Standard Safety

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The Standard
for service and security

The Standard

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2015 was a busy year for the Loss Prevention team at The Standard Club during which we launched the new *PEME scheme*, published a detailed *methodology bulletin* and held a successful *'Spot the Hazard'* campaign.

In this edition

Please feel free to contact the editor or authors if you have any queries on the topics covered in this Standard Safety.

Introduction

In this publication, we continue our series of articles on the MARPOL annexes with articles on Annexes II and III. The six annexes of The International Convention for the Prevention of Pollution from Ships *(MARPOL 73/78)* set out mandatory regulations aimed at minimising and preventing pollution from ships – both accidental and from routine operations. *Captain Rahul Sapra* discusses how to ensure compliance with Annex II, which aims to protect the marine environment from chemical pollution by noxious liquid substances carried in bulk. *Captain Akshat Arora* explains the difference between environmentally hazardous substances and marine pollutants under the revised regulations brought about by Amendment 37-14, which has become mandatory from 1 January 2016.

We regularly receive queries from our members regarding the carriage of radioactive cargoes and how it affects the ship's P&I cover. We thought it would be useful to explain '*Excepted Matter*' and what the member needs to do in order for the club to confirm that cover remains in place, or instances in which additional nuclear liability insurance is necessary.

Our previous *Standard Safety* publication included the first in a series of articles on *breaking the error chain*. The article discussed three collision case studies and how only a small change could have stopped the chain of events leading to the incident. In this publication, we will look at three personal injury claims where, similarly, a proper risk assessment could have prevented the incident.

Navigational errors and collisions are sadly frequent occurrences. With all the modern equipment on board a vessel's bridge, navigation officers do not appear to give due consideration to the effect of human error. *Richard Bell* presents a case study of a grounding in Northern Europe during which the master did not follow company procedures, lost his situational awareness, was overconfident and ran the ship aground, resulting in a very expensive pollution claim.

Lastly, we will give some advice on carrying out a safe launching and recovery of gravity-type lifeboats during an abandon ship drill.

We hope you will enjoy reading this issue of Standard Safety. We welcome any suggestions for topics or issues to cover in our future editions.

MARPOL Annex II – preserving the marine ecosystem is imperative

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Marine pollution is one of the primary concerns facing the maritime industry today. As the volume of chemicals transported by sea continues to increase, so does the threat to human health and the marine environment.

Introduction

Increased knowledge of the impact of chemicals on the marine environment has led to the development and progressive implementation of *MARPOL Annex II*, which aims to protect the marine environment from chemical pollution by noxious liquid substances carried in bulk. Unlike the other MARPOL annexes, which set out regulations for the 'prevention' of pollution, Annex II talks about the regulations for the 'control' of pollution by these noxious liquid substances when carried in bulk.

Defining noxious liquid substances

In MARPOL Annex II, 'noxious liquid substance' means any substance indicated in the Pollution category column of chapter 17 or 18 of the *International Bulk Chemical code (IBC code)* or provisionally assessed under the provisions of regulation 6.3 as falling into that category. The MEPC issues an *annual circular* with the provisional categorisation of liquid substances. The annexes to the circular provide lists of noxious liquid substances with associated categories and minimum carriage requirements, which are established through a tripartite agreement and registered with the IMO Secretariat.

Noxious liquid substances (NLS) are divided into four categories.

Category X: Noxious liquid substances that, if discharged into the sea from tank cleaning or de-ballasting operations, are deemed to present a major hazard to either marine resources or human health, and therefore justify the prohibition of the discharge into the marine environment.

Category Y: Noxious liquid substances that, if discharged into the sea from tank cleaning or de-ballasting operations, are deemed to present a hazard to either marine resources or human health or cause harm to amenities or other legitimate uses of the sea, and therefore justify a limitation on the quality and quantity of the discharge into the marine environment.

Category Z: Noxious liquid substances that, if discharged into the sea from tank cleaning or de-ballasting operations, are deemed to present a minor hazard to either marine resources or human health, and therefore justify less stringent restrictions on the quality and quantity of the discharge into the marine environment.

Chemicals have varying physical properties, which mean they behave differently once spilt. Noxious liquid substances can be divided into four major categories:

Evaporators: volatile liquids that are less dense than sea water;

Floaters: volatile liquids that are less dense than sea water;

Sinkers: products that are more dense than sea water; and

Dissolvers: products that are soluble in sea water.

Other Substances: Substances indicated as OS (Other Substances) in the pollution category column of chapter 18 of the IBC code that have been evaluated and found to fall outside Category X, Y or Z as defined in regulation 6.1 because they are, at present, considered to present no harm to marine resources, human health, amenities or other legitimate uses of the sea when discharged into the sea from tank cleaning or de-ballasting operations. The discharge of bilge or ballast water or other residues or mixtures containing only substances referred to as 'Other Substances' shall not be subject to any requirements of the Annex.

Where it is proposed to carry a liquid substance in bulk that has not been categorised under one of the above categories, the governments of parties to the Convention involved in the proposed operation shall establish and agree on a provisional assessment for the proposed operation. Until full agreement among the governments involved is reached, the substance shall not be carried. After the agreement has been reached, the government of the producing or shipping country, initiating the agreement concerned, shall notify the IMO and provide details of the substance and the provisional assessment for annual circulation to all parties for their information. The IMO maintains a register of all such substances and their provisional assessments until such time as the substances are formally included in the IBC code.

As Annex II deals with a variety of products, all of which present different hazards, even low doses of chemicals can produce sublethal effects to marine ecosystems over the longer term. Although major effects are more likely following large-scale spills, it is possible that the effect of continual small discharges in a limited area may cause changes to the marine environment, for example, in salinity and oxygen content.

Operations

The IBC code provides an international standard for the safe carriage, in bulk by sea, of the dangerous chemicals and noxious liquid substances listed in chapter 17 of the code. The code prescribes the design and construction standards of ships, regardless of tonnage, and the equipment they shall carry to minimise the risk to the ship, its crew and the environment, having regard to the nature of the products involved.

Types of chemical tankers

The basic philosophy of the code is to assign each chemical tanker one of three ship types according to the degree of the hazards of the products carried by such ships. Each of the products may have one or more hazardous properties, including flammability, toxicity, corrosivity and reactivity, as well as the hazard they may present to the environment.

A 'Type 1' chemical tanker is intended for the transportation of products considered to present the greatest overall hazard, and 'Type 2' and 'Type 3' tankers are intended for products of progressively lesser hazards. Accordingly, a 'Type 1' ship must survive the most severe damage and its cargo tanks shall be located at the maximum prescribed distance inboard from the shell plating.

Pumping and piping arrangements

Appreciating the diverse nature of the trade and the fact that different chemicals have different discharge criteria, every chemical tanker is provided with a pumping and piping arrangement to ensure that each tank certified for the carriage of NLS does not retain a quantity of residue in excess of the quantity prescribed in regulation 12 of the Annex. This quantity depends on the age of the ship and the type of cargo that particular tank is certified to carry. A performance test is required to be carried out by the administration in accordance with appendix 5 of the Annex.

MARPOL Annex II – preserving the marine ecosystem is imperative continued

Ships certified to carry substances of Category X, Y or Z shall have an underwater discharge outlet, except for those certified to carry Category Z cargo only, which were constructed before 1 January 2007.

Discharge of residue

Control of discharge of residues of NLS or ballast water, tank washings or other mixtures shall be in compliance with the requirements of regulation 13. It is imperative that the tanks are emptied to the full extent as prescribed in the code. Where the provisions allow the discharge of residues into the sea, the following discharge standards apply:

- The ship is proceeding en route at a speed of at least 7 knots for self-propelled ships or at least 4 knots for ships that are not self-propelled;
- The discharge is made below the waterline and the maximum designed discharge rate for underwater outlet(s) is not exceeded;
- The discharge is made at a distance of not less than 12 miles from the nearest land in a depth of water of not less than 25 metres.
- For ships constructed before 1 January 2007, the discharge of residue containing category Z substances or of those provisionally assessed as such, discharge below the waterline is not mandatory.

Unlike Annex I, the Antarctic area is the only special area under Annex II. Discharge of residue is prohibited in the Antarctic area as defined in regulation 13.

Ventilation procedures approved by the administration in accordance with appendix 7 may be used to remove any cargo residue. Any water subsequently introduced into the tank is regarded as clean and is not subject to the above discharge requirements.

Particular attention is to be given to the prewash requirements for the various categories of the NLS as described in regulation 13. Appropriate entries of these operations shall be made in the Cargo Record Book and endorsed by the surveyor approved or appointed by the contracting government.

Guidelines to ensure compliance with Annex II

1. The ships are designed, constructed and certified in accordance with the provisions of the IBC code and in accordance with the MARPOL regulations.
2. Cargoes are carried in accordance with the list available in the ship's International Pollution Prevention Certificate for the Carriage of noxious liquid substances in Bulk (NLS certificate).
3. Proper procedures in accordance with regulation 6 of the Annex are followed if the ship is scheduled to load a cargo not listed in the NLS certificate.
4. The ship has an up-to-date Procedures and Arrangements Manual (P&A manual) and Shipboard Marine Pollution Emergency Plan for noxious liquid substances (SMPEP) approved by the administration.
5. The cargo record book is maintained in accordance with regulation 15 and appendix 2 of the Annex.
6. Cargo unloading and stripping procedure shall be in accordance with appendix 4 of the Annex and a detailed plan is made for cargo loading and unloading, stripping, tank prewashing and tank washing requirements.
7. Checks are done on the pumping and stripping system on a periodical basis to confirm that the system is in good working order in accordance with the regulations and the age of the ship.
8. Prewash and ventilation requirements are met in accordance with appendices 6 and 7 of the Annex.
9. The material safety data sheets (MSDS) for each cargo are obtained prior to loading, and all persons involved are aware of the risks and hazards and the action they need to take in case of any exposure or spill.

Hazards associated with any NLS are listed in the MSDS sheet. The IMO has standardised the information that is required on the MSDS sheets as per the MSC circular *MSC/Circ.1100* and MEPC circular *MEPC/Circ.407*.

Conclusion

There is a growing awareness of the need to develop procedures for the safe transport of chemicals and effective contingency planning to deal with a spill. There is a wide variety of chemicals with varying properties and hazards. It is vital to ensure that these cargoes are carried in a safe manner in accordance with the regulations. We recommend carrying out a risk assessment prior to carrying any NLS to determine its hazards and effects on the marine environment and human health in the event of a spill, and that members take proper actions to ensure that the ecosystem is not disturbed.

MARPOL Annex III and Amendment 37-14 to the IMDG code

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The above regulations relate to preventing and minimising the pollution of the marine environment by harmful substances in packaged forms.

This article aims to provide guidance on the requirements of MARPOL Annex III with reference to relevant IMDG code text and its latest amendments. It also provides information on liability and compensation for damage in connection with the carriage of hazardous and noxious substances.

'Harmful substances' means "those substances which are identified as marine pollutants in the International Maritime Dangerous Goods Code (IMDG code) or which meet the criteria in the appendix of Annex III".

'Packaged form' is defined as "the forms of containment specified for harmful substances in the IMDG code".

What is MARPOL Annex III?

Annex III of MARPOL, which came into force worldwide on 1 July 1992, aims to prevent or minimise pollution of the marine environment by **harmful substances in packaged forms**. This includes freight containers, portable tanks or road and rail tank wagons, or other forms of containment specified in the schedule for harmful substances in the IMDG code.

Annex III therefore sets out requirements for the packing, marking, labelling, documentation, stowage, quantity limitations, exceptions and notifications for preventing pollution by harmful substances.

As defined under MARPOL Annex III Regulation 1.1, 'harmful substances' are those substances that are identified as 'marine pollutants' in the International Maritime Dangerous Goods (IMDG) code or that meet the criteria in the appendix of the Annex. 'Packaged form' is defined as 'the forms of containment' specified for harmful substances in the IMDG code. Regulation 1(2) of Annex III prohibits the carriage of harmful substances except in accordance with the provisions of Annex III. This is also stated in the IMDG code.

Unlike Annex II (bulk chemicals), there are no pollution categories in Annex III. Such categorisation is made in the IMDG code, which must therefore also be considered when consulting MARPOL Annex III.

The revised MARPOL Annex III regulations entered into force on 1 January 2014 in order for changes to the Annex to coincide with the update of the IMDG code.

What is the IMDG code?

Dangerous goods that are carried in packaged form, in solid form or in bulk are regulated by Part A of SOLAS Chapter VII: carriage of dangerous goods, also known as the *IMDG code*.

The IMDG code was initially adopted in 1965 as a recommendatory instrument and got its mandatory status under the umbrella of the SOLAS Convention (Chapter VII) from 1 January 2004. Since its introduction, the code has undergone many changes, both in format and content, in order to keep up with the rapid expansion of the shipping industry.

The latest amendment *(37-14)*, which is mandatory from 1 January 2016, includes revisions to various sections of the code and to transport requirements for specific substances. It was adopted by the IMO's Maritime Safety Committee (MSC) at its 93rd session in May 2014.

Classification and Identification of marine pollutants & environmentally hazardous substances (aquatic environment)

Many substances, articles and materials falling under IMDG classes 1 to 9 have the potential to cause pollution to the marine environment, because they:

- are hazardous to aquatic life (marine flora and fauna);
- impair the taste of seafood; or
- accumulate pollutants in aquatic organisms.

The IMDG code establishes regulations for the transportation of marine pollutants and environmentally hazardous substances (aquatic environment) in Chapters 2.10 and 2.9.3, respectively. Marine pollutants, based on the MARPOL convention, are noted with the letter 'P' in column 4 (headed with MP) of the Dangerous Goods List. However, the absence of the letter 'P' or the presence of a dash in column 4 does not preclude classification of the material as a marine pollutant when deemed necessary.

Marine pollutants should be transported under the appropriate entry according to their properties if they fall within the criteria of any of the classes 1 to 8. If they do not fall within the criteria of any of these classes, they should be transported under the entry: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S., UN 3077 or ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S., UN 3082, as appropriate, unless there is a specific entry in class 9.

Environmentally hazardous substances (aquatic environment) criteria are based on the *Globally Harmonized System of Classification and Labelling of Chemicals (GHS)* standards established by the United Nations. These criteria are also listed in the appendix to Annex III of MARPOL and classify the substances and mixtures based on their acute and chronic toxicity to fish, crustaceans, and algae or other aquatic plants, bioaccumulation, and environmental degradation data and calculations.

MARPOL Annex III and Amendment 37-14 to the IMDG code continued

Are environmentally hazardous substances (UN3077 & UN3082) always a marine pollutant?

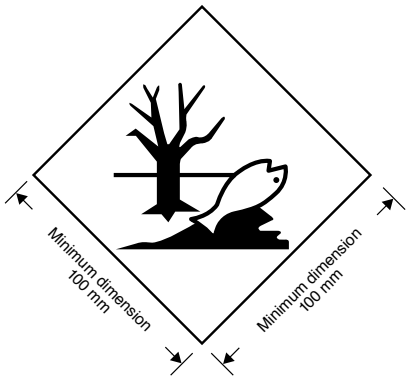
- If a substance meets the provisions of section 2.9.3 of the IMDG code, then it is a marine pollutant.
- If a substance does not meet the provisions of section 2.9.3 of the IMDG code, but is transported under UN3077 or UN3082 then it is not a marine pollutant.
- If a substance is identified as a marine pollutant by the IMDG code but no longer meets the provisions of classification as per section 2.9.3 of the IMDG code, then it can be transported as a non-marine pollutant with the approval of a competent authority.
- Basel waste which does not meet any criteria of the IMDG code can also be transported under UN3077 or UN3082.

Marking and labelling

Marine pollutants must be specially packaged, labelled and stowed on board to prevent their release into the marine environment. Special labelling also enables pollutants to be identified and separated from other cargoes during salvage operations after an accident.

The marking of packages, containers and tanks is required through Regulation 3 of MARPOL Annex III. Packages must be marked on one side, intermediate bulk containers (IBCs) on two opposing sides, and containers and tanks on all four sides. The IMDG code 37-14 has amended the requirement of marine pollutant marking through section 5.2.1.6.3 as follows:

Marine Pollutant Mark



"The marking must be in the form of a square set at an angle of 45° (diamond-shaped). The symbol (fish and tree) shall be black on white or suitable contrasting background. The minimum dimensions must be 100mm x 100mm and the minimum width of line forming the diamond shall be 2mm. If the size of the package so requires, the dimensions/line thickness may be reduced, provided the marking remains clearly visible. Where dimensions are not specified, all features shall be in approximate proportion to those shown.

The labelling provisions of 5.2.2 apply in addition to any requirement for packages to bear the marine pollutant mark.

The provisions of section 5.2.1.6.3 of IMDG code (Amendment 36-12) continue to apply until 31 December 2016."

Any packaged cargo transported at sea which poses a threat to people, other living organisms, property or the environment should be listed on the manifest as "dangerous goods" and should display the appropriate hazard labels. Any packaged cargo that represents a threat to the marine environment should also display the "marine pollutant" label.

Stowage

According to MARPOL Annex III Regulation 4, whenever a marine pollutant is offered for transport by sea, the document must mention the words 'marine pollutant' after the description of dangerous goods. This can be supplemented with the words 'environmentally hazardous'. Also, if the cargo is under a generic or N.O.S. (not otherwise specified) entry, then the proper shipping name shall be supplemented with the technical name.

Every ship must have a special list, manifest or stowage plan showing the stowage location of marine pollutants loaded at each port. This must be revised at every load and discharge port. These two documents must be handed to the person or organisation designated by the port authority.

An HNS is defined as "any substance other than oil which, if introduced into the marine environment, is likely to create hazards to human health, to harm living resources and marine life, to damage amenities or to interfere with other legitimate uses of the sea".

To prevent containers falling into the sea, carriers loading marine pollutant packages or containers/ tanks containing marine pollutants normally prefer under-deck stowage, when permitted, or will stow only on well-protected decks or inboard in sheltered areas of exposed decks (Regulation 5 – MARPOL Annex III).

The IMDG code 37-14 gives relaxation from many requirements when marine pollutants that do not have the properties of any other classes are packaged in single or combination packaging containing a net quantity per single or inner packaging of 5 litres or less for liquids, or having a net mass per single or inner packaging of 5 kg or less for solids.

Hazardous and noxious substances

Noxious liquid substances (MARPOL Annex II) and harmful substances carried by sea in packaged form (MARPOL Annex III) also fall under the definition of a 'hazardous and noxious substance' (HNS). Issues related to the preparedness for and response to incidents of chemical pollution are covered by the IMO OPRC-HNS Protocol 2000.

An HNS is defined as "any substance other than oil which, if introduced into the marine environment, is likely to create hazards to human health, to harm living resources and marine life, to damage amenities or to interfere with other legitimate uses of the sea".

HNSs could be accidentally released into the sea in a number of ways, such as containers falling overboard during severe weather or rough seas, or due to inadequately secured cargo.

Marine pollution caused by an HNS differs from oil pollution in that it could have a range of consequences. Even low doses of HNSs can have sublethal effects on marine organisms, producing impairments that may be detrimental to individual organisms, species, populations or marine communities over the longer term.

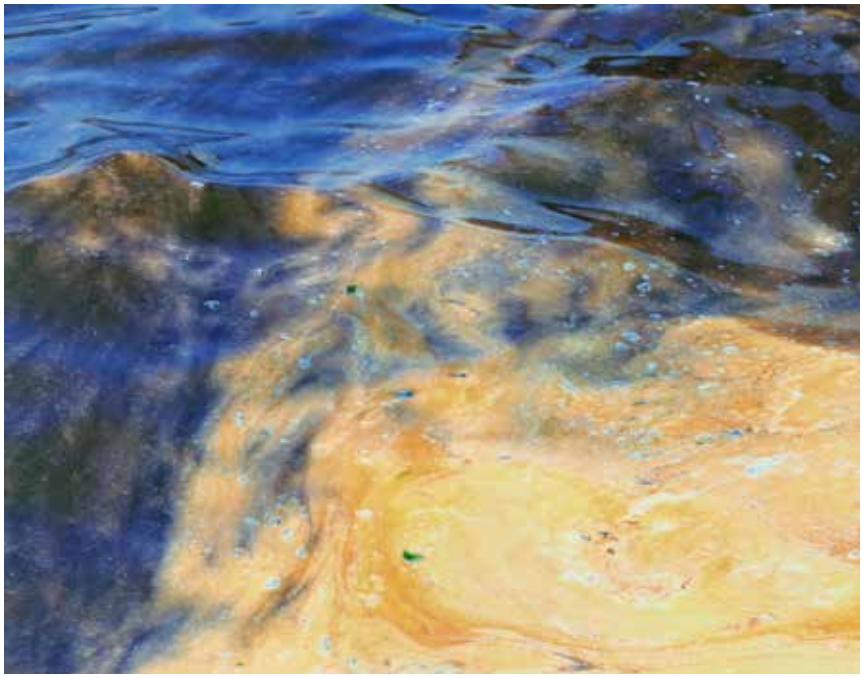
It is the physical characteristics of the HNS, once it is released into the environment, which determines whether the substance's flammable, reactive, toxic, explosive, corrosive properties will have an impact. Some materials behave in a similar way to oil spills (not least because a number are derived from petroleum products), but others react differently, such as forming gases, evaporating into the atmosphere, dissolving into sea water, igniting, etc.

Liability and compensation for incidents involving chemical pollution are covered by the HNS Convention 2010, which at the time of writing is yet to enter into force.

MARPOL Annex III and Amendment 37-14 to the IMDG code continued

Summary

- Ships carrying dangerous goods in packaged form need, according to SOLAS II-2/19 and VII, a document of compliance issued by the flag state administration. This document of compliance states the dangerous goods that the ship is certified to carry.
- The pollution caused by container ships could be as a result of loss of harmful packaged goods overboard (marine pollutants) or from hold bilges contaminated with cargo/oil seepage.
- Hold bilges must be sounded daily to check if any oil or cargo effluent exists. If the vessel is in port, bilges should be transferred to the bilge holding tank (where fitted). Pumping out of bilges must only be done after checking and verifying the uncontaminated water and in accordance with MARPOL requirements.
- If any marine pollutant (as per IMDG) leaks from a container into the hold bilges or on deck, it must be collected, taking due precautions as per Emergency Schedule (EMS), and disposed of ashore. Accidental loss overboard of containers must be notified to the shore authorities, including the nature of the contents, especially if they are a marine pollutant.
- Jettisoning of harmful substances is prohibited except when it is needed to secure the safety of life on board vessels or for securing the safety of the vessel.



Carriage of radioactive cargoes

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The International Atomic Energy Agency (IAEA) estimates that around 10 million shipments of radioactive materials take place annually, with up to 4 million of these by sea.

The transport of radioactive materials involves a potential radiological hazard. To ensure the safety of people, property and the environment, international and domestic transport regulations are necessary. This article outlines the key requirements.

Introduction

It is imperative when carrying radioactive cargoes that the materials to be transported are declared correctly and that proper cargo documents as stated in the relevant regulations/codes are provided to the ship sufficiently in advance to enable precautions to be put into place. This information includes, but is not limited to, cargo declarations that the information provided is accurate, laboratory test/analysis reports (where practicable) and documentation of relevant hazards posed by the material in order to guide the shipboard team on safe carriage and how to react in case of emergency.

Club cover for Excepted Matters

From the club's perspective, it is important to ascertain whether the consignment is an 'Excepted Matter'. The definition of 'Excepted Matter' is based on the Nuclear Installations Act 1965 (or any regulations made thereafter) and NOT whether it can be shipped under the IMDG code.

Members are advised that, in accordance with the club's *Rule 4.4* on the carriage of radioactive material, P&I cover extends only to 'Excepted Matter' (as defined in the Nuclear Installations Act 1965 of the United Kingdom or any regulations made thereunder), in individual consignments presented for transport on a specific route and vessel, and at a specific time.

When members want to carry a radioactive material, they need to request the club to confirm cover prior to **each** consignment and send the IMDG code dangerous goods declaration (as listed under para 5.4.1.5.7) for the **actual** voyage.

It is essential that the precise information on the cargo is provided. For the carriage of empty containers that previously carried radioactive cargo, the club also requires precise details of the radioactive cargoes that were previously carried in the container.

Carriage of radioactive cargoes continued

The IMDG code dangerous goods declaration should contain, at least:

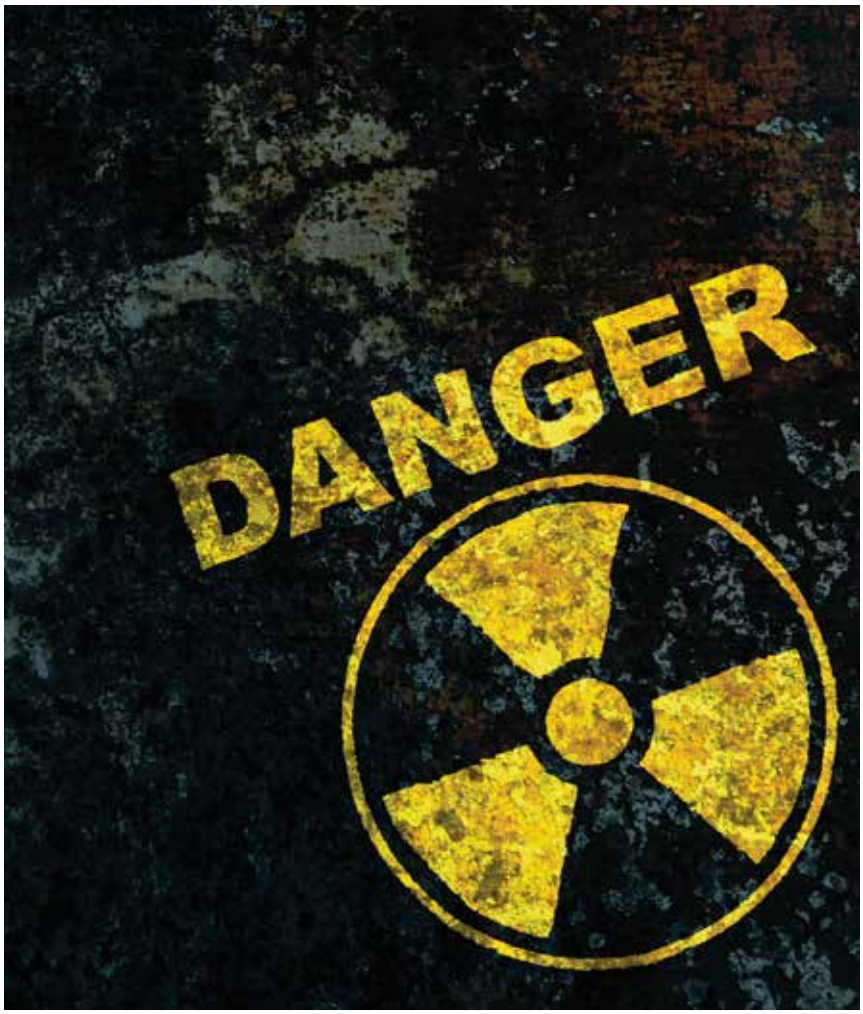
- The proper shipping name of the material.
- The UN number of the material.
- The weight of the actual cargo.
- The name of the isotope/ radionuclide.
- The radioactivity in Bq for each isotope.
- The form of the material (Special or Normal Form).
- Whether it is in its finished form for use or whether it is a radioactive waste material.

The club then seeks advice from our nuclear expert to confirm whether the subject cargo is Excepted Matter or not. The approval of cover will only be valid for one voyage, and each subsequent voyage will require confirmation of cover again upon viewing the IMDG declaration for the actual shipment.

A blanket approval for cover of carriage of Excepted Matter cannot be given. Each shipment will require a separate and new approval, even if identical to previous shipments.

Other radioactive cargo

If the consignment of radioactive cargo is not Excepted Matter, then it is not covered by P&I Club Rules, and the consignor needs to arrange for nuclear liability insurance and produce a Certificate of Financial Security from the relevant government before the consignment can be transported.



Breaking the error chain, part 2

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The purpose of the procedures for safe working is to prevent injuries. Short cuts taken by crew invariably result in reduced safety for the crew member themselves as well as others through failure to wear the correct personal protective equipment (PPE) or accepting increased risk for the convenience of completing a task quickly.

Introduction

In the previous edition of *Standard Safety*, we discussed three collision cases in which human error and bad judgement by the bridge team led to a chain of errors, resulting in collisions. We explained how a simple action from any of the bridge team members could have broken the chain and prevented the incident.

In this review, we will look at two crew injuries and a fatal injury to a stevedore and explain how the error chain could have been broken.

Case study 1

The ship in question was mid-ocean, navigating at full speed, when a crew member painting a mushroom ventilator fell overboard. The ventilators, positioned at the ship's side, had their tops above the side railing. A short ladder was used to reach the ventilator's top. While working on the ladder, the seaman leaned forward, the ladder slipped and the seaman fell a long distance before landing in the sea. The ladder had not been secured, the crew member did not wear a safety harness and neither a permit to work nor risk assessment had been completed. A second crew member was nearby, but was not holding the ladder. The principal cause was failure to secure the ladder. A short cut had been taken.

Errors made

- Failure to secure the ladder against slippage
- Failure to wear a safety harness
- Failure to use a permit to work system
- Failure to properly supervise

Breaking the chain

The error chain would have been broken if a fellow seaman had instructed the injured seaman to work safely by securing the ladder and wearing a safety harness. In addition, a rigorously applied permit to work system, which requires potentially hazardous tasks to be risk assessed before work is commenced, would have prevented the incident.

How often does a fellow seaman stand by and watch a colleague work dangerously? How often does a short cut become the accepted method of work?

Breaking the error chain, part 2 continued

Case study 2
In the second incident, a stevedore was killed when a ro-ro trailer fell onto and crushed him.

Stevedores loaded and discharged the ro-ro cargo. When the garage space was full, cargo was loaded on the ramp between the garage space and weather deck.

The loading process involved using a tug to haul the trailers on board and placing the trailer's head-end on a pedestal, before releasing the tug, applying axle lashings and wheel wedges. The trailer had air brakes that locked the rear wheels, but on this particular trailer, the air brakes were faulty and the brakes did not engage – something neither the ship nor the stevedores at the discharge port would have known.

The discharge was completed in the same way, but in reverse. However, removal of the trailer lashings and wheel wedges was only allowed when the trailer had been safely raised and secured by a tug. The stevedore at the discharge port assumed the trailer's air brakes were engaged. He had removed the lashings from the trailer's high-end and climbed under the trailer, when it moved forward, fell off the pedestal and crushed him.

Errors made
- Removal of the high-end lashings before the trailer was safely secured by a tug
- Climbing under an unsupported trailer
- Failure to follow written procedures for safe working

Breaking the chain
During the accident investigation, it was found that wheel wedges were not applied. The ship's crew had checked the lashings after loading but failed to notice the missing wedges and failed to apply them. Had the wedges been applied, the incident may have been avoided.

Case study 3
In the third incident, a seaman was injured while freeing a trapped gangway, when the gangway suddenly became free and struck him.

The ship was alongside a tidal berth. The tidal range was small, but the gangway had become trapped between the quay and the ship. Had a proper gangway watch been kept, this situation would not have arisen. In order to free the gangway, the mooring ropes should have been slackened to allow the ship to come off the berth. In this instance, they used a crowbar and considerable force to prise the gangway free. It was not surprising that when the gangway did come free, it sprung and hit someone.

The principal cause was the method used to free the gangway. There was no danger posed by walking back mooring ropes and allowing the ship to come off the berth, which would have automatically freed the gangway. It is assumed the crew chose another method to save time and effort.

Errors made
- Failure to maintain a proper gangway watch
- Failure to raise the gangway as the tide fell
- Failure to release mooring lines to allow the gangway to naturally come free

Breaking the chain
The error chain would have been broken if the ship had operated with a safety culture that promoted diligence, safety and best practice.

This concludes our second article in a series of three articles on how human error can lead to a chain of errors and how the chain can be interrupted to avoid an incident. In the next and last edition, we will discuss a cargo overflow and a total loss.

Navigation and complacency

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Tight waters require tight teamwork. This article looks at some of the key ways to minimise the risk of incident in pilotage waters.

Tips for working with a pilot:

1. Always conduct a 'master/pilot exchange'.
2. Agree on a plan, so that the whole bridge team has a shared mental model.
3. Monitor the actions of the pilot using:
   a. position fixes;
   b. parallel indexes;
   c. ECDIS/Radar Overlay;
   d. transits, sectored lights, buoyage.
4. Don't be afraid to challenge the pilot's actions.
5. Maintain proper logbook records throughout.
6. Ensure that a proper handover is conducted prior to the pilot's departure.

Case study

A vessel grounded during pilotage in Northern Europe on a bank well marked by an illuminated beacon. Prior to the grounding, the co-operation between the ship's crew and the pilot had been poor, and few steps had been taken to monitor the pilot's actions. No formal handover took place between the master and the pilot when the pilot departed, and the disembarkation of the pilot reduced the bridge team to a single deck officer, the master. The pilot disembarked just before the most challenging section of the passage and the master, navigating without reference to the chart or radar, failed to alter course at the appropriate time, resulting in grounding and pollution.

Pilots – part of the bridge team

Whilst pilots are primarily chosen for their skill and experience, they are vulnerable to making mistakes. The master in our case study appeared to have placed too much faith in the abilities of the pilot, ignoring the fact that the final responsibility for the ship's safety was his alone. Pilots will routinely take control of the ship's navigation in compulsory pilotage areas instead of acting in an advisory capacity. They should instead be treated like a part of the bridge team and be monitored to ensure that their actions are safe and in line with the plan agreed during the master/pilot exchange.

In our case study, the master was content to rely solely on the pilot for the navigation of the vessel and only commenced monitoring the vessel's passage when the pilot had disembarked. The master's lack of residual awareness directly contributed to his failure to recognise the imminent danger to his ship. Situational awareness cannot be instantly obtained; it must be built up using the appropriate navigation aids, regardless of how familiar a mariner is with the area.

Single watchkeeper – singular danger

The pilot's departure reduced the bridge team to the master and the watchkeeping rating, who subsequently left the bridge on a non-essential errand. Single watchkeeping is only permitted by the Standards of Training, Certification and Watchkeeping (STCW) code during daylight hours and only after an account has been taken of the prevailing circumstances and conditions. To do so at night in pilotage waters was at best unwise and at worst a breach of the STCW code.

Navigation and complacency continued

Officers should remember that, whilst allowed by the STCW code, ships navigated by a single watchkeeper are vulnerable to single point failures, where a single error made by an individual will result in an unsafe occurrence or accident. It should also be noted that whilst a single watchkeeper may be able to recognise the development of an emergency, their ability to take corrective action is limited: a single emergency may require alarms to be silenced, broadcasts to be made and the ship to be manoeuvred.

Complacency

The company that operated the vessel in our case study had a certified safety management system, which detailed the procedures and precautions to take when engaged in navigation. It specified the actions to take when navigating and working with a pilot.

During the course of normal navigation, the officer of the watch is required to confirm the vessel's:

1. course;
2. speed; and
3. location.

This should be done using the navigational equipment available as often as necessary in the prevailing circumstances. When in compulsory pilotage waters, the pilot and master: *"shall exchange information about the cargo, draught and navigational marks. The master and/or the officer on watch shall work closely with the pilot and maintain an accurate check on the progress of the voyage and the location of the vessel".*

Had the crew complied with the company's established procedures, the master would have been more aware of the ship's position and the implications of disembarking the pilot at their chosen location. It is likely that the accident could have been averted. The master in this case displayed a high level of complacency by failing to ensure that the cross-checks designed to maintain the ship's safety were carried out. Familiarity with the waters and overconfidence in the pilot's ability meant that the systems designed to protect the ship and her crew were effectively subverted.

Every officer serving at sea should ask themselves the questions:

"Are we cutting corners? Are we ignoring company procedure for the sake of expediency?"

If the answer to either is yes, they could be exposing their ship and crew to a possible hazardous incident.

Lifeboat release and retrieval systems: handle with care

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This article is aimed at giving practical advice to crew before carrying out a lifeboat drill. It might be an overstatement to say that lifeboats have caused more fatalities than they have saved lives, but reading the regular incident reports certainly raises this question. The majority of lifeboat incidents occur during a lifeboat drill.

- Release and retrieval systems are complex mechanisms
- New IMO requirements do not remove the need for competent use
- Minor lapses in judgement can have fatal results

Training, training, training

Before a crew member takes part in a lifeboat drill featuring an on-load release and retrieval system (RRS), they should be thoroughly trained in its operation. Crew members should know the associated hazards and the logical sequence of events that should occur during a successful launching procedure. Proper training equips crew members with a shared mental model of how lifeboat drills should be conducted and enables them to challenge actions that diverge from proper procedure. Remember that neither briefings nor drills should be conducted at such times as to induce fatigue by unduly disrupting hours of rest.

Areas to include in this training are:

1. Equipment knowledge

a. The state of the mechanism at all stages of the launch.
b. Purpose of the hydrostatic plate and emergency release mechanism.
c. Operation of the release handle, removable pin, etc.
d. Operation of the hooks.
e. Removal/insertion of locking pins (if applicable).
f. The catastrophic occurrence that may result from a hook failure or premature hook release.
g. How to operate the brake release wire.
h. The function of fall prevention devices (FPD).

2. Drill familiarity

a. Roles and responsibilities of each team member.
b. Safety checks to make prior to entering the lifeboat.
c. Safe sequence of actions required to launch/recover the lifeboat.
d. Safety checks to make prior to retrieval.
e. The procedure to follow if a crew member witnesses an unsafe act.
f. How and when to rig fall prevention devices.

Initial familiarisation does not have to take place on board the lifeboat. Explaining the procedures and talking crew through the steps using diagrams or pictures will impart an understanding of a safe way to conduct lifeboat drills.

Some ships are equipped with a mock-up of the hook mechanism mounted on a bulk head, which allows crew to practise the operation of the mechanism and view its results safely. All drills should be conducted in such a way as to encourage learning, rather than just carrying out the launching actions – crewmembers need to know the whys as well as the hows of what they are doing.

Lifeboat release and retrieval systems: handle with care continued

Advice for a safe launch and recovery

Launch

1. Conduct a briefing for all personnel involved. This should not be done on board a lifeboat rigged outboard.
2. Check crew personal protective equipment (PPE). Do not allow the crew to ease their PPE, even to relieve heat/discomfort.
3. Conduct visual checks of the fore and aft hooks prior to boarding to ensure that they are correctly set and are positioned identically.
4. Keep the number of persons on board the lifeboat to a minimum until the time of launch.
5. Confirm that fall prevention devices are properly rigged.
6. Check that the emergency release is situated in the green zone and that the release handle is in the safe/locked position, with pin present. This should be done by a single crew member.
7. Board the lifeboat in an orderly manner only after all checks have been completed.
8. Before descent, all personnel should be seated and secured with the restraints provided, with steps taken to evenly distribute weight.
9. After entering the water, reset and check the hooks at the earliest opportunity.

Recovery

1. Visually confirm that hooks have been reset.
2. Ensure that boat hooks and other necessary equipment required for recovery are ready and near-at-hand.
3. Crew responsible for reattaching the falls should ensure that they give positive confirmation when the falls are reattached.
4. Reattach fall prevention devices.
5. Initially raise the lifeboat to a position just above the water line and check that the emergency release has returned to the green zone.
6. In the event that the emergency release handle fails to return to the green sector, do not hoist the lifeboat further.
7. Ensure that personnel depart the lifeboat calmly and carefully.
8. Conduct post-drill debriefing to ensure that any lessons learned can be incorporated into the SMS.

Safety first, safety always

A successful lifeboat drill is not only one in which nobody was injured, but also one in which the participating crew gained a better understanding of the launching and recovery procedures. In the unfortunate event that the crew needs to abandon ship, successful drills are what will have prepared them for the emergency and what will save their lives. To that end, seafarers need to be trained to know their RRS, recognise potential dangers and raise the alarm in the face of a dangerous action by another crewmember or if they are in any doubt as to the task they are being asked to undertake. Crewmembers who stick to these principles when conducting drills will see a reduction in preventable accidents and a corresponding rise in the ability of the crew to operate the equipment when it matters most, in a real emergency.

Conclusion

Release and retrieval systems have been the subject of much debate amongst mariners. The IMO's action to improve the safety of launching systems should go some way to improving seafarers' confidence, but seafarers must also take ownership of the problem by enhancing their own knowledge and handling of their survival craft's RRS. The combination of improved systems and following safer procedures should help to improve the perception of this most essential piece of survival equipment.

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