

21 HAZARDOUS SUBSTANCES AND MIXTURES

21.1 General advice

21.1.1 Many substances and mixtures found on ships are capable of damaging the health and safety of those exposed to them. They include not only substances displaying hazard-warning labels (particularly those declared as dangerous goods in ships' stores) but also, for example, a range of dusts, including hardwood dusts, fumes and fungal spores from goods, plant or activities aboard ship.

21.1.2 This chapter deals with the use of hazardous substances and mixtures (referred to in this chapter as 'hazardous substances') carried on board ships, e.g. in a ship's stores. Dangerous substances carried as cargo are covered in the relevant sections of Chapter 28, Dry cargo, and Chapter 29, Tankers and other ships carrying bulk liquid cargoes.

21.1.3 A hazard-warning label includes a pictogram, a precautionary statement, a hazard statement (e.g. carcinogenic, flammable) and, where required, a signal word (either 'Danger' or 'Warning'). Seafarers should familiarise themselves with the meaning of such labels.

21.1.4 The Company's risk assessment will identify where seafarers are working in the presence of hazardous substances, and evaluate any risks from exposure. Appropriate measures should be taken to remove, control or minimise the risk. It is essential before use of any hazardous substance that the manufacturer's safety data sheet (SDS) is referred to, to select appropriate personal protective equipment (PPE) and working methods.

21.1.5 The Company should instruct and inform seafarers so that they know and understand the risks arising from their work and the precautions to be taken. Employers should inform seafarers of the results of any monitoring of exposure.

21.1.6 Where possible, seafarers should avoid direct contact with hazardous substances, wear appropriate gloves and if necessary safety glasses/goggles, and follow the manufacturer's instructions.

21.1.7 The Company should instruct seafarers to take appropriate precautions and make them aware of the potentially hazardous by-products that may be produced from mixing hazardous substances together, e.g. mixing chlorine-based toilet cleaner with de-scaler will evolve a hazardous gaseous by-product, which may result in an asphyxiating, explosive or other hazardous atmosphere.

21.1.8 The risk assessment will also provide information to determine whether health surveillance is appropriate as a result of exposure to hazardous substances. Advice can be found in Chapter 7, Health surveillance.

21.1.9 As an aid to the identification of hazards and the assessment of risks from hazardous substances, reference may be made to the SDS, which in Europe the manufacturer is required to supply with hazardous substances and mixtures.

21.1.10 For more specialist advice relating to particular work activities, reference may also be made where appropriate to the series of publications issued by the Health and Safety Executive (HSE) under the Control of Substances Hazardous to Health (COSHH) Regulations (see Appendix 2, Other sources of information).

21.2 Carcinogens and mutagens

21.2.1 The Merchant Shipping and Fishing Vessels (Health and Safety at Work) (Carcinogens and Mutagens) Regulations 2007 (the 2007 Regulations) specifically require that the risk assessment considers the risk arising from exposure to carcinogens and mutagens. A carcinogen is a substance or mixture for which evidence exists to establish a link between exposure to it and the development of cancer, and a mutagen is a substance or mixture for which evidence exists to establish a link between exposure to it and heritable genetic damage.

S.I. 2007/3100 and MGN 356(M+F)

21.2.2 Hazardous substances that are found on ships and considered carcinogens and mutagens include:

- aflatoxins;
- arsenic;
- asbestos (see section 21.4);
- hardwood dusts;

- rubber dust and rubber fumes; ~~and~~
- used engine oils; and
- welding fumes (see Chapter 24).

21.2.3 The supplier of a hazardous substance or mixture is required to:

- identify the hazards of the substance or mixture;
- provide information about the hazards to their customers. This information is usually provided on the package itself (e.g. by means of a hazard label) and, if supplied for use at work, in a SDS; and
- package the chemical safely (classification of carcinogens is described in Annex 21.1).

The hazard information should be used to help the Company comply with the 2007 Regulations.

21.2.4 Where the risk assessment reveals a risk to seafarers' health from carcinogens and mutagens, and the measures set out in section 21.3 do not result in the complete removal of that risk, the Company should ensure that in no circumstances does the exposure exceed the limit values set out in the regulations.

21.2.5 All cases of cancer that can be identified as resulting from occupational exposure to a carcinogen or mutagen, and have been confirmed in a report from a doctor, are required to be reported to the Maritime and Coastguard Agency (MCA). (See Chapter 7, Health surveillance, on the reporting of occupational diseases.)

21.3 Prevention or control of exposure

21.3.1 The first consideration should always be to prevent exposure by removing the substance, e.g. by substituting a less harmful one.

21.3.2 Where this is not reasonably practicable, prevention or control of exposure may be achieved by any combination of the following means:

- Total or partial enclosure of the process and handling systems.

- Using plant, processes and systems of work, which minimise the generation of, or suppress and contain/prevent, spills, leaks, dust fumes and vapours of hazardous substances.
- Local exhaust ventilation (to remove toxic fumes and therefore limit exposure).
- Limiting the quantities of a substance at the place of work.
- Keeping the number of persons who might be exposed to a substance to a minimum, and reducing the period of exposure.
- Prohibiting eating, drinking and smoking in areas that may be contaminated by the substance.
- Hygiene measures, including providing adequate washing and laundering facilities, and regular cleaning of walls/bulkheads and other surfaces.
- Designation of those areas that may be contaminated and the use of suitable and sufficient warning signs.
- Safe storage, handling and disposal of hazardous substances and use of closed and clearly labelled containers.
- Using appropriate procedures for the measurement of hazardous substances, in particular for the early detection of abnormal exposures resulting from an unforeseeable event or an accident.
- Taking individual/collective protection measures.
- Where appropriate, drawing up plans to deal with emergencies likely to result in abnormally high exposure.

21.3.3 These measures should be applied to reduce the risk to seafarers to the minimum, but where they do not adequately control the risk to health, PPE should be provided in addition.

21.3.4 The Company should take reasonable steps to ensure that any control measures are properly used and maintained. Where appropriate, exposure levels should be monitored and recorded. For some hazardous substances, seafarers must not be subject to exposure at work beyond a statutory level. These workplace exposure limits are published by HSE in the publication, 'EH40/2005 Workplace exposure limits', available on the HSE website.

21.3.5 Seafarers should comply fully with the control measures in force.

21.3.6 For certain substances (e.g. asbestos and benzene), very specific control measures apply. In cases where failure of the control measures could result in risk to health and safety, the exposure of personnel should be monitored and a record kept for future reference.

21.3.7 Where the adequacy or efficiency of control measures is in doubt, work should not be undertaken until outside advice is sought and action taken proportionate to the risks involved.

21.4 Asbestos dust

21.4.1 The use of asbestos in ship construction has been banned internationally, but cases of its use are still being discovered in non-approved parts such as gaskets and brake linings. Caution should be exercised when obtaining spare parts, because some components may contain asbestos even when declared 'asbestos free'. Measures to protect seafarers' health where there is a risk of exposure to asbestos are in the Merchant Shipping and Fishing Vessels (Health and Safety at Work) (Asbestos) Regulations 2010 and associated marine guidance notes (MGNs).

S.I. 2010/2984, MGN 429(M+F) and MGN 493(M+F)

21.4.2 All types of asbestos have a fibrous structure and can produce harmful dust if the surface exposed to the air is damaged or disturbed. The danger is not immediately obvious because the fibres that can damage the lungs and cause lung cancer are too small to be seen with the naked eye. Asbestos that is in good condition is unlikely to release fibres, but where the material is damaged or deteriorating, or work is undertaken on it, airborne fibres can be released. Dry asbestos is much more likely to produce dust than asbestos that is thoroughly wet or oil-soaked. Asbestos is particularly likely to occur on older vessels in insulation and panelling, but certain asbestos compounds may also be found elsewhere and on other vessels in machinery components such as gaskets and brake linings.

21.4.3 The Company should advise masters of any location where asbestos is known or believed to be present on their ship. Masters and/or safety officers should keep a written record of this information and should also note any other position where asbestos is suspected, but they should not probe or disturb any suspect substance. Crew members who work regularly near asbestos or a substance likely to contain it should be warned of the need for caution and should report any deterioration in its condition such as cracking or flaking.

21.4.4 The condition of old asbestos may deteriorate and where reasonably practicable consideration should be given to its removal. This should be carried out in port and a specialist removal contractor should be used to ensure adequate protective procedures. Where the port is in the UK and the work involves asbestos insulation or asbestos coating, it is usually necessary for the contractor to hold a licence issued by HSE. If such work is carried out outside the UK, the contractor should be of equivalent competence.

21.4.5 If it is essential to carry out emergency repairs liable to create asbestos dust while the ship is at sea, strict precautions, including the use of the appropriate protective clothing and respiratory protective equipment, should be observed in accordance with the guidance given in the relevant merchant shipping notice (MSN). See also the general guidance on the assessment and control of risks from hazardous substances in section 3.11 of this Code.

21.4.6 Where asbestos or asbestos-containing materials are carried as a cargo, generally in shipping containers, extreme caution should be exercised so as to prevent exposure.

21.5 Use of chemical agents

21.5.1 Relevant MGNs give further guidance on the handling of chemicals and should be consulted. Particular emphasis is given to health monitoring for those exposed to chemicals (see Chapter 7, Health surveillance).

S.I. 2010/330, MGN 409(M+F) and MGN 454(M+F)

21.5.2 A chemical from an unlabelled package or receptacle should never be used unless its identity has been positively established. In addition to transport labelling, packaged substances supplied in Europe may also display similar or additional labelling for supply and use for compliance with the European regulation on classification, labelling and packaging of substances and mixtures ('the CLP Regulation').

European regulation (EC) 1272/2008

21.5.3 Employers should ensure workers are instructed to familiarise themselves with the accompanying data sheet for any chemical agents they may use in the course of their work. They should also be aware of the potentially hazardous gaseous by-products that may be produced from the reaction of a cleaner/de-scaling product and the object itself, or products used together, because this may result in an asphyxiating, explosive or other hazardous atmosphere.

21.5.4 Chemicals should always be handled with the utmost care. Industrial formulations may be stronger. Eyes and skin should be protected from accidental exposure or contact.

21.5.5 Manufacturers' or suppliers' advice on the correct use of chemicals should always be followed. Some cleaning agents (e.g. caustic soda and bleaches), even though used domestically, may burn the skin. The product's hazard-warning label should identify where skin corrosion/serious eye damage hazards are present. Instructions on handling such chemicals safely will be made clear in the precautionary statements.

21.5.6 Chemicals should not be mixed unless it is known that no dangerous reaction will be caused.

21.5.7 Employers should ensure that any necessary training in the use of chemicals is given.

21.6 Dry-cleaning operations

21.6.1 The principal hazard presented by a dry-cleaning solvent is that it is highly volatile, producing a vapour that is anaesthetic. Effective mechanical ventilation should therefore be provided in any compartment containing dry-cleaning plant. Smoking should be prohibited in compartments when the solvent is present.

21.6.2 Dry-cleaning solvent is also a potential cause of skin damage and suitable PPE should be worn.

21.6.3 A competent person should be appointed to take overall responsibility for the security and operation of the dry-cleaning plant and access should be controlled.

21.7 Safe use of pesticides

21.7.1 The following guidance should be read in conjunction with MSN 1718(M), which has mandatory force under the Merchant Shipping (Carriage of Cargoes) Regulations 1999.

S.I.1999/336 and MSN 1718(M)

21.7.2 Where pesticides are used in the cargo spaces of ships or cargo units, safety procedures should be in accordance with the International Maritime Organization (IMO) publication, MSC.1/Circ.1264, and a copy of this publication should be retained on board and kept accessible for all crew members.

MSC.1/Circ.1264

Where pesticides are used in other spaces of ships, safety procedures should be in accordance with MSC.1/Circ.1358.

MSC.1/Circ.1358

21.7.3 Where space and surface-spraying operations are being carried out by the crew, the master should ensure that the appropriate protective clothing, gloves, respirators and eye protection are being worn.

21.7.4 The ship's personnel should not handle fumigants and such operations should be carried out only by qualified operators. Fumigation should only be carried out with the authority of the ship's master. (Health and safety guidance on fumigation can be found in the HSG251 publication, which is available from the HSE website.)

21.7.5 In exceptional circumstances, the master may choose to allow an in-transit fumigation only after first referring to the requirements of the ship's own national administration, and seeking the approval of the administration of the state of the vessel's next destination or port of call. The master should provide safe working conditions and ensure that at least two members of the crew, including one certificated officer, have received the appropriate training. They should be familiar with the recommendations of the fumigant manufacturer concerning the methods of detection of the fumigant in air, its behaviour and hazardous properties, symptoms of poisoning, relevant first-aid treatment and special medical treatment and emergency procedures.

21.7.6 The 'fumigation warning' sign should be conspicuously displayed on cargo units or spaces under fumigation. A watchman should be posted to prevent access to areas of risk by unauthorised personnel.

21.8 Biological agents

21.8.1 The following guidance should be read in conjunction with MGN 408(M+F) on biological agents. Biological agents are classified in groups 1 to 4. These groups are defined in Annex 21.1.

S.I. 2010/323 and MGN 408(M+F)

21.8.2 In excess to the guidance given above, employers are required to keep a list of those exposed to biological agents of group 3 or higher.

21.8.3 Any worker involved with the handling of, or being exposed to, biological agents should be given appropriate training and advice.

21.8.4 Before any work is carried out, a risk assessment should be carried out and procedures put in place for any potential accident to minimise its effects.

21.8.5 The most likely areas for contamination by biological agents are from the following:

- food preparation;
- contact with animals and/or products of animal origin;
- health care;
- work with air-conditioning and water-supply systems; and
- work involving waste disposal and the sewage plant.

21.9 Solid carbon dioxide

21.9.1 Solid carbon dioxide (drikold, cardice, dry ice) can be used as an emergency refrigerant for storing deep frozen food supplies, in their hard frozen condition.

21.9.2 The following precautions should be taken when solid carbon dioxide is used:

- Carbon dioxide does not diffuse readily, because it is heavier than air, therefore, special care should be taken to test the atmosphere thoroughly and ventilate such compartments/enclosed spaces before entering.
- The door of the compartments/enclosed spaces should remain open while the seafarer is inside the cold chambers/enclosed spaces.
- Gloves should always be worn when handling solid carbon dioxide to prevent blistering of the skin.

21.9.3 Chapter 15 gives guidance on entering dangerous (enclosed) spaces and the procedures that should be followed prior to entry and while inside.

ANNEX 21.1 CLASSIFICATION OF CARCINOGENS AND BIOLOGICAL AGENTS

Classification of carcinogens

Carcinogenic category 1	Substances known to cause cancer on the basis of human experience.
Carcinogenic category 2	Substances that it is assumed can cause cancer on the basis of reliable animal evidence.
Carcinogenic category 3	Substances where there is only evidence in animals and it is of doubtful relevance to human health, i.e. the evidence is not good enough for categories 1 or 2.

In the case of **mutagens**, there are three similar categories with analogous descriptors, based on the strength of evidence for heritable genetic damage.

All categories should be treated as hazardous substances or mixtures.

Classification of biological agents

Group 1	Unlikely to cause human disease.
Group 2	Can cause human disease and may be a hazard to employees; it is unlikely to spread to the community and there is usually effective prophylaxis or treatment available.
Group 3	Can cause severe human disease and may be a serious hazard to employees; it may spread to the community, but there is usually effective prophylaxis or treatment available.
Group 4	Causes severe human disease and is a serious hazard to employees; it is likely to spread to the community and there is usually no effective prophylaxis or treatment available.