General Packaging Requirements for Dangerous Goods: Master the Key Points at One Go for Safe Shipment by Sea

In the transportation of dangerous goods, packaging is the first line of safety defense. The IMDG Code (International Maritime Dangerous Goods Code) imposes extremely stringent requirements on packaging. Once packaging fails, it may lead to minor cargo damage or even catastrophic consequences such as shipwreck and fatalities. This article will explain the relevant concepts in the most down-to-earth way with my own understanding.

1 Five Types of General Packaging

General packaging in the IMDG Code is designated by numbers, with a total of five types (Number 2 is reserved and not currently used):

- 1 Drum: Cylindrical packaging made of metal, plastic, fibreboard, etc. Note: Wooden barrels and jerricans are not classified as drums! Mnemonic: Drums are cylindrical.

☑ Easy confusion point: Wooden barrels and jerricans are not categorized as drums. No matter how similar their appearance is, they shall not be classified as drums if they are not cylindrical products made of the specified materials.

- 3 Jerrican: Rectangular or polygonal cross-section packaging made of metal or plastic. Mnemonic: Jerricans are square-shaped.

☑ Mnemonic tip: Cylindrical ones are drums, square/polygonal ones are jerricans, with materials limited to metal and plastic only.

- 4 Box: Containers with complete rectangular or polygonal sides, which can be made of metal, wood, fibreboard, etc. Mnemonic: Boxes have complete sides.

☑ Detail: Boxes may be perforated (for ease of loading/unloading, opening or compliance with classification regulations), but the small holes shall not impair the integrity of the packaging during transportation.

- 5 Bag: Flexible packaging made of paper, plastic film, textile materials, etc.

☑ Mnemonic: Bags are flexible.

- 6 Composite packaging: An integrated unit consisting of an outer packaging and an inner receptacle that cannot be separated. For example, a plastic inner receptacle bonded with a fibreboard outer case. Mnemonic: Composite packaging is an inseparable whole.

2 Packaging Material Codes

In addition to numbers, uppercase letters are used on packaging to indicate materials (from IMDG 6.1.2.5):

- A – Steel (of all types and surface treatments); commonly used for dangerous goods such as strong acids and high-pressure substances
- B – Aluminium; commonly used for organic solvents with low corrosivity

- C – Natural wood; for solid dangerous goods and light-weight cargo
- D – Plywood; cost-effective packaging for solid cargo
- F – Reconstituted wood; artificial board material for general solid cargo
- G – Fibreboard; paper-based rigid packaging, use with caution for moisture-sensitive cargo
- H – Plastic materials; corrosion-resistant, commonly used for acid and alkaline liquids
- L – Textiles; for bagged solid cargo and non-leakage granular cargo
- M – Multi-layer paper; moisture-proof packaging for powdered and granular solid cargo
- N – Metals (excluding steel and aluminium), e.g., copper, brass; metal packaging for special requirements
- P – Glass, porcelain and earthenware; for high-purity chemicals and cargo susceptible to metal contamination

♥ Key Practical Points: Packaging selection must be based on the characteristics of dangerous goods! For example:

- Corrosive substances (e.g., sulfuric acid, sodium hydroxide): Ordinary steel drums are prohibited (due to chemical reaction), plastic drums (H) or steel drums with internal coating shall be used. Glass bottles (P) are also commonly used but are fragile and must be fitted with outer packaging.
- Flammable liquids (e.g., gasoline, acetone): Closed steel drums (1A1) or plastic drums (1H1) are commonly used, with strict requirements for airtightness to prevent volatilization.
- Flammable solids (e.g., yellow phosphorus, magnesium powder, aluminium powder): P-type glass and ceramic packaging are prohibited, as breakage may cause cargo exposure and spontaneous combustion. Airtight metal boxes (Class A) or plastic boxes (Class H) are preferred for water and moisture proofing.

- Substances which in contact with water emit flammable gases (e.g., sodium metal): Must be packed in hermetically sealed metal drums filled with inert gas or desiccants; water-absorbent materials are prohibited.
- Organic peroxides (e.g., benzoyl peroxide): Plastic drums or internally coated steel drums shall be used to avoid metal-catalyzed decomposition, and pressure relief devices must be equipped.
- Radioactive substances: Special steel drums or lead-shielded packaging are commonly used, and material codes may involve N or special markings.

3 Packaging Codes

A packaging code consists of three parts: Number + Letter + Number, e.g., 1A1, 4G, 1H2.

- First digit: Packaging type (1 Drum, 2 Wooden cask, 3 Jerrican, 4 Box, 5 Bag, 6 Composite packaging)
- Middle letter: Material (refer to the list above)

Last digit: Type (e.g., 1 for closed, 2 for open; this digit is omitted for some combination packagings)

Common Examples:

1A1: Closed steel drum (non-removable top)

1A2: Open steel drum (removable top, for solid cargo or cargo requiring large opening for loading/unloading)

1H1: Closed plastic drum

4G: Fibreboard box

5H1: Woven plastic bag without inner lining or coating

6HA1: Composite packaging, plastic inner receptacle with steel outer drum (integral type)

4 Package, Combination Packaging, Composite Packaging

These concepts are often confusing, so let's clarify them one by one:

• Packaging: Empty container plus any components, e.g., an empty drum.

• Package: Packaging plus contents, the final product ready for transportation. Simply put: Packaging is empty, while a package is a loaded unit.

• Overpack: Multiple packages bound together for ease of handling, e.g., several boxes on a pallet secured with stretch film.

• Combination packagings: Inner packagings plus outer packagings, which can be separated. For example, several glass bottles (inner packagings) placed in a carton (outer packaging).

• Composite packagings: An integrated unit of inner receptacle and outer packaging that cannot be separated. For example, a plastic bottle body and a steel drum wall formed in one piece, with codes starting with 6.

• Inner packagings: Packagings that require an outer packaging for transportation (e.g., glass bottles).

• Inner receptacles: Containers that rely on an outer packaging to perform their functions and are incomplete on their own (e.g., plastic inner liners in composite packaging).

• Intermediate packagings: Buffering layers placed between inner packagings and outer packagings.

Mnemonic: Combination packagings are separable, composite packagings are not; a package is a finished product, a packaging is an empty container.

5 Packaging Grade and Hazard Classification

Marks X, Y and Z on packaging indicate compliance with tests for different hazard grades:

• X: Complies with the requirements for Packing Groups Ⅰ, Ⅱ and Ⅲ (highest grade, suitable for packing dangerous goods of high, medium and low hazard levels)

• Y: Complies with the requirements for Packing Groups Ⅱ and Ⅲ (medium grade, suitable for packing dangerous goods of medium and low hazard levels)

• Z: Complies with the requirements for Packing Group Ⅲ (lowest grade, only suitable for packing dangerous goods of low hazard level)

Key point: Class 1 Explosives, Class 5.2 Organic Peroxides and Class 4.1 Self-reactive Substances shall meet the requirements of at least Packing Group Ⅱ (Grade Y), but more stringent requirements apply in many cases, and specific packing instructions shall be consulted.

6 IMDG Amendment 42-24

The new version of the IMDG Code has been mandatorily implemented on 1 January 2026. Here is a brief overview:

• Sodium-ion batteries are officially classified as Class 9 dangerous goods, with newly added UN numbers UN 3551 (Sodium-ion batteries) and UN 3552 (Sodium-ion batteries contained in or packed with equipment).

• For new energy vehicles, new UN numbers are added: UN 3556 (Vehicles powered by lithium-ion batteries), UN 3557 (Vehicles powered by lithium metal batteries), UN 3558 (Vehicles powered by sodium-ion batteries).

• Packaging instruction update: A new packaging instruction P912 is added for the transportation of lithium batteries and sodium-ion batteries, applicable to the lashing requirements of battery systems in large equipment such as vehicles.

• Packaging grade requirement: Is the packaging of some batteries upgraded from "Packing Group Ⅱ" to "Packing Group Ⅰ"? No, batteries are generally still classified as Packing Group Ⅱ, but special provisions shall be noted.

This article is compiled based on IMDG Code Amendment 42-24 and relevant materials. For specific operations, refer to the latest regulations.