 1
Pyrophoric liquids	Category 1
Self-heating substances	Categories 1 and 2
Substances which in contact with water emit flammable gases	Categories 1 - 3
Oxidizing liquids	Categories 1 - 3
Oxidizing solids	Categories 1 - 3
Organic peroxides	Types A-G
Substances corrosive to metal	Category 1

10.3.1 Flammable Liquids

Definition: A liquid having a flash point of not more than 93 °C (199.4 °F)

Classification Criteria: Separated into four (4) categories

Category	Criteria
1	Flash point < 23 °C (73.4 °F) and initial boiling point ≤ 35 °C (95 °F)
2	Flash point < 23 °C (73.4 °F) and initial boiling point > 35 °C (95 °F)
3	Flash point ≥ 23 °C (73.4 °F) and ≤ 60 °C (140 °F)
4	Flash point > 60 °C (140 °F) and ≤ 93 °C (199.4 °F)

Additional Considerations: The flash point must be determined in accordance with ASTM D56-05, ASTM D3278, ASTM D3828, ASTM D93-08, or any other method specified in GHS Revision 3, Chapter 2.6. The initial boiling point must be determined in accordance with ASTM D86-07a or ASTM D1078.

10.3.2 Corrosive to Metals

Definition: A chemical with by chemical action will materially damage, or even destroy, metals.

Classification Criteria: Corrosives must be classified in a single category, using the test in Part III, sub-section 37.4 of the UN ST/SG/AC.10.

Category	Criteria
1	Corrosion rate on either steel or aluminum surfaces exceeding 6.25 mm per year at a test temperature of 55 °C (131 °F) when tested on both materials.

Additional Considerations: For testing steel, steel types S235JR + CR (1.0037 resp.St 37-2), S275J2G3 + CR (1.0144 resp.St 44-3), ISO 3574, UNS G 10200, or SAE 1020 must be used. For aluminum, non-clad types 7075-T6 or AZ5GU-T6 must be used.

10.3.3 Flammable Aerosols

Definition: Any non-refillable receptacle containing a gas compressed, liquefied or dissolved under pressure, and fitted with a release device allowing the contents to be ejected as particles in suspension in a gas, or as a foam, paste, powder, liquid or gas.

Classification Criteria: Aerosols must be considered for classification as flammable if they contain any component which is classified as flammable in accordance with the Appendix B (i.e. flammable liquids, flammable gases, or flammable solids). Flammable aerosols must be classified in one of the two categories.

Category	Criteria
1	Contains $\geq 85\%$ flammable components and the chemical heat of combustion is ≥ 30 kJ/g; or (a) For spray aerosols, in the ignition distance test, ignition occurs at a distance ≥ 75 cm (29.5 in), or (b) For foam aerosols, in the aerosol foam flammability test (i) The flame height is ≥ 20 cm (7.87 in) and the flame duration ≥ 2 s; or (ii) The flame height is ≥ 4 cm (1.57 in) and the flame duration ≥ 7 s
2	Contains $> 1\%$ flammable components, or the heat of combustion is ≥ 20 kJ/g; and (a) for spray aerosols, in the ignition distance test, ignition occurs at a distance ≥ 15 cm (5.9 in), or in the enclosed space ignition test, the (i) Time equivalent is ≤ 300 s/m ³ ; or (ii) Deflagration density is ≤ 300 g/m ³ (b) For foam aerosols, in the aerosol foam flammability test, the flame height is ≥ 4 cm and the flame duration is ≥ 2 s and it does not meet the criteria for Category 1

Additional Considerations: To classify as a flammable aerosol, data on its flammable components, on its chemical heat of combustion and, if applicable, the results of the aerosol foam flammability test (for foam aerosols) and of the ignition distance test and enclosed space test (for spray aerosols) are necessary. The chemical heat of combustion (ΔH_c), in kilojoules per gram (kJ/g), is the product of the theoretical heat of combustion (ΔH_{comb}), and a combustion efficiency, usually less than 1.0 (a typical combustion efficiency is 0.95 or 95%).

10.4 Labeling Requirements

OSHA's HCS requirements include labeling of hazardous chemicals. The label, example shown below, must be applied to the container that holds the hazardous chemical so that workers will recognize the contents as hazardous. Further, these workplace labels must be legible and must not be defaced, removed, or covered.

When determining what information to apply to a workplace chemical label, consider the following minimum information that must be present:

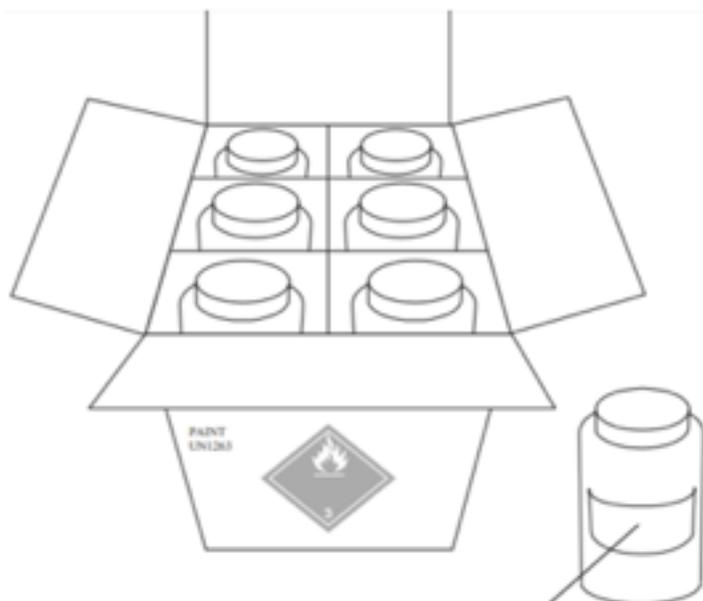
- Name, Address, and Telephone Number of Manufacturer, Importer, or Responsible Party
- Product Identifier
 - This can be, but is not limited to, a chemical name, code number, or batch number. The product identifier on the label must match the identifier on the SDS in Section 1
- Signal Word
 - These are used to indicate the severity of the hazard. There are only two options "Danger" and "Warning." "Danger" is used to signify the more severe hazard (e.g. lower flash point, more easily ignitable flammable liquid) and "Warning" is used to signify a less severe hazard. The label may have either word depending on the chemical, but it should never have both.

- Hazard Statement(s)
 - Describe the nature of the hazard. The hazard statements are specific to the hazard classification and should always be the same for that particular hazard. Standard hazard statements are found in Annex 3 of the UN GHS Purple Book.
- Precautionary Statement(s)
 - These are recommended measures that should be taken to minimize adverse effects of exposure to the hazardous chemical. The precautionary statement that must be displayed will depend on the classification of the chemical. Precautionary statements are also found in Annex 3 of the GHS Purple Book.
- Pictogram(s)
 - Pictograms are the graphic symbol used on the label to make the particular hazard more recognizable to workers. See below for the breakdown of pictograms and their meaning.
 -

HCS Pictograms and Hazards

Health Hazard  <ul style="list-style-type: none"> • Carcinogen • Mutagenicity • Reproductive Toxicity • Respiratory Sensitizer • Target Organ Toxicity • Aspiration Toxicity 	Flame  <ul style="list-style-type: none"> • Flammables • Pyrophorics • Self-Heating • Emits Flammable Gas • Self-Reactives • Organic Peroxides 	Exclamation Mark  <ul style="list-style-type: none"> • Irritant (skin and eye) • Skin Sensitizer • Acute Toxicity (harmful) • Narcotic Effects • Respiratory Tract Irritant • Hazardous to Ozone Layer (Non-Mandatory)
Gas Cylinder  <ul style="list-style-type: none"> • Gases Under Pressure 	Corrosion  <ul style="list-style-type: none"> • Skin Corrosion/ Burns • Eye Damage • Corrosive to Metals 	Exploding Bomb  <ul style="list-style-type: none"> • Explosives • Self-Reactives • Organic Peroxides
Flame Over Circle  <ul style="list-style-type: none"> • Oxidizers 	Environment (Non-Mandatory)  <ul style="list-style-type: none"> • Aquatic Toxicity 	Skull and Crossbones  <ul style="list-style-type: none"> • Acute Toxicity (fatal or toxic)

Label Example



**PAINT (FLAMMALINE,
LEAD CHROMOMIUM)**

Product identifier

UN1263

CAS#: xxx-x-x



**



DANGER

Causes damage to the liver and kidneys through prolonged or repeated exposure to the skin.
Highly flammable liquid and vapour.
Wash hands thoroughly after use and before eating.
Keep away from food and drink
Keep away from heat and ignition sources.

FIRST AID

Call emergency medical care.
Wash affected area of body thoroughly with soap and fresh water.

Company ABC, Washington, DC

Telephone: (202) 555-5555

10.5 Safety Data Sheet

The HCS requires chemical manufacturers, distributors, and importers to provide Safety Data Sheets (SDS) to effectively communicate the hazards of the particular chemical or chemicals. The SDS, formerly known as a Material Safety Data Sheet (MSDS), has a defined format that includes sixteen (16) sections. It should be noted that Sections 12 through 15 are not enforced by OSHA because other U.S. government agencies regulate the information in these sections. A section-by-section breakdown is provided below.

Section	Section Heading	Required Information
1	Identification	<ul style="list-style-type: none"> Product identifier Manufacturer/Distributor name and contact info Recommended use & Restrictions on use
2	Hazard(s) Identification	<ul style="list-style-type: none"> Chemical hazards Match label pictograms/statement
3	Composition/Information on Ingredients	<ul style="list-style-type: none"> Chemical ingredients Trade secret claims, if applicable
4	First-Aid Measures	<ul style="list-style-type: none"> Important symptoms/effects of chemical Acute & delayed treatment instructions
5	Fire-Fighting Measures	<ul style="list-style-type: none"> Suitable extinguishing methods and equipment Chemical hazards from fire
6	Accidental Release Measures	<ul style="list-style-type: none"> Emergency procedures Personal protective equipment (PPE) Methods of containment/clean up
7	Handling and Storage	<ul style="list-style-type: none"> Safe handling and storage procedures Chemical incompatibilities, if applicable
8	Exposure Controls/Personal Protection	<ul style="list-style-type: none"> OSHA Permissible Exposure Limits (PELs) Other exposure limits
9	Physical and Chemical Properties	<ul style="list-style-type: none"> List of chemical characteristics including pH, appearance, odor, density, boiling point, flash point, flammability, and vapor pressure.
10	Stability and Reactivity	<ul style="list-style-type: none"> Chemical stability Possible hazardous reactions
11	Toxicological Information	<ul style="list-style-type: none"> Routes of exposure Symptoms (acute & chronic) Numerical measures of toxicity
12	Ecological Information	<ul style="list-style-type: none"> Environmental impacts if released Aquatic toxicity, Degradation & Bioaccumulation
13	Disposal Considerations	<ul style="list-style-type: none"> Proper disposal instructions Recommended PPE and safe handling
14	Transport Information	<ul style="list-style-type: none"> Classification for transport (i.e. UN Number, Proper Shipping Name, Hazard Class, Packing Group), if applicable
15	Regulatory Information	<ul style="list-style-type: none"> Other safety, health, or environmental regulations that may apply, including other OSHA, EPA, CPSC, or state regulations.
16	Other Information	<ul style="list-style-type: none"> Date of SDS Date of last revision

CHAPTER 11 – SECURITY PLAN REQUIREMENTS

11.1 Introduction: Security Awareness

In an attempt to ensure that hazardous materials are not used to purposely harm life, property or the environment, DOT has mandated that all “hazmat employees” have security awareness training to provide an awareness of security risks associated with the transportation of hazardous materials and methods designed to enhance transportation security. In addition, the training must cover how to recognize and respond to possible security threats.

This module is designed to give you a basic understanding of the security threats associated with hazardous materials transportation.

It is important to understand that even though hazardous materials are an essential part of our everyday life, certain hazardous materials in the wrong hands, can be used to cause great harm. Incidents involving hazardous materials have occurred here in the US. In addition, several incidents have been thwarted in the planning stages. These involve things such as: causing explosions in buildings, causing fires in highway tunnels, contaminating the air, and contaminating the water supply. In addition, facilities that store hazardous materials, whether before or after transportation, can themselves become targets of terrorists.

For the types of materials typically transported by the paint and coating industry, the main hazard is the flammability of the materials. The security threat posed by these materials is related to the quantity being shipped and the flammability of the material.

In order to properly address security threats related to the transportation of hazardous materials, the first step must be an objective look at the actual type and severity of security risk posed by your hazardous materials transportation operations. If your facility is required to develop and implement a security plan, a vulnerability assessment must be conducted. Shippers should analyze things such as; the nature of the surrounding area, the nature and quantity of hazardous materials, physical barriers to entry of the facility, means of detecting intrusion, and methods of screening new hazmat employees. Not every hazmat shipper will have the same level of threat associated with their transportation operations. Even among shippers required to have a written security plan, the threat will vary. For instance, a company offering a one pound shipment of lithium (Class 4.3) and a company offering millions of pounds of chlorine (Class 2.3) per year, will both require security plans, but it is clear that the chlorine would pose a much more serious security risk, due to both the nature and the quantity of the material.

Some simple things that can be done to increase security at every facility that offers hazardous materials for transportation are:

- Keep storage areas locked
- Keep an updated and accurate inventory
- Inspect storage areas on a regular basis
- Perform security spot checks of personnel and vehicles
- Watch for unusual purchases or odd behavior
- Restrict access of non-employees
- Lock all equipment used to transfer or transport hazardous materials

There are many guidelines currently recommended by various industries and associations. Most of those guidelines involve simple techniques for monitoring the inventory of hazardous materials and preventing access to those materials by unauthorized persons. Again, the guidelines actually followed will be based on the assessed security threat of the hazardous material.

Perhaps the most difficult aspect of transportation security for the shipper is the en-route security of their hazardous materials. For those shippers required to have a security plan, it must specifically address “En-route security.” Since security plan details should never be shared with anyone who doesn’t have a direct responsibility for implementing the plan, or anyone outside of your company, you cannot ask carriers for copies of their security plan. However, you can ask your carrier to certify that they have implemented a security plan that meets the requirements of 49 CFR Part

172, Subpart I. Many carriers and shippers are working closely together to ensure the safe and secure transportation of hazardous materials. This involves measures such as prior notification of the name of the driver and checking the driver's identification before loading the hazardous materials.

The main methods of addressing en-route security involve awareness and communication. Carriers must be aware of the hazards of the materials they are carrying and any security threats associated with those hazards. Carriers must also perform a vulnerability assessment to determine where their security weaknesses lie. Regular communication between the carrier and their drivers is essential for transportation security. Carriers are using many methods, from regularly scheduled driver check-ins by telephone, to more sophisticated methods such as satellite tracking and global positioning systems to ensure that their vehicles are always where they should be. Some carriers are also implementing technologies which do not permit the vehicle to be started by anyone other than the assigned driver. The particular methods that a carrier chooses to address security will depend on several factors, most importantly the security risks associated with the types and quantities of hazardous materials that they are transporting.

Some simple security measures that should be considered by all carriers, include:

- Careful route planning:
 - Choose shortest route
 - Avoid high population areas, tunnels and bridges
- Choose well-lit rest stops where driver can see vehicle while eating
- Know your customers
- Report suspicious activity
- Report lost or stolen shipments
- Report delays, deviations from planned route or timetable
- Lock the power unit and the transport unit

Whether or not your facility is required to have a Security Plan for the transportation of hazardous materials, there are things you can do to enhance hazardous materials transportation security. The most important is to be aware. Awareness of your surroundings, the hazardous materials you handle and the people who have access to those materials is crucial. So is reporting any suspicious activities and people. Awareness alone won't increase security if the suspicious activities and unauthorized persons aren't reported to someone who has the authority to take action. One purpose of the security plan is to better define who is authorized to have access to hazardous materials and what might be considered "suspicious activities." The plan will also tell you to whom to report those suspicious activities.

If your facility is required to have a security plan and you have duties or responsibilities under the plan, or handle the hazardous materials covered by the plan, you will receive in-depth security training related to the plan developed for your facility.

11.2 Who is Required to Develop a Security Plan?

Anyone who offers for transportation or transports certain types or quantities of hazardous materials must develop and implement a security plan. For the most part, these are highly hazardous materials such as explosives or materials that are poisonous by inhalation. However, some materials present an increased security risk simply because of the quantity being transported. In general, you will need to develop and implement a security plan if you offer or transport quantities of hazardous materials that require placards. §172.800(b) contains a complete list of the hazardous materials that trigger the security plan requirements.

(b) Applicability. Each person who offers for transportation in commerce or transports in commerce one or more of the following hazardous materials must develop and adhere to a transportation security plan for hazardous materials that conforms to the requirements of this subpart. As used in this section, “large bulk quantity” refers to a quantity greater than 3,000 kg (6,614 pounds) for solids or 3,000 liters (792 gallons) for liquids and gases in a single packaging such as a cargo tank motor vehicle, portable tank, tank car, or other bulk container.

- (1) Any quantity of a Division 1.1, 1.2, or 1.3 material;
- (2) A quantity of a Division 1.4, 1.5, or 1.6 material requiring placarding in accordance with subpart F of this part;
- (3) A large bulk quantity of Division 2.1 material;
- (4) A large bulk quantity of Division 2.2 material with a subsidiary hazard of 5.1;
- (5) Any quantity of a material poisonous by inhalation, as defined in §171.8 of this subchapter;
- (6) A large bulk quantity of a Class 3 material meeting the criteria for Packing Group I or II;
- (7) A quantity of desensitized explosives meeting the definition of Division 4.1 or Class 3 material requiring placarding in accordance with subpart F of this part;
- (8) A large bulk quantity of a Division 4.2 material meeting the criteria for Packing Group I or II;
- (9) A quantity of a Division 4.3 material requiring placarding in accordance with subpart F of this part;
- (10) A large bulk quantity of a Division 5.1 material in Packing Groups I and II; perchlorates; or ammonium nitrate, ammonium nitrate fertilizers, or ammonium nitrate emulsions, suspensions, or gels;
- (11) Any quantity of organic peroxide, Type B, liquid or solid, temperature controlled;
- (12) A large bulk quantity of Division 6.1 material (for a material poisonous by inhalation see paragraph (5) above);
- (13) A select agent or toxin regulated by the Centers for Disease Control and Prevention under 42 CFR part 73 or the United States Department of Agriculture under 9 CFR part 121;
- (14) A quantity of uranium hexafluoride requiring placarding under §172.505(b);
- (15) International Atomic Energy Agency (IAEA) Code of Conduct Category 1 and 2 materials including Highway Route Controlled quantities as defined in 49 CFR 173.403 or known radionuclides in forms listed as RAM-QC by the Nuclear Regulatory Commission;
- (16) A large bulk quantity of Class 8 material meeting the criteria for Packing Group I.

11.3 Security Plan Components

The security plan must address security risks related to the transportation of hazardous materials listed in §172.800(b). At a minimum, the plan must include an assessment of possible transportation security risks, personnel security, unauthorized access and en-route security.

Since many different types and quantities of hazardous materials trigger the requirement for security plans, there is no “one size fits all” security plan. Each plan must begin with an assessment of the possible security threat based on the actual types and quantities of hazardous materials to be transported and the operational conditions associated with that transportation. Then, each of the other plan components must be developed to address the assessed security threat.

11.3.1 Personnel Security

Each plan must include methods for confirming information provided by job applicants hired for positions that involve access to and handling of the hazardous materials covered by the security plan. The plan is not required to cover existing employees, or employees who have no access to the hazardous materials covered by the plan.

11.3.2 Unauthorized Access

This section of the plan must include measures to address the assessed risk of unauthorized persons gaining access to the hazardous materials covered by the plan, or to transport conveyances being prepared for the transportation of the materials covered by the plan.

11.3.3 En-Route Security

This is probably the most difficult segment of the plan for the shipper, since control of the material is given to the carrier. The plan must include measures to address the assessed security risks of shipments of hazardous materials covered by the plan en-route from origin to destination, including shipments stored incidental to transportation. This will require working closely with carriers to ensure that they have taken appropriate measures to address en-route security. Keep in mind that a security plan is a confidential document. The plan specifics should not be shared with anyone who is not required to be trained in or to implement the provisions of the security plan.

11.4 Security Plan Format

The security plan is not required to follow any particular format, but it must be in writing, made available to those who are responsible for implementing it and updated to reflect changing circumstances. DOT realizes that many facilities may be subject to other state and federal requirements to prepare and implement security plans. It is not DOT's intent to require a separate plan to address transportation security. Any security plan that addresses the areas required by DOT can be used to satisfy the DOT requirements.

The measures implemented by the security plan may be structured in such a way that they vary based on the threat level at any particular time. For instance, different security measures may be implemented based on the current threat level assigned by the Homeland Security Advisory System.

Detailed information and guidance on the development of security plans can be found on DOT's website, at https://hazmatonline.phmsa.dot.gov/services/publication_documents/Enhanced_Security_02_22_12%20

