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**GUIDING PRINCIPLES**

**FOR THE DEVELOPMENT**

**OF THE UN MODEL REGULATIONS**

Fourth version (2013)

Guiding Principles for use with the 18th revised edition



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## **PART 0**

### **INTRODUCTION AND GENERAL PRINCIPLES**

#### **INTRODUCTION**

The purpose of this document is to explain the underlying principles that have been applied in developing the UN Model Regulations since their inception in the 1950s. The current document is valid for use with the 18th Revised Edition of the Model Regulations. It is not intended that the document is absolutely definitive. The Guidelines are intended to be a dynamic set of principles to be reviewed and amended as necessary as each future revised edition of the Model Regulations is adopted.

These Guiding Principles may be used by regulators and others who intend to submit proposals for revisions to the Model Regulations as an aide-memoire to the approach taken to particular aspects of the Model Regulations. It does not preclude new approaches or deviations, but it is expected that these must be explained and properly justified.

It is hoped that this document may also be useful for those intending to apply the Model Regulations in legislation or those who need to explain the purpose of the regulations or train others in their use to understand the rationale behind their drafting.

Some text, particularly in this Part, reproduces text that can be found in the Recommendations on the Transport of Dangerous Goods themselves. Whilst wishing to avoid unnecessary duplication, it is felt that including that text in this document will be helpful to the general reader.

#### **GENERAL PRINCIPLES**

##### *NATURE, PURPOSE AND SIGNIFICANCE OF THE RECOMMENDATIONS*

These Recommendations, the first version of which was published in 1956, have been developed by the United Nations Economic and Social Council's Sub-Committee of Experts on the Transport of Dangerous Goods<sup>1</sup>. They are intended to promote public safety in the transport of dangerous goods which includes the safety of human life and health and of property and the environment. They take into account technical progress, the development of new substances and materials and the requirements of modern multi-modal transport systems

The Recommendations are addressed to governments and international organizations concerned with the safety and the regulation of the transport of dangerous goods.

The Recommendations do not apply to the bulk transport of dangerous goods in sea-going or inland navigation bulk carriers or tank-vessels, which is subject to special international or national regulations.

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<sup>1</sup> By resolution 1999/65 of 26 October 1999, the Economic and Social Council extended the mandate of the Committee to the global harmonization of the various systems of classification and labelling of chemicals. The Committee was reconfigured and renamed the Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized System of Classification and Labelling of Chemicals with one sub-committee specialized in the transport of dangerous goods and one sub-committee addressing the global harmonization of classification and labelling of chemicals.

The Recommendations on the Transport of Dangerous Goods are presented in the form of “Model Regulations on the Transport of Dangerous Goods”, which are an annex to the Recommendations. The Model Regulations are a scheme of basic provisions that will allow uniform development of national regulations and international regulations governing the various modes of transport. However, the Model Regulations are intended to be flexible enough to accommodate any special requirements.

The United Nations Economic and Social Council expects that governments, intergovernmental organizations and international organizations, when revising or developing regulations regarding the transport of dangerous goods will conform to the principles set out in these Model Regulations, thus contributing to worldwide harmonization in the transport of dangerous goods. Furthermore, the structure, format and content should be followed to create a more user-friendly approach, to enhance harmonization of regulatory requirements, to facilitate the work of enforcement bodies and to reduce administrative burdens. The Model Regulations have been drafted in the mandatory sense (i.e., the word “shall” is used throughout the text rather than “should”) to facilitate direct use of the Model Regulations as a basis for national and international transport regulations.

The scope of the Model Regulations should ensure their value for all who are directly or indirectly concerned with the transport of dangerous goods. The Model Regulations include provisions for training, security, principles of classification, definition of classes, listing of proper shipping names and UN numbers for dangerous goods, general packing requirements, testing procedures, marking, labelling or placarding, and transport documents. There are, in addition, special requirements related to particular classes of dangerous goods.

With this system of classification, listing, packing, marking, labelling, placarding and documentation in general use, carriers, consignors and enforcement authorities will benefit from harmonized requirements. In general, their task will be facilitated and obstacles to the international transport of dangerous goods reduced accordingly. At the same time, the advantages will become increasingly evident as trade in dangerous goods steadily grows.

#### *PRINCIPLES UNDERLYING THE REGULATION OF THE TRANSPORT OF DANGEROUS GOODS*

The transport of dangerous goods is regulated to prevent or mitigate, as far as possible, incidents that could endanger public safety or harm the environment. At the same time, regulations should be framed so that they do not hamper the movement of dangerous goods, other than those too dangerous to be accepted for transport. The aim of regulations, therefore, is to make transport feasible and safe by reducing risks to a minimum.

The Model Regulations are addressed to all modes of transport (road, rail, marine, inland waterway, air). Modal transport regulations may occasionally apply other requirements for operational reasons.

#### *PRINCIPLES FOR THE WORK ON REFORMATTING THE RECOMMENDATIONS ON THE TRANSPORT OF DANGEROUS GOODS INTO A MODEL REGULATION*

The purposes of presenting the Recommendations on the Transport of Dangerous Goods into the form of a model regulation are as follows:

- (a) To provide a basis for internationally harmonized regulations governing the multimodal transport of dangerous goods, and in doing so, enhance the international harmonization already attained through the current Recommendations;
- (b) To “recommend” the Recommendations on the Transport of Dangerous Goods to modal organizations, regional bodies and national governments (in particular those governments

considering the development of national regulations affecting the transport of dangerous goods) in a form that can be adopted with little or no modification directly into modal, regional or national regulations.

(c) To improve the understanding of dangerous goods transport regulations affecting international transport and in doing so, improve compliance and dangerous goods transport safety and facilitate the international transport of dangerous goods.

Whenever possible, a clear distinction should be made between general requirements (i.e. marking, labelling, documentation and packing requirements) and technical requirements (i.e. specifications and test requirements for packagings, Intermediate Bulk Packagings (IBCs) and tanks). The regulations should also identify responsibilities.

In order to provide the greatest international consistency, the model rule should be as comprehensive as possible.

If areas or requirements needing substantial changes are identified in the course of the work, they should be brought to the attention of the Sub-Committee (including if appropriate, proposed solutions).

Specifications for single mode cargo transport units (i.e. rail tank cars, tank vehicles) and modal specific operational requirements should in general not be provided in the model regulation. However, provision for their insertion by modal, regional or national authorities should be made (i.e. additional columns in the Table of dangerous goods).

**The following text is intended to provide general information on the structure and use of the Model Regulations and is set out in the same Part order as the Model Regulations themselves.**

# **PART 1**

## **GENERAL PROVISIONS, DEFINITIONS, TRAINING AND SECURITY**

These Model Regulations consist of seven parts, each of which is divided into chapters. Chapters are numbered sequentially within each part, with the first digit identifying the part in which the chapter is located. For example, the second chapter in Part 7 is designated “Chapter 7.2”.

Chapters are further divided into sections which, in turn, are normally divided into a number of paragraphs. Sections and paragraphs are numbered sequentially with the first number always being the number of the chapter in which the section or paragraph is located. For example, 7.2.1 would be the first section in Chapter 7.2, and 7.2.1.1 would be the first paragraph in that section.

As an exception, and in an effort to maintain a correspondence between the class number and the chapter number in Part 2, the first chapter, “Introduction”, of Part 2 has been numbered Chapter 2.0.

When references appear in the text to other provisions of these regulations, the reference will normally consist of the full section or paragraph reference, as described above. In certain cases, however, broader reference may be made to an entire part, e.g., Part 5, or chapter, e.g., Chapter 5.4.

Recommendations on tests and criteria, which are incorporated by reference into certain provisions of the Model Regulations are published as a separate manual, “Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria” (ST/SG/AC.10/11/Rev.5 and Amend.1).

### **Chapter 1.2 - definitions and units of measurements**

Definitions and units of measurements of general applicability used throughout the Model Regulations are listed here. However, some additional definitions that are specific to relevant Chapters of the Model Regulations are found at the beginning of those Chapters (such as the definition of ‘security’ found in Note 2 to Chapter 1.4.).

### **Chapter 1.3 - training**

General training requirements applicable to all persons engaged in the transport of dangerous goods by any mode of transport are included in the Model Regulations. Additional training requirements for security purposes are given in Chapter 1.4. More specific training requirements (such as for drivers of vehicles) are included in the relevant modal provisions.

### **Chapter 1.4 - security**

Until after the events of 11 September 2001, the Model Regulations addressed only the safety of dangerous goods in transport. Since then it has been determined appropriate to consider transport security as a sub-set of safety provisions. The Model Regulations now include general security requirements for all dangerous goods transported above the appropriate limited quantity thresholds. More demanding requirements are included for high consequence dangerous goods. These are dangerous goods that have the potential to cause mass casualties or



mass destruction. An indicative list of such substances is included in Table 1.4.1 as guidance. It is open to competent authorities to add or remove substances from such a list depending on their own national circumstances or the perceived level of threat at any particular time, but it is suggested that the current list of substances offers sound guidance on the minimum applicability of such measures.

#### **Chapter 1.5 - general provisions concerning Class 7**

Provisions for the transport of radioactive material have been transposed from the International Atomic Energy Agency's 'Regulations for the Safe Transport of Radioactive Material'. No amendments of substance have been made, but they have been re-formatted to fit the structure of the Model Regulations. A table of correspondence between paragraph numbers in the IAEA Regulations (2012 Edition) and the 18th revised edition of the Model Regulations can be found at the end of Volume II of the Model Regulations.

## PART 2

### CLASSIFICATION

#### CLASSIFICATION AND DEFINITIONS OF CLASSES OF DANGEROUS GOODS

Substances, including mixtures and solutions, and articles are assigned to one of nine classes according to the hazard or the most predominant of the hazards they pose in transport. Some of the classes are divided into divisions, e.g., Class 1, while others are not e.g., Class 3.

The Chemical Abstracts Service (CAS), based in the United States, issues unique numbers to unique substances. The number of unique CAS numbers can be taken as an estimate of the number of unique substances that have been produced. As of June 2007, there were over 14,400,000 commercially available chemicals registered by the CAS. The total of all registered substances exceeded 60,000,000. In 1980 this number was less than 5,000,000. However, not all CAS registered chemicals have physical or chemical characteristics that would make them goods classified as dangerous in transport.

To accommodate the large number of dangerous goods and the consistent, rapid development of new substances, the unusual chemical names used to describe them and the different emergency response for them, the UNSCETDG devised tests and criteria to be used to determine which substances could be identified as dangerous goods in transport. The UNSCETDG then devised a system of nine classes for substances with the objective of dividing all current and future dangerous goods into these classes. The system of classes was established keeping in mind the type of containment to be used, the chemical and physical characteristics of the substances and response procedures that would be most appropriate in the event of an accidental release. Consequently, in the UN Model Regulations each substance has a name (called a Proper Shipping Name) and a four-digit UN number and, according to its chemical and physical characteristics, is assigned to a class and a packing group. The nine classes are:

- Class 1 Explosives
- Class 2 Gases
- Class 3 Flammable Liquids
- Class 4 Flammable solids; substances liable to spontaneous combustion; substances which, on contact with water, emit flammable gases
- Class 5 Oxidizing substances and organic peroxides
- Class 6 Toxic and Infectious substances
- Class 7 Radioactive material
- Class 8 Corrosive substances
- Class 9 Miscellaneous dangerous substances and articles, including environmentally hazardous substances

The classification of substances by type of hazard was developed to meet technical conditions while at the same time minimizing interference with existing regulations. It should be noted that the numerical order of the classes does not indicate the degree of danger.

The objective of the definitions is to establish which substances are dangerous and in which class, according to their specific characteristics, they should be included. These definitions are intended to provide criteria which should be possible to follow in the various national and international regulations.

For purposes of selecting the appropriate packaging for dangerous goods, substances are further divided into packing groups (although some classes do not have packing groups, i.e. Class 2, Division 6.2 and Class 7) in accordance with the degree of danger they present:

Packing Group I:	high danger
Packing Group II:	medium danger
Packing Group III:	low danger

Criteria for classification and assignment to a Packing Group conform to those set out in the Globally Harmonized System of Classification and Labelling of Chemicals (GHS).

Generally, articles are not assigned to packing groups. For packing purposes any requirement for a specific packaging performance level is set out in the applicable packing instruction.

When these definitions are used with the list of proper shipping names for dangerous goods, they provide guidance to those who are responsible for classifying substances; and a notable degree of standardization while retaining a flexibility that allows diverse situations to be taken into account. Classifications for substances in the Model Regulations are made on the basis of consideration of data submitted to the Sub-Committee of Experts on the Transport of Dangerous Goods by governments, intergovernmental organizations and other international organizations in the form recommended in Figure 1. However the actual data submitted are not formally endorsed by the Sub-Committee.

Revision Five of the Manual of Tests and Criteria (ST/SG/AC.10/11/Rev.5 and Amend.1) include the tests and procedures required to determine if substances are dangerous goods in transport and to determine their class and, if appropriate, their division, and their packing group or, for explosives, their compatibility group. It should be noted that the Manual is not a concise formulation of testing procedures that will unerringly lead to a proper classification of substances and it assumes, therefore, competence on the part of the testing authority and leaves responsibility for classification with them.

Wastes should be transported under the requirements of the appropriate class considering their hazards and the criteria presented in the Model Regulations. Wastes not otherwise subject to these Regulations but covered under the Basel Convention<sup>2</sup> may be transported under Class 9.

Many of the substances included in Classes 1 to 9 are deemed dangerous to the environment. Additional labelling or marking is not always specified, other than for UN Nos. 3077 and 3082, except for transport by sea. Criteria for substances and mixtures dangerous to the aquatic environment are given in Chapter 2.9 of the Model Regulations.

Many consignments of goods are treated with fumigants that pose a risk during transport, in particular to workers who may be exposed unknowingly when they open cargo transport units. The Model Regulations address fumigated cargo transport units as consignments that are subject to special documentation and warning sign requirements in the consignment procedures of Part 5.

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<sup>2</sup> Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (1989).

## **PART 3**

### **DANGEROUS GOODS LIST, LIMITED QUANTITY AND EXCEPTED QUANTITY PROVISIONS**

#### **Chapter 3.2, Dangerous Goods List**

The Dangerous Goods List in Chapter 3.2 lists the proper shipping names and UN numbers of substances most commonly transported. The list is not exhaustive but is intended to include, as much as possible, proper shipping names and UN numbers for substances that are of commercial importance. Additional information about the list is provided in Chapter 3.1.

A substance or article specifically listed by name in column 2 of the list, such as UN 1203, GASOLINE, is already classified and the requirements in the other columns of the list as well as the requirements in the body of the Model Regulations apply.

A substance that is listed in column 2 as "generic" or "not otherwise specified" such as UN 3010, COPPER BASED PESTICIDE, LIQUID, TOXIC or UN 1481, PERCHLORATES, INORGANIC, N.O.S., must be classified according to the requirements for classification in the Model Regulations and, of course, if the substance is included in any of the nine classes, the requirements in the Model Regulations apply. Note that any substance or article that is suspected of having explosive characteristics must first be considered for inclusion in Class 1. The concept of generic and "n.o.s." entries in the list is important to understand mainly because the Dangerous Goods List is not exhaustive and is really not a "list of dangerous goods" but, rather, a list of proper shipping names and UN numbers that can be assigned to substances included in any of the nine classes. These n.o.s. entries in the list represent thousands, if not millions, of substances so that the "dangerous goods list" cannot be considered a list of all dangerous goods.

In addition, the dangerous goods list in Chapter 3.2 does not include those substances that are so dangerous they are forbidden for transport without authorization, usually from competent authorities.

#### **Chapter 3.3, Special provision**

##### *Special provision 274*

The attention is drawn to the application of special provision (SP) 274: generic and "not otherwise specified" proper shipping names that are assigned to that special provision in column 6 of the Dangerous Goods List shall be supplemented with the technical or chemical group name unless a national law or international convention prohibits its disclosure if it is a controlled substance.

The following rationale for assigning SP 274 has been applied:

- SP 274 is assigned to entries for which a special provision in column 6 refers to the prohibition of carriage for one or more substances under this UN number e.g. UN 2627 with special provision (SP) 103. This helps carriers and enforcement officers in checking if goods are authorized for carriage;
- SP 274 is assigned to generic and n.o.s. entries of Division 6.1 because the knowledge of the technical name will speed up the provision of appropriate first aid measures. Exception is

made for the entries for medicines (UN 1851- 3248-3249) in order to address concerns over the disclosure of controlled medicinal substances whose identity in transport could lead to practical and logistical problems including theft and unauthorized use and distribution;

- SP 274 is assigned to generic and n.o.s. entries of classes or divisions other than Division 6.1 only if the knowledge of the technical name would lead to different emergency measures;
- SP 274 is not assigned to n.o.s. entries for gas samples (e.g. UN 3167) because this is not required by 2.0.4.1;
- SP 274 is assigned to entries for metal catalysts (e.g. UN 1378) for which the technical name can help emergency services in identifying the appropriate fire extinguishing medium;
- SP 274 is assigned to entries for elevated temperature substances (UN 3256-3257-3258) because the technical name can help emergency services in identifying the appropriate fire extinguishing medium (e.g. presence of alcohol in the substance carried) or in estimating the temperature (e.g. melting point of the substance carried).

### **Chapter 3.4, Limited quantities**

The rationale behind limited quantity provisions is that selected dangerous goods packed in small quantities and in good, robust packaging pose a lesser risk in transport than do the same goods packed in larger volumes, and on this basis some relief from the requirements may be accepted. In summary, the requirements for dangerous goods in limited quantities generally provide relief from:

- The performance packaging requirements provided they are packaged in combination packagings of not more than 30 kg gross mass including strong outer packagings or in shrink wrapped trays of not more than 20 kg gross mass;
- The labelling (except for air transport) and placarding requirements; and
- Segregation requirements.

Information on the goods transported as limited quantities is provided by specific marking and documentation.

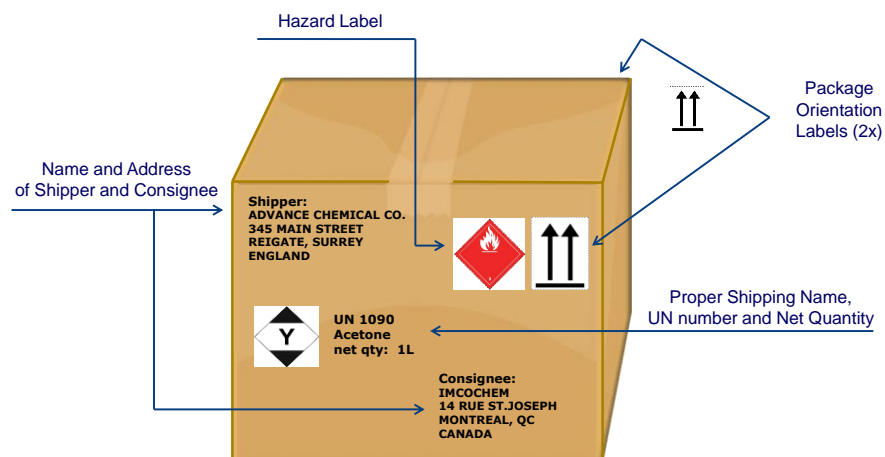
**Methodology for determining limited quantities**

<b>Class/ Division</b>	<b>Packing Group</b>	<b>Quantity</b>
1		Not permitted except for UN Nos. 0012, 0014 and 0055
2		Aerosols and gas cartridges containing toxic substances: 120 ml/30 kg Other aerosols and gas cartridges: 1 L/30 kg
2.1		Not permitted
2.2 (without subsidiary risk)		120 ml/30 kg
2.2 (with subsidiary risk)		Not permitted
2.3		Not permitted
3	I	Not permitted <sup>a</sup>
3	II	1 L/30 kg <sup>b</sup>
3	III	5 L/30 kg <sup>c</sup>
4.1		Self-reactive substances for which packing groups have not been assigned: - Temperature controlled substances: Not permitted Others: Type B or C: 25 ml - 100 g/30 kg Type D, E or F: 125 ml - 500 g/30 kg
4.1	I	Not permitted
4.1	II	Desensitized explosives : not permitted Others: 1 kg/30 kg <sup>d</sup>
4.1	III	5 kg/30 kg <sup>e</sup>
4.2		Not permitted <sup>f</sup>
4.3	I	Not permitted
4.3	II	500 ml - 500 g/30 kg <sup>g</sup>
4.3	III	1 L - 1 kg/30 kg <sup>h</sup>
5.1	I	Not permitted
5.1	II	1 L - 1 kg/30 kg <sup>i</sup>
5.1	III	5 L - 5 kg /30 kg
5.2		Temperature controlled substances: Not permitted Others: Types B or C: 25 ml - 100 g/30 kg Types D, E or F: 125 ml -500 g/30 kg
6.1	I	Not permitted
6.1	II	100 ml - 500 g/30 kg <sup>j</sup>
6.1	III	5 L - 5 kg/30 kg
7		Not permitted
8	I	Not permitted
8	II	1 L - 1 kg/30 kgk
8	III	5 L - 5 kg/30 kg <sup>l</sup>
9	II	1 L - 1 kg/30 kgm
9	III	5 L - 5 kg/30 kg <sup>n</sup>

<sup>a</sup> UN Nos. 1133, 1139, 1210, 1263, 1267, 1268, 1863, 1866 and 3295: 500 ml/30 kg.

- b UN Nos. 1133, 1139, 1169, 1197, 1210, 1263, 1266, 1286, 1287, 1306, 1866, 1999, 3065 and 3269: 5 L Chlorosilanes (UN Nos. 1162, 1196, 1250, 1298, 1305, 2985): not permitted. UN Nos. 3064, 3343 and 3357: not permitted.
- c UN Nos. 3256 and 3343: not permitted.
- d UN 3176 (molten substance): not permitted.
- e UN Nos. 2304, 2448 and 3176 (molten substances): not permitted.
- f UN 3400: 500 g/30 kg (Packing Group II) and 1 kg/30 kg (Packing Group III).
- g UN Nos. 1418, 1436, 3135, 3209 and 3292: not permitted.
- h UN Nos. 1418, 1436, 3135 and 3209: not permitted.
- i UN Nos. 3100, 3356 and 3375: not permitted.
- j UN Nos. 1569, 1600, 1693, 1697, 1700, 1701, 1737, 1738, 2016, 2017, 2312, 3124, 3250, 3361, 3362, 3416, 3417 and 3448: not permitted.
- k Chlorosilanes (UN Nos. 1724, 1728, 1747, 1753, 1762, 1763, 1766, 1767, 1769, 1771, 1781, 1784, 1799, 1800, 1801, 1804, 1816, 1818, 2434, 2435, 2437, 2986, 2987): not permitted. UN Nos. 1818, 2028, 2442, 2576, 2826 and 3301: not permitted.
- l UN 2215 (molten): not permitted.
- m UN 2969: 5 kg/30 kg. UN Nos. 3090, 3091, 3480 and 3481: not permitted.
- n UN Nos. 2216, 2590, 3257, 3258 and 3268: not permitted.

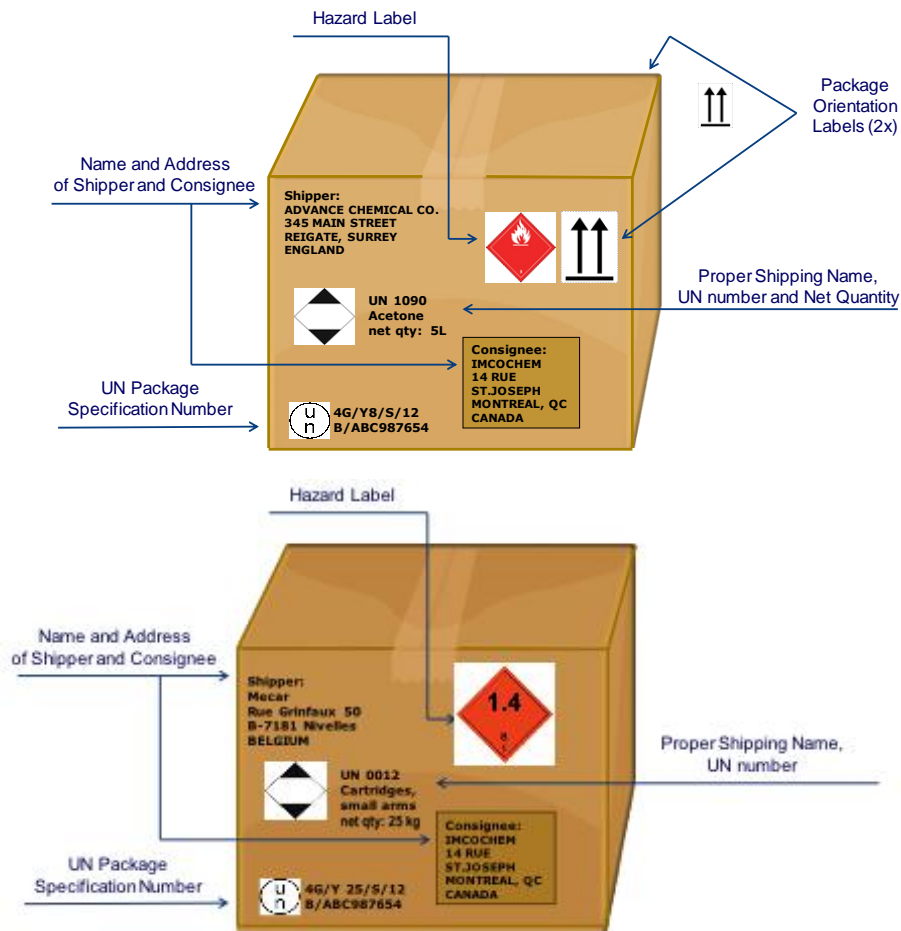
**1) Limited Quantity for Air – Acceptable for Road and Sea as per UN 3.4.9**



**2) Limited Quantity Road and Sea 3.4.7– Not acceptable for Air**



### 3) Limited Quantity Road and Sea – Fully Regulated for Air –3.4.10



### Chapter 3.5, Excepted quantities

The rationale behind excepted quantity provisions is that selected dangerous goods packed in very small quantities, other than articles, with limitations on the quantity per inner packaging and outer packaging and in very robust, tested packaging pose a lesser risk in transport than do the same goods packed in larger volumes, and on this basis some relief from the requirements may be accepted. The substances permitted and the provisions applied are based on some 20 years' experience in air transport, with no reported incidents. There is no requirement for such dangerous goods to be labelled or for transport document provisions to be met but a suitable mark, based on the established air transport mark, is used to aid identification of packages.

Given the lower level of measures applied, a threshold limit has been placed on the total quantity of such goods that may be carried on any one cargo transport unit. Given the difficulty of calculating whether the threshold is reached based on the very small net mass of dangerous goods contained in each package, that threshold is set, uniquely, simply on the total number of packages of dangerous goods packed in excepted quantities. The limit is 1000 packages per cargo transport unit.

Substances permitted in excepted quantities are based on those that may be transported by passenger aircraft by the 2005-2006 edition of the ICAO Technical Instructions. These are:



	<b>Packing Group I</b>	<b>Packing Group II</b>	<b>Packing Group III</b>
<b>Class/Division</b>	<b>E-Code</b>	<b>E-Code</b>	<b>E-Code</b>
1	E0 (not permitted)		
2.1	E0 (not permitted)		
2.2 without subsidiary risk <sup>a</sup>	E1		
2.2 with subsidiary risk	E0 (not permitted)		
2.3	E0 (not permitted)		
3 without subsidiary risk <sup>b</sup>	E3	E2	E1
3 with subsidiary risk <sup>c</sup>	E0 (not permitted)	E2	E1
4.1 <sup>d</sup>	E0 (not permitted)	E2	E1
4.2	E0 (not permitted)	E2	E1
4.3	E0 (not permitted)	E2	E1
5.1	E0 (not permitted)	E2	E1
5.2 <sup>e</sup>	E0 (not permitted)		
6.1 <sup>f,g</sup>	Substances which are toxic by inhalation <sup>k</sup> : E0 (not permitted)	E4	E1
	Other substances: E5		
6.2	E0 (not permitted)		
7	E0 (not permitted)		
8 <sup>h,i</sup>	E0 (not permitted)	E2	E1
9 <sup>j</sup>	Not applicable	E2	E1

<sup>a</sup> For gases, the volume indicated for inner packagings refers to the water capacity of the inner receptacle and the volume indicated for outer packagings refers to the combined water capacity of all inner packagings within a single outer package;

<sup>b</sup> Desensitized explosives and UN 3256 shall not be transported as excepted quantities;

<sup>c</sup> Chlorosilanes (UN Nos. 1162, 1196, 1250, 1298, 1305, 2985) shall not be transported as excepted quantities.

<sup>d</sup> Self-reactive substances, desensitized explosives, UN Nos. 2304, 2448, 3176 (molten substances) and 3360 shall not be transported as excepted quantities;

<sup>e</sup> Division 5.2 dangerous goods shall ONLY be transported as excepted quantities if in UN 3316, Chemical Kit or First Aid Kit;

<sup>f</sup> UN Nos. 1600, 2312 and 3250 (molten substances) shall not be transported as excepted quantities;

<sup>g</sup> Chlorosilanes (UN Nos. 3361, 3362) shall not be transported as excepted quantities.

<sup>h</sup> UN Nos. 2215 (molten), 2576, 2803 and 2809 shall not be transported as excepted quantities;

<sup>i</sup> Chlorosilanes (UN Nos. 1724, 1728, 1747, 1753, 1762, 1763, 1766, 1767, 1769, 1771, 1781, 1784, 1799, 1800, 1801, 1804, 1816, 1818, 2434, 2435, 2437, 2986, 2987) shall not be transported as excepted quantities.

<sup>j</sup> Code E1 applies for UN Nos. 3334 and 3335. UN Nos. 1845, 2807, 3245, 3257 and 3258 shall not be transported as excepted quantities;

<sup>k</sup> These are substances which are assigned Special Provision 354 in column (6) of the Dangerous Goods List and "TOXIC BY INHALATION" N.O.S entries.

The meaning of the Codes in the Table above is explained in 3.5.1.2 of the Model Regulations.

*“De minimis” quantities (3.5.1.4)*

Excepted quantities of dangerous goods assigned to codes E1, E2, E4, and E5 are not subject to the Model Regulations in quantities often referred to as "de minimis". The rationale behind "de minimis" quantity provisions is that selected dangerous goods packed in minute quantities, with limitations on the quantity per inner packaging and outer packaging and in good quality packaging pose a negligible risk in transport compared to those same goods packed in larger quantities. On this basis relief from all other provisions of the Model Regulations is accepted. Subjecting minute quantities of certain goods to the full requirements of the Model Regulations is of questionable value, and may also falsely communicate a risk in transport. This in turn can lead to unjustified precautions and unnecessary incident response actions which are unwarranted and have a negative effect on transport safety. To ensure consistency with the excepted quantity provisions, only dangerous goods assigned to excepted quantity codes E1, E2, E4, and E5 qualify for “de minimis” provisions:

<i>E-Code</i>	<i>Maximum quantity per inner receptacle</i>	<i>Maximum quantity per package</i>
E1, E2, E4, and E5	1 ml (liquids and gases) 1 g (solids)	100 ml (liquids and gases) 100 g (solids)

## PART 4

### PACKING AND TANK PROVISIONS

#### 4.1 BASIC PRINCIPLES FOR DEVELOPING PACKING INSTRUCTIONS FOR THE MODEL REGULATIONS

##### *General provisions:*

1. Packing Instructions should be clear and provide as wide a choice of packagings as possible.
2. The Packing Instructions consist of a small number of general instructions supplemented by a limited number of more specific instructions for particularly hazardous or specialized dangerous goods.
3. Packing Instructions should be developed with the objective of being suitable for multimodal transport. More severe packaging restrictions, in some instances, may be necessary for mode specific regulations.
4. A rationalized approach (based on similar properties or hazards presented) should be used for allocating packing instructions to specific substances.
5. The Packing Instructions are primarily intended for the person preparing the package for consignment. They should not address classification or operational provisions.

##### *The Packing Instruction Structure*

There are Packing Instructions for:

- Packagings, prefixed by "P". Included are:
  - Packagings in accordance with Chapter 6.1 (up to 450 l and/or 400 kg net, as appropriate).
  - Pressure receptacles in accordance with Chapter 6.2.
  - Packagings for Division 6.2 substances in accordance with Chapter 6.3.
  - Packagings or packing methods not subject to the provisions of Chapters 6.1, 6.2, 6.3, 6.5 or 6.6.
- IBCs, prefixed by "IBC", up to 3 m<sup>3</sup> (intermediate bulk containers in accordance with Chapter 6.5);
- Large packagings, prefixed by "LP", exceeding 400 kg net or 450 l (large packagings in accordance with Chapter 6.6).

The majority of substances and articles, excluding Classes 1, 2 and 7, have been allocated to a packing instruction beginning "P00\*". When considering new Packing Instructions the use of one of these numbers should be considered first; class specific packing instructions should only be used when there is need for restricted packaging options or extensive special conditions. The exception to this rule is P004 to which fuel cell cartridges containing dangerous goods of different Classes are assigned.

Where the "P00\*" instructions cannot be used then there are series of class specific packing instructions all beginning with the class number. In some cases it will be necessary to indicate in the Packing Instruction that in addition to the permitted design types packages and any quantity thresholds that are specified, there are some 'Additional Requirements' that apply for all substances or articles assigned to that Packing Instruction. An example is the requirement to protect cells and batteries against short circuit as may be found in Packing Instruction P801 or P903. Some Packing Instructions may need to include provisions which are relevant only for a small number of substances or articles among many others that are assigned to a particular Packing Instruction. These are referred to as Special Packing Provisions and because these are indicated in Column 9 of the Dangerous Goods List they are individually numbered as PPxx. An example is PP28 which is specific to Perchloric Acid in Packing Instruction P502. Some, such as PP26 which requires packagings to be lead free, will appear in more than one Packing Instruction with the same number since the requirement is the same but the UN numbers to which it applies are different.

Where a solid or liquid substance can only be transported in a cylinder then allocation to Table 3 of P200 shall be considered.

#### *Packagings "P"*

Some general principles of assignment of substances to Packing Instructions and examples of exceptions are given below:

#### **Class 1 P100s**

Given the intrinsic properties of explosive substances and articles and the variable effects that they display depending on the manner in which they are packaged, the classification process addresses issues of possible over-confinement, for example in metal packagings. Such packagings are often chosen for their robustness in handling rather than their appropriateness in transport.

However, given the desirability of uniformity in assessing packaging in relation to the classification process (as set out in the Manual of Tests and Criteria) it has been decided that packagings used to transport explosive substances and articles should meet the Packing Group II test performance level.

Similar principles apply to the assignment of packaging for organic peroxides and self-reactive substances.

#### **Class 2 P200s**

For gases, except some small articles containing gas such as UN2037 or UN3150 which are allocated to P003.

#### **Class 3 P300s**

Flammable liquids with explosive properties are assigned to P300 (UN 3064). Substances that form part of chemical kits are assigned to P302.

#### **Class 4 P400s**

Many substances of this class have been allocated to special P400 Packing Instructions.

Self reactive substances in Division 4.1 are packaged in the same way as organic peroxides and are allocated to P520. This Packing Instruction contains packing method codes OP1 to OP8 which refer to the packing methods for the various types of organic peroxides/self reactive substances.

#### **Class 5 P500s**

Chemical oxygen generators only are assigned to P500 and stabilized hydrogen peroxide only is assigned to P501.

Substances of Division 5.2 are assigned to P520. This Packing Instruction contains packing method codes OP1 to OP8 which refer to the packing methods for the various types of organic peroxides/self reactive substances.

**Division 6.1 P600s**

Toxic ammunition and tear gas candles are assigned to P600.

**Division 6.2 P600s**

Infectious substances are assigned to P620, P621 or P650.

**Class 7**

No packing instructions have yet been allocated to radioactive materials as the packaging requirements have been set by IAEA and do not align easily to the system for the other classes. Instead radioactive material is assigned to special UN numbers which depend on a number of characteristics including packaging such as the activity level of radionuclides in the package, or the fissile or non fissile properties.

**Class 8**

There are a number of specific Packing Instructions for Class 8 substances and articles.

**Class 9**

Substances and articles of this Class each have a hazard not covered by other Classes. When any substance or article is assigned to this Class its unique properties will need to be considered in developing or assigning a Packing Instruction.

The following should form the template for any new proposal to the UN Subcommittee of experts for new Packing Instruction (PXXX) for Classes/Divisions 3, 4, 5.1, 6, 8 or 9.

PXXX	PACKING INSTRUCTION	PXXX
For specific UN number(s) ONLY: <b>This instruction applies to UNXXXX.....</b> (E.g. see P301) Packing instructions for articles should consider the required packaging performance level.		
The following packagings are authorized, provided that the general provisions of <b>4.1.1</b> and <b>4.1.3</b> are met: Sometimes additional paragraphs will need to be quoted or alternatives given e.g. P620		
		<b>Maximum net mass (see 4.1.3.3)</b>
<b>Combination packagings</b>		
<b>Inner packagings</b>	<b>Outer packagings</b>	
List permitted types and capacity/mass	<b>Drums</b> List permitted types <b>Boxes</b> List permitted types <b>Jerricans</b> List permitted types	
		<b>Maximum capacity (see 4.1.3.3)</b>
<b>Single packagings</b>		
<b>Drums</b> List permitted types <b>Jerricans</b> List permitted types <b>Boxes</b> List permitted types <b>Bags</b> List permitted types		
<b>Composite packagings</b> List permitted types		
<b>Pressure receptacles</b> , provided the general provisions of 4.1.3.6 are met If 4.1.3.6 is not sufficient then the use of cylinders should be addressed in detail. E.g.P602(4)		
<b>Additional requirements</b> This section should contain additional packaging information which should be applicable to specific or all the packaging choices listed above		
<b>Special packing provision</b> <b>PPXX</b> For UNxxxx..... These should address specific requirements for individual or groups of substances. The provision should only address packaging issues and not classification or operational provisions.		

#### 4.2 RATIONALIZED APPROACH FOR THE ASSIGNMENT OF IBC PACKING INSTRUCTIONS TO SUBSTANCES OF CLASSES 3, 4, 5, 6, 8, AND 9

*General provisions:*

The following are not allowed in IBCs:

- Explosives of Class 1 (other than UN Nos. 0082, 0241, 0331 and 0332)
- Desensitized explosives of Class 3 (other than UN Nos. 1204 and 2059, Packing Group II and III)
- Desensitized explosives of Division 4.1
- Pyrophoric substances of Division 4.2

- Gases of Class 2
- Chlorosilanes
- Radioactive Materials of Class 7 (except as provided in 6.4.5.4.5)
- Packing Group I Liquids of any Class or Division
- Liquids with a vapour pressure  $\geq 110$  kPa at 50 °C (other than substances specifically permitted, i.e. UN 2672)

*IBC Packing instruction assignment table:*

The following table indicates the appropriate IBC Packing Instruction assignment for substances based on their Class or Division, Special Properties, Subsidiary Risk, and Packing Group. A dash in the subsidiary risk column indicates that the IBC Instruction is assigned irrespective of the substance's subsidiary risk unless otherwise stated in the Special Properties column. The unique physical and chemical properties of a substance must be considered when determining an appropriate IBC assignment.

<b>IBC packing instruction assignments</b>				
<b>Class or Division</b>	<b>Special properties</b>	<b>Subsidiary risk</b>	<b>PG</b>	<b>IBC instruction</b>
1	-Explosive, blasting, type B or E in Division 1.1D (UN 0082, UN 0241) -Explosive, blasting, type B or E in Division 1.5D (UN 0331, UN 0332)	-	-	IBC100
3		-	II	IBC02
		-	III	IBC03
4.1	Sulphides and Hydrides	-	II	IBC04
	Wetted powders, n.o.s. substances with a subsidiary risk, and solids containing a flammable liquid (UN 3175)	-	II	IBC06
	4.1 PG II substances other than those identified above	-	II	IBC08
	Fused calcium resinate (UN 1314) and Metal hydrides, flammable, n.o.s. (UN 3182)	-	III	IBC04
	Resinates and n.o.s. substances with a subsidiary risk	-	III	IBC06
	4.1 PG III substances other than those identified above	-	III	IBC08
4.2	Liquids	-	II	IBC02
	Solids with a subsidiary risk	-	II	IBC05
	Solids without a subsidiary risk	None	II	IBC06
	Fish meal, unstabilized (UN 1374) and Organic pigments, self-heating (UN 3313)	-	II	IBC08
	Liquids	-	III	IBC02
	Maneb (UN 2210)	-	III	IBC06
	Solids	-	III	IBC08
4.3	Alkali metals, (Caesium, Lithium, Rubidium, Sodium, Potassium), Calcium carbide, and Lithium nitride	-	I	IBC04
	Liquids	-	II	IBC01
	Hydrides, Sulphides, and Organometallic substance, solid, water-reactive (UN 3395)	-	II	IBC04
	Solids with a flammable subsidiary risk	4.1	II	IBC04
	Solids with a subsidiary risk other than flammability	Other than 4.1	II	IBC05

IBC packing instruction assignments				
Class or Division	Special properties	Subsidiary risk	PG	IBC instruction
	Solids without a subsidiary risk	None	II	IBC07
	Liquids	-	III	IBC02
	Solids with a flammable subsidiary risk	4.1	III	IBC06
	Solids without a flammable subsidiary risk	Other than 4.1	III	IBC08
5.1	Sodium peroxide (UN 1504) and Oxidizing solid, n.o.s. (UN 1479)	-	I	IBC05
	Potassium peroxide (UN 1491), Potassium superoxide (UN 2466), and Sodium superoxide	-	I	IBC06
	<b>Liquid:</b> -n.o.s. substances with a subsidiary risk -Nitrites, inorganic, aqueous solution, n.o.s. (UN 3219)	-	II	IBC01
	<b>Liquid:</b> -liquids other than those assigned to IBC01	-	II	IBC02
	<b>Solid:</b> -chlorates and chlorites (n.o.s. substances only) -permanganates -peroxides -n.o.s. substances with a subsidiary risk	-	II	IBC06
	<b>Solid:</b> -nitrates and nitrites -chlorates and chlorites (other than n.o.s substances) -solids other than those assigned to IBC06	-	II	IBC08
	Liquids	-	III	IBC02
	Solids	-	III	IBC08
6.1	Solids without a subsidiary risk other than those evolving vapours that are toxic (i.e. Cyanogen bromide) or irritating (i.e. Tear gas substance, solid, n.o.s.)	None	I	IBC07
	Liquids	-	II	IBC02
	Solids	-	II	IBC08
	Liquids	-	III	IBC03
	Solids	-	III	IBC08
6.2	Clinical waste, unspecified, n.o.s. (UN 3291)	-	II	IBC620
8	Solids without a subsidiary risk	None	I	IBC07
	Liquids with a self-heating subsidiary risk	4.2	II	Not Allowed
	Liquids other than those with a self-heating subsidiary risk	All except 4.2	II	IBC02
	Solids containing corrosive liquid, n.o.s. (UN 3244)	-	II	IBC05
	Solids with a self-heating, water-reactive or oxidizing subsidiary risk	4.2, 4.3 or 5.1	II	IBC06
	Liquids	-	III	IBC03
	Solids	-	III	IBC08
9 <i>Note: Class 9 IBC authorizations should</i>	Elevated temperature liquid (UN 3257)	-	III	IBC01
	Liquids	-	III	IBC03



IBC packing instruction assignments				
Class or Division	Special properties	Subsidiary risk	PG	IBC instruction
<i>be considered based on the specific properties of the substance.</i>	Solids	-	III	IBC08

The following substances are allowed in IBCs only on the basis of an approval by the competent authority:

Substances assigned IBC99				
UN#	Name	Class/Div.	PG	Subsidiary risk
3286	FLAMMABLE LIQUID, TOXIC, CORROSIVE, N.O.S.	3	II	6.1 8
2359	DIALLYLAMINE	3	II	6.1 8
3230	SELF-REACTIVE SOLID TYPE F	4.1		
3229	SELF-REACTIVE LIQUID TYPE F	4.1		
3208	METALLIC SUBSTANCE, WATER-REACTIVE, N.O.S.	4.3	I	
2813	WATER-REACTIVE SOLID, N.O.S.	4.3	I	
3132	WATER-REACTIVE SOLID, FLAMMABLE, N.O.S.	4.3	I	4.1
3375	AMMONIUM NITRATE EMULSION or SUSPENSION or GEL, intermediate for blasting explosives	5.1	II	
2588	PESTICIDE, SOLID, TOXIC, N.O.S.	6.1	I	
3288	TOXIC SOLID, INORGANIC, N.O.S.	6.1	I	
2811	TOXIC SOLID, ORGANIC, N.O.S.	6.1	I	
2930	TOXIC SOLID, FLAMMABLE, ORGANIC, N.O.S.	6.1	I	4.1
3290	TOXIC SOLID, CORROSIVE, INORGANIC, N.O.S.	6.1	I	8
2928	TOXIC SOLID, CORROSIVE, ORGANIC, N.O.S.	6.1	I	8
2921	CORROSIVE SOLID, FLAMMABLE, N.O.S.	8	I	4.1
2923	CORROSIVE SOLID, TOXIC, N.O.S.	8	I	6.1
3245	GENETICALLY MODIFIED MICROORGANISMS	9		

#### 4.3 GUIDELINES FOR ASSIGNING PORTABLE TANK REQUIREMENTS TO SUBSTANCES LISTED IN THE DANGEROUS GOODS LIST

1. These guidelines are provided as a reference to be used for assigning portable tank requirements to specific substances listed in the dangerous goods list. The guidelines were developed taking into consideration the hazards of dangerous goods and their physical and chemical characteristics.
2. For certain substances, the tank requirements recommended by these guidelines may not be appropriate owing to unique characteristics of the substance not addressed in these guidelines. In these instances expert judgement should be applied in assigning appropriate requirements. For example bottom openings may not be appropriate for substances corrosive to ship structures.
3. The guidelines are provided in three parts. Part I provides general guidance. Part II provides specific guidance for groups of substances organized on the basis of the Class or Division, Packing Group and subsidiary risk. Part III provides guidance on the assignment of TP notes.

## A. GENERAL GUIDELINES

In assigning tank requirements to a substance the following should be taken into account:

**Prohibited substances:** Some substances should be prohibited from transport in portable tanks. These substances are considered too dangerous for transport in bulk typically because of their instability or because they pose an unacceptably high level of risk when transported in bulk quantities under normal conditions of transport. The following substances are prohibited from transport in portable tanks:

- Substances of Class 1 (other than UN 0331 or UN 0332 - Explosive, blasting, type B or E (Agent, blasting, type B or E));
- Desensitized explosives of Class 3;
- Desensitized explosives of Division 4.1;
- Self-reactive substances (other than type F);
- Organic peroxides of Division 5.2 other than type F; and
- Radioactive materials other than Low Specific Activity (LSA) non-fissile or fissile excepted materials.

Additional prohibited substances are specifically identified in the Model Regulations. Furthermore, some substances may only be transported on the basis of an approval by the competent authority.

**Minimum shell thicknesses:** The minimum shell thicknesses prescribed are provided in thicknesses relevant to reference steel with a guaranteed minimum tensile strength of 370 N/mm<sup>2</sup> and a guaranteed minimum elongation of 27%. When other materials are used equivalent thickness calculations should be performed. Minimum thicknesses range from 5 mm to 10 mm. Part II of the guidelines provides guidance for assigning minimum thicknesses. Granular or powdered solid substances of packing groups II or III may be transported in tanks with minimum shell thicknesses of 5 mm in the reference steel regardless of the tank diameter when 6.7.2.4.2 of the Model Regulations is specified in the portable tank instructions in 4.2.5.2.6 relevant to a given substance. Regardless of the minimum thickness specified in Part II, if the thickness determined in accordance with the provisions of sections 6.7.2.4 is greater, the greater thickness shall be applied. A reduced thickness may also be authorized in accordance with 6.7.2.4.3 for substances assigned to portable tank instructions T1 and T2.

**Corrosive effects of substances on materials of construction:** The minimum thicknesses prescribed do not take a substance's corrosive effects into account. The consignor must ensure that the tank materials of construction are compatible with the lading.

**Minimum test pressures:** Irrespective of the pressure assigned in these guidelines, the minimum test pressure assigned to an individual substance should be the greater of the pressure determined on the basis of the definitions in 6.7.2.1 of the Model Regulations and the pressure assigned in these guidelines.

**Pressure-relief devices requirements:** Two pressure relief device requirements are possible,

- (1) "Normal" (where the provisions of paragraph 6.7.2.8.1 apply); or
- (2) 6.7.2.8.3.

When paragraph 6.7.2.8.3 is referenced, a frangible disk must be provided in series preceding the pressure relief device. Paragraph 6.7.2.8.3 should be assigned to substances that have the potential to polymerize or to produce solid or highly viscous substances capable of preventing proper operation of the relief valve.

In addition, 6.7.2.8.3 is also specified for certain groups of substances as indicated in Part II and for individual substances as indicated in the Dangerous Goods List of Chapter 3 of the Model Regulations based on the decisions of the Committee of Experts having particular regard to inhalation toxicity.

**Bottom openings:** Three possible bottom opening arrangements are proposed, 6.7.2.6.3 (which indicates three serially mounted means of closure), 6.7.2.6.2 (two serially mounted means of closure) or "Not Allowed". Bottom openings are not allowed for packing group I and certain packing group II substances which are highly corrosive to steel or aluminium.

**Filling limits:** Three different filling restrictions are possible. The filling limits are considered operational requirements. The filling limits do not have a direct relationship to the construction of the tank or the arrangement of the service equipment. On this basis, filling limits are not addressed in Part II of this Annex and will not be included in the tank type designations. The maximum filling limit for a substance should be consistent with the provisions under "Filling" in Chapter 4.2 of the Model Regulations. The consignor of the dangerous goods has the ultimate responsibility for assuring portable tanks are not filled in excess of the specified limits for each substance, solution or mixture transported.

**Molten substances:** Assignments for molten substances of all classes should be based on the requirements established for liquids of the same class, division, packing group and subsidiary risk of the molten substance taking into account the hazards posed by the high temperature of the substance during loading, unloading and while in transport (see 4.2.1.18). Specific filling limits apply for molten and elevated temperature substances (see 4.2.1.9.5).

**B. GUIDANCE FOR GROUPS OF SUBSTANCES BASED ON CLASS OR DIVISION,  
PACKING GROUP AND SUBSIDIARY RISK**

<b>Class or Division</b>	<b>PG</b>	<b>Sub-Risk</b>	<b>Tank Instruction</b>	<b>Notes</b>
<b>1</b>			T1	Only UN 0331 or UN 0332 - Explosive, blasting, type B or E (Agent, blasting, type B or E) are authorized for transport in portable tanks.
<b>2.1</b>			T50/T75	T50 applies to non-refrigerated liquefied flammable gases. T75 applies to refrigerated liquefied flammable gases. These are evaluated on a case by case basis.
<b>2.2</b>			T50/T75	T50 applies to non-refrigerated liquefied gases. T75 applies to refrigerated liquefied gases. These are evaluated on a case by case basis.
<b>2.3</b>			T50	These are evaluated on a case by case basis.
<b>3</b>	I	Any other than 6.1/8	T11	
	II	Any other than 6.1/8	T4 or T7 <sup>a</sup>	
	III	Any other than 6.1/8	T2 or T4 <sup>a</sup>	
<b>3</b>	I	6.1 or 8	T14	
	II	6.1 or 8	T7 or T11 <sup>a</sup>	T10 and T14 <sup>a</sup> apply to chlorosilanes
	III	6.1 or 8	T4 <sup>a</sup> or T7 <sup>b</sup>	
<b>4.1</b>	I	Any		Desensitized explosives of Division 4.1 are not authorized for transport in portable tanks. Only Type F Self-reactive substances are authorized for transport in tanks. These substances are assigned T23.
	II	Any	T3	
	III	Any	T1	
<b>4.2 Liquids</b>	I	Any	T21	
	II	Any		Portable tank instructions are not currently assigned to any liquid self-heating substances
	III	Any		
<b>4.2 Solids</b>	I	Any	T21	
	II	Any	T3	
	III	Any	T1	

<sup>a</sup> This instruction shall be assigned to n.o.s. substances and may also be assigned based on the absolute vapour pressure of the substance.

<sup>b</sup> This instruction shall be assigned to n.o.s. substances with a Division 6.1 subsidiary risk.

Class or Division	PG	Sub-Risk	Tank Instruction	Notes
4.3 Liquids	I	Any other than 6.1/8	T9 or T13 <sup>a</sup>	
	II	Any other than 6.1/8	T7	
	III	Any other than 6.1/8	T7	
4.3 Liquids	I	6.1 or 8	T10 or T14 <sup>a</sup>	
	II	6.1 or 8	T7 or T11 <sup>a</sup>	
	III	6.1 or 8	T7	
4.3 Solids	I	Any	T9	
	II	Any	T3	
	III	Any	T1	
5.1 Liquids	I	Any other than 8	T10	
	II	Any other than 8	T4	
	III	Any other than 8	T4	
5.1 Liquids	I	8	T10 or T14 <sup>a</sup>	Substances with both toxic <i>and</i> corrosive subsidiary risks are assigned T22.
	II	8	T7 or T11 <sup>a</sup>	
	III	8	T7	
5.1 Solids	I	Any	Not Allowed	
	II	Any	T3	
	III	Any	T1	
5.2				Only Type F organic peroxides are authorized for transport in tanks. These substances are assigned T23.
6.1 Liquids (TIH)	I	Any	T20	This instruction shall be assigned to substances with an LC <sub>50</sub> less than or equal to 1000 ml/m <sup>3</sup> and saturated vapour concentration greater than or equal to 10 LC <sub>50</sub> .
			T22	This instruction shall be assigned to substances with an LC <sub>50</sub> less than or equal to 200 ml/m <sup>3</sup> and a saturated vapour concentration greater than or equal to 500 LC <sub>50</sub> .
6.1 Liquids	I	Any	T14	
	II	Any	T7 or T8 <sup>c</sup> or T11 <sup>a</sup>	T14 <sup>a</sup> applies to chlorosilanes
	III	Any	T4 or T7 <sup>a</sup>	

<sup>a</sup> This instruction shall be assigned to n.o.s. substances and may also be assigned based on the absolute vapour pressure of the substance.

<sup>c</sup> This instruction shall be assigned to n.o.s. substances with a Division 6.1 subsidiary risk.

Class or Division	PG	Sub-Risk	Tank Instruction	Notes
<b>6.1 Solids</b>	I	Any	T6	
	II	Any	T3	
	III	Any	T1	
<b>8 Liquids</b>	I	Any	T10 or T14 <sup>a</sup> or T20 <sup>d</sup> or T22 <sup>d</sup>	
	II	Any	T7 or T8 <sup>c</sup> or T11 <sup>a</sup>	T10 and T14 <sup>a</sup> apply to chlorosilanes
	III	Any	T4 or T7 <sup>a</sup>	
<b>8 Solids</b>	I	Any	T6	
	II	Any	T3	
	III	Any	T1	
<b>9 Liquids</b>	II	Any	T4	Special consideration may need to be given to Class 9 substances based on the substances' properties.
	III	Any	T4	
<b>9 Solids</b>	II	Any	T3	
	III	Any	T1	

<sup>a</sup> This instruction shall be assigned to n.o.s. substances and may also be assigned based on the absolute vapour pressure of the substance.

<sup>c</sup> This instruction shall be assigned to n.o.s. substances with a Division 6.1 subsidiary risk.

<sup>d</sup> T20 shall be assigned to substances with an LC<sub>50</sub> less than or equal to 1000 ml/m<sup>3</sup> and saturated vapour concentration greater than or equal to 10 LC<sub>50</sub>. T22 shall be assigned to substances with an LC<sub>50</sub> less than or equal to 200 ml/m<sup>3</sup> and a saturated vapour concentration greater than or equal to 500 LC<sub>50</sub>.

## C. GUIDELINES FOR ASSIGNING PORTABLE TANK SPECIAL PROVISIONS (TP NOTES) TO INDIVIDUAL SUBSTANCES

Portable tank special provisions should be considered on an individual basis depending on the characteristics of the substances. The following guidance should be used:

**TP1** The degree of filling prescribed in 4.2.1.9.2 shall not be exceeded.

$$\text{Degree of filling} = \frac{97}{1 + \alpha(t_r - t_f)}$$

*(Note: TP1 applies to liquid substances with a vapour pressure of not more than 175 kPa (1.75 bar) at 65 °C other than substances of Division 6.1 or Class 8 in PG I or II)*

**TP2** The degree of filling prescribed in 4.2.1.9.3 shall not be exceeded.

$$\text{Degree of filling} = \frac{95}{1 + \alpha(t_r - t_f)}$$

*(Note: TP2 applies to liquid substances with a vapour pressure greater than 175 kPa (1.75 bar) at 65 °C and also to substances of Division 6.1 or Class 8 in PG I or II.)*

**TP3** The maximum degree of filling (in %) for solids transported above their melting points and for elevated temperature liquids shall be determined in accordance with 4.2.1.9.5.1.

$$\text{Degree of filling} = 95 \frac{d_r}{d_f}$$

*(Note: TP3 applies to solids transported above their melting point and to elevated temperature liquids.)*

**TP4** The degree of filling shall not exceed 90% or, alternatively, any other value approved by the competent authority (see 4.2.1.16.2).

*(Note: TP4 applies to low specific activity radioactive materials authorized for transport in portable tanks, and to sulphur trioxide, stabilized.)*

**TP5** The degree of filling prescribed in 4.2.3.6 shall be met.

*(Note: TP5 applies to refrigerated liquefied gases.)*

**TP6** To prevent the tank bursting in any event, including fire engulfment, it shall be provided with pressure-relief devices which are adequate in relation to the capacity of the tank and to the nature of the substance transported. The device shall also be compatible with the substance.

*(Note: TP6 applies to Hydrogen peroxides (UN Nos. 2014, 2015, 2984 and 3149) and Chloroprene, UN 1991.)*

**TP7** Air shall be eliminated from the vapour space by nitrogen or other means.

*(Note: TP7 applies to pyrophoric, water reactive and other substances that are reactive with air, water or moisture.)*

**TP8** The test pressure for the portable tank may be reduced to 1.5 bar when the flash point of the substances transported is greater than 0 °C.

*(Note: TP8 applies to certain flammable liquids with a flash point greater than 0 °C.)*

**TP9** A substance under this description shall only be transported in a portable tank under an approval granted by the competent authority.

*(Note: TP9 is assigned only to UN 3375.)*

**TP10** A lead lining, not less than 5 mm thick, which shall be tested annually, or another suitable lining material approved by the competent authority is required.

*(Note: TP10 applies to bromine or bromine solutions.)*

**TP12** This tank provision, which applied to substances highly corrosive to steel, is no longer used.

*(Note: The designation "highly corrosive to steel" is not defined or established by specific criteria and is based on expert judgement.)*

**TP13** Self-contained breathing apparatus shall be provided when this substance is transported.

*(Note: TP13 applies to substances which are toxic by inhalation.)*

**TP16** The tank shall be fitted with a special device to prevent under-pressure and excess pressure during normal transport conditions. This device shall be approved by the competent authority. Pressure-relief requirements are as indicated in 6.7.2.8.3 to prevent crystallization of the product in the pressure-relief valve.

*(Note: TP16 applies to ammonium nitrate, liquid (hot concentrated solution).)*

**TP17** Only inorganic non-combustible materials shall be used for thermal insulation of the tank.

*(Note: TP17 applies to blasting explosives and blasting agents of types B or E, ammonium nitrate, liquid (hot concentrated solution), and to ammonium nitrate emulsions, suspensions, or gels.)*

**TP18** Temperature shall be maintained between 18 °C and 40 °C. Portable tanks containing solidified methacrylic acid shall not be reheated during transport.

*(Note: TP18 applies to stabilized methacrylic acid.)*

**TP19** The calculated shell thickness shall be increased by 3 mm. Shell thickness shall be verified ultrasonically at intervals midway between periodic hydraulic tests.

*(Note: TP19 applies to sulphur dioxide and chlorine.)*

**TP20** This substance shall only be transported in insulated tanks under a nitrogen blanket.

*(Note: TP20 applies to ethylene oxide, or ethylene oxide with nitrogen, up to a total pressure of 1 MPa (10 bar) at 50 °C.)*

**TP21** The shell thickness shall be not less than 8 mm. Tanks shall be hydraulically tested and internally inspected at intervals not exceeding 2.5 years.

*(Note: TP21 applies to dinitrogen tetroxide and trifluoroacetyl chloride.)*

**TP22** Lubricant for joints or other devices shall be oxygen compatible.

*(Note: TP22 applies to refrigerated liquids containing oxygen.)*

**TP23** Transport permitted under special conditions prescribed by the competent authorities.

*(Note: TP23 applies to hydrogen, refrigerated liquid.)*



**TP24** The portable tank may be fitted with a device located under maximum filling conditions in the vapour space of the shell to prevent the build up of excess pressure due to the slow decomposition of the substance transported. This device shall also prevent an unacceptable amount of leakage of liquid in the case of overturning or entry of foreign matter into the tank. This device shall be approved by the competent authority or its authorized body.

*(Note: TP24 applies to substances liable to build up excess pressure due to decomposition.)*

**TP25** Sulphur trioxide 99.95% pure and above may be transported in tanks without an inhibitor provided that it is maintained at a temperature equal to or above 32.5 °C.

*(Note: TP25 applies to stabilized sulphur trioxide.)*

**TP26** When transported under heated conditions, the heating device shall be fitted outside the shell. For UN 3176 this requirement only applies when the substance reacts dangerously with water.

*(Note: TP26 applies to substances transported in a molten state which react dangerously with water.)*

**TP27** A portable tank having a minimum test pressure of 4 bar may be used if it is shown that a test pressure of 4 bar or less is acceptable according to the test pressure definition in 6.7.2.1.

*(Note: TP27 applies when a higher test pressure has been assigned to a substance on the basis of its generic nomenclature, but it can be shown that a test pressure of 4 bar or less is acceptable according to the test pressure definition in 6.7.2.1 for the particular substance transported.)*

**TP28** A portable tank having a minimum test pressure of 2.65 bar may be used if it is shown that a test pressure of 2.65 bar or less is acceptable according to the test pressure definition in 6.7.2.1.

*(Note: TP28 applies when a higher test pressure has been assigned to a substance on the basis of its generic nomenclature, but it can be shown that a test pressure of 2.65 bar or less is acceptable according to the test pressure definition in 6.7.2.1 for the particular substance transported.)*

**TP29** A portable tank having a minimum test pressure of 1.5 bar may be used if it is shown that a test pressure of 1.5 bar or less is acceptable according to the test pressure definition in 6.7.2.1.

*(Note: TP29 applies when a higher test pressure has been assigned to a substance on the basis of its generic nomenclature, but it can be shown that a test pressure of 1.5 bar or less is acceptable according to the test pressure definition in 6.7.2.1 for the particular substance transported.)*

**TP30** This substance shall be transported in insulated tanks.

*(Note: TP30 applies to stabilized methacrylic acid.)*

**TP31** This substance may only be transported in tanks in the solid state.

*(Note: TP31 applies to certain substances whose proper shipping name authorizes a solid and a liquid state but whose portable tank instruction and special provisions only apply to the solid state.)*

**TP32** For UN Nos. 0331, 0332, 2426 and 3375, portable tanks may be used subject to the following conditions:

(a) To avoid unnecessary confinement, each portable tank constructed of metal shall be fitted with a pressure-relief device that may be of the reclosing spring-loaded type, a frangible disc or

a fusible element. The set to discharge or burst pressure, as applicable, shall not be greater than 2.65 bar for portable tanks with minimum test pressures greater than 4 bar;

(b) The suitability for transport in tanks shall be demonstrated. One method to evaluate this suitability is test 8 (d) in Test Series 8 (see "*Manual of Tests and Criteria*", Part 1, sub-section 18.7);

(c) Substances shall not be allowed to remain in the portable tank for any period that could result in caking. Appropriate measures shall be taken to avoid accumulation and packing of substances in the tank (e.g. cleaning, etc).

*(Note: TP32 applies to blasting explosives and blasting agents of Division 1.5 of types B or E, and to ammonium nitrate emulsions, suspensions, or gels.)*

**TP33** The portable tank instruction assigned for this substance applies for granular and powdered solids and for solids which are filled and discharged at temperatures above their melting point which are cooled and transported as a solid mass. For solids which are transported above their melting point see 4.2.1.19.

*(Note: TP33 applies to certain granular and powdered solids and to certain solids which are filled and discharged at temperatures above their melting point which are cooled and transported as a solid mass.)*

**TP34** Portable tanks need not be subjected to the impact test in 6.7.4.14.1 if the portable tank is marked "NOT FOR RAIL TRANSPORT" on the plate specified in 6.7.4.15.1 and also in letters of at least 10 cm high on both sides of the outer jacket.

*(Note: TP34 applies to hydrogen, refrigerated liquid and helium, refrigerated liquid.)*

**TP35** Portable tank instruction T14 prescribed in the Model Regulations annexed to the 14th revised edition of the Recommendations on the Transport of Dangerous Goods may continue to be applied until 31 December 2014.

*(Note: TP35 applies to certain toxic by inhalation liquids with portable tank instruction T20 or T22.)*

**TP36** Fusible elements in the vapour space may be used on portable tanks.

*(Note: TP36 applies to organometallic substances of Divisions 4.2 and 4.3.)*

**TP37** Portable tank instruction T14 may continue to be applied until 31 December 2016 except that until that date:

(a) For UN Nos. 1810, 2474 and 2668, T7 may be applied;

(b) For UN No. 2486, T8 may be applied; and

(c) For UN No. 1838, T10 may be applied.

*(Note: TP37 applies to certain toxic by inhalation liquids with portable tank instruction T20 or T22.)*

**TP38** The portable tank instruction T9 prescribed in the Model Regulations annexed to the sixteenth revised edition of the Recommendations on the Transport of Dangerous Goods may continue to be applied until 31 December 2018.

*(Note: TP38 applies to UN No. 3148, packing group I, for which T13 was assigned in the Model Regulations annexed to the seventeenth revised edition of the Recommendations instead of T9.)*

**TP39** The portable tank instruction T4 prescribed in the Model Regulations annexed to the sixteenth revised edition of the Recommendations on the Transport of Dangerous Goods may continue to be applied until 31 December 2018.

*(Note: TP39 applies to UN No. 2381 for which T7 was assigned in the Model Regulations annexed to the seventeenth revised edition of the Recommendations instead of T4 to take into account subsidiary risk 6.1.)*

**TP40** Portable tanks shall not be transported when connected with spray application equipment.

*(Note: TP40 applies to Chemicals under pressure.)*

## **D. USE OF BULK CONTAINERS**

*To be developed.*

## **PART 5**

### **CONSIGNMENT PROCEDURES**

Whenever dangerous goods are offered for transport certain measures should be taken to ensure that the potential risks the dangerous goods pose in transport are correctly communicated. This has traditionally been accomplished through marking and labelling of packages and by placarding of cargo transport units to indicate the hazards of the dangerous goods and through the inclusion of relevant information in the dangerous goods transport documents. Requirements are in Chapters 5.2, 5.3, 5.4 and 5.5 of the Model Regulations.

The labels illustrated in 5.2.2.2 of the Model Regulations should be affixed on dangerous goods or packages containing dangerous goods. The labelling system is based on the classification of dangerous goods and was established with the following aims in mind:

- (a) To make dangerous goods easily recognizable by the general appearance (symbol, colour and shape) of the labels they bear;
- (b) To provide a useful first guide for handling, stowage and segregation.

In certain cases, where the hazard posed by dangerous goods is considered low, or the dangerous goods are in a limited quantity, exemptions from labelling may be provided. In such cases, marking of packages with the class or division and the packing group number may be required.

One of the primary requirements of the dangerous goods transport document is to convey basic hazard information about the dangerous goods being offered for transport. It is recognized that individual national authorities or international organizations may consider it necessary to require additional information. However, the basic items of information considered necessary for each of the dangerous goods offered for transport by any mode are identified in Chapter 5.4 of the Model Regulations.

## **PART 6**

### **CONSTRUCTION AND TESTING OF PACKAGINGS, INTERMEDIATE BULK CONTAINERS (IBCs), LARGE PACKAGINGS, PORTABLE TANKS, MULTIPLE-ELEMENT GAS CONTAINERS (MEGCs) AND BULK CONTAINERS**

#### **CHAPTER 6.2: SYSTEM FOR PROVIDING A PERIOD OF TRANSITION WHEN NEW STANDARDS REPLACE EXISTING REFERENCED STANDARDS FOR UN PRESSURE RECEPTACLES, THEIR SERVICE EQUIPMENT AND PERIODIC INSPECTION AND TEST**

##### **1. Principles**

(a) When an existing standard is replaced by either a revised version or another standard having the same scope, there shall be a period during which either the new or old standard may be used. This will allow for the issue of new type approvals, the adjustment of procedures and where necessary, the acquisition of new equipment.

(b) The period shall be expressed by setting a limiting date after which the old standard can no longer be used. The new standard can be used from the date at which the regulations in which they are listed come into force.

(c) For standards covering the design and manufacture of pressure receptacles and their closures, the limiting date shall normally be set at six years from the close of the biennium in which the new standard was agreed for referencing in the Model Regulations. For example, if a standard is adopted in the 2011/2012 biennium, the standard which it replaces shall have a limiting date of 31 December 2018.

*NOTE: Given the time taken to transfer new provisions from the Model Regulations into the international provisions for the air, sea and land modes, it is expected that this will result in an actual transition period of four years.*

(d) For standards covering periodic inspection a limiting date of four years from the end of the biennium of adoption of the new standard shall be set. When the transition period is completed, the old standard shall be deleted.

(e) If the Sub Committee of Experts on the Transport of Dangerous Goods believes that the new standard provides a significant improvement in public safety, it may set shorter transition periods.

(f) A transition period is not envisaged for standards in sub section 6.2.2.2 concerning materials (ISO 11114, parts 1 and 2 concerning the compatibility of materials with gases) since these provide information and guidance only.

(g) A transition period shall not be set when a new standard is introduced having a scope not previously covered in section 6.2.2.

(h) The regulations shall include a statement that UN pressure receptacles constructed according to standards applicable at the date of manufacture may continue in use subject to periodic inspection provisions of the Model Regulations.

##### **2. Presentation of the transition periods in the Model Regulations**

Each table of standards shall have a column at the right showing the date after which the standard shall not be used. In the case of standards for design and manufacture this column shall be headed “Applicable for manufacture”. In the table in the sub section for Periodic inspection and test, the column shall be headed “Applicable”.

Alongside each standard for which a limit date has been set shall appear “Until 31 December 2XYZ”. If no date has been set the words “Until further notice” shall appear.

### 3. Examples of how the standards shall be listed

(a) The table below gives an example for sub section 6.2.2.1 *Design, construction and initial inspection and test* showing a revised standard adopted in the biennium 2011/2012 (for the eighteenth Revised Edition).

<b>Reference</b>	<b>Title</b>	<b>Applicable for manufacture</b>
ISO 9809-2:2000	Gas cylinders – Refillable seamless steel gas cylinders – Design, construction and testing – Part 2: Quenched and tempered steel cylinders with tensile strength greater than or equal to 1 100 MPa	Until 31 December 2018
ISO 9809-2:2010	Gas cylinders – Refillable seamless steel gas cylinders – Design, construction and testing – Part 2: Quenched and tempered steel cylinders with tensile strength greater than or equal to 1 100 MPa	Until further notice

(b) The table gives an example for sub section 6.2.2.4 *Periodic inspection and test* showing a revised standard adopted in the biennium 2015/2016 (for the twentieth Revised edition).

<b>Reference</b>	<b>Title</b>	<b>Applicable</b>
ISO 6406:2005	Periodic inspection and testing of seamless steel gas cylinders	Until 31 December 2020
ISO 6406:2015	Periodic inspection and testing of seamless steel gas cylinders	Until further notice

The 2005 version of the standard could be deleted in the twenty-second Revised Edition.

## **PART 7**

### **PROVISIONS CONCERNING TRANSPORT OPERATIONS**

Part 7 is divided into two chapters.

The provisions in Chapter 7.1 are applicable to all modes of transport and include

- Requirements for loading and segregation,
- Special provisions for explosives, gases, self-reactive substances, organic peroxides, for substances stabilized by temperature control other than self-reactive substances and organic peroxides, for Class 6 and for Class 7,
- Requirements for reporting of accidents or incidents, and
- Requirements for the retention of dangerous goods transport information.

The provisions in Chapter 7.2 are generally mode specific and are in addition to the provisions for all modes in Chapter 7.1. The provisions in Chapter 7.2 include

- Special provisions for the transport of portable tanks on vehicles,
- Special provisions for radioactive material, and
- Security provisions for transport by road, rail and inland waterway.

It must be emphasized that the provisions in Part 7 are additional requirements to those in other parts of the Model Regulations so that Part 7 cannot be read in isolation nor can it be deemed to contain all the requirements necessary for transporting dangerous goods.

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