



## Stowage of Explosives on Vessels and issues noted with Small Ships

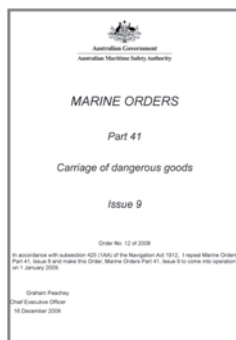
### INTRODUCTION

The purpose of this Information Sheet is to advise all ship owners and operators of the requirements for the stowage of Explosives (Class 1 goods) in packaged form on board ships, with particular emphasis on small ships. For the purpose of this sheet, small ships include single hold vessels and vessels equipped solely with an exposed cargo deck (such as offshore support vessels or barges).

The requirements for the carriage of packaged Class 1 goods are detailed in the International Maritime Dangerous Goods (IMDG) Code<sup>1</sup> which in turn is mandated for the carriage of dangerous goods by sea under Regulation 3 of Chapter VII of SOLAS.

The mandatory application of the IMDG Code within Australia is implemented through delegated legislation adopted by the Australian Maritime Safety Authority (AMSA) under the *Navigation Act 1912*.

This delegated legislation is known as *Marine Orders Part 41 – Carriage of Dangerous Goods* (MO41) and by virtue of the scope of the application of the *Navigation Act 1912*, this Marine Order applies to voyages of both an interstate and international nature. MO41 can be accessed from the AMSA website at:



[www.amsa.gov.au/shipping\\_safety/marine\\_orders/Marine\\_Orders\\_currently\\_in\\_force.asp](http://www.amsa.gov.au/shipping_safety/marine_orders/Marine_Orders_currently_in_force.asp)

On the basis of the adoption of the IMDG Code within SOLAS and within Australian legislation, the carriage of explosives of Class 1 (and in fact all dangerous goods) in packaged form must be in compliance with the relevant provisions of the IMDG Code.

This information sheet only provides guidance on the requirements relating to the stowage of class 1 goods with particular reference to issues of stowage on small vessels, it does not replace or alter the requirements of the IMDG Code. All requirements of the IMDG Code are to be complied with by vessels carrying dangerous goods where those vessels are subject to the *Navigation Act 1912*.

*Note: This information sheet is for advice only and shippers and masters must consult the IMDG Code when every shipping or carrying Class 1 goods or any other class of dangerous good.*

### WHAT ARE THE REQUIREMENTS?

The stowage requirement for all classes of dangerous goods are detailed in the individual entries in the Dangerous Goods list (chapter 3.2) of the IMDG Code and in Chapter 7.1 of the IMDG Code. In addition the vessel will be subject to:

- SOLAS II-2/19 - Special requirements for Ships Carrying Dangerous goods, including the issue of a Document of Compliance (DOC)<sup>2</sup>, depending on the date of construction<sup>3</sup>, and
- SOLAS VII/5 - Cargo Securing including the need for a Cargo securing Manual (CSM)<sup>4</sup>, regardless of the date of construction.

<sup>1</sup>The IMDG Code as adopted by the Maritime Safety Committee of the Organization by resolution MSC.122(75), as amended. The 2008 edition will come into mandatory effect from the 1st of January 2010 but may be used in lieu of the 2006 edition until that time.

<sup>2</sup>Document of Compliance for the carriage of dangerous goods (should not be confused with the ISM DOC). The certificate should provide the information detailed in MSC/Circ.1266.

<sup>3</sup>The following vessels on voyages subject to the *Navigation Act 1912* are required to have a document of compliance when they carry dangerous goods in packaged form or in bulk (except where the vessel only carries dangerous goods in limited/excepted quantities or Class 6.2 or class 7):

- i. Passenger ships constructed on or after 1 September 1984;
- ii. Cargo ships of 500 gross tonnage or above constructed on or after 1 September 1984;
- iii. ships below 500 gross tonnage constructed on or after 1 February 1992.

<sup>4</sup>Cargo Securing Manual. These should be developed using the information provided in the Code of Safe Practice for Cargo Stowage and Securing, and specifically MSC/Circ.745.

## 1.0 What Class 1 goods can be carried

For a ship to carry Class 1 goods it must be specifically certified to do so in the DOC (where the ship is required to have one). If the vessel is required to have a DOC and does not have one, or has a DOC that does not allow the vessel to carry Class 1 goods on deck or in a particular cargo described space, the ship **cannot carry Class 1 goods**.

*Note: The DOC will differentiate between Class 1 goods of division 1.4S and other divisions*

If the DOC does permit the carriage of Class 1 goods, the next step is to look at the stowage category of the explosives detailed in column 16 of the dangerous goods list in Chapter 3.2 of the IMDG Code. The stowage categories are explained in section 7.1.7.2 of the IMDG Code and these categories indicate where explosives can be carried, how they can be carried or if they are prohibited.

Passenger ships (even small ones) are prohibited from carrying some Class 1 goods. It should be noted that for Class 1 goods a passenger ship is defined as any vessel carrying more than 12 passengers. Given the application of Marine Orders Part 41 this would apply to domestic passenger vessels on voyages subject to the *Navigation Act 1912*<sup>5</sup>.

## 2.0 How Class 1 goods are to be stowed

Part of this information is provided by the Stowage Category which indicates whether the goods are to be stowed on deck or under deck and if they need to be in a closed Cargo Transport Unit<sup>6</sup> or any other specific requirements<sup>7</sup>.

Additional specific information is provided in section 7.1.7 of the IMDG Code. This sheet will explain some of the requirements of this section but shippers and ship's masters need to review all relevant IMDG Code sections before carrying class 1 goods.

### What are "special stowage" requirements?

Special stowage requirements are detailed in section 7.1.7.1.7 of the IMDG Code and apply where specifically

referred to in column 16 for a particular type of explosive (as detailed in the individual entry in the dangerous goods list).

Special stowage includes a requirement that explosives allocated to this category are not to be over stowed and closed cargo transport units used for these goods are not to be positioned closer to the ship's side than a distance equal to one eighth of the beam or 2.4m, whichever is the lesser.

### For example:

A small vessel with a beam of 10m is carrying explosives subject to special stowage. As such goods can be stowed no closer than:

$$\begin{aligned} \text{Distance from ships side} &= 10 \times 0.125 \\ &= 1.25\text{m} \end{aligned}$$

Section 7.1.7.4.1.2 of the IMDG Code also has requirements in regards to the outer most stow which will be discussed later.

### How are explosives stowed in relation to "sources of heat"?

Section 7.1.7.4.2 of the IMDG Code requires that all Class 1 goods be stowed in a cool part of the ship and to be kept as cool as practical. Stowage is also to be "away from" all sources of heat. In addition where a cargo space is being used it must be clean and free of any residue of previous cargoes<sup>8</sup>.

Section 7.2.2.2 of the IMDG Code defines "away from" as three metres extended vertically. What constitutes a source of heat is defined in section 7.1.1.15 and includes:

- Sparks, flames, steam pipes, heating coils, top or side walls of heated fuel and cargo tanks, and
- Bulkheads of machinery spaces<sup>9</sup>, where they are insulated to A-60 standards or equivalent. The only exception to this requirement is for goods of division 1.4S<sup>10</sup> which may be stowed directly adjacent to a machinery space bulkhead which is insulated to A-60 standard (see section 7.1.7.4.3.6 of the IMDG Code).

<sup>5</sup>Additional restrictions are placed on the amount of class 1 goods that can be carried on a passenger vessel by section 7.1.7.5 of the IMDG Code.

<sup>6</sup>**Cargo transport unit** means a road freight vehicle, a railway freight wagon, a freight container, a road tank vehicle, a railway tank wagon or a portable tank. **Closed cargo transport unit**, with the exception of class 1, means a unit which totally encloses the contents by permanent structures. Cargo transport units with fabric sides or tops are not closed cargo transport units; The definition of class 1 cargo transport unit are provided in section 7.1.7.1.1 of the IMDG Code.

<sup>7</sup>There are specific requirement for the under deck stowage of goods subject to Stowage category 09 and 10 detailed in section 7.1.7.4.1.1.

<sup>8</sup>Particular reference is made to dust such as grain and coal dust.

The requirement for segregation from machinery spaces is explained further in section 7.1.7.4.6 of the IMDG Code. Section 7.1.7.4.6.6 also takes into account other potential sources of ignition such as any:

- open fire,
- machinery exhausts,
- galley uptakes,
- lockers used for combustible stores, or
- any other potential sources of ignition

This provision requires that class 1 goods not be stowed within six metres of such potential sources of ignition. These restrictions may have a significant impact on the ability of a small vessel to carry explosives.

**Are there any relaxations for heated fuel and cargo tanks?**

All Heavy Oil fuel tanks and some cargo tanks have heating fitted; however, it will not always be necessary to heat these tanks during the course of a voyage. Where a vessel has planned its voyage in such a way that heat will not be applied to a particular tank at any stage in the voyage, AMSA will not consider this tank as a heated fuel tank for the purpose of the voyage.

**What if fuel tanks are only heated to a certain temperature?**

Some bulk cargoes are permitted to be stowed immediately adjacent to fuel tanks that cannot (or are managed in a way that they will not) attain a temperature of more than 50°C. From AMSA's perspective this interpretation is **not acceptable** for explosives noting section 7.1.7.4.2 requires the goods be kept as cool as practical while on board.

**How are explosives stowed in relation to living quarters?**

Due to the risk associated with explosives, it is important that they are stowed 'away from' living quarters. However this is not simply a three metre separation but rather it depends on the where the Class 1 goods are stowed and the nature of the space. The requirements are described in section 7.1.7.4.6 and can be summarised as follows:

- Explosives of division 1.1, 1.2, 1.3, 1.4 and 1.5 cannot be stowed within three metres (projected vertically) of an A class division separating a Cargo space and Accommodation spaces;
- All Class 1 goods must be stowed at least six metres from galley uptakes
- All Class 1 goods must not be stowed less than a horizontal distance of eight metres from the bridge, living quarters and life-saving appliances<sup>11</sup>.

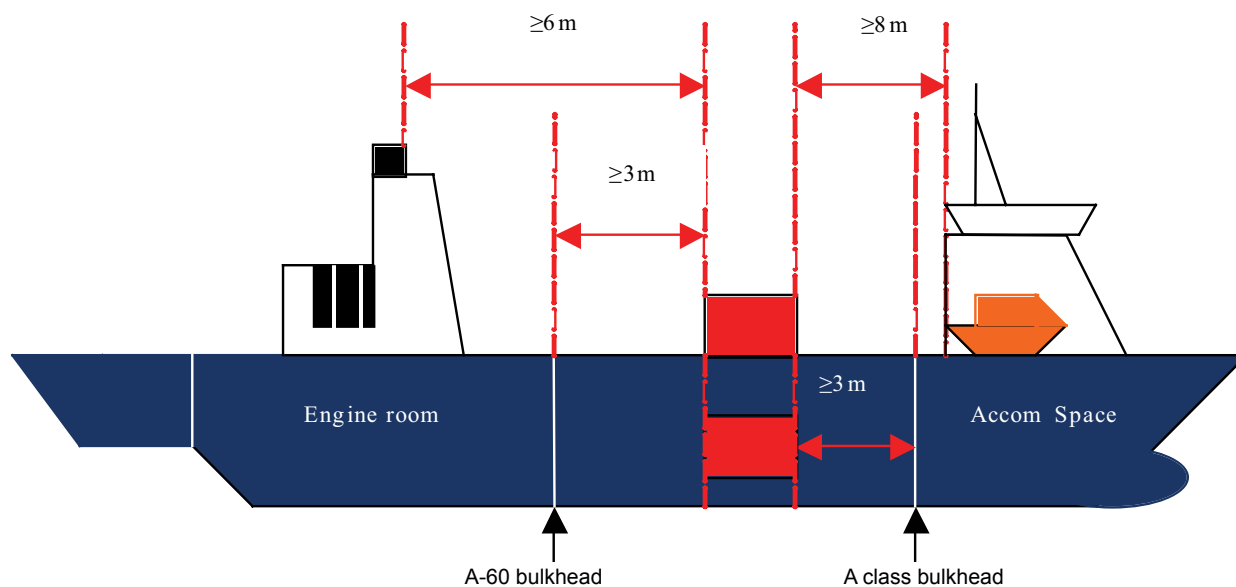


Figure 1: Example of separation of Class 1 goods from living quarters and machinery spaces and sources of ignition

<sup>9</sup>Regulation 2 of Chapter II-1 of SOLAS currently defines a machinery spaces as spaces between the watertight boundaries of a space containing the main and auxiliary propulsion machinery, including boilers, generators and electric motors primarily intended for propulsion. In the case of unusual arrangements, the Administration may define the limits of the machinery spaces.

<sup>10</sup>For goods to be classified as Class 1.4S they must be tested to prove that they are if they are so packaged or designed that any hazardous effects arising from the accidental functioning are confined within the package unless the package has been degraded by fire, in which case all blast or projection effects are limited to the extent that they do not significantly hinder fire fighting or other emergency response efforts in the immediate vicinity of the package.

### What happens if the machinery space bulkhead is not insulated to A-60?

Section 7.1.7.4.6.3 requires a separation of class 1 goods from a machinery space bulkhead of three metres on the basis it is an A-60 division. However, not all ships have been built with the machinery space bulkheads insulated to this standard.

*Note: A machinery space is not limited to the engine room noting that spaces containing auxiliary propulsion machinery are also included in the definition in regulation 2 of SOLAS II-1.*

Where the keel of the ship was laid before 1 September 1984 alternative arrangements are provided to the A-60 bulkhead in Appendix 2 to Chapter 7.1 of the IMDG Code. These are:

- Separation of at least nine metres from an A-0 bulkhead; or
- Separation of at least three metres from an alternative construction arrangement<sup>12</sup> combined with additional safety measures listed in section 4 of appendix 2.

### What about stowage of explosives in respect to access?

Again this is covered in section 7.1.7.4.6 of the IMDG Code and Class 1 goods are always required to be stowed clear of **walkways, fire hydrants, steam pipes and means of access** as well as “away from” all other facilities necessary for the safe working of a ship.

“Away from” is again three metres as defined in 7.2.2.2 of the IMDG Code and such facilities would include, but not be limited to, the focsle and poop deck, work shops and some deck stores (particularly where these contain mooring equipment machinery).

### How close to the side of the ship can Class 1 goods be stowed?

Notwithstanding the “special stowage” requirements discussed above, Section 7.1.7.4.1.2 has similar requirements but these apply to all Class 1 goods except division 1.4. This section states:

*“Goods of class 1 with the exception of goods in division 1.4, shall not be stowed in the outermost row.”*

Where the beam is 10m, in order to comply with the outer most row requirement the distance between the ships side and the class 1 container needs to be at least 1.25m.

(Ships with greater beam should be one eighth of the beam of 2.4m, which ever is the least).

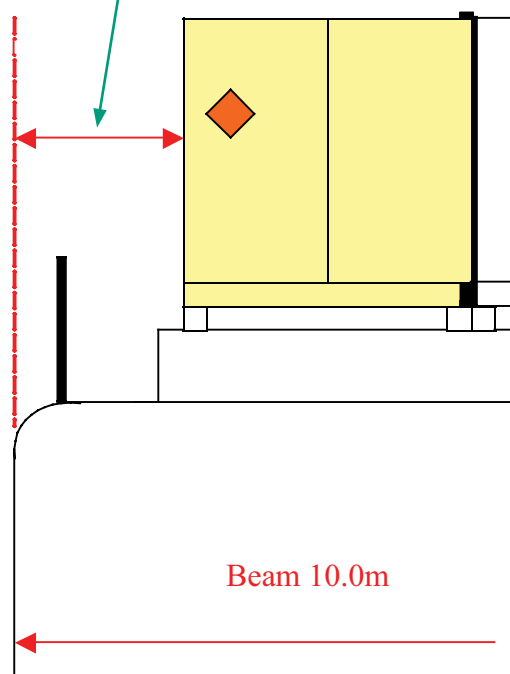


Figure 2: Example of “Outer most row” on a small vessel.

The outer most row is not defined but is effectively the outboard stow directly adjacent to the side of the ship. In some cases ships do not have stows located at the side of the ship and clarification has been sought.

AMSA applies the following consideration to this issue. As a single container width is 2.4m anything stowed no closer than 2.4m from the side of the ship (at any point) is not considered to be in the outermost row. For smaller ships the same formula as is used in the “special stowage” requirements is applied, where no part of the container is closer than 2.4m or one eighth of the beam from the ships side, which ever is the least.

### 3.0 Vessels not required to be issued with a DOC

As noted in section 1 of this information sheet not all vessels are required to be issued with a DOC as compliance is dependent on the date of construction. This does not mean that the vessel can load Class 1 goods in

<sup>11</sup>This would exclude personal life-saving appliance as identified in SOLAS chapter III. However, immersions suits and lifejackets would not be stowed on the cargo deck in any case.

<sup>12</sup>This could be a floodable cofferdam consisting of two steel bulkheads at least 0.6m apart or the addition of a temporary timber bulkhead at least 0.6m from the machinery space bulkhead and insulated to the A-30 standard. Both involve considerable work and the flag state or it RO should accept the arrangement.

any cargo space as the IMDG Code still requires that the ship and cargo space is suitable in regards to sources of ignition (as discussed in section 2), electrical safety and lightning protection.

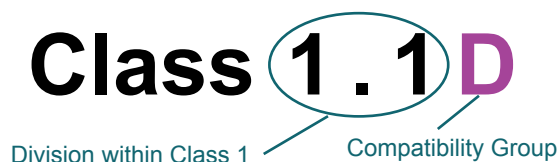
The requirements for electrical safety are contained in section 7.1.7.4.7 and Appendix 3 of the IMDG Code, while lightning protection is covered in 7.1.7.4.8 of the IMDG Code. In order to comply with SOLAS VII/3 in respect of Class 1 goods stowage the ship **must comply with these sections**. If the vessel does not comply it cannot carry Class 1 goods.

#### 4.0 Segregation of different types of explosive

The segregation requirement between goods of Class 1 and other classes are addressed in chapter 7.2 of the IMDG Code and will not be examined by this information sheet. However, it is important to note that some different types of Class 1 goods may not be stowed together.

#### How are different types of Class 1 goods identified?

Different types of Class 1 goods are identified by their compatibility group. This is the letter following the division number when describing class 1 goods as follows:



The compatibility group is important as it keeps goods apart that are likely to cause a more energetic reaction

in an accident. As an example, detonators (compatibility group B) are not stowed with goods with a mass explosion hazard (compatibility group D) as the latter normally needs a detonator to initiate.

There are thirteen compatibility groups and these are described in detail in chapter 2.1 of the IMDG Code.

#### Where is it stated what Class 1 goods can be stowed together?

Table 7.2.7.2.1.4 in the IMDG Code shows which compatibility groups may be stowed together. Where goods cannot be stowed together then “separated from” segregation should be applied. The distance involved will vary depending on whether the goods are loaded as break bulk or are containerised but generally means a distance of at least six metres horizontally. This is extended vertically unless a fire and liquid resistant deck separates the incompatible goods.

Where incompatible Class 1 goods are to be carried on deck, a distance of at least six metres is required between containers carrying incompatible loads

#### What segregation is required in single hold ships?

Many smaller vessels have a single cargo hold which complicates segregation between the different Class 1 goods. In such cases, section 7.2.7.2.3 of the IMDG Code does allow a limited amount of flexibility in respect of compatibility group “B” and “D” but with strict limitations on the net explosive mass of compatibility group “B” that can be carried.