

## Key Learning Points

### General Packing Provisions (A.I.R. ref. 4.0)

The packaging requirements are the most important aspect of the dangerous goods regulations. Dangerous goods which are in appropriate packagings and which have been properly packed, under normal transport conditions, will be safe. An error in documentation, for example, will not result in a package leaking. An error in preparing a packaging could have serious consequences. In addition, government statistics show that the most common cause of leaking packages is the failure of the shipper to properly close the inner packagings.

For consignments by air, dangerous goods must be packed in quality packagings, strong enough to withstand the impacts, vibration, temperature variations and pressure variations normally encountered in air transport. Particular resistance to both mechanical and physical handling, loading and unloading from pallets, unit load devices and other handling equipment must be ensured. Manufacturers and distributors of dangerous goods packagings must provide shippers with detailed instructions for the use of the packaging. This will include the types and dimensions of closures, cushioning and absorbent materials necessary to ensure that the packagings meet the regulatory requirements.

The shipper is responsible for ensuring that appropriate packaging is selected for shipping each of their consignments. This includes selection, sizing, compatibility and use (A.I.R. Shipper 5.1.1).

In order to understand and apply the packing provisions, there are several key definitions listed in the following Table that will help clarify the terminology used in relation to packing:

TERM	DEFINITION
Inner Packaging	The inner-most packaging containing a dangerous goods article or substance when combination packaging is used
Outer Packaging	The outside packaging when combination packaging is used
Single Packaging	A unit that can serve as a stand-alone package for a dangerous good
Combination Packaging	A packaging system that uses an inner and outer container
UN Specification Packaging	Any type of packaging (box, drum, bag etc.) which meets prescribed construction criteria, including drop tests and other design/performance tests and subsequently bears the UN specification mark
Package	Contents + packaging
Packing Instruction	A section in the regulations (yellow bordered pages) which summarizes all of the packing requirements for entries in the dangerous goods list

TERM	DEFINITION
Q Value	Calculation performed to determine the maximum quantity of two or more different dangerous goods that can be shipped together without causing a dangerous reaction when placed in one outer packaging
Packing Group	Packing groups (based on the danger of the substance or article) are the basis for determining the packaging system to be used

### **General Packing Requirements (A.I.R. ref. 4.3)**

The following types of packagings are used to ship dangerous goods, other than Class 7, Radioactive Material:

- UN Specification packaging
- Limited quantity packaging
- Other packaging

For both UN Specification and Limited Quantity packagings, there are general packing requirements:

- (1) Packages must be designed, constructed and used so that any loss of contents as a result of “normal conditions of transport” is prevented.
- (2) All packages, whether new or reused, must meet the applicable requirements of A.I.R. Shipper Chapter 6. When packagings are to be tested under the UN Packaging Performance Tests, their use must be specified in the applicable test report with respect to the design type which was tested.
- (3) Packagings used must also be compatible with the dangerous goods to be transported. It is the shipper’s responsibility to ensure this.
- (4) The body and the closure of any packaging must be constructed to adequately resist the effects of temperature and vibration occurring in normal conditions of transport. Closures must be held firmly in place by positive means. When filling for liquids, outage must be left to allow for expansion of the liquid caused by temperatures likely to occur during transport. Liquids must not completely fill a packaging at 55°C (130°F).
- (5) Inner packagings must be so packed, secured or cushioned in an outer packaging in such a way that, under normal conditions of transport, they cannot break, be punctured or leak their contents into the outer packaging.
- (6) Dangerous goods must not be packed together in the same outer packaging with dangerous or other goods if they react dangerously with each other. For mixed packages of dangerous goods that are compatible, a “Q” value must be calculated (A.I.R. ref. 4.3.5.2).
- (7) Empty packagings must be treated the same as if full, unless adequate steps have been taken to nullify the hazard
- (8) The outer package must be large enough to apply all marks and labels.

More detail on packing requirements for liquids and other packagings can be found in A.I.R. Shipper 4.3, 4.4, and 4.5.

### **Packing Instructions – General (A.I.R. ref. 4.6)**

The Dangerous Goods List (Table 3.1) specifies for each article or substance, in columns 8(a) – limited quantities, 9(a) - passenger aircraft and 10(a) - cargo aircraft only, the number of the permissible packing instruction. The packing instruction itself describes inner packagings, outer packagings, single packagings, material permitted, maximum quantities per inner packaging and any applicable State and Airline variations. While columns 8(b), 9(b) and 10(b) of the Table 3.1 show the total maximum quantity allowed in each package, the individual packing instruction shows the maximum net quantity allowed in each inner package.

The choice of packing instruction is determined by a number of factors.

For example:

- What is the quantity to be shipped?
- What are the customer's requirements for packaging size?
- Are freighter aircraft an option? This depends on routing and frequency.
- Is appropriate UN specification packaging tested and available?

The answers to these questions will assist the shipper in determining the applicable packing instruction for any particular consignment.

The specific packing instructions applicable to each class of dangerous goods are identified in A.I.R. Shipper sections 4.7 to 4.15. For some classes, sections begin with general requirements applicable to all substances in the class.

Each packing instruction specifies the acceptable single and combination packagings. Single packagings may not be applicable and are not permitted for limited quantities.

- a) In the case of combination packaging, the acceptable inner and outer packagings are shown in separate tables. The maximum net quantity permitted in each inner packaging is specified.
- b) Where provisions for particular articles or substances apply, tables show the inner packagings with associated quantity limitations and single packagings which are acceptable for the individual commodities (identified by their UN number).
- c) If a commodity is identified in the table applicable to inner packagings of combination packagings but not in the table applicable to single packagings, it means that the particular commodity is not permitted in single packagings.
- d) Where appropriate, particular packing requirements are also indicated for each commodity; these requirements are detailed at the end of that packing instruction. Particular packing requirements apply to both inner packagings of combination packagings and single packagings as appropriate.

### Description of a Packing Instruction

The following graphics illustrate the different components of a standard packing instruction. There are some variances in format, and it is important to remember that when shipping under limited quantity provisions, the “Y” packing instruction for the article or substance must be used. If there is no “Y” packing instruction for a particular commodity, then limited quantities are prohibited.

