

## ประกาศกรมเจ้าท่า

ที่ ๕๕/๒๕๖๖

เรื่อง แนวทางในการตอบสนองต่อเหตุฉุกเฉินสำหรับเรือบรรทุกสินค้าอันตราย  
และแนวทางสำหรับการปฐมพยาบาลเมื่อเกิดอุบัติเหตุที่เกี่ยวข้องกับสินค้าอันตราย

ตามที่องค์การทางทะเลระหว่างประเทศ (International Maritime Organization: IMO) ได้กำหนดในอนุสัญญาระหว่างประเทศว่าด้วยความปลอดภัยแห่งชีวิตในทะเล ค.ศ. ๑๙๗๔ และที่แก้ไขเพิ่มเติม (International Convention for the Safety of Life at Sea, 1974 as amended (SOLAS 1974)) บทที่ VII Carriage of dangerous goods ให้ใช้ประมวลข้อบังคับระหว่างประเทศว่าด้วยการขนส่งสิ่งของที่อาจทำให้เกิดอันตรายขึ้นได้ทางน้ำระหว่างประเทศ (International Maritime Dangerous Goods Code: IMDG Code) ประกอบกับแนวทางในการตอบสนองต่อเหตุฉุกเฉินสำหรับเรือบรรทุกสินค้าอันตราย (Emergency Response Procedures for Ships Carrying Dangerous Goods: EMS Guide) และแนวทางสำหรับการปฐมพยาบาลเมื่อเกิดอุบัติเหตุที่เกี่ยวข้องกับสินค้าอันตราย (Medical First Aid Guide for Use in Accidents involving Dangerous Goods: MFAG)

เพื่อให้การปฏิบัติตามพันธกรณีระหว่างประเทศ รวมถึงการบังคับใช้กฎหมายเป็นไปอย่างมีประสิทธิภาพและเกิดประสิทธิผลสูงสุด อาศัยอำนาจตามความในข้อ ๑๗ แห่งกฎกระทรวงการดำเนินการสำหรับสิ่งของที่อาจทำให้เกิดอันตรายขึ้นได้ พ.ศ. ๒๕๖๔ และมาตรา ๑๙๐ แห่งพระราชบัญญัติการเดินเรือในน่านน้ำไทย พระพุทธศักราช ๒๔๕๖ แก้ไขเพิ่มเติมโดยพระราชบัญญัติการเดินเรือในน่านน้ำไทย (ฉบับที่ ๑๔) พ.ศ. ๒๕๓๕ อธิบดีกรมเจ้าท่าจึงประกาศกำหนดให้นายเรือเจ้าของเรือ ตัวแทนเจ้าของเรือ ผู้ส่งสินค้าทางเรือ ผู้รับขนส่งสินค้าทางเรือ ปฏิบัติตามแนวทางในการตอบสนองต่อเหตุฉุกเฉินสำหรับเรือบรรทุกสินค้าอันตราย (EMS Guide) และแนวทางสำหรับการปฐมพยาบาลเมื่อเกิดอุบัติเหตุที่เกี่ยวข้องกับสินค้าอันตราย (MFAG) ตามภาคผนวกที่แนบท้ายประกาศนี้

ทั้งนี้ ตั้งแต่บัดนี้เป็นต้นไป

ประกาศ ณ วันที่ ๑๐ กุมภาพันธ์ พ.ศ. ๒๕๖๖

สุริพัฒน์ อธิ์กุลพิศุทธิ์

รองอธิบดี รักษาราชการแทน

อธิบดีกรมเจ้าท่า

# ภาคผนวก

ระเบียบแนวทางการปฏิบัติการตอบสนองฉุกเฉินสำหรับเรือบรรทุกสินค้าอันตราย  
และคำแนะนำสำหรับการปฐมพยาบาลเมื่อเกิดอุบัติเหตุที่เกี่ยวข้องกับสินค้าอันตราย  
Emergency Response Procedures for Ships Carrying Dangerous Goods (EMS  
Guide) and Medical First Aid Guide for Use in Accidents involving Dangerous  
Goods (MFAG)

4 ALBERT EMBANKMENT  
LONDON SE1 7SR  
Telephone: +44 (0)20 7735 7611 Fax: +44 (0)20 7587 3210

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## **CARRIAGE OF DANGEROUS GOODS**

### **INTERNATIONAL MARITIME DANGEROUS GOODS (IMDG) CODE**

#### **REVISED EMERGENCY RESPONSE PROCEDURES FOR SHIPS CARRYING DANGEROUS GOODS (EMS GUIDE)**

1 The Maritime Safety Committee, at its ninety-ninth session (16 to 25 May 2018), approved the *Revised Emergency Response Procedures for Ships Carrying Dangerous Goods* (EmS Guide), which had been prepared by the Sub-Committee on Carriage of Cargoes and Containers (CCC) at its fourth session (11 to 15 September 2017), and finalized by the Sub-Committee's Editorial and Technical Group.

2 The Maritime Safety Committee, at its 102nd session (4 to 11 November 2020), approved amendments to the EmS Guide (MSC.1/Circ.1588), resulting from the amendments (40-20) to the International Maritime Dangerous Goods (IMDG) Code, as adopted by resolution MSC.477(102). Consequently, the Maritime Safety Committee decided that it would be preferable to prepare a revised consolidated version of the EmS Guide, with a view to dissemination as MSC.1/Circ.1588/Rev.1.

3 Member States are invited to bring the annexed Revised EmS Guide to the attention of all parties concerned, taking into account the voluntary application date of 1 January 2021 of amendments (40-20) to the IMDG Code, pending its envisaged mandatory entry-into-force date of 1 June 2022.

4 This Circular supersedes MSC.1/Circ.1588.

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## **ANNEX**

### **Revised Emergency Response Procedures for Ships Carrying Dangerous Goods (EmS Guide)**

## **Contents**

Foreword .....	2
Preamble .....	3
How to use this Guide .....	4
<b>Fire</b>	
Introduction to the emergency schedules for FIRE .....	5
General guidelines for FIRE .....	12
Emergency schedules for FIRE .....	13
<b>Spillage</b>	
Introduction to the emergency schedules for SPILLAGE .....	25
General guidelines for SPILLAGE .....	32
Emergency schedules for SPILLAGE .....	33
Index .....	62



## Foreword

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This EmS Guide contains guidance on Emergency Response Procedures for Ships Carrying Dangerous Goods including the emergency schedules (EmS) to be followed in case of incidents involving dangerous substances, materials or articles, or harmful substances (marine pollutants), regulated under the *International Maritime Dangerous Goods Code* (IMDG Code).

This edition takes into account the Amendment 40-20 to the IMDG Code. The EmS Guide will be further amended as and when necessary to reflect amendments made to the IMDG Code.

## Preamble

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The purpose of this Guide is to provide guidance for dealing with fires and spillages (leakages) on board ships involving the dangerous goods listed in the *International Maritime Dangerous Goods Code* (IMDG Code).

In accordance with the *International Safety Management Code* (ISM Code), all ships, and the companies responsible for their operation, are required to maintain a safety management system (SMS). Within the SMS, procedures for responding to potential shipboard emergencies are required. This Guide is intended to assist shipowners, ship operators and other parties concerned with developing such emergency response procedures, which should be integrated into the ship's contingency plan.

In November 1997, the IMO Assembly adopted resolution A.852(20) on *Guidelines for a structure of an integrated system of contingency planning for shipboard emergencies*, which were further revised by resolution A.1072(28) in December 2013 and amended by its Corr.1 in May 2014. This Guide should be integrated into Module IV on Response actions, as contained in paragraph 3.2.4.6 of the latter resolution, for cargo-related incidents.

In the event of a fire or spillage incident, initial actions should be carried out in accordance with the shipboard emergency plan. Where dangerous goods are involved, the responses in the emergency plan should be based on this Guide for specific dangerous goods having regard to, inter alia, the type of ship, the quantity and type of packaging of the dangerous goods and whether the goods are stowed on or under deck.

## How to use this Guide

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- 1 The guidance contained in this Guide is intended for fire and/or spillage (leakage) emergencies on board a ship involving packaged dangerous goods transported in accordance with the provisions of the IMDG Code. The Guide should not be used for emergencies involving bulk cargoes or any other fire and/or spillage on board a ship which does not involve packaged dangerous goods as cargo.
- 2 This guidance is for shipboard use where master and crew have to respond to a fire or a spillage without external assistance. The recommendations are based on the fire safety provisions contained in chapter II-2 of the *International Convention for the Safety of Life at Sea, 1974* as amended, and the provisions of the IMDG Code. The guidance should be integrated into the contingency plan for shipboard emergencies, which should be specific to the individual ship and should take into account the equipment on board.
- 3 There are international and national requirements for ships to contact or report to the nearest coastal State when an incident takes place involving the loss or likely loss of packaged dangerous goods (see Reporting procedures). Contacting shore-based experts at an early stage irrespective of how insignificant the incident may seem to be is recommended. However, it should be noted that shore-based personnel or rescue/ coastguard experts may use different techniques to fight a fire or to deal with spillage on board a ship.
- 4 In this Guide, there is separate advice for fire and spillage emergencies which should be consulted accordingly.
- 5 This Guide should be used as follows:
  - .1 for fire and spillage, read and incorporate into the ship's training regime the INTRODUCTIONS to the emergency schedules, before any emergency occurs;
  - .2 in the event of an emergency involving packaged dangerous goods, consult the GENERAL GUIDELINES as a first step; and
  - .3 obtain detailed advice for the specific cargo(es) involved by reading the relevant EMERGENCY SCHEDULE(S) (EmS) for the cargo(es).

# Fire

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## *Introduction to the emergency schedules for FIRE*

### 1 Be prepared

- 1.1 Preventing a fire from occurring is the most important part of a shipboard safety programme. However, once a fire has started, a well trained crew is the best defence for bringing the fire under control. Given the complexity of extinguishing a fire involving dangerous goods, it is essential that the advice in this Guide be incorporated into the ship's training regime so that the crew will be able to respond to a fire casualty in a timely and effective manner.
- 1.2 This Guide should be integrated into a safety management system (SMS). Procedures contained in the shipboard emergency plan should be tailored to the individual ship.
- 1.3 The firefighting procedures within the EmS SCHEDULES are different for "on deck" and "under deck" stowage. For specific ship types (e.g. hatchless containerships) or cargo holds (e.g. open vehicle decks of ferries), these two procedures have to be assigned specifically to the individual ship.
- 1.4 Given the toxic nature of some of the dangerous goods involved, accommodation spaces should be protected from fire and smoke as far as possible (e.g. water spray). Therefore, the ventilation systems for working and living spaces should be shut off, closed and secured to reduce the possibility of vapours, dusts and gases penetrating these spaces. In some instances, it may be necessary to turn the ship's accommodation spaces upwind, if possible.
- 1.5 The safety of firefighting personnel is most important. Use of appropriate protective clothing (i.e. a firefighter's outfit when dealing with a fire) and self-contained breathing apparatus, to protect skin and lungs from toxic and/or corrosive liquids, vapours, dusts and gases, is essential. This equipment should be suitable for each individual member of the firefighting team, as working with such equipment requires a high level of fitness and training. It should be kept in mind that even a weak acute illness may interfere with a crew member's fitness. In addition, pregnant crew members should not be exposed to dangerous vapours.
- 1.6 It is also essential to ensure that there is always an escape route for firefighting personnel despite the limitations due to narrow exit paths and the danger of falling overboard.

### 2 Identification of the dangerous good(s) involved

- 2.1 It is essential to identify the dangerous good(s) involved in the fire in order that the specific EmS FIRE SCHEDULE(S) for the cargo(es) may be consulted and appropriate action taken. This is important because some dangerous goods are incompatible with some firefighting media and could exacerbate the situation (e.g. use of a water-based extinguishing medium on water-reactive cargoes).
- 2.2 An identification number with four digits preceded by the letters "UN" is assigned to all dangerous goods. From the UN Number, it is possible to find the appropriate EmS FIRE SCHEDULE. The Dangerous Goods List in part 3, chapter 3.2, of the IMDG Code contains the names and the UN numbers, as well as the EmS SCHEDULE NUMBERS. The special Dangerous Goods Manifest and the detailed Stowage Plan required by SOLAS regulation VII/4.2 will also contain the proper shipping name and UN number of the dangerous good(s) concerned. Packages will usually be labelled as well.
- 2.3 Specific information as to properties of dangerous goods may also be found in the Dangerous Goods List in the IMDG Code. Dangerous goods are classified and labelled according to their hazards. Labels and marks on packages provide a warning of the general risks to be encountered. Personnel should understand the labelling system.
- 2.4 Emergency preparedness should form part of the ship's Safety Management System as required by the ISM Code. Prepared information can reduce errors during a fire emergency. Therefore, it is recommended that the EmS SCHEDULE(S) be identified and included on the Dangerous Goods Manifest and Stowage Plan recording the stowage position of the cargo. That will enable key members of the crew to know in advance which emergency procedures could be necessary. In the event of a fire, the allocation of a specific EmS FIRE SCHEDULE via identification of cargo

via the UN number takes time and is open to error, especially in mixed cargoes in one container. Furthermore, some firefighting procedures may require specific media and operations could be affected by the stowage location of such media. The advice given in the EmS FIRE SCHEDULE should be directly usable based on the stowage information, without time-consuming identification and location of the cargo involved.

### 3 Cool and suffocate

- 3.1 In general, fires require heat (energy) and oxygen to start burning. Only a limited number of chemicals do not need oxygen from the air. Therefore, the aim of firefighting is to exclude oxygen and to cool the cargo(es). On board ship, this is generally carried out by using water spray or gas extinguishing systems.
- 3.2 Some burning cargoes will need special firefighting media (like dry inert material) to suffocate the fire. In such circumstances, normal firefighting procedures are often impracticable, and concentrating on cooling nearby cargo and ship structures is recommended in such cases.
- 3.3 Firefighters should be made aware of the hazards of opening doors of an over-heated space or freight container which is suspected of containing cargo on fire. There may be a lack of oxygen inside and fresh air from outside the space may instantly start a fire, and cause a flashback that could injure the firefighters. Cool down the container first!

### 4 Seek advice

- 4.1 Expert advice should be sought irrespective of how insignificant the fire may seem to be when dealing with dangerous goods fires. Such advice could be given by:
- .1 ship operating companies (e.g. designated persons);
  - .2 emergency information centres (such as CHEMTREC in the USA);
  - .3 specialized agencies;
  - .4 professional responders;
  - .5 port State authorities;
  - .6 coastguard;
  - .7 fire brigades; and
  - .8 manufacturers of the products.

### 5 Evacuation

Within some EmS FIRE SCHEDULES the phrase "Sudden or short-term events (e.g. explosions) may endanger the safety of the ship" or the phrase "The danger of uncontrolled spread of fire should be considered" has been introduced. Depending on the type of ship and on the volume of dangerous goods allocated to this specific FIRE SCHEDULE, it may be necessary to consider abandoning the ship at an early stage. In this case, the master should be aware of the hazard and should decide whether the ship requires assistance.

### 6 Firefighting media

#### 6.1 Water

- 6.1.1 Water is the obvious firefighting medium at sea and is recommended for most fires involving dangerous goods. However, it should be noted that shore-based firefighters may use a different medium.
- 6.1.2 When water is applied to a burning cargo, the temperature is reduced and the fire will be extinguished when the temperature drops below the ignition point. However, water is not suitable to extinguish all fires involving dangerous goods. Different firefighting media should be used if so indicated on the specific EmS FIRE SCHEDULE.
- 6.1.3 If the fire is under deck, consideration should be given to the stability of the ship when flooding the hold with water.
- 6.1.4 Some dangerous goods will react chemically with water, producing flammable and/or toxic gases. The most effective way to extinguish a fire involving these dangerous goods is to smother them with a dry inert powdered material. However, the availability of suitable inert material on board is limited. It may also be dangerous to approach the fire in order to use inert material properly. Consequently, the most appropriate method of extinguishing the fire may be to use copious quantities of water. This would have an overall cooling effect on the fire even though the water may react with the dangerous goods involved.

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- 6.1.5 Ships are equipped with a number of dual-purpose spray/jet nozzles as required by SOLAS. Most EmS FIRE SCHEDULES recommend that the nozzles be set to spray when used to fight fires. Water spray may also be achieved by using water jets from some distance. This method of producing water spray is generally recommended. However, it is dangerous to direct a water jet onto the fire at close range because this could result in the spread of burning material.
- 6.1.6 The term “copious quantities of water” used within the EmS FIRE SCHEDULES refers to the minimum total quantities of water provided for optimal firefighting using four jets of water, as required by SOLAS regulation II-2/10. The master and crew should know the practical limitations that may be encountered at specific stowage locations in this respect.
- 6.1.7 Following the advice “use copious quantities of water” or “water spray from as many hoses as possible” may interfere with the safety of the ship with regard to the ship’s stability. Stress forces on the hull due to increased quantities of water in the ship should be considered.
- 6.2 Fixed gas fire-extinguishing systems
- 6.2.1 If a fixed gas fire-extinguishing system is used for incidents under deck, all hatches and vent dampers should be closed and ventilation shut off before the system is activated. If smoke is seen coming from around the hatches, the leaks should be sealed with any suitable material available.
- 6.2.2 The majority of the fixed gas fire-extinguishing systems use carbon dioxide (CO<sub>2</sub>), but some use nitrogen (N<sub>2</sub>) as the extinguishing medium. The instructions on board should be followed. The fire control plan will sometimes specify a given volume of gas to be applied to a given space. No advantage will be gained by exceeding this volume of gas where burning dangerous goods are involved.
- 6.2.3 It is important to realise that it will take an appreciable time for the space to cool after the fire has been extinguished. Therefore it would be extremely dangerous to reopen the hatches since the extinguishing gas would escape and air would enter the space again, thus allowing the fire to re-ignite. The ship’s on-board instructions for such cases should be followed.
- 6.2.4 Fixed gas fire-extinguishing systems are not effective against all fires. EmS FIRE SCHEDULES may contain specific information in this regard.
- 6.3 Fixed pressure water spraying systems
- 6.3.1 In some ships (e.g. ro-ro ships and car ferries), some cargo spaces may be fitted with a water drencher or spray system instead of a fixed gas fire-extinguishing system. There will be instructions on board which should be followed.
- 6.3.2 A closed cargo space should be ventilated to clear it of smoke and toxic gases after the fire has been extinguished and the space has cooled. The ventilation equipment should be of a certified safe type for smoke removal. Evidence that the space is cooling down can be obtained by monitoring adjacent bulkheads and decks. Thereafter, a firefighting team should look for any small remaining fires and inspect the surrounding cargo. After the fire has been extinguished, the cargo should be kept under surveillance until its normal temperature is reached.
- 6.4 Foam
- In general, foam is an effective firefighting medium for fires involving flammable liquids. The foam forms a layer on the liquid thereby excluding oxygen and reducing heat. However, it is less effective on solid substances on fire. Most foams contain water and should not be used on fires where the use of water is restricted because of adverse chemical reaction.
- 6.5 Dry chemicals
- Dry chemicals may be an effective extinguishing medium for fires involving water-reactive substances and metals. The dry chemical should not react with the dangerous goods involved in the fire. Some dangerous goods require a specific dry chemical to extinguish a fire.
- 7 Dangerous goods exposed to fire
- 7.1 Rupture and cooling
- 7.1.1 Where possible, packages should be removed from the vicinity of the fire. In general, heated material will expand, thus needing more volume and creating pressure in the package. This will affect the integrity of the package which could lead to rupture and dispersal of the contents. Effective cooling can lower the possibility of rupture.
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- 7.1.2 Where there is a danger that heat will have already started to cause a chemical or physical change to the dangerous substance, packages should not be moved. Care should always be exercised, for example, with those substances liable to polymerize, as this reaction may continue for a long time after the removal of the heat source. Provided no discharge or pumping overboard problem arises, cooling should continue for many hours after the fire has been extinguished. After heat evolution has ceased, cooling with water may be stopped. A careful watch should be kept on the stability of the ship.
- 7.1.3 The EmS FIRE SCHEDULES advise that a number of dangerous goods should be removed or jettisoned if there is a likelihood of their involvement in a fire. However, where full or nearly full cargo transport units are involved, such guidance may be impractical. In that case, the advice should be taken to indicate that the goods are particularly dangerous. Personnel on board should fight the fire and cool nearby cargo as far as possible. It should be borne in mind that some heated dangerous goods may have already damaged the packaging or may explode during handling. Consequently, moving or jettisoning burning cargo should only be attempted with utmost caution.
- 7.2 Spillage
- 7.2.1 It should be remembered that leakage of dangerous goods can be very dangerous for the crew and for the ship. Fire and explosion can rupture nearby packages or tanks, creating a spillage.
- 7.2.2 If a leak is discovered, the hazards associated with that leak should be ascertained immediately. In cases involving leaks of flammable liquids or flammable gases (class 3 and class 2.1 labels respectively), the crew should withdraw to a well-protected position. Air-vapour and air-gas mixtures are liable to explode and such an explosion may injure crew members and damage the ship.
- 7.2.3 Many toxic gases are odourless and colourless. A number of liquids will produce toxic vapours if exposed to heat. In an emergency, the ship should be manoeuvred to keep the bridge, living quarters and crew upwind as far as possible.
- 7.2.4 The EmS SPILLAGE SCHEDULES should be consulted when dealing with a leakage.

## 8 Personal protection

### 8.1 Ship's personnel

- 8.1.1 Many vapours and gases of dangerous goods produced by a fire are hazardous to health. In the case of fire, the use of a firefighter's outfit and self-contained breathing apparatus is essential. Only trained personnel should use this equipment, which should be well maintained. Particular attention should be given to ensuring that toxic vapours or fumes do not penetrate occupied areas of the ship (e.g. bridge, living quarters, machinery spaces, working areas, etc).
- 8.1.2 According to the ship's fire emergency plan, ventilation systems to living and working spaces should be shut off, closed and secured to reduce the possibility of vapours, dusts, and gases from penetrating these areas.
- 8.2 Firefighting team
- 8.2.1 Chapter II-2 of SOLAS requires firefighter's outfits, full chemical protective suits and self-contained breathing apparatus to be readily available on board. Masters are reminded that personnel will need regular training in the use of self-contained breathing apparatus and that special attention should be given to ensure that face masks fit satisfactorily at all times.
- 8.2.2 Self-contained breathing apparatus is essential for firefighting because dangerous goods on fire produce various substances hazardous to health. Handling water jets from some distance or cooling of heated cargo may not require the use of self-contained breathing apparatus. However, decisions not to use self-contained breathing apparatus should be undertaken carefully and on a case-by-case basis.
- 8.2.3 Firefighting outfits offer only limited protection from dangerous goods. Firefighting outfits are not chemical suits. Chemical protective clothing is designed to protect against specific properties of chemicals. In general, there will be no such thing as a single type chemical protective suit on board. Therefore, contact with dangerous goods should be avoided. Chemical protective clothing is not resistant to fire or heat.

## 9 First aid and actions after termination of firefighting

- 9.1 Any contamination with hazardous material should be immediately removed from the skin and then washed, for example with copious quantities of water. Information on medical first aid is provided in the IMO/WHO/ ILO *Medical First Aid Guide for Use in Accidents Involving Dangerous Goods* (MFAG) published by IMO. Be prepared to use the MFAG!



- 9.2 Cargo may re-ignite after a fire has been extinguished. An efficient patrol should be maintained in the spaces in which the fire occurred and in any adjoining spaces to ensure that any new ignition or leakages are dealt with promptly. Fire-extinguishing systems should remain on stand-by. Post a fire watch.
- 9.3 After extinguishing the fire, all emergency team personnel should ensure that all contamination of equipment and protective clothing is removed and washed immediately. Equipment should be restored and re-stowed for use.
- 9.4 There are reporting procedures under SOLAS and MARPOL which have to be followed (see Reporting procedures).
- 10 Special notes on classes of dangerous goods**
- 10.1 Explosives – class 1**
- 10.1.1 In the event of a fire, everything should be done to prevent the spread of the fire to containers which contain class 1 goods. If it is not possible to prevent the spread of the fire, all personnel should immediately withdraw from the area.
- 10.1.2 Many explosives will burn to the point of an explosion. The master's main concern will be whether or not there is likely to be a mass explosion. Such an explosion could damage the ship. If goods of division 1.1 or division 1.5 are involved, this likelihood will exist. The time between fire reaching the explosives and the subsequent mass explosion will be of the order of a few seconds to minutes. The master should ascertain how large a quantity of such explosives is involved. A few kilograms are unlikely to sink the ship, but above this a clear risk to the safety of the crew and the stability of the ship should be considered. Sudden or short- term events may endanger the safety of the ship.
- 10.1.3 Explosives of divisions 1.2, 1.3, 1.4, and 1.6 are unlikely to explode *en masse*. Irrespective of the division of the explosives, any firefighting should take place from behind substantial cover. If the risk to firefighters is too high, hoses could be lashed to the rail or other suitable fixtures and left unmanned.
- 10.1.4 Neither exclusion of air nor the use of smothering material is likely to be effective against a fire involving explosives. The use of the largest possible quantity of water in the shortest possible time is the only means of attempting to prevent a rise in temperature that could affect the chemical stability of the explosives.
- 10.1.5 Some dangerous goods of this class have been wetted or immersed in water. As they dry, they become unstable. The master should seek advice (see section 4 above).
- 10.2 Gases – class 2**
- 10.2.1 Gases are substances usually transported in cylinders, flasks, portable tanks, aerosol dispensers and bottles under varying degrees of pressure. The gases may be flammable, toxic or corrosive and may be compressed, liquefied or refrigerated.
- 10.2.2 Gases will not start burning at the valve, unless there has been an ignition source nearby (e.g. fire or heat). The location of the burning gas needs to be identified because it may be the heart of the fire. The heating of the receptacle is the most serious danger because of the possibility of rupture, rocketing or explosion. In the event of a fire, receptacles containing gas should be liberally sprayed with water to keep them as cool as possible.
- 10.2.3 Non-burning leakages from receptacles of flammable gases may give rise to explosive mixtures in air. If a fire caused by the ignition of leaking gas is extinguished within a cargo space before the leak is stopped, accumulation of gas will occur. This will result in an explosive mixture or a toxic or suffocating atmosphere. The EmS SPILLAGE SCHEDULES should be consulted.
- 10.2.4 Extremely low temperatures around leakages of some liquefied gases are an additional hazard (other than flammability and toxicity). Emergency teams should avoid contact with such leakages and the immediate vicinity.
- 10.3 Flammable liquids – class 3**
- 10.3.1 It is dangerous to direct a jet of water onto a fire involving flammable liquids. Many flammable liquids float on water and the water jet would spread the liquid, thus creating a greater danger. Closed containers exposed to fire will become pressurized and a rupture will occur.
- 10.3.2 Heated flammable liquid will release vapours that may start burning instantly with explosive effect. Consequently, firefighting personnel should stay in a well-protected position and use water spray on the area of the fire. This will cool down the temperature of the liquid and the air-vapour mixture



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| 10.4   | Flammable solids, self-reactive substances, solid desensitized explosives and polymerizing substances – class 4.1   |
| 10.4.1 | This class of substances includes flammable solids, water-wetted explosives (i.e. desensitized explosives) and self-reactive substances.  |
| 10.4.2 | Flammable solids will easily ignite, and the appropriate EmS FIRE SCHEDULE should be consulted. In the event of a fire, water-wetted explosives (i.e. desensitized explosives) will effectively have the properties of a class 1 product. The special notes on class 1 explosives (see 10.1) and the relevant EmS FIRE SCHEDULES should be consulted.   |
| 10.4.3 | Self-reactive substances are sometimes transported under temperature controlled conditions where the control temperature will depend upon the specific properties of the substance being transported. If the control temperature is exceeded, the refrigeration unit has to be inspected. If the temperature control cannot be restored, the manufacturer should be consulted as soon as possible. The manufacturer should be similarly consulted if smoke is observed. The cargo should then be kept under surveillance.   |
| 10.5   | Substances liable to spontaneous combustion – class 4.2   |
| 10.5.1 | This class of substances includes pyrophoric substances, which will instantly burn on contact with air, and self-heating substances, which lead to spontaneous combustion.  |
| 10.5.2 | Although the use of dry inert powdered material to smother the fire would be the preferred option, in most circumstances such a procedure may not be possible. Two methods of dealing with such fires are possible:   |
| .1     | controlled burning: stay in a well-protected position. Let the goods burn. Many goods of this class react dangerously with water: refer to the relevant EmS FIRE SCHEDULE. In such cases, contact with water may intensify burning. Therefore, it is not recommended to apply water directly on the burning goods. When portable water monitors providing water shield function are available: generate a water screen to prevent spread of fire. The fire involving the goods should be left to burn out completely. If the fire has already spread to the adjacent cargo which is not reacting with water (see relevant EmS FIRE SCHEDULE): fight this fire from a safe distance; |
| .2     | fight the fire from a safe distance: if the location of the fire makes it possible, copious quantities of water should be used immediately. Although the goods on fire will react with water and create heat, a large quantity of water will cool down the reaction and prevent further heat radiation. However, water should not be used when the location of the fire makes it impossible to apply copious amounts of water directly onto the goods. Refer to the relevant EmS FIRE SCHEDULE.   |
| 10.6   | Substances which, in contact with water, emit flammable gases – class 4.3   |
| 10.6.1 | This class of substances reacts violently with water, evolving flammable gases. The heat of the reaction is sometimes sufficient to initiate a fire.  |
| 10.6.2 | Although the use of dry inert powdered material to smother the fire would be the preferred option, in most circumstances such a procedure may not be possible. Two methods of dealing with such fires are possible:   |
| .1     | controlled burning: stay in a well-protected position. Let the goods burn. All goods of this class react dangerously with water: refer to the relevant EmS FIRE SCHEDULE. Contact with water will intensify burning. Therefore, it is not recommended to apply water directly on the burning goods. When portable water monitors providing water shield function are available: generate water screen to prevent spread of fire. The fire involving the goods should be left to burn out completely. If the fire has already spread to adjacent cargo which is not reacting with water (see relevant EmS FIRE SCHEDULE): fight this fire from a safe distance;                      |
| .2     | fight the fire from a safe distance: refer to the relevant EmS FIRE SCHEDULE, since it is possible that firefighting with water may intensify the fire and generate the evolution of flammable gases which could explode in mixtures with air.  |
| 10.7   | Oxidizing substances – class 5.1  |
| 10.7.1 | This class of substances is liable to evolve oxygen and therefore to accelerate a fire. These substances, while in themselves not necessarily combustible, may cause the combustion of other material (e.g. sawdust or paper) or contribute to the fire, leading to an explosion.   |
| 10.7.2 | Fires in which these substances are present are difficult to extinguish, because the ship's firefighting installation may not be effective. Everything possible should be done to prevent the spread of fire to containers containing these dangerous goods. However, if fire reaches the cargo, personnel should be withdrawn immediately to a well-protected position.  |
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- 10.8           Organic peroxides – class 5.2
- 10.8.1       This class of substances is liable to burn vigorously. Some substances have a low decomposition temperature and are transported under temperature controlled conditions, where the control temperature will depend upon the specific properties of the substance being transported.
- 10.8.2       If the temperature control cannot be restored, the manufacturer should be consulted as soon as possible even if evolution of smoke has ceased. The cargo should then be kept under surveillance. The surrounding area should be kept isolated because liquid may be ejected from relief arrangements.
- 10.9           Toxic substances – class 6.1
- Substances of this class are poisonous by contact or inhalation, and the use of self-contained breathing apparatus and firefighters' outfits is therefore essential.
- 10.10         Infectious substances – class 6.2
- These are substances which are known or reasonably expected to contain pathogens (i.e. micro-organisms that are known or reasonably expected to cause infectious disease in humans or animals). Pathogens may survive the fire and self-contained breathing apparatus should therefore be used.
- 10.11         Radioactive material – class 7
- 10.11.1       Many radioactive materials are transported in packages designed to retain their containment and shielding in accidents. However, under extreme fire conditions, failure of containment or loss of shielding or criticality safety could result in significant hazard to personnel. Long-term exposure of any class 7 package to extreme heat should be avoided and in emergencies they should be kept as cool as possible using copious quantities of water. If a packaging of radioactive material has been exposed to any significant fire, expert advice should be sought. Suspected contamination of safety and firefighting equipment should be removed as quickly as possible.
- 10.11.2       Some packages may have a class 7 label and other hazard labels. Such additional hazards may be greater than the radiation hazard. In that case, actions as specified in the applicable EmS FIRE SCHEDULE should be followed.
- 10.11.3       Although radiation monitors are not required by regulation on board ships, applicable relevant provisions on segregation, separation or radiation protection programmes (e.g. section 1.5.2 and paragraph 7.1.4.5.18 of the IMDG Code) or the INF Code may require monitors on board. For ships carrying radiation monitoring equipment, monitoring of radiation levels is recommended.
- 10.12         Corrosive substances – class 8
- These substances are extremely dangerous to humans, and many may cause destruction of safety equipment. Burning cargo of this class will produce highly corrosive vapours. Consequently, wearing self-contained breathing apparatus is essential.
- 10.13         Miscellaneous dangerous substances and articles and environmentally hazardous substances – class 9
- This class includes those substances, materials and articles which are deemed to possess some danger, but which are not classified within the criteria of classes 1 to 8. No general guidelines are applicable to these goods. They have been allocated to the relevant EmS FIRE SCHEDULE according to their hazards in the event of a fire.
- 10.14         Marine pollutants
- 10.14.1       A number of substances within all of the above classes have also been designated as marine pollutants. Packages containing these substances will bear a marine pollutant mark.
- 10.14.2       In the case of leakage resulting from burning cargo, it is important to be aware that any spillage of a marine pollutant which is washed overboard will pollute the sea. It is, however, more important to fight a fire on board a ship rather than to prevent pollution of the sea.

### *General guidelines for FIRE*

- Think safety first!
- Avoid any contact with dangerous substances.
- Keep away from fire, smoke, fumes and vapours.
- Sound the fire alarm and start firefighting procedures.
- Keep the bridge and living quarters upwind if possible.
- Locate stowage position of cargo that is burning or evolving smoke.
- Identify cargo.
- Obtain UN numbers and the EmS FIRE SCHEDULE of the dangerous goods involved.
- Consider which measures of the EmS FIRE SCHEDULE are applicable and should be followed.
- Check if other dangerous goods may potentially be involved in the fire and identify the relevant EmS FIRE SCHEDULE.
- Wear suitable protective clothing and self-contained breathing apparatus.
- Be prepared to use the Medical First Aid Guide (MFAG).
- Contact the designated person of the company responsible for the operation of the ship or a rescue coordination centre to obtain expert advice on dangerous goods emergency response measures.

Precaution: Contamination of the skin with dangerous goods should be removed and washed immediately.

*Emergency schedules for FIRE*

	<i>Page</i>
F-A .....	14
F-B .....	15
F-C .....	16
F-D .....	17
F-E .....	18
F-F .....	19
F-G .....	21
F-H .....	22
F-I .....	23
F-J .....	24

FIRE SCHEDULE Alfa

## F–A

### GENERAL FIRE SCHEDULE

General comments		In a fire, exposed cargoes may explode or their containment may rupture. Fight fire from a protected position from as far away as possible.
Cargo on fire on deck	Packages	Create water spray from as many hoses as possible.
	Cargo transport units	
Cargo on fire under deck		Stop ventilation and close hatches. Use cargo space fixed fire-extinguishing system. If this is not available, create water spray using copious quantities of water.
Cargo exposed to fire		If practicable, remove or jettison packages which are likely to be involved in fire. Otherwise, keep cool using water.
Special cases: UN 1381, UN 2447		After extinguishing the fire, treat immediately as for spillage (see relevant EmS SPILLAGE SCHEDULE).

## FIRE SCHEDULE Bravo

### F-B

#### EXPLOSIVE SUBSTANCES AND ARTICLES

General comments		<p>In a fire, exposed cargoes may explode or their containment may rupture. Fight fire from a protected position from as far away as possible.</p> <p>All crew members should be made aware of the explosion hazard and instructed to take appropriate action.</p> <p>SUDDEN OR SHORT-TERM EVENTS (e.g. EXPLOSIONS) MAY ENDANGER THE SAFETY OF THE SHIP.</p>
Cargo on fire on deck	Packages	Use copious quantities of water from as many hoses as possible.
	Cargo transport units	Cargo will explode or burn fiercely. Extinguishing may not be possible.
Cargo on fire under deck		<p>Cargo will explode or burn fiercely. Extinguishing will not be possible.</p> <p>Stop ventilation and close hatches.</p> <p>Use cargo space fixed fire-extinguishing system. If this is not available, create water spray using copious quantities of water.</p>
Cargo exposed to fire		<p>Do not move packages that have been exposed to heat.</p> <p>If practicable, remove or jettison packages which are likely to be involved in the fire.</p> <p>If the packages are not directly involved in the fire, efforts should be concentrated on preventing the fire from reaching the cargo. This is done by keeping the packages wet by using water jets from as far away as practicable to drive the fire away. If the fire reaches the cargo, the firefighters should withdraw to a safe area and continue to fight the fire.</p> <p>Where practicable, articles having been exposed to the fire should be kept separated from unexposed articles. They should be kept wet and monitored from a safe distance.</p>
Special cases: UN 0018, UN0019, UN 0020, UN 0021, UN 0301 UN 0248, UN 0249  UN 3268		<p>Ammunition producing tear or toxic gas. The crew should be aware of the hazard. After explosion, only self-contained breathing apparatus will protect efficiently. Consult SPILLAGE SCHEDULE S-Z.</p> <p>These water-activated devices will become more liable to explosion on contact with water.</p> <p>SAFETY DEVICES, electrically initiated, could be subject to self-sustaining decomposition if heated. The temperature could reach 500°C, producing gas. This process may lead to an explosion of the cargo even after the exposure to heat has ended.</p>

## FIRE SCHEDULE Charlie

## F–C

## NON-FLAMMABLE GASES

General comments		<p>Gases in closed tanks exposed to heat may explode suddenly in or after a fire situation by a <i>boiling liquid – expanding vapour explosion</i> (BLEVE). Heated or ruptured cylinders may rocket.</p> <p>Gases listed under this schedule are non-flammable. However, some gases will support combustion though not flammable itself.</p> <p>Fire may produce leakages. Most gases allocated to this schedule are hazardous to health. Some are corrosive. Create water spray.</p> <p>Identify the source of the fire and take appropriate action.</p>
Cargo on fire on deck	Packages	Use copious quantities of water from as many hoses as possible.
	Cargo transport units	
Cargo on fire under deck		Use fixed fire-extinguishing system.
Cargo exposed to fire		<p>If practicable, remove or jettison packages which are likely to be involved in the fire.</p> <p>Otherwise, cool for several hours using water.</p> <p>Heated or ruptured cylinders may rocket.</p>
Special cases: UN 1003, UN 1070, UN 1072, UN 1073, UN 2201, UN 3156, UN 3157, UN 3513, UN 3515, UN 3518		Although these cargoes are non-flammable, they will intensify the fire.

## FIRE SCHEDULE Delta

### F–D

#### FLAMMABLE GASES

General comments		<p>Gases in closed tanks exposed to heat may explode suddenly in or after a fire situation by a <i>boiling liquid – expanding vapour explosion</i> (BLEVE).</p> <p>Crew members should be aware of the explosion hazard and take appropriate action. Keep tanks cool with copious quantities of water.</p> <p>Fight fire from a protected position from as far away as possible.</p> <p>Extinguishing a burning gas leak may lead to the formation of an explosive atmosphere. Flames may be invisible.</p>
Cargo on fire on deck	Packages	<p>Create water spray from as many hoses as possible.</p> <p>Do not try to extinguish a gas flame.</p>
	Cargo transport units	<p>Cool burning transport units and nearby cargo exposed to the fire with copious quantities of water.</p> <p>Do not try to extinguish a gas flame.</p>
Cargo on fire under deck		<p>Stop ventilation and close hatches.</p> <p>Use cargo space fixed fire-extinguishing system. If this is not available, create water spray using copious quantities of water.</p>
Cargo exposed to fire		<p>If practicable, remove or jettison packages which are likely to be involved in the fire. Otherwise, keep cool for several hours using water.</p>
<p>Special cases:</p> <p>UN 1038, UN 1075, UN 1965, UN 1966, UN 1972, UN 3138, UN 3160, UN 3309, UN 3312</p> <p>UN 1001, UN 3374</p> <p>UN 3501, UN 3504, UN 3505</p>		<p>SUDDEN OR SHORT-TERM EVENTS (e.g. EXPLOSIONS) MAY ENDANGER THE SAFETY OF THE SHIP.</p> <p><i>Acetylene</i> is a gas which is particularly dangerous due to its potential to explode. Rough handling or local heating may lead to delayed explosion. Keep cool for several hours using water. Do not move receptacles. All cylinders that have been subjected to rough handling or to local heating should be jettisoned.</p> <p>A flammable liquid, paste or powder may be expelled if the package is ruptured. Also consult FIRE SCHEDULE F-E.</p>



## FIRE SCHEDULE Echo

### F–E

#### NON-WATER-REACTIVE FLAMMABLE LIQUIDS

General comments		Cargoes in tanks exposed to heat may explode suddenly in or after a fire situation by a <i>boiling liquid – expanding vapour explosion</i> (BLEVE). Keep tanks cool with copious quantities of water. Fight fire from a protected position from as far away as possible. Stop leakage or close open valve if practicable. Flames may be invisible.
Cargo on fire on deck	Packages	Create water spray from as many hoses as possible.
	Cargo transport units	Cool burning transport units and nearby cargo exposed to the fire with copious quantities of water.
Cargo on fire under deck		Stop ventilation and close hatches. Use cargo space fixed fire-extinguishing system. If this is not available, create water spray using copious quantities of water.
Cargo exposed to fire		If practicable, remove or jettison packages which are likely to be involved in the fire. Otherwise, keep cool for several hours using water.
Special cases: UN 1162, UN 1250, UN 1298, UN 1717, UN 2985		Cargoes will create hydrochloric acid in contact with water: stay away from effluent.

FIRE SCHEDULE Foxtrot

Part 1 of 2

F–F

TEMPERATURE-CONTROLLED SELF-REACTIVES AND ORGANIC PEROXIDES

General comments		<p>Exposed cargoes may decompose violently.</p> <p>Crew members should be aware of the explosion hazard and take appropriate action. Fight fire from a protected position from as far away as possible.</p> <p>Switch off electrical power supplies only during firefighting.</p> <p>Check temperature readings if possible. Measures have to be taken to alert the crew when the temperature of the cargo increases.</p> <p>In case of a temperature increase or smoke evolution, follow the relevant instructions. Contact the manufacturer (consignor) of the cargo as soon as possible.</p>
Cargo on fire on deck	Packages	Not applicable.
	Cargo transport units	<p>Cool burning transport units and nearby cargo exposed to the fire with copious quantities of water.</p> <p>After the fire has been extinguished, do not open the unit until well after smoke evolution has ceased. If possible, restore cooling. Keep under surveillance.</p>
Cargo on fire under deck		Not applicable. According to the IMDG Code, under deck stowage is not allowed. Radio for expert ADVICE.
Cargo exposed to fire	Cargo transport units with IBCs, packages	<p>Cool units exposed to fire with water.</p> <p>After the fire has been extinguished, check and restore cooling. Keep under surveillance. Check temperature frequently.</p> <p>In case of temperature increase or smoke evolution, follow the relevant instructions.</p>
	Tanks	<p>Keep personnel away from tanks as liquid may be ejected from relief arrangements. Cool units exposed to fire with copious quantities of water.</p> <p>After the fire has been extinguished, check and restore cooling. Keep under surveillance.</p> <p>After the fire has been extinguished, water spray should be continued to cool down the outer parts of the tanks. Check refrigeration unit, keep tanks under surveillance. Check temperature frequently.</p>
Temperature increase	Cargo transport units with IBCs, packages	<p>If the <i>control temperature</i> is exceeded, the refrigeration unit has to be inspected (consult manual) and repaired. If not possible and/or temperature control cannot be restored, contact the manufacturer of the cargo.</p> <p>If the <i>emergency temperature</i> is reached but the refrigeration unit is operating correctly, contact the manufacturer of the cargo and consider disposal of packagings. Keep firefighting team on stand-by.</p> <p>If the <i>emergency temperature</i> is reached due to cooling unit failure, contact the manufacturer of the cargo. When emergency temperature is reached, 12 hours are left for repairing the cooling unit and/or disposal of packaging. After that time, keep a safe distance and prepare for firefighting.</p>
	Tanks	<p>If the <i>control temperature</i> is exceeded, the refrigeration unit has to be inspected (consult manual) and repaired. If not possible and/or temperature control cannot be restored, contact manufacturer of the cargo.</p> <p>If the <i>emergency temperature</i> is reached but the refrigeration unit is operating correctly, contact the manufacturer of the cargo. Keep at a safe distance and consider emptying of tank overboard via bottom outlet using a flexible hose.</p> <p>If the <i>emergency temperature</i> is reached due to failure of the cooling unit, repairs may be undertaken as long as the temperature has not exceeded the emergency temperature by more than 5°C. After that, consider emptying the tank using a flexible hose attached to the bottom opening of the tank if provided.</p>
Special cases: None.		

FIRE SCHEDULE Foxtrot (*continued*)

Part 2 of 2

## F–F

### TEMPERATURE-CONTROLLED SELF-REACTIVES AND ORGANIC PEROXIDES

Smoke evolution	Cargo transport units with IBCs, packages	Keep firefighting team on stand-by. The freight container should not be approached. When smoke evolution increases, keep safe distance and prepare for firefighting. After smoke has ceased, check refrigeration system. Follow guidelines for temperature increase. Keep under surveillance, as new smoke evolution might take place.
	Tanks	Keep personnel away from the tank, as liquid may be ejected from relief arrangements. Cool unit exposed to fire with water. Use water spray from a protected position. In case smoke or pressure-relief venting is moderate and temperature is below the emergency temperature, consider emptying the tank overboard via bottom outlet, using a flexible hose. Even when smoke evolution or pressure-relief venting has ceased, water spray should be continued for some hours and the tank should be kept under surveillance, as new smoke evolution might take place.
Special cases: None.		

FIRE SCHEDULE Golf

F–G

WATER-REACTIVE SUBSTANCES

General comments		<p>In a fire, exposed cargoes may explode or their containment may rupture.</p> <p>Liquid material leaking from ruptured receptacles may be ignited and spread the fire. Cargoes in tanks exposed to heat may explode suddenly in or after a fire situation by a <i>boiling liquid – expanding vapour explosion</i> (BLEVE).</p> <p>Fight fire from a protected position from as far away as possible.</p> <p>Use of copious quantities of water at once is recommended to cool down the heat radiation and to cool down heated cargo nearby.</p> <p>Water in direct contact with the material will start or intensify burning of that material. Only in locations where direct access to the cargo is possible and where the cargo on fire can be submerged with water, large quantities of water may significantly reduce the thermal reactivity and stop the fire.</p> <p><b>THE DANGER OF UNCONTROLLED SPREAD OF FIRE SHOULD BE CONSIDERED.</b></p>
Cargo on fire on deck	Packages	<p>DO NOT use water or foam; smother with dry inert powdered material when available or let fire burn.</p> <p>Cool nearby cargo with copious quantities of water.</p>
	Cargo transport units	<p>Let the fire burn. Cool nearby cargo with copious quantities of water. Use the water shield function of portable water monitors when available, to prevent the spread of fire.</p> <p>Try to avoid getting water into the cargo transport unit on fire.</p>
Cargo on fire under deck		<p>Stop ventilation and close hatches.</p> <p>The fixed gas fire-extinguishing system should be used. If this is not available:</p> <p>DO NOT use water onto the material in enclosed spaces under deck. Cool nearby cargo with copious quantities of water.</p>
Cargo exposed to fire		<p>If practicable, remove or jettison packages which are likely to be involved in the fire. Otherwise cool the cargo with copious quantities of water. Use the water shield function of portable water monitors when available, to prevent the spread of fire.</p>
Special cases: Class 4.3, packing group I		<p>In contact with water, large volumes of flammable gases are produced, which when not instantly ignited may form a highly dangerous explosive atmosphere.</p>

FIRE SCHEDULE Hotel

## F–H

### OXIDIZING SUBSTANCES WITH EXPLOSIVE POTENTIAL

General comments		In a fire, exposed cargoes may explode or their containment may rupture. Crew members should be aware of the explosion hazard and take appropriate action. Fight fire from a protected position from as far away as possible. SUDDEN OR SHORT-TERM EVENTS (e.g. EXPLOSIONS) MAY ENDANGER THE SAFETY OF THE SHIP.
Cargo on fire on deck	Packages	Create water spray from as many hoses as possible.
	Cargo transport units	
Cargo on fire under deck		OPEN HATCHES to provide maximum ventilation. Fixed gas fire-extinguishing systems may not be effective on these fires. Create water spray from as many hoses as possible.
Cargo exposed to fire		Do not move packages that have been exposed to heat. If practicable, remove or jettison packages which are likely to be involved in the fire. If the packages are not directly involved in the fire, efforts should be concentrated on preventing the fire from reaching the cargo. This is done by keeping the packages wet by using water jets from as far away as practicable to drive the fire away. If the fire reaches the cargo, the firefighters should withdraw to a safe area and continue to fight the fire from a safe position.  Where practicable, articles having been exposed to the fire should be kept separated from unexposed articles. They should be kept wet and monitored from a safe distance.
Special cases: None.		

FIRE SCHEDULE India

F-I

RADIOACTIVE MATERIAL

General comments		<p>Evacuate compartment or downwind area of non-essential personnel. Do not touch damaged packages.</p> <p>In cases of suspected radioactive contamination, limit entry of firefighters for the shortest time possible.</p> <p>For ships carrying radiation monitoring equipment, measure radiation levels. Radio for expert ADVICE.</p> <p>After the fire has been extinguished, clean ship's surfaces with copious quantities of water.</p> <p>Decontaminate firefighters before protective clothing is removed. Isolate potentially contaminated clothing and equipment.</p> <p>If exposure of personnel is suspected, clean body and hair with warm water and soap; discharge resultant washings directly overboard.</p> <p>Record the names of potentially exposed persons. Ensure medical examination of these persons after reaching any medical staff.</p> <p>For ships carrying radiation monitoring equipment, continue monitoring of radiation levels after fire is extinguished.</p>
Cargo on fire on deck	Packages	Create water spray from as many hoses as possible.
	Cargo transport units	<p>Create water spray from as many hoses as possible.</p> <p>Cool burning transport units and nearby cargo exposed to the fire with copious quantities of water.</p>
Cargo on fire under deck		<p>Stop ventilation and close hatches.</p> <p>Use cargo space fixed fire-extinguishing system. If this is not available, create water spray using copious quantities of water.</p>
Cargo exposed to fire		<p>If practicable, remove or jettison packages which are likely to be involved in the fire. Otherwise, cool for several hours using copious quantities of water.</p>
<p>Special cases:</p> <p>UN 2977, UN 2978, UN 3507</p> <p>UN 3332, UN 3333</p> <p>Subsidiary hazard label class 4.2 or class 4.3</p>		<p>Chemical hazard greatly exceeds radiation hazard. Material reacts with moisture to form toxic and corrosive gas. The run-off may be corrosive. Keep clear.</p> <p>Exposed cargoes may explode in a fire. Create water spray.</p> <p>Leak may be evident by visible and irritating vapours. Released vapours may also react violently with hydrocarbons (fuel).</p> <p>If the source capsule is identified as being out of its packaging, do not touch. Stay away, minimize exposure to radiation by limiting time near material and by maximizing distance. Radio for expert ADVICE.</p> <p>All radioactive material with subsidiary hazard label 4.2 or 4.3 affixed (e.g. pyrophoric uranium or thorium metal):</p> <p>Radio for expert ADVICE.</p> <p><i>On deck:</i> Do not use water onto the material. Cool nearby cargo with copious quantities of water, although the fire could intensify for a short period. Do not spray small quantities of water onto the fire, use copious quantities of water.</p> <p><i>Under deck:</i> Stop ventilation and close hatches.</p> <p>The fixed gas fire-extinguishing system should be used.</p> <p>If this is not available, do not use water onto the material in enclosed spaces under deck. With open hatches, cool nearby cargo with copious quantities of water, although the fire could intensify for a short period. Do not spray small quantities of water onto the fire, use copious quantities of water only.</p>

## FIRE SCHEDULE Juliet

## F–J

## NON-TEMPERATURE-CONTROLLED SELF-REACTIVES AND ORGANIC PEROXIDES

General comments		<p>Exposed cargoes may decompose violently.</p> <p>Crew members should be aware of the explosion hazard and take appropriate action. Fight fire from a protected position from as far away as possible.</p> <p>Exposed cargoes may decompose violently in a fire.</p>
Cargo on fire on deck	Packages	Not applicable.
	Cargo transport units	<p>Cool burning transport units and nearby cargo exposed to the fire with copious quantities of water.</p> <p>After the fire has been extinguished, carry on water spraying of the container for several hours. Do not open container until well after smoke evolution has ceased. After this, cool down packages or IBCs if practicable for at least one hour with water. Otherwise, check contents on regular intervals. In case smoke is evolved again, apply further water cooling. Dispose of residues overboard. Clean the area thoroughly.</p> <p>After the fire has been extinguished, keep cargo transport unit under surveillance.</p>
Cargo on fire under deck		Not applicable – According to the IMDG Code, under deck stowage is not allowed. Radio for expert ADVICE.
Cargo exposed to fire	Cargo transport units with IBCs, packages	<p>Cool unit exposed to the fire with water.</p> <p>After the fire has been extinguished, keep transport unit under surveillance. In case of smoke evolution, follow the relevant instructions.</p>
	Tanks	<p>Keep personnel away from tank, as fluid ejection from relief arrangements might take place.</p> <p>Cool unit exposed to the fire with water.</p> <p>Contact the manufacturer (consignor) of the cargo.</p> <p>Cooling the tank should be continued until the temperature is below 50°C.</p> <p>Check temperature frequently. If temperature increases again, cool unit with water.</p> <p>Consider emptying the tank overboard via bottom outlet, using a flexible hose.</p>
Smoke evolution	Cargo transport units with IBCs, packages	<p>Cool unit with water.</p> <p>Use water spray from a protected position.</p> <p>Do not open the unit until well after smoke evolution has ceased. After this, cool down packages or IBCs if practicable for at least one hour with water. Otherwise, check contents on regular intervals. In case smoke is evolved again, apply further water cooling. Dispose of residues overboard. Clean the area thoroughly.</p>
	Tanks	<p>Keep personnel away from the tank, as fluid ejection from relief arrangements might take place.</p> <p>Cool unit exposed to fire with water.</p> <p>Use water spray from a protected position.</p> <p>Even when smoke evolution or pressure-relief venting has ceased, cooling the tank should be continued until the temperature is below 50°C. Check temperature frequently. If temperature increases again, cool unit with water.</p> <p>Consider emptying tank overboard via bottom outlet, using a flexible hose.</p>
Special cases: None.		

# Spillage

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## *Introduction to the emergency schedules for SPILLAGE*

### 1 Be prepared

- 1.1 Incidents involving dangerous goods may result in spillages from such goods, and the magnitude of the effects of an incident depends upon the type and amount of product released, together with the type of any other product involved and whether the spillage is on deck or in enclosed spaces.
- 1.2 Spillages could create additional hazards to those indicated by classification and labelling of the dangerous goods (e.g. the spillage of a flammable liquid may create an explosive atmosphere). Of particular concern are leakages of reactive chemicals, which in contact with other materials or further spillages will produce additional or other chemicals (e.g. toxic gases).
- 1.3 When dealing with a spillage on board a ship, the value of crew training and of familiarity with the general contingency plan will become evident. Drills and exercises specific to the cargoes on board at the time should be a part of shipboard routine.
- 1.4 This Guide should be integrated into the ship's Safety Management System. Procedures contained within the shipboard emergency plan have to be tailored to the individual ship. Spillage response procedures within the EmS SPILLAGE SCHEDULES are differentiated for "on deck" and "under deck" stowage. For specific ship types (e.g. hatchless container ships) or cargo spaces (e.g. open vehicle decks of ferries) these two procedural categories have to be assigned specifically to the individual ship (e.g. run-off considerations concerning bilges and drains).

### 2 Personal protection

- 2.1 The safety of the emergency personnel is of paramount importance.
- 2.2 The likelihood of the development of an explosive, flammable or toxic atmosphere should be considered.
- 2.3 Full protective clothing resistant to the effects of the specific dangerous substance involved should be worn. The protective clothing should cover all skin so that no part of the body is unprotected. Wearing self-contained breathing apparatus is essential to protect against inhalation of toxic or corrosive dusts, vapours or gases.
- 2.4 Emergency teams should avoid direct contact with any dangerous goods regardless of the protective clothing being used. If direct contact takes place when dealing with a spillage, the contact time should be kept to a minimum.
- 2.5 It is a requirement of SOLAS that four sets of full protective clothing resistant to chemical attack should be provided in addition to firefighters' outfits.
- 2.6 Firefighters' outfits are not designed to protect against chemical hazards and chemical-resistant clothing is not designed to protect against fire. Masters are reminded that personnel should have regular training in the use of self-contained breathing apparatus, and that special attention should be paid to ensuring that face masks fit satisfactorily at all times.
- 2.7 Responders should also ensure that any chemical protective clothing is used with other suitable protection against the specific hazards involved.

### 3 General response

- 3.1 The safety of the emergency personnel is most important.
- 3.2 Working spaces and living quarters should be protected by water spray wherever possible. Ventilation systems for living quarters and working spaces should be shut off, closed and secured to reduce the possibility of smoke, dust, fumes and gases from entering these areas. Particular care should be given to ventilation inlets (e.g. machinery and accommodation spaces). It may be necessary to turn the ship to ensure that the accommodation spaces are upwind.



- 3.3 Before entering cargo holds or compartments, the emergency personnel should determine the oxygen content of the space's atmosphere and should test for the presence of dangerous vapours. If a confined space entry is attempted, the use of self-contained breathing apparatus is essential. Only trained personnel should use this equipment, which should be well maintained.
- 3.4 It is essential to ensure that there is always an escape route for emergency personnel despite the limited means of escape due to narrow exit paths and the danger of falling overboard.
- 3.5 Decontamination and medical first aid also need to be considered. Arrange for a decontamination station to be set up at a suitable safe location.
- 3.6 The general response to spillage involving dangerous goods can be subdivided into the following tactical objectives:
- .1 Identification;
  - .2 Rescue;
  - .3 Isolation; and
  - .4 Response.

Experience from previous incidents has shown that these objectives can normally be achieved in this order.

## 4 Identification of the dangerous goods involved

- 4.1 It is essential to identify the dangerous good(s) involved in the spillage in order that the specific EmS SPILLAGE SCHEDULE(S) for the cargo(es) may be consulted and appropriate action taken. This is important because some dangerous goods are incompatible with some media available for dealing with a spillage.
- 4.2 An identification number with four digits preceded by the letters "UN" is assigned to each dangerous good. From the UN number, it is possible to find the appropriate EmS SPILLAGE SCHEDULE. The Dangerous Goods List in part 3 of chapter 3.2 of the IMDG Code contains the names and the UN numbers, as well as the EmS SCHEDULE numbers. The Dangerous Goods Manifest and the Stowage Plan required by SOLAS regulation VII/4.2 will also contain the proper shipping name and UN number of the dangerous good(s) concerned. Packages will usually be labelled as well.
- 4.3 Specific information as to properties of dangerous goods may also be found in the Dangerous Goods List in the IMDG Code. Dangerous goods are classified and labelled according to their hazards. Labels and marks on packages provide a warning of the general risks to be encountered. Personnel should understand the labelling system. It will also be beneficial to consult other sources of information. A safety data sheet provided by the manufacturer may be one such source of additional information. Seek expert advice from manufacturers, specialized agencies or professional responders.
- 4.4 Emergency preparedness should form part of the ship's Safety Management System as required by the ISM Code. Prepared information can reduce errors during a spillage emergency. Therefore, it is recommended that the EmS SCHEDULE(S) be identified and included within the Dangerous Goods Manifest and Stowage Plan, so directly connected to the stowage position of the cargo. This will enable key members of the crew to know in advance which emergency procedures would be necessary. In the event of a spillage, the allocation of a specific EmS SPILLAGE SCHEDULE via identification of the cargo via the UN number takes time and is open to error, especially in mixed cargoes in one container. Furthermore, some spillage response procedures may require specific use of material which could be hampered by an inaccessible stowage location. After locating the spillage area, the advice given in the EmS SPILLAGE SCHEDULE should be directly available from the Dangerous Goods Manifest and Stowage Plan.

## 5 Rescue

- 5.1 The safety of personnel should be the highest priority. One of the first concerns after evaluating the situation of the incident is finding and rescuing victims. This includes searching for and evacuating persons who may be exposed or who are disoriented or disabled by the release. It might be necessary to rescue persons from elevated places or confined spaces or those who are pinned under wreckage.
- 5.2 Appropriate equipment will need to be available, and prior training is essential for such circumstances.

## 6 Isolation

- 6.1 The objective of isolation is to limit the number of personnel exposed to the spilled material. This may be achieved by simply roping or taping off dangerous areas. Consider sealing off ventilation, air conditioning and other openings to living and working spaces.

6.2 At sea, the master has the capability and discretion to alter course and speed to ensure that dangerous gases or vapours are kept away from personnel, living quarters or ventilation inlets.

6.3 Consider the evacuation of passengers and members of the crew.

## 7 Response

7.1 At sea, human and other resources are limited. So in most cases involving spillage of dangerous goods, the most effective response will probably be to wash the substance overboard or jettison it. Attempts to repack dangerous goods may expose personnel to unreasonable risks.

7.2 The response to the spillage should be in accordance with the appropriate EmS SPILLAGE SCHEDULE(S) for the dangerous good(s) involved in the incident. The emergency team should take all reasonable precautions when dealing with the spillage and remember that the safety of personnel is most important.

## 8 Seek advice

8.1 Always seek expert ADVICE when dealing with dangerous goods spills. Such ADVICE could be given by:

- .1 ship operating companies (e.g. designated persons);
- .2 emergency information centres (such as CHEMTREC in the USA);
- .3 specialized agencies;
- .4 professional responders;
- .5 port State authorities;
- .6 coastguard;
- .7 fire brigades; and
- .8 manufacturers of the products.

## 9 Materials to be used

9.1 Water is the obvious medium to be used when dealing with a spillage on board a ship. It is recommended in the majority of cases to be used in copious quantities to wash the spillage overboard. However, certain dangerous goods react violently with water, producing flammable and toxic vapours. Others, for example marine pollutants, will produce pollution if washed overboard.

9.2 The term "copious quantities of water" used within the EmS SPILLAGE SCHEDULE(S) refers to the minimum total quantities of water provided for optimal firefighting with four jets as defined by SOLAS regulation II-2/10, Construction requirements. Master and crew should consider practical limitations at specific stowage locations in this respect.

9.3 Inert material should be used for spillages where it would be dangerous to use water. The inert material should be dry.

9.4 Sawdust should not be used as it is liable to be ignited by ignition sources or in contact with a number of substances. Cement may be used as an inert material for barricading.

9.5 An electric discharge may ignite some materials (e.g. explosives). Therefore, the use of non-certified safe type equipment within spillage areas may be dangerous. For some materials, "non-sparking footwear" is recommended (e.g. rubber boots without metal parts).

## 10 Action after spillage has been dealt with

10.1 Decontamination of personnel, clothing and ship's structures

10.1.1 After the spillage has been dealt with, the emergency team personnel should ensure that all contamination of equipment and protective clothing is removed and washed immediately. All equipment should be restored and re-stowed for further use.

10.1.2 Areas not affected initially may have been contaminated during response procedures. Crew members coming in contact with improperly decontaminated areas may become contaminated. Clean the site thoroughly before any unprotected personnel are allowed to enter.

10.1.3 Contaminated material should be properly disposed of or be cleaned.

**11 First aid**

11.1 Information on medical first aid is provided in the IMO/WHO/ILO *Medical First Aid Guide for Use in Accidents Involving Dangerous Goods* (MFAG). Be prepared to use the MFAG!

11.2 Any contamination of the skin with a dangerous substance should be immediately removed and then washed, for example with water. Radio for expert advice if personnel have been exposed to dangerous goods.

**12 Special notes on specific dangerous goods classes**

12.1 Based on the specific properties of the individual dangerous goods listed under one UN number, experts have allocated the substances, articles and materials to EmS SPILLAGE SCHEDULES. The allocation has not been based on the classification and labelling of the substances only. However, to help the mariner who is used to the handling and labelling of packaged dangerous goods to understand the advice given in the EmS SPILLAGE SCHEDULES, this introduction based on classification properties of substances is given.

**12.2 Explosives – class 1**

12.2.1 Properly packaged explosives are unlikely to detonate unless exposed to a fire or source of ignition. Within the divisions of this class, there are differences in explosive power. From a mariner's standpoint, the volumes of explosives concerned are of primary importance for the safety of the ship. However, even small volumes of spilled material may ignite and injure individual crew members. In general, spilled explosive substances are less hazardous when kept wet (see SPILLAGE SCHEDULE S-X).

12.2.2 Some explosive mixtures are stabilized in such a way that water will separate explosives from the stabilizer, thus creating a higher risk. The explosive component becomes very sensitive to shock and heat. The explosive should be kept mixed under water and washed overboard. Wetted articles should be jettisoned (see SPILLAGE SCHEDULE S-Y).

12.2.3 Some ammunition types contain a toxic material or a tear-gas substance. In addition to the explosive hazard, the toxicity hazard has to be realized. Use of self-contained breathing apparatus is essential (see SPILLAGE SCHEDULE S-Z).

**12.3 Gases – class 2**

12.3.1 A release of a flammable gas (class 2.1) is the preliminary step leading to a potential *vapour cloud explosion* (VCE). For a blast to take place, the substance has to mix with air in a quantity that will allow the mixture to form a cloud. As soon as a friction (electrostatic potential) lies within the explosive range and encounters an ignition source, a flash fire, a deflagration or, sometimes, even a detonation may occur, with devastating consequences. In dealing with gas leakages, let the gas evaporate and drift away. Keep away all sources of ignition. Water spray could reduce the ignition potential of the cloud (see SPILLAGE SCHEDULE S-U).

12.3.2 Non-toxic, non-flammable gases (class 2.2) may displace oxygen, creating a suffocation hazard. Ventilation of all areas concerned is important (see SPILLAGE SCHEDULE S-V).

12.3.3 Toxic gases (class 2.3) when released may fill an area of the ship or a compartment with a toxic atmosphere. Therefore, it is important to shut off, close and secure all ventilation supplying the accommodation, machinery spaces and bridge to protect against such gases. Self-contained breathing apparatus is essential for the emergency team (see SPILLAGE SCHEDULE S-U).

12.3.4 Liquefied gases can cause the additional hazard of very low temperatures around the point of leakage. Such a leakage will be particularly dangerous when the leakage is in the liquid phase from a container where very low temperatures will be experienced. The emergency team should avoid contact with liquefied gases if at all possible.

12.3.5 Oxidizing gases can react violently with a number of organic materials. These reactions can generate heat, produce flammable gases and are liable to ignite combustible materials.

**12.4 Flammable liquids – class 3**

12.4.1 The release of a vaporized flammable liquid is the preliminary step leading to a potential *vapour cloud explosion* (VCE). For a blast to take place, the vapour has to mix with air in a quantity that will allow the mixture to form a cloud. As soon as a friction (electrostatic potential) lies within the explosive range and encounters an ignition source, a flash fire, a deflagration or, sometimes, even a detonation may occur, with devastating consequences. Water spray will reduce the vaporization and the ignition potential of the cloud. Keep away all sources of ignition (see SPILLAGE SCHEDULE S-D).

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- 12.4.2 At high concentrations, many flammable liquids exhibit a narcotic effect (which is not labelled accordingly), a short-term potentially lethal effect (which is identified by a class 6.1 label) or a long-term toxic effect (not labelled). In all cases, the use of self-contained breathing apparatus is therefore recommended (see SPILLAGE SCHEDULE S-D).
- 12.4.3 Some flammable liquids are corrosive to human skin, the ship's hull or normal personal protection equipment. Their vapours are toxic by inhalation. Therefore, washing of spillages and forcing vapours overboard with water spray is the method of choice. It is important to close all ventilation to protect the accommodation and machinery spaces and the bridge from the vapours. Crew members should stay away from any effluent (see SPILLAGE SCHEDULE S-C).
- 12.4.4 Many flammable liquids are not soluble in water and will float on the water (e.g. mineral oil, gas oil, petroleum). In general, high concentrations of these substances are not lethal but exhibit a narcotic effect. The crew should be aware of that and stay away from highly concentrated vapours. Mineral oil is considered to be a marine pollutant although not classified nor labelled as such. Depending on the quantities, oil spilt into the sea may cause problems and is usually given a high profile by the media. In case of spillage on board, the dominating hazard is flammability. Keep away all sources of ignition (see SPILLAGE SCHEDULE S-E).
- 12.5 Flammable solids, self-reactive substances, solid desensitized explosives and polymerizing substances – class 4
- 12.5.1 This class contains many different substances and varying hazards within its three sub-classes. Many are not solids. Some of these materials require special agents to be used for cleaning/absorbing as they react unfavourably with water, sand or other inert material. The procedures and materials to be used in case of a spillage are identified in ten different schedules.
- 12.5.2 Spilled flammable solids may create an explosive atmosphere that could be ignited easily. Whereas some solids (e.g. articles) can be repacked (see SPILLAGE SCHEDULE S-I), others will contaminate ships' surfaces, which have to be cleaned thoroughly by washing the substances overboard (see SPILLAGE SCHEDULE S-G).
- 12.5.3 A few flammable substances are transported in a molten state. To clean contaminated areas, the use of inert materials is possible to enable the emergency team to shovel up the spillage and dispose of it overboard (see SPILLAGE SCHEDULE S-H).
- 12.5.4 Flammable solids that exhibit explosive properties when spilt from a package should be kept wet and disposed of overboard. Drying material being ignited (e.g. by heat or friction) would lead to a detonation (see SPILLAGE SCHEDULE S-J).
- 12.5.5 Temperature-controlled self-reactive substances are also classified as flammable solids under class 4.1. Spillage is often connected to a failure of temperature control, leading to chemical reaction and creating a fire hazard. If not disposed of overboard, the relevant FIRE SCHEDULE should be consulted (see SPILLAGE SCHEDULE S-K).
- 12.5.6 Some spontaneously combustible substances could react with water (see SPILLAGE SCHEDULE S-L). Smothering with dry inert material and the immediate disposal overboard could limit the ignition hazard. Others will ignite within minutes (see SPILLAGE SCHEDULE S-M) and firefighting will be necessary (see FIRE SCHEDULE F-G).
- 12.5.7 Depending on the chemical properties, substances which are dangerous when wet (class 4.3) could be collected and disposed of overboard (see SPILLAGE SCHEDULE S-P), or could be kept dry and disposed of overboard or could be washed overboard with copious quantities of water even though a reaction with water will occur (see SPILLAGE SCHEDULES S-N and S-O). The use of water spray is recommended in case of the development of flammable gases (see SPILLAGE SCHEDULE S-O).
- 12.5.8 Many flammable solids, substances liable to spontaneous combustion and most substances that are dangerous when wet are hazardous to health by skin contact or by inhalation of dust. The use of self-contained breathing apparatus and appropriate chemical protection (e.g. chemical suit) is therefore recommended in all cases.
- 12.6 Oxidizing substances and organic peroxides – class 5
- 12.6.1 Dangerous goods of class 5 contain oxygen, and some will ignite combustible material on contact. In general, contact with substances of class 5 will be harmful to the skin, eyes and mucous membranes. The use of self-contained breathing apparatus and appropriate chemical protection (e.g. chemical suit) is therefore recommended.
- 12.6.2 Spilled oxidizing substances (class 5.1) could ignite combustible material or destroy materials (e.g. personal protection) by their chemical reactivity. Such spillages should be washed overboard. All crew members should stay away from effluent (see SPILLAGE SCHEDULE S-Q).
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- 12.6.3 Organic peroxides (class 5.2) are highly reactive and some may explode when ignited. Class 5.2 liquids are flammable liquids which should be kept away from all sources of ignition. These substances will instantly destroy eyes. Some substances are transported under temperature control which is necessary to prevent reaction (mostly noticed as smoke evolution) and development of heat which may lead to fire (see SPILLAGE SCHEDULE S-R).
- 12.7 Toxic and infectious substances – class 6
- 12.7.1 The effects of toxic substances (class 6.1) may appear at once during exposure to them or may be delayed until after exposure. Inhalation is the major route for vapours, gases, mists and dusts. Skin and eye contact is of concern for the emergency team. The use of self-contained breathing apparatus and appropriate chemical protection (e.g. chemical suit) is recommended in all cases. Vapours of toxic liquids may fill an area of the ship or a space with a toxic atmosphere. Therefore, in case of vapour development, it is important to shut off, close and seal off all ventilation leading to accommodation and machinery spaces and the bridge (see SPILLAGE SCHEDULE S-A).
- 12.7.2 Some toxic substances are also flammable. In this case, the safety advice for both flammable and toxic liquids should be followed (see SPILLAGE SCHEDULE S-D).
- 12.7.3 In case of spillage of toxic substances, be prepared to use the MFAG.
- 12.7.4 The substances of class 6.2 are infectious, biological products, diagnostic specimens, clinical waste, etc. In case of spillage of such substances, different types of a biohazard may develop. Some spilled goods of class 6.2 could create illness of crew members after skin contact or inhalation. Whereas washing overboard is advised for on-deck spillage, waiting for expert ADVICE is recommended for under-deck spillages. Any skin contact or inhalation of mists or dusts should be avoided. Expert ADVICE is particularly important in respect of exposure risk, decontamination methods and reporting procedures (see SPILLAGE SCHEDULE S-T).
- 12.7.5 Most toxic substances and many infectious substances are also toxic to marine animals. Consult safety data sheets or experts for individual properties if needed.
- 12.8 Radioactive material – class 7
- 12.8.1 Many radioactive materials are transported in packages designed to retain their containment and shielding under accident conditions. Failure of the containment resulting in spillage that could be a significant hazard to personnel would only be expected under very severe conditions. Damp surfaces on undamaged or slightly damaged packages are seldom an indication of packaging failure. If a packaging of radioactive material appears to have leaked its accidental contents, expert ADVICE should be sought.
- 12.8.2 Some packages may have both a class 7 label and other hazard labels. Such additional hazards may be greater than the radiation hazard. In that case, actions as specified in the applicable SPILLAGE SCHEDULES should be followed.
- 12.8.3 Although radiation monitors are not required by regulation on board ships, applicable relevant provisions on segregation, separation or radiation protection programme (e.g. section 1.5.2 and paragraph 7.1.4.5.18 of the IMDG Code) or the INF Code may require monitors on board. For ships carrying radiation monitoring equipment, monitoring the extent of contamination is possible.
- 12.8.4 Spillage may constitute a release of any solid, liquid or gaseous radioactive material from its packaging. Personal protection material and equipment on board cannot generally provide protection against the health effects of penetrating ionizing radiation. Therefore, to protect personnel from the potential effects of radiation from spilled cargo (which may include the release from the packaging of special form radioactive material), two parameters are important when responding to spillages of these materials: TIME and DISTANCE. Entry of personnel into the area involving the spill of radioactive material should be limited to the shortest time possible, and the distance between the spillage and any personnel should be maximized. In addition, radiation contamination of personnel by inhalation, ingestion or skin contact should be of concern, and appropriate protective actions should be taken (protective clothing and self-contained breathing apparatus is recommended in all cases) (see SPILLAGE SCHEDULE S-S).
- 12.9 Corrosive substances – class 8
- 12.9.1 Corrosive solids and liquids can permanently damage human tissue. Some substances may corrode steel and destroy other materials (e.g. personal protection equipment). Corrosive vapours are highly toxic, often lethal by destroying lung tissue. All corrosive chemicals will be dangerous to human health (toxic). Avoid direct contact with the skin, protect against inhalation of vapours or mists. The use of self-contained breathing apparatus and appropriate chemical protection (e.g. chemical suit) is recommended in all cases. Washing spillages and forcing vapours overboard with water spray is the method in all cases. It is important to shut off, close and secure all ventilation leading into the accommodation of choice, machinery spaces and the bridge. All personnel should stay away from effluent (see SPILLAGE SCHEDULE S-B).

- 12.9.2        Some corrosive substances are also flammable. In these cases, the safety advice for both flammable and corrosive substances should be followed. Use of copious quantities of water and water spray is recommended. In general, the flammability hazard is more important than the corrosive properties for the safety of the ship and the crew (see e.g. SPILLAGE SCHEDULES S-C and S-G).
- 12.10        Miscellaneous dangerous substances and articles and environmentally hazardous substances – class 9
- This class contains miscellaneous dangerous substances that do not fit easily under the criteria for other hazard classes. Nonetheless, these substances represent hazards. There are no common properties that apply to all goods of this class. They have been allocated to the relevant EmS SPILLAGE SCHEDULE according to their hazards in the event of a spillage.
- 12.11        Marine pollutants
- 12.11.1      A number of substances within all classes have also been designated as marine pollutants because they are hazardous to marine life. Packages containing these substances will bear a marine pollutant mark.
- 12.11.2      In the case of spillage, it is important to be aware that any marine pollutant which is washed overboard will pollute the sea and must therefore be reported in accordance with the Reporting procedures by the fastest telecommunication channel available with the highest possible priority to the nearest coastal State (see Reporting Procedures).
- 12.11.3      It is, however, more important to ensure the safety of the crew and the integrity of the laden ship, rather than to prevent pollution of the sea by marine pollutants.



### *General guidelines for SPILLAGE*

- Think of safety first!
- Avoid any contact with dangerous substances. Do not walk through spilled liquids or dust (solids).
- Keep away from vapours or gases.
- Sound alarm.
- Keep the bridge and living quarters upwind if possible.
- Wear full protective clothing resistant to chemical attack and self-contained breathing apparatus.
- Locate stowage position of leaking cargo.
- Identify cargo.
- Obtain UN numbers and the EmS SPILLAGE SCHEDULE of dangerous goods involved.
- Consider which measures of the EmS SPILLAGE SCHEDULE are applicable and should be followed.
- Be prepared to use the Medical First Aid Guide (MFAG).
- Contact the designated person of the company responsible for the operation of the ship to obtain expert advice on dangerous goods emergency response measures.

Precaution: Contamination of the skin with any dangerous goods should be removed and washed immediately.

*Emergency schedules for SPILLAGE*

	<i>Page</i>
S-A .....	34
S-B .....	35
S-C .....	36
S-D .....	37
S-E .....	38
S-F .....	39
S-G .....	40
S-H .....	41
S-I .....	42
S-J .....	43
S-K .....	44
S-L .....	45
S-M .....	46
S-N .....	47
S-O .....	48
S-P .....	49
S-Q .....	50
S-R .....	51
S-S .....	52
S-T .....	54
S-U .....	55
S-V .....	57
S-W .....	58
S-X .....	59
S-Y .....	60
S-Z .....	61



## SPILLAGE SCHEDULE Alfa

## S–A

## TOXIC SUBSTANCES

General comments		<p>Wear suitable protective clothing and self-contained breathing apparatus. Avoid contact, even when wearing protective clothing.</p> <p>Stop leak if practicable.</p> <p>Contaminated clothing should be washed off with water and then removed.</p>
Spillage on deck	Packages (small spillage)	Wash overboard with copious quantities of water. Do not direct water jet straight onto the spillage. Keep clear of effluent. Clean the area thoroughly.
	Cargo transport units (large spillage)	<p>Keep bridge and living quarters upwind.</p> <p>Wash overboard with copious quantities of water. Do not direct water jet straight onto the spillage. Keep clear of effluent. Clean the area thoroughly.</p>
Spillage under deck	Packages (small spillage)	<p>Do not enter space without self-contained breathing apparatus. Check atmosphere before entering (toxicity and explosion hazard). If atmosphere cannot be checked, do not enter. Let vapours evaporate. Keep clear.</p> <p><i>Liquids:</i> Provide good ventilation of the space. Restrict flow of liquid to an enclosed area (e.g. by barricading with inert material or cement if available).</p> <p><i>Solids:</i> Collect spillage. Dispose of overboard.</p> <p>Otherwise, keep clear. Radio for expert ADVICE.</p>
	Cargo transport units (large spillage)	<p>Keep clear. Radio for expert ADVICE. After hazard evaluation by experts, you may proceed.</p> <p>Provide adequate ventilation. Do not enter space without self-contained breathing apparatus.</p> <p>Check atmosphere before entering (toxicity and explosion hazard). If atmosphere cannot be checked, do not enter. Let vapour evaporate, keep clear. Where the ventilation system is used, particular attention should be taken to prevent toxic vapours or fumes entering occupied areas of the ship, e.g. living quarters, machinery spaces, working areas.</p> <p><i>Liquids:</i> Provide good ventilation of the space. Wash down to the bottom of the hold. Pump overboard.</p> <p><i>Solids:</i> Collect spillage. Keep spilt solids dry and cover with plastic sheet. Dispose of overboard. Otherwise, close hatches. Wait until the ship arrives in port.</p>
Special cases: Marine pollutant mark  UN 3546		<p>Keep disposal overboard as low as possible. Dilute with copious quantities of water. Report incident according to MARPOL reporting requirements.</p> <p>Substances might be spilled when the articles are damaged.</p> <p>Undamaged articles can be collected.</p>

## SPILLAGE SCHEDULE Bravo

## S–B

## CORROSIVE SUBSTANCES

General comments		<p>Wear suitable protective clothing and self-contained breathing apparatus. Avoid contact, even when wearing protective clothing.</p> <p>Keep clear of effluent. Keep clear of evolving vapours.</p> <p>Even short-time inhalation of small quantities of vapour can cause breathing difficulties.</p> <p>Use of water on the substance may cause a violent reaction and produce toxic vapours. Substance may damage ship's construction materials.</p> <p>Contaminated clothing should be washed off with water and then removed.</p>
Spillage on deck	Packages (small spillage)	Wash overboard with copious quantities of water. Do not direct water jet straight onto the spillage. Keep clear of effluent. Clean the area thoroughly.
	Cargo transport units (large spillage)	<p>Keep bridge and living quarters upwind. Protect crew and living quarters against corrosive or toxic vapours by using water spray to drive vapours away.</p> <p>Wash overboard with copious quantities of water. Do not direct water jet straight onto the spillage. Keep clear of effluent. Clean the area thoroughly.</p>
Spillage under deck	Packages (small spillage)	<p>Provide adequate ventilation. Do not enter space without self-contained breathing apparatus. Check atmosphere before entering (toxicity and explosion hazard). If atmosphere cannot be checked, do not enter. Let vapour evaporate. Keep clear.</p> <p><i>Liquids:</i> Provide good ventilation of the space. Wash down to the bottom of the hold. Use copious quantities of water. Pump overboard.</p> <p><i>Solids:</i> Collect spillage. Dispose of overboard. Wash residues down to the bottom of the hold. Use copious quantities of water. Pump overboard.</p>
	Cargo transport units (large spillage)	<p>Keep bridge and living quarters upwind. Protect crew and living quarters against corrosive or toxic vapours by using water spray to drive vapours away.</p> <p>Do not enter space. Keep clear. Radio for expert ADVICE. After hazard evaluation by experts, you may proceed.</p> <p>Provide adequate ventilation. Do not enter space without self-contained breathing apparatus. Check atmosphere before entering (toxicity and explosion hazard). If atmosphere cannot be checked, do not enter. Let vapours evaporate, keep clear. Where a ventilation system is used, particular attention should be taken in order to prevent toxic vapours or fumes entering occupied areas of the ship, e.g. living quarters, machinery spaces, working areas.</p> <p><i>Liquids:</i> Provide good ventilation of the space. Wash down to the bottom of the hold. Use copious quantities of water. Pump overboard.</p> <p><i>Solids:</i> Collect spillage. Dispose of overboard. Wash residues down to the bottom of the hold. Use copious quantities of water. Pump overboard.</p>
Special cases: Marine pollutant mark UN 2802, UN 2809, UN 3506 UN 3547		<p>Report incident according to MARPOL reporting requirements.</p> <p>No reaction with water. Not highly corrosive to protective clothing. Collect spillages if practicable. Try to avoid disposal overboard. Radio for expert ADVICE.</p> <p>Substances might be spilled when the articles are damaged.</p> <p>Undamaged articles can be collected.</p>

## SPILLAGE SCHEDULE Charlie

## S–C

## FLAMMABLE, CORROSIVE LIQUIDS

General comments		<p>Wear suitable protective clothing and self-contained breathing apparatus. Avoid contact, even when wearing protective clothing.</p> <p>Keep clear of effluent. Keep clear of evolving vapours.</p> <p>Even short-time inhalation of small quantities of vapour can cause breathing difficulties. Use of water on the substance may cause violent reaction and produce toxic vapours. Substance may damage the ship's construction materials.</p> <p>Spillage or reaction with water may evolve flammable vapours. Avoid all sources of ignition (e.g. naked lights, unprotected light bulbs, electric handtools, friction).</p> <p>Contaminated clothing must be washed off with water and then removed.</p>
Spillage on deck	Packages (small spillage)	Wash overboard with copious quantities of water. Do not direct water jets straight onto the spillage. Keep clear of effluent. Clean the area thoroughly.
	Cargo transport units (large spillage)	<p>Keep bridge and living quarters upwind. Protect crew and living quarters against corrosive or toxic vapours by using water spray to drive vapours away.</p> <p>Wash overboard with copious quantities of water. Do not direct water jets straight onto the spillage. Keep clear of effluent. Clean the area thoroughly.</p>
Spillage under deck	Packages (small spillage)	<p>Provide adequate ventilation. Do not enter deck without self-contained breathing apparatus. Check atmosphere before entering (toxicity and explosion hazard). If atmosphere cannot be checked, do not enter. Let vapours evaporate, keep clear.</p> <p><i>Liquids:</i> Provide good ventilation of the space. Use water spray on effluent in hold to avoid ignition of flammable vapours. Wash down to the bottom of the hold. Use copious quantities of water. Pump overboard.</p> <p><i>Solids:</i> Collect spillage. Dispose of overboard. Wash residues down to the bottom of the hold. Use copious quantities of water. Pump overboard.</p>
	Cargo transport units (large spillage)	<p>Keep bridge and living quarters upwind. Protect crew and living quarters against corrosive or toxic vapours by using water spray to drive vapours away.</p> <p>Do not enter space. Keep clear. Radio for expert ADVICE. After hazard evaluation by experts, you may proceed.</p> <p>Provide adequate ventilation. Do not enter space without self-contained breathing apparatus. Check atmosphere before entering (toxicity and explosion hazard). If atmosphere cannot be checked, do not enter. Let vapours evaporate, keep clear. Where a ventilation system is used, particular attention should be taken in order to prevent toxic vapours or fumes entering occupied areas of the ship, e.g. living quarters, machinery spaces, working areas.</p> <p><i>Liquids:</i> Provide good ventilation of the space. Use water spray on effluent to avoid ignition of flammable vapours. Wash down to the bottom of the hold. Use copious quantities of water. Pump overboard.</p> <p><i>Solids:</i> Collect spillage. Dispose of overboard. Wash residues down to the bottom of the hold. Use copious quantities of water. Pump overboard.</p>
Special cases: Marine pollutant mark UN 2029, UN 3484		Report incident according to MARPOL reporting requirements. Self-ignition of spilt material is possible.

## SPILLAGE SCHEDULE Delta

## S-D

## FLAMMABLE LIQUIDS

General comments		<p>Wear suitable protective clothing and self-contained breathing apparatus.</p> <p>Avoid all sources of ignition (e.g. naked lights, unprotected light bulbs, electric handtools, friction).</p> <p>Stop leak if practicable.</p> <p>Avoid contact, even when wearing protective clothing. Spillage may evolve flammable vapours.</p> <p>Contaminated clothing must be washed off with water and then removed.</p>
Spillage on deck	Packages (small spillage)	Wash overboard with copious quantities of water. Do not direct water jet straight onto the spillage. Keep clear of effluent. Clean the area thoroughly.
	Cargo transport units (large spillage)	<p>Keep bridge and living quarters upwind.</p> <p>Wash overboard with copious quantities of water. Do not direct water jet straight onto the spillage. Keep clear of effluent. Clean the area thoroughly.</p>
Spillage under deck	Packages (small spillage)	<p>Shut off all possible sources of ignition in the space. Provide adequate ventilation. Do not enter space without self-contained breathing apparatus. Check atmosphere before entering (toxicity and explosion hazard). If the atmosphere cannot be checked, do not enter. Let vapours evaporate, keep clear.</p> <p>Provide good ventilation of the space. Use water spray on effluent in hold to avoid ignition of flammable vapours. Wash down to the bottom of the hold. Pump overboard.</p>
	Cargo transport units (large spillage)	<p>Keep bridge and living quarters upwind. Protect crew and living quarters against corrosive or toxic vapours by using water spray to drive vapours away.</p> <p>Do not enter space. Keep clear. Radio for expert ADVICE. After hazard evaluation by experts, you may proceed.</p> <p>Provide adequate ventilation. Do not enter space without self-contained breathing apparatus. Check atmosphere before entering (toxicity and explosion hazard). If atmosphere cannot be checked, do not enter. Let vapour evaporate, keep clear. Where a ventilation system is used, particular attention should be taken in order to prevent toxic vapours or fumes entering occupied areas of the vessel, e.g. living quarters, machinery spaces, working areas.</p> <p>Provide good ventilation of the space. Use water spray on effluent in the space to avoid ignition of flammable vapours. Wash down to the bottom of the hold. Use copious quantities of water. Pump overboard.</p>
Special cases: Marine pollutant mark UN 2749 UN 3359  UN 3540		<p>Report incident according to MARPOL reporting requirements. Self-ignition of spilt material is possible.</p> <p>This is a cargo transport unit under fumigation. When opened, it will be ventilated. However, experience has shown that toxic fumigants will stay within packaging material and in non-ventilated areas. Obtain information about the fumigation agent.</p> <p>Substances might be spilled when the articles are damaged.</p> <p>Undamaged articles can be collected and repacked.</p>

## SPILLAGE SCHEDULE Echo

## S–E

## FLAMMABLE LIQUIDS, FLOATING ON WATER

General comments		<p>Avoid sources of ignition (e.g. naked lights, unprotected light bulbs, electric handtools). Liquid is flammable and spillage may evolve flammable vapours.</p> <p>Wear suitable protective clothing and self-contained breathing apparatus. Stop leak if practicable.</p> <p>In general, substances covered under this schedule will have fuel-oil-like properties. They are immiscible with water and are liable to float on the surface of water. The use of inert absorbent material, as used in machinery spaces, is appropriate in all cases. For sticky liquids, shovels may be used, preferably shovels made of non-sparking or non-ferrous material.</p> <p>You may use light oil or soap-like products (surfactants) to clean small areas. Clean the area thoroughly because of the flammability hazard.</p> <p>Any pumping of spilled liquid overboard will create an oil spill on the sea surface. In this case, contact coastal authorities.</p> <p>Report discharge overboard according to MARPOL reporting requirements.</p>
Spillage on deck	Packages (small spillage)	Collect spillage in oil drums, metal boxes or salvage packagings. You may use inert absorbent material.
	Cargo transport units (large spillage)	<p>Restrict flow of leakage to an enclosed area (e.g. by diking with inert material or cement).</p> <p>Collect spillage in oil drums, metal boxes or salvage packagings. You may use inert absorbent material.</p> <p>Otherwise, wash overboard with copious quantities of water.</p>
Spillage under deck	Packages (small spillage)	<p>Shut off possible sources of ignition in the space. Provide adequate ventilation. Do not enter space without self-contained breathing apparatus. Check atmosphere before entering (toxicity and explosion hazard). If atmosphere cannot be checked, do not enter. Let vapours evaporate.</p> <p>Collect spillage in oil drums, metal boxes or salvage packagings. You may use inert absorbent material. Keep collected spillages in well ventilated areas or on deck only.</p>
	Cargo transport units (large spillage)	<p>Shut off possible sources of ignition in the space. Provide adequate ventilation. Do not enter deck without self-contained breathing apparatus. Check atmosphere before entering (toxicity and explosion hazard). If atmosphere cannot be checked, do not enter. Let vapours evaporate. Where a ventilation system is used, particular attention should be taken in order to prevent toxic vapours or fumes entering occupied areas of the ship, e.g. living quarters, machinery spaces, working areas.</p> <p>Provide good ventilation of the space. Use water spray on effluent in the space to avoid ignition of flammable vapours. Wash down to the bottom of the hold. Use copious quantities of water.</p> <p>Treat effluent according to Shipboard Oil Pollution Emergency Plan. Otherwise, radio for expert ADVICE.</p>
Special cases:		
UN 1136, UN 1993		These substances may be miscible with water and hence not float on the surface. In this case, SPILLAGE SCHEDULE S–D will be appropriate.
UN 1139, UN 1263, UN 1866		No thorough cleaning of spillage site necessary. Residues will dry out and coat surfaces.

SPILLAGE SCHEDULE Foxtrot

S–F

WATER-SOLUBLE MARINE POLLUTANTS

General comments		<p>Wear suitable protective clothing and self-contained breathing apparatus. Stop leak if practicable.</p> <p>Substances covered under this schedule will present a hazard to the marine environment. Try to avoid disposal overboard.</p> <p>The use of inert absorbent material, as used in machinery spaces, is appropriate in all cases. For sticky liquids, shovels may be used.</p> <p>Discharge of spilled substance overboard will damage the marine environment, including living resources of the sea. In this case, contact coastal authorities.</p> <p>Report discharge overboard according to MARPOL reporting requirements.</p>
Spillage on deck	Packages (small spillage)	<p><i>Liquids:</i> Smother spillage with inert absorbent material.</p> <p>Collect spillage in oil drums, metal boxes or salvage packagings.</p> <p><i>Solids:</i> Collect material.</p>
	Cargo transport units (large spillage)	<p>Restrict flow of leakage to an enclosed area (e.g. by barricading with inert material or cement if available).</p> <p><i>Liquids:</i> Collect spillage in empty tanks, oil drums, metal boxes or salvage packagings. You may use inert absorbent material.</p> <p><i>Solids:</i> Collect spillage in oil drums or metal boxes.</p>
Spillage under deck	Packages (small spillage)	<p><i>Liquids:</i> Smother spillage with inert absorbent material.</p> <p>Collect spillage in oil drums, metal boxes or salvage packagings.</p> <p><i>Solids:</i> Collect material.</p>
	Cargo transport units (large spillage)	<p>Restrict flow of leakage to an enclosed area (e.g. by barricading with inert material or cement if available).</p> <p><i>Liquids:</i> Collect spillage in empty tanks, oil drums, metal boxes or salvage packagings. You may use inert absorbent material.</p> <p><i>Solids:</i> Collect spillage in oil drums or metal boxes. Otherwise, wash down to the bottom of the hold. Use copious quantities of water. Treat effluent according to Shipboard Oil Pollution Emergency Plan.</p>
Special cases: None.		

## SPILLAGE SCHEDULE Golf

## S–G

## FLAMMABLE SOLIDS AND SELF-REACTIVE SUBSTANCES

General comments		<p>Wear suitable protective clothing and self-contained breathing apparatus.</p> <p>Avoid all sources of ignition (e.g. naked lights, unprotected light bulbs, electric handtools, friction). Wear non-sparking footwear.</p> <p>Stop leak if practicable.</p>
Spillage on deck	Packages (small spillage)	Wash overboard with copious quantities of water. Keep clear of effluent.
	Cargo transport units (large spillage)	
Spillage under deck	Packages (small spillage)	<p>Do not enter space without self-contained breathing apparatus.</p> <p>Check atmosphere before entering (toxicity and explosion hazard). Collect and contain spillage if practicable. Dispose of overboard.</p> <p>Collect spillage using soft brushes and plastic trays.</p>
	Cargo transport units (large spillage)	<p>Provide adequate ventilation.</p> <p>Do not enter space without self-contained breathing apparatus.</p> <p>Check atmosphere before entering (toxicity and explosion hazard). Collect and contain spillage if practicable. Dispose of overboard. Collect spillage using soft brushes and plastic trays.</p>
Special cases: UN 3541		<p>Substances might be spilled when the articles are damaged.</p> <p>Undamaged articles can be collected.</p>

SPILLAGE SCHEDULE Hotel

# S-H

## FLAMMABLE SOLIDS (MOLTEN MATERIAL)

General comments		Wear suitable protective clothing and self-contained breathing apparatus. Avoid all sources of ignition (e.g. naked lights, unprotected light bulbs, electric handtools, friction). Wear non-sparking footwear. Stop leak if practicable. Do not touch or walk on spilled material.
Spillage on deck	Packages (small spillage)	Smother with dry inert material. Dispose of overboard.
	Cargo transport units (large spillage)	
Spillage under deck	Packages (small spillage)	
	Cargo transport units (large spillage)	
Special cases: None.		



## SPILLAGE SCHEDULE India

## S-I

## FLAMMABLE SOLIDS (REPACKING POSSIBLE)

General comments		Wear suitable protective clothing and self-contained breathing apparatus. Avoid all sources of ignition (e.g. naked lights, unprotected light bulbs, electric handtools, friction). Wear non-sparking footwear. Stop leak if practicable.
Spillage on deck	Packages (small spillage)	Collect spillage and repack if practicable. Otherwise, wash overboard with copious quantities of water. Keep clear of effluent.
	Cargo transport units (large spillage)	
Spillage under deck	Packages (small spillage)	Collect spillage and repack if practicable.
	Cargo transport units (large spillage)	
Special cases: None.		

SPILLAGE SCHEDULE Juliet

S–J

WETTED EXPLOSIVES AND CERTAIN SELF-HEATING SUBSTANCES

General comments		<p>Wear suitable protective clothing and self-contained breathing apparatus.</p> <p>Avoid all sources of ignition (e.g. naked lights, unprotected light bulbs, electric handtools, friction). Wear non-sparking footwear.</p> <p>Stop leak if practicable.</p> <p>Dried out material may explode if exposed to heat, flame, friction, or shock.</p>
Spillage on deck	Packages (small spillage)	<p>Keep spillage wet.</p> <p>Dispose of solid material overboard.</p> <p>Wash overboard with copious quantities of water. Keep clear of effluent.</p>
	Cargo transport units (large spillage)	
Spillage under deck	Packages (small spillage)	<p>Keep spillage wet.</p> <p>Collect and contain spillage if practicable. Dispose of overboard. Collect spillage using soft brushes and plastic trays.</p>
	Cargo transport units (large spillage)	
Special cases: UN 3542		<p>Substances might be spilled when the articles are damaged.</p> <p>Undamaged articles can be collected.</p>

## SPILLAGE SCHEDULE Kilo

## S–K

## TEMPERATURE-CONTROLLED SELF-REACTIVE SUBSTANCES

General comments		<p>If smoke is observed, see FIRE SCHEDULE F-F.</p> <p>Check temperature reading if possible. If temperature is increasing: see FIRE SCHEDULE F-F.</p> <p>Wear suitable protective clothing and self-contained breathing apparatus.</p> <p>Avoid all sources of ignition (e.g. naked lights, unprotected light bulbs, electric handtools, friction). Wear non-sparking footwear.</p>
Spillage on deck	Packages (small spillage)	Wash overboard with copious quantities of water. Keep clear of effluent.
	Cargo transport units (large spillage)	Wash overboard with copious quantities of water. Keep clear of effluent. Leave units closed.
Spillage under deck	Packages (small spillage)	Not applicable. According to the IMDG Code, under deck stowage not allowed. Radio for expert ADVICE.
	Cargo transport units (large spillage)	
Special cases:		

SPILLAGE SCHEDULE Lima

S–L

SPONTANEOUSLY COMBUSTIBLE, WATER-REACTIVE SUBSTANCES

General comments		<p>Wear suitable protective clothing and self-contained breathing apparatus.</p> <p>Avoid all sources of ignition (e.g. naked lights, unprotected light bulbs, electric handtools, friction). Wear non-sparking footwear.</p> <p>DO NOT USE WATER.</p>
Spillage on deck	Packages (small spillage)	<p>Avoid getting water on spilled substances or inside cargo transport units. Smother with dry inert material. Dispose of overboard immediately.</p>
	Cargo transport units (large spillage)	
Spillage under deck	Packages (small spillage)	<p>Not applicable. According to the IMDG Code, under deck stowage not allowed. Radio for expert ADVICE.</p>
	Cargo transport units (large spillage)	
Special cases: UN 2210, UN2968		<p>These substances are allowed to be carried under deck. Take action as given for on deck stowage.</p>

## SPILLAGE SCHEDULE Mike

## S–M

## HAZARD OF SPONTANEOUS IGNITION

General comments		Substances covered by this schedule may ignite within 5 minutes after contact with air. See firefighting guidance: FIRE SCHEDULE F–G.
Spillage on deck	Packages (small spillage)	
	Cargo transport units (large spillage)	
Spillage under deck	Packages (small spillage)	
	Cargo transport units (large spillage)	
Special cases: UN 3542		Substances might be spilled when the articles are damaged. Undamaged articles can be collected.

SPILLAGE SCHEDULE November

# S–N

## SUBSTANCES REACTING VIGOROUSLY WITH WATER

General comments		<p>Wear suitable protective clothing and self-contained breathing apparatus.</p> <p>Avoid all sources of ignition (e.g. naked lights, unprotected light bulbs, electric handtools, friction). Wear non-sparking footwear.</p> <p>Stop leak if practicable.</p>
Spillage on deck	Packages (small spillage)	<p>If dry, contain and collect spillage if practicable. Dispose of overboard.</p> <p>Avoid contact with water except to wash residues overboard with copious quantities of water. Keep clear of effluent.</p>
	Cargo transport units (large spillage)	
Spillage under deck	Packages (small spillage)	<p>Provide adequate ventilation.</p> <p>Check atmosphere before entering space (toxicity and explosion hazards). If atmosphere cannot be checked, do not enter. Do not enter space without self-contained breathing apparatus.</p> <p>Keep dry. Collect spillages using soft brushes and plastic trays.</p> <p><i>If dry</i>, collect and contain spillage if practicable. Dispose of overboard.</p> <p><i>If wet</i>, use inert absorbent material. Do not use combustible material. Dispose of overboard.</p>
	Cargo transport units (large spillage)	
Special cases: UN 3543		<p>Substances might be spilled when the articles are damaged.</p> <p>Undamaged articles can be collected.</p>

## SPILLAGE SCHEDULE Oscar

## S–O

## SUBSTANCES DANGEROUS WHEN WET (NON-COLLECTABLE ARTICLES)

General comments		<p>Wear suitable protective clothing and self-contained breathing apparatus.</p> <p>Avoid all sources of ignition (e.g. naked lights, unprotected light bulbs, electric handtools, friction). Wear non-sparking footwear.</p> <p>Stop leak if practicable.</p>
Spillage on deck	Packages (small spillage)	Wash overboard with copious quantities of water. Keep clear of effluent.
	Cargo transport units (large spillage)	
Spillage under deck	Packages (small spillage)	<p>Do not enter space without self-contained breathing apparatus.</p> <p><i>If dry</i>, collect and contain spillage if practicable. Keep dry. Dispose of overboard. Avoid contact with water except to wash residues with copious quantities of water. Keep clear of effluent.</p> <p><i>If wet</i>, wash down to the bottom of the hold. Use copious quantities of water. Pump overboard. If gas is developing, provide good ventilation of the hold. Use water spray on effluent in hold to avoid ignition of flammable vapours.</p>
	Cargo transport units (large spillage)	<p>Do not enter space without self-contained breathing apparatus.</p> <p><i>If dry</i>, collect and contain spillage if practicable. Keep dry. Dispose of overboard. Avoid contact with water except to wash residues with copious quantities of water. Keep clear of effluent.</p> <p><i>If wet</i>, wash down to the bottom of the hold. Use copious quantities of water. Pump overboard. If gas is developing, provide good ventilation of the hold. Use water spray on effluent in hold to avoid ignition of flammable vapours. Where a ventilation system is used, particular attention should be taken in order to prevent toxic vapours or fumes entering occupied spaces of the ship, e.g. living quarters, machinery spaces, working areas.</p>
Special cases: UN 1295		Beware of a highly flammable atmosphere.

SPILLAGE SCHEDULE Papa

S-P

SUBSTANCES DANGEROUS WHEN WET (COLLECTABLE ARTICLES)

General comments		Wear suitable protective clothing and self-contained breathing apparatus.
Spillage on deck	Packages (small spillage)	Contain and collect spillage if practicable. Dispose of overboard.
	Cargo transport units (large spillage)	
Spillage under deck	Packages (small spillage)	Provide adequate ventilation. Do not enter space without self-contained breathing apparatus. Contain and collect spillages if practicable. Dispose of overboard.
	Cargo transport units (large spillage)	
Special cases: UN 3257, UN 3258 UN 3316 UN 3363, UN 3548		Hot substance. No hazard when cool. If FIRST AID KIT, collect articles and repack. Substances might be spilled when the articles or machinery are damaged. Undamaged articles can be collected. Take care of hazardous properties according to transport documents or radio for expert ADVICE.



## SPILLAGE SCHEDULE Quebec

## S–Q

## OXIDIZING SUBSTANCES

General comments		<p>Wear suitable protective clothing and self-contained breathing apparatus.</p> <p>Avoid all sources of ignition (e.g. naked lights, unprotected light bulbs, electric handtools, friction). Wear non-sparking footwear.</p> <p>May ignite combustible material (e.g. wood, paper, clothing). Stop leak if practicable.</p>
Spillage on deck	Packages (small spillage)	Wash overboard with copious quantities of water. Keep clear of effluent.
	Cargo transport units (large spillage)	
Spillage under deck	Packages (small spillage)	<p>Do not enter space without self-contained breathing apparatus.</p> <p><i>If dry</i>, contain and collect spillage if practicable. Dispose of overboard.</p> <p><i>If wet</i>, use inert absorbent material. Do not use combustible material.</p> <p><i>If liquid</i>, wash down to the bottom of the hold, using copious quantities of water. Pump overboard.</p> <p>Dispose of overboard.</p>
	Cargo transport units (large spillage)	<p>Provide adequate ventilation.</p> <p>Do not enter space without self-contained breathing apparatus.</p> <p><i>If dry</i>, contain and collect spillage if practicable. Dispose of overboard.</p> <p><i>If wet</i>, use inert absorbent material. Do not use combustible material.</p> <p><i>If liquid</i>, wash down to the bottom of the hold, using copious quantities of water. Pump overboard.</p> <p>Dispose of overboard.</p>
Special cases: UN 3544		<p>Substances might be spilled when the articles are damaged.</p> <p>Undamaged articles can be collected.</p>

SPILLAGE SCHEDULE Romeo

S–R

ORGANIC PEROXIDES

General comments		<p>Wear suitable protective clothing and self-contained breathing apparatus.</p> <p>Contact of substance (or vapour) with eyes may cause blindness within minutes.</p> <p>Avoid all sources of ignition (e.g. naked lights, unprotected light bulbs, electric handtools, friction). Wear non-sparking footwear.</p> <p>Stop leak if practicable.</p> <p>Substances covered by this schedule are liable to explode by exposure to heat or ignition.</p> <p>In case of <i>smoke evolution</i>, see appropriate FIRE SCHEDULE. Radio for expert ADVICE or contact manufacturer.</p>
Spillage on deck	Packages (small spillage)	<p>Wash overboard with copious quantities of water. Keep clear of effluent. Collect damaged or leaking receptacles and dispose of overboard.</p> <p>Handle with care.</p>
	Cargo transport units (large spillage)	
Spillage under deck	Packages (small spillage)	<p>Not applicable. According to the IMDG Code, under deck stowage not allowed. Radio for expert ADVICE.</p>
	Cargo transport units (large spillage)	
Special cases: UN 3545		<p>Substances might be spilled when the articles are damaged.</p> <p>Undamaged articles can be collected.</p>

## SPILLAGE SCHEDULE Sierra

(Part 1 of 2)

## S–S

## RADIOACTIVE MATERIAL

General comments		<p>Evacuate compartment or downwind area of non-essential personnel.</p> <p>Provide respiratory protection to personnel in downwind area.</p> <p>For ships carrying radiation monitoring equipment, measure radiation levels. In this case, assess the extent of contamination and resultant radiation level of the package, the adjacent areas and, if necessary, all other material which has been carried in the conveyance.</p> <p>Define a zone for restricted entry. Personnel should not enter this zone without suitable protective clothing and self-contained breathing apparatus.</p> <p>Limit entry of personnel to the restricted zone for the shortest time possible.</p> <p>Cover liquid spill with inert absorbent materials, if available. Cover powder spills with plastic sheet or tarpaulin to minimize spread.</p> <p>If exposure of personnel is suspected, clean body and hair with warm water and soap; discharge resultant washings directly overboard.</p> <p>Record the names of potentially exposed persons. Ensure medical examination of these persons after reaching any medical staff.</p> <p>Emergency procedures, if established for the ship or the specific cargo by relevant authorities or the shipper, should be followed.</p> <p>For ships carrying radiation monitoring equipment, continue monitoring the radiation levels. Radio for expert ADVICE.</p>
Spillage on deck	Packages (small spillage)	<p>Wash spillages overboard with copious quantities of water. Keep clear of effluent.</p> <p>Packages damaged or leaking radioactive contents may be removed to an acceptable restricted access interim location. Isolate and sheet over. Do not remove packages from restricted access zone until approved by the competent authority.</p>
	Cargo transport units (large spillage)	<p>Let released gas escape. Keep clear. Use water spray to protect bridge, living quarters and personnel from precipitation of vapours (water curtain).</p> <p>Absorb liquid spillage, where practicable, using absorbent material. Isolate and sheet over.</p> <p>Packages damaged or leaking radioactive contents may be removed to an acceptable restricted access interim location. Isolate and sheet over. Do not remove packages from restricted access zone until approved by the competent authority.</p> <p>Wash residues of liquids or solids overboard with copious quantities of water (use spray nozzles). Do not allow water to enter receptacles.</p>
Spillage under deck	Packages (small spillage)	<p>Provide adequate ventilation.</p> <p>Let released gas escape, keep clear. Where a ventilation system is used, particular attention should be taken in order to prevent radioactive vapours or fumes entering occupied areas of the ship, e.g. living quarters, machinery spaces, working areas.</p> <p>Keep solids dry.</p> <p>Absorb liquid spillage, where practicable, using inert absorbent material. Isolate and sheet over.</p> <p>Packages damaged or leaking radioactive contents may be removed to an acceptable restricted access interim location. Isolate and sheet over. Do not remove packages from restricted access zone until approved by the competent authority.</p> <p>Keep working period of emergency team in space as short as possible.</p>
	Cargo transport units (large spillage)	<p>Do not enter space. Radio for expert ADVICE.</p> <p><i>If liquid, or vapour is developing:</i> Where a ventilation system is used, particular attention should be taken in order to prevent radioactive vapours entering occupied areas of the ship, e.g. living quarters, machinery spaces, working areas. Use water spray to protect bridge, living quarters and personnel from precipitation of vapours evolving from the hold (water curtain).</p>

SPILLAGE SCHEDULE Sierra (*continued*) (Part 2 of 2)

# S–S

## RADIOACTIVE MATERIAL

<p>Special cases: UN 2977, UN 2978, UN 3507</p>	<p>Avoid contact, even when wearing protective clothing. Keep clear of evolving vapours. Even short-time inhalation of small quantities of vapour can cause breathing difficulties.</p> <p>Bear in mind that gases are heavier than air. Measures should be taken to prevent leaking gases from penetrating into any other part of the ship.</p> <p>Keep bridge and living quarters upwind. Protect crew and living quarters against corrosive and toxic vapours by using water spray to drive vapours away.</p> <p>Do not enter space without protective equipment. Keep clear. Radio for expert ADVICE.</p>
<p>UN 3332, UN 3333</p>	<p>If a special form radioactive material is identified as being outside its packaging, do not touch. Stay away and radio for expert ADVICE.</p>
<p>UN 2919, UN 3331</p>	<p>For radioactive material, <i>transported under special arrangement</i>, use special precautions, operational controls or emergency procedures as specifically designated by the competent authorities in their approval certificates and declared by the shipper in its transport documents.</p>
<p>Subsidiary labels class 4.2 or class 4.3</p>	<p>These are pyrophoric substances, water will ignite the material. DO NOT USE WATER. Radio for expert ADVICE.</p>
<p>Restowing of packages UN 2977, UN 3324, UN 3325, UN 3326, UN 3327, UN 3328, UN 3329, UN 3330, UN 3331</p>	<p>Check package labels and transport documents to determine whether packages contain fissile material.</p> <p>Prior to any restowing of these packages, radio for expert ADVICE.</p>

## SPILLAGE SCHEDULE Tango

## S–T

## DANGEROUS GOODS WITH BIOHAZARD

General comments		<p>Wear suitable protective clothing and self-contained breathing apparatus.</p> <p>Avoid handling leaking or damaged packages or keep handling to a minimum.</p> <p>Inform the public health, veterinary or other competent authority if persons or the marine environment might have been exposed. A competent authority to which actual or suspected leakage is reported should notify the authorities of any countries in which the goods may have been handled, including countries of transit.</p> <p>Radio for expert ADVICE.</p> <p>Notify consignor/consignee.</p>
Spillage on deck	Packages (small spillage)	<p>Stop leak if practicable.</p> <p>Collect potentially contaminated packages or equipment. Isolate and sheet over.</p> <p>Wash spillage or residues overboard with copious quantities of water. Keep clear of effluent.</p>
	Cargo transport units (large spillage)	<p>Clean contaminated area thoroughly using bleach-like products (like sodium hypochlorite 1–6% solution or Javel water). Keep clear of effluent.</p>
Spillage under deck	Packages (small spillage)	Do not enter space.
	Cargo transport units (large spillage)	
Special cases: None.		

## SPILLAGE SCHEDULE Uniform

(Part 1 of 2)

## S–U

## GASES (FLAMMABLE, TOXIC OR CORROSIVE)

General comments		<p>Spaces and areas where leakages or spillages have occurred should be evacuated downwind immediately.</p> <p>Take care: Flames may be invisible. Leaking gas may be extremely cold.</p> <p>Measures should be taken to prevent leaking gases from penetrating into any other part of the ship. Bear in mind that some gases are heavier than air or may otherwise accumulate in lower or non-ventilated parts of the ship. Ensure that there is no smoking</p> <p>or any other open fire on board unless the leak has been closed and all spaces have been ventilated. Particular attention should be taken in order to prevent gases drifting into occupied areas of the ship, e.g. living quarters, machinery spaces, working areas.</p> <p>Wear protective clothing suitable for gas protection and self-contained breathing apparatus.</p> <p>Avoid all sources of ignition (e.g. naked lights, unprotected light bulbs, electric handtools, friction). Wear non-sparking footwear.</p> <p>Even short inhalation of small quantities of gas can cause breathing difficulties. Keep clear of evolving gases. Avoid all skin contact.</p> <p>Let <i>spilt liquefied gas</i> evaporate. When in contact with cold liquefied gases, most materials become brittle and are likely to break without warning. Avoid all contact, even when wearing protective clothing. If practicable, protect ship's superstructure with copious quantities of water. Do not direct water jet onto the spill.</p>
Spillage on deck	Packages (small spillage)	Let gas dissipate. Keep clear.
	Cargo transport units (large spillage)	<p>Let gas dissipate. Keep bridge and living quarters upwind.</p> <p>Otherwise, protect crew and living quarters against flammable or toxic gases by using water spray to drive gases away (water curtain).</p> <p><i>Spilt liquefied gas</i>: Use water jets from as far as practicable to accelerate evaporation, not directing them straight onto the spill.</p>
Spillage under deck	Packages (small spillage)	<p>Do not enter space. Provide adequate ventilation.</p> <p>Where a ventilation system is used, particular attention should be taken in order to prevent gases penetrating into other areas of the ship.</p> <p>Let gas evaporate. Keep clear. Radio for expert ADVICE.</p> <p>Check atmosphere before entering (toxicity and explosion hazard). Do not enter space without self-contained breathing apparatus.</p>
	Cargo transport units (large spillage)	<p>Do not enter space. Provide adequate ventilation.</p> <p>Where a ventilation system is used, particular attention should be taken in order to prevent gases drifting into other areas of the ship.</p> <p>Keep bridge and living quarters upwind.</p> <p>Otherwise, protect crew and living quarters against flammable or toxic gases by using water spray to drive gases away (water curtain).</p> <p>If practicable, use water spray to avoid ignition of flammable gases in the space. Radio for expert ADVICE.</p> <p>Check atmosphere before entering (toxicity and explosion hazard).</p> <p>Do not enter deck without self-contained breathing apparatus.</p>

**S–U****GASES (FLAMMABLE, TOXIC OR CORROSIVE)**

Special cases: UN 1001, UN 3374  UN 1614  UN 3501  UN 3504  UN 3505  UN 3537, UN 3539	<p>Heated or roughly handled receptacles may explode even after several hours of being removed from external sources of heat. Cool for several hours by using water.</p> <p>The gas is absorbed in a porous inert material, but will evaporate if the receptacle is damaged.</p> <p>A flammable liquid, paste or powder may be expelled if the package is ruptured. Also consult SPILLAGE SCHEDULES S-D or S-G, as appropriate.</p> <p>A flammable or toxic liquid, paste or powder may be expelled if the package is ruptured. Also consult SPILLAGE SCHEDULES S-D, S-G or S-A, as appropriate.</p> <p>A flammable or corrosive liquid, paste or powder may be expelled if the package is ruptured. Also consult SPILLAGE SCHEDULES S-C or S-G, as appropriate.</p> <p>Gases might be released when the articles are damaged.</p> <p>Undamaged articles can be collected and repacked.</p>
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SPILLAGE SCHEDULE Victor

S–V

GASES (NON-FLAMMABLE, NON-TOXIC)

General comments		<p>Measures should be taken to prevent leaking gases from penetrating into any other part of the ship. Bear in mind that some gases are heavier than air or may otherwise accumulate in lower or non-ventilated parts of the ship. Particular attention should be taken in order to prevent gases drifting into occupied areas of the ship, e.g. living quarters, machinery spaces, working areas. Leaking gas may be extremely cold.</p> <p>Wear suitable protective clothing and self-contained breathing apparatus (suffocation hazard).</p> <p>Let <i>spilt liquefied gas</i> evaporate. When in contact with cold liquefied gases, most materials become brittle and are likely to break without warning. Avoid all contact, even when wearing protective clothing. If practicable, protect ship's superstructure with copious quantities of water. Do not direct water jet onto the spill.</p>
Spillage on deck	Packages (small spillage)	Let gas dissipate. Keep clear.
	Cargo transport units (large spillage)	<p>Let gas dissipate.</p> <p><i>Spilt liquefied gas</i>: Use water jets from as far as practicable to accelerate evaporation, not directing them straight onto the spill.</p> <p>Keep clear of evolving gases.</p>
Spillage under deck	Packages (small spillage)	<p>Provide adequate ventilation.</p> <p>Stop leak if practicable. Otherwise, let gas evaporate. Keep clear.</p> <p>Check atmosphere before entering space (suffocation hazard). Do not enter space without self-contained breathing apparatus.</p>
	Cargo transport units (large spillage)	<p>Provide adequate ventilation.</p> <p>Stop leak if practicable. Otherwise, let gas evaporate. Keep clear.</p> <p><i>Spilt liquefied gas</i>: Use water jets from as far as practicable to accelerate evaporation, not directing them straight onto the spill.</p> <p>Check atmosphere before entering space (suffocation hazard). Do not enter space without self-contained breathing apparatus.</p>
<p>Special cases:</p> <p>UN 2990, UN 3072</p> <p>UN 3502</p> <p>UN 3503</p> <p>UN 3538</p>		<p>No suffocation hazard. Collect articles and repack.</p> <p>A toxic liquid, paste or powder may be expelled if the package is ruptured. Also consult SPILLAGE SCHEDULE S-A.</p> <p>A corrosive liquid, paste or powder may be expelled if the package is ruptured. Also consult SPILLAGE SCHEDULES S-C or S-G, as appropriate.</p> <p>Gases might be released when the articles are damaged.</p> <p>Undamaged articles can be collected and repacked.</p>



## SPILLAGE SCHEDULE Whisky

## S–W

## OXIDIZING GASES

General comments		<p>Areas containing leakages or spillages should be evacuated downwind immediately. These gases may ignite combustible material and enhance fire.</p> <p>Take care: Flames may be invisible. Leaking gas may be extremely cold.</p> <p>Measures should be taken to prevent leaking gases from penetrating into any other part of the ship.</p> <p>Ensure that there is no smoking or any other open fire on board unless the leak has been closed and all spaces have been ventilated. Particular attention should be taken in order to prevent gases drifting into occupied areas of the vessel, e.g. living quarters, machinery spaces, working areas.</p> <p>Wear suitable protective clothing and self-contained breathing apparatus.</p> <p>Avoid all sources of ignition (e.g. naked lights, unprotected light bulbs, electric handtools, friction). Wear non-sparking footwear.</p> <p>Even short inhalation of small quantities of gas can cause breathing difficulties. Keep clear of evolving gases. Avoid all skin contact.</p> <p>Let <i>spilt liquefied gas</i> evaporate. When in contact with cold liquefied gases, most materials become brittle and are likely to break without warning. Avoid all contact, even when wearing protective clothing. If practicable, protect ship's superstructure with copious quantities of water. Do not direct water jet onto the spill.</p>
Spillage on deck	Packages (small spillage)	Let gas evaporate. Keep clear.
	Cargo transport units (large spillage)	<p>Let gas evaporate.</p> <p>Keep bridge and living quarters upwind.</p> <p>Otherwise, protect crew and living quarters against flammable or toxic gases by using water spray to drive gases away (water curtain).</p> <p><i>Spilt liquefied gas</i>: Use water jets from as far as practicable to accelerate evaporation, not directing them straight onto the spill.</p>
Spillage under deck	Packages (small spillage)	<p>Do not enter space.</p> <p>Provide adequate ventilation.</p> <p>Where a ventilation system is used, particular attention should be observed in order to prevent gases penetrating into other areas of the ship.</p> <p>Let gas evaporate. Keep clear. Radio for expert ADVICE.</p> <p>Check atmosphere before entering space (toxicity and explosion hazard). Do not enter space without self-contained breathing apparatus.</p>
	Cargo transport units (large spillage)	<p>Do not enter space.</p> <p>Provide adequate ventilation.</p> <p>Where a ventilation system is used, particular attention should be observed in order to prevent gases drifting into other areas of the ship.</p> <p>Keep bridge and living quarters upwind.</p> <p>Otherwise, protect crew and living quarters against gases by using water spray to drive gases away (water curtain).</p> <p>If practicable, use water spray to avoid ignition of gases in the space. Radio for expert ADVICE.</p>
Special cases: UN 1072, UN 1073		This is concentrated oxygen. No inhalation hazard after a short distance from a leak. No skin irritation hazard.

## SPILLAGE SCHEDULE X-Ray

### S-X

#### EXPLOSIVE ITEMS AND ARTICLES

General comments		Avoid all sources of ignition (e.g. naked lights, unprotected light bulbs, electric handtools). <i>Electrostatic hazard:</i> Electric charge may ignite ammunition. Keep spilled material away from generators of static electricity (e.g. mobile phones, friction of synthetic polymers like PVC gloves). Wear non-sparking footwear.
Spillage on deck	Packages (small spillage)	<i>Articles:</i> Sweep or pick up articles. If the articles remain intact but appear damaged, separate out and radio for expert ADVICE. <i>Spilled substance:</i> Keep wet. Wash spillage overboard with copious quantities of water.
	Cargo transport units (large spillage)	
Spillage under deck	Packages (small spillage)	<i>Articles:</i> Sweep or pick up articles. If the articles remain intact but appear damaged, separate and radio for expert ADVICE. <i>Spilled substance:</i> Keep wet. Collect spillage where practicable. Dispose of overboard.
	Cargo transport units (large spillage)	
Special cases: None.		

## SPILLAGE SCHEDULE Yankee

## S–Y

## EXPLOSIVE CHEMICALS

General comments		<p>Avoid all sources of ignition (e.g. naked lights, unprotected light bulbs, electric handtools). Stop leak if practicable.</p> <p><i>Electrostatic hazard:</i> Electric charge may ignite ammunition. Keep spilled material away from generators of static electricity (e.g. mobile phones, friction of synthetic polymers like PVC gloves). Wear non-sparking footwear.</p> <p>Some explosive mixtures are stabilized in such a way that water will separate explosives from the stabilizer, thus creating a higher risk. The explosive component becomes very sensitive to shock and heat.</p> <p>Radio for expert ADVICE.</p>
Spillage on deck	Packages (small spillage)	<p><i>Articles:</i> Sweep or pick up articles. If the articles remain intact but appear damaged, separate out and ask for expert ADVICE. Wetted articles should be jettisoned.</p>
	Cargo transport units (large spillage)	<p><i>Spilled substance:</i> Keep it under water. Wash spillages overboard with copious quantities of water.</p>
Spillage under deck	Packages (small spillage)	<p><i>Articles:</i> Sweep or pick up articles. If the articles remain intact but appear damaged, separate out and radio for expert ADVICE. Wetted articles should be jettisoned.</p>
	Cargo transport units (large spillage)	<p><i>Spilled substance:</i> Keep it under water. Collect spillages where practicable. Dispose of overboard.</p>
Special cases: None.		

SPILLAGE SCHEDULE Zulu

S–Z

TOXIC EXPLOSIVES

General comments		<p>Wear suitable protective clothing and self-contained breathing apparatus.</p> <p>Even short inhalation of small quantities of gas can cause breathing difficulties or lead to severe poisoning.</p> <p>Avoid all sources of ignition (e.g. naked lights, unprotected light bulbs, electric handtools).</p> <p><i>Electrostatic hazard:</i> Electric charge may ignite ammunition. Keep spilled material away from generators of static electricity (e.g. mobile phones, friction of synthetic polymers like PVC gloves). Wear non-sparking footwear.</p> <p>Particular attention should be taken in order to prevent developing gases drifting into occupied areas of the ship, e.g. living quarters, machinery, working areas.</p> <p>Keep bridge and living quarters upwind. Otherwise, protect crew and living quarters against gases by using water spray to drive gases away (water curtain).</p> <p>Radio for expert ADVICE.</p>
Spillage on deck	Packages (small spillage)	<p>Let vapours dissipate, keep clear.</p> <p><i>Articles:</i> Sweep or pick up articles. If the articles remain intact but appear damaged, separate out and ask for expert ADVICE.</p>
	Cargo transport units (large spillage)	<p><i>Spilled substance:</i> Keep wet. Wash spillage overboard with copious quantities of water. Keep clear of effluent.</p>
Spillage under deck	Packages (small spillage)	<p>Do not enter space without self-contained breathing apparatus. Check atmosphere before entering. Let vapours dissipate, keep clear.</p> <p><i>Articles:</i> Sweep or pick up articles. If the articles remain intact but appear damaged, separate out and ask for expert ADVICE.</p>
	Cargo transport units (large spillage)	<p><i>Spilled substance:</i> Keep wet. Collect spillages where practicable. Dispose of overboard.</p>
Special cases: None.		

# Index

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Each current UN substance identification number (UN number) is allocated to EmS Fire and Spillage schedules as shown below. Underlined EmS codes (special cases) indicate a substance, material or article for which additional advice is given in the emergency response procedures.

UN No.	EmS Fire	EmS Spill	UN No.	EmS Fire	EmS Spill	UN No.	EmS Fire	EmS Spill
0004	F-B	S-Y	0066	F-B	S-X	0135	F-B	S-Y
0005	F-B	S-X	0070	F-B	S-X	0136	F-B	S-X
0006	F-B	S-X	0072	F-B	S-Y	0137	F-B	S-X
0007	F-B	S-X	0073	F-B	S-X	0138	F-B	S-X
0009	F-B	S-X	0074	F-B	S-Y	0143	F-B	S-Z
0010	F-B	S-X	0075	F-B	S-Y	0144	F-B	S-Y
0012	F-B	S-X	0076	F-B	S-Z	0146	F-B	S-Y
0014	F-B	S-X	0077	F-B	S-Z	0147	F-B	S-Y
0015	F-B	S-X	0078	F-B	S-Y	0150	F-B	S-Y
0016	F-B	S-X	0079	F-B	S-Y	0151	F-B	S-Y
0018	<u>F-B</u>	S-Z	0081	F-B	S-Y	0153	F-B	S-Y
0019	<u>F-B</u>	S-Z	0082	F-B	S-Y	0154	F-B	S-Y
0020	<u>F-B</u>	S-Z	0083	F-B	S-Y	0155	F-B	S-Y
0021	<u>F-B</u>	S-Z	0084	F-B	S-Y	0159	F-B	S-Y
0027	F-B	S-Y	0092	F-B	S-X	0160	F-B	S-Y
0028	F-B	S-Y	0093	F-B	S-X	0161	F-B	S-Y
0029	F-B	S-X	0094	F-B	S-Y	0167	F-B	S-X
0030	F-B	S-X	0099	F-B	S-X	0168	F-B	S-X
0033	F-B	S-X	0101	F-B	S-X	0169	F-B	S-X
0034	F-B	S-X	0102	F-B	S-X	0171	F-B	S-X
0035	F-B	S-X	0103	F-B	S-X	0173	F-B	S-X
0037	F-B	S-X	0104	F-B	S-X	0174	F-B	S-X
0038	F-B	S-X	0105	F-B	S-X	0180	F-B	S-X
0039	F-B	S-X	0106	F-B	S-X	0181	F-B	S-X
0042	F-B	S-X	0107	F-B	S-X	0182	F-B	S-X
0043	F-B	S-X	0110	F-B	S-X	0183	F-B	S-X
0044	F-B	S-X	0113	F-B	S-Y	0186	F-B	S-X
0048	F-B	S-X	0114	F-B	S-Y	0190	F-B	S-X
0049	F-B	S-X	0118	F-B	S-Y	0191	F-B	S-X
0050	F-B	S-X	0121	F-B	S-X	0192	F-B	S-X
0054	F-B	S-X	0124	F-B	S-X	0193	F-B	S-X
0055	F-B	S-X	0129	F-B	S-Y	0194	F-B	S-X
0056	F-B	S-X	0130	F-B	S-Y	0195	F-B	S-X
0059	F-B	S-X	0131	F-B	S-X	0196	F-B	S-X
0060	F-B	S-X	0132	F-B	S-Y	0197	F-B	S-X
0065	F-B	S-X	0133	F-B	S-Y	0204	F-B	S-X

UN No.	EmS Fire	EmS Spill	UN No.	EmS Fire	EmS Spill	UN No.	EmS Fire	EmS Spill
0207	F-B	S-Y	0280	F-B	S-X	0334	F-B	S-X
0208	F-B	S-Y	0281	F-B	S-X	0335	F-B	S-X
0209	F-B	S-Y	0282	F-B	S-Y	0336	F-B	S-X
0212	F-B	S-X	0283	F-B	S-X	0337	F-B	S-X
0213	F-B	S-Y	0284	F-B	S-X	0338	F-B	S-X
0214	F-B	S-Y	0285	F-B	S-X	0339	F-B	S-X
0215	F-B	S-Y	0286	F-B	S-X	0340	F-B	S-Y
0216	F-B	S-Y	0287	F-B	S-X	0341	F-B	S-Y
0217	F-B	S-Y	0288	F-B	S-X	0342	F-B	S-Y
0218	F-B	S-Y	0289	F-B	S-X	0343	F-B	S-Y
0219	F-B	S-Y	0290	F-B	S-X	0344	F-B	S-X
0220	F-B	S-Y	0291	F-B	S-X	0345	F-B	S-X
0221	F-B	S-X	0292	F-B	S-X	0346	F-B	S-X
0222	F-B	S-Y	0293	F-B	S-X	0347	F-B	S-X
0224	F-B	S-Z	0294	F-B	S-X	0348	F-B	S-X
0225	F-B	S-X	0295	F-B	S-X	0349	F-B	S-X
0226	F-B	S-Y	0296	F-B	S-X	0350	F-B	S-X
0234	F-B	S-Z	0297	F-B	S-X	0351	F-B	S-X
0235	F-B	S-Y	0299	F-B	S-X	0352	F-B	S-X
0236	F-B	S-Y	0300	F-B	S-X	0353	F-B	S-X
0237	F-B	S-X	0301	<u>F-B</u>	S-Z	0354	F-B	S-X
0238	F-B	S-X	0303	F-B	S-X	0355	F-B	S-X
0240	F-B	S-X	0305	F-B	S-Y	0356	F-B	S-X
0241	F-B	S-X	0306	F-B	S-X	0357	F-B	S-Y
0242	F-B	S-X	0312	F-B	S-X	0358	F-B	S-Y
0243	F-B	S-X	0313	F-B	S-X	0359	F-B	S-Y
0244	F-B	S-X	0314	F-B	S-X	0360	F-B	S-X
0245	F-B	S-X	0315	F-B	S-X	0361	F-B	S-X
0246	F-B	S-X	0316	F-B	S-X	0362	F-B	S-X
0247	F-B	S-X	0317	F-B	S-X	0363	F-B	S-X
0248	<u>F-B</u>	S-Y	0318	F-B	S-X	0364	F-B	S-X
0249	<u>F-B</u>	S-Y	0319	F-B	S-X	0365	F-B	S-X
0250	F-B	S-X	0320	F-B	S-X	0366	F-B	S-X
0254	F-B	S-X	0321	F-B	S-X	0367	F-B	S-X
0255	F-B	S-X	0322	F-B	S-X	0368	F-B	S-X
0257	F-B	S-X	0323	F-B	S-X	0369	F-B	S-X
0266	F-B	S-Y	0324	F-B	S-X	0370	F-B	S-X
0267	F-B	S-X	0325	F-B	S-X	0371	F-B	S-X
0268	F-B	S-X	0326	F-B	S-X	0372	F-B	S-X
0271	F-B	S-X	0327	F-B	S-X	0373	F-B	S-X
0272	F-B	S-X	0328	F-B	S-X	0374	F-B	S-X
0275	F-B	S-X	0329	F-B	S-X	0375	F-B	S-X
0276	F-B	S-X	0330	F-B	S-X	0376	F-B	S-X
0277	F-B	S-X	0331	F-B	S-Y	0377	F-B	S-X
0278	F-B	S-X	0332	F-B	S-Y	0378	F-B	S-X
0279	F-B	S-X	0333	F-B	S-X	0379	F-B	S-X

UN No.	EmS Fire	EmS Spill	UN No.	EmS Fire	EmS Spill	UN No.	EmS Fire	EmS Spill
0380	F-B	S-X	0429	F-B	S-X	0475	F-B	S-Y
0381	F-B	S-X	0430	F-B	S-X	0476	F-B	S-Y
0382	F-B	S-X	0431	F-B	S-X	0477	F-B	S-Y
0383	F-B	S-X	0432	F-B	S-X	0478	F-B	S-Y
0384	F-B	S-X	0433	F-B	S-Y	0479	F-B	S-Y
0385	F-B	S-Y	0434	F-B	S-X	0480	F-B	S-Y
0386	F-B	S-Y	0435	F-B	S-X	0481	F-B	S-Y
0387	F-B	S-Y	0436	F-B	S-X	0482	F-B	S-Y
0388	F-B	S-Y	0437	F-B	S-X	0483	F-B	S-Y
0389	F-B	S-Y	0438	F-B	S-X	0484	F-B	S-Y
0390	F-B	S-Y	0439	F-B	S-X	0485	F-B	S-Y
0391	F-B	S-Y	0440	F-B	S-X	0486	F-B	S-X
0392	F-B	S-Y	0441	F-B	S-X	0487	F-B	S-X
0393	F-B	S-Y	0442	F-B	S-X	0488	F-B	S-X
0394	F-B	S-Y	0443	F-B	S-X	0489	F-B	S-Y
0395	F-B	S-X	0444	F-B	S-X	0490	F-B	S-Y
0396	F-B	S-X	0445	F-B	S-X	0491	F-B	S-X
0397	F-B	S-X	0446	F-B	S-X	0492	F-B	S-X
0398	F-B	S-X	0447	F-B	S-X	0493	F-B	S-X
0399	F-B	S-X	0448	F-B	S-Y	0494	F-B	S-X
0400	F-B	S-X	0449	F-B	S-X	0495	F-B	S-Y
0401	F-B	S-Y	0450	F-B	S-X	0496	F-B	S-Y
0402	F-B	S-Y	0451	F-B	S-X	0497	F-B	S-Y
0403	F-B	S-X	0452	F-B	S-X	0498	F-B	S-Y
0404	F-B	S-X	0453	F-B	S-X	0499	F-B	S-Y
0405	F-B	S-X	0454	F-B	S-X	0500	F-B	S-X
0406	F-B	S-Y	0455	F-B	S-X	0501	F-B	S-Y
0407	F-B	S-Y	0456	F-B	S-X	0502	F-B	S-X
0408	F-B	S-X	0457	F-B	S-X	0503	F-B	S-X
0409	F-B	S-X	0458	F-B	S-X	0504	F-B	S-Y
0410	F-B	S-X	0459	F-B	S-X	0505	F-B	S-X
0411	F-B	S-Y	0460	F-B	S-X	0506	F-B	S-X
0412	F-B	S-X	0461	F-B	S-X	0507	F-B	S-X
0413	F-B	S-X	0462	F-B	S-X	0508	F-B	S-Y
0414	F-B	S-X	0463	F-B	S-X	0509	F-B	S-Y
0415	F-B	S-X	0464	F-B	S-X	0510	F-B	S-X
0417	F-B	S-X	0465	F-B	S-X	0511	F-B	S-X
0418	F-B	S-X	0466	F-B	S-X	0512	F-B	S-X
0419	F-B	S-X	0467	F-B	S-X	0513	F-B	S-X
0420	F-B	S-X	0468	F-B	S-X	1001	<u>F-D</u>	<u>S-U</u>
0421	F-B	S-X	0469	F-B	S-X	1002	F-C	S-V
0424	F-B	S-X	0470	F-B	S-X	1003	<u>F-C</u>	S-W
0425	F-B	S-X	0471	F-B	S-X	1005	F-C	S-U
0426	F-B	S-X	0472	F-B	S-X	1006	F-C	S-V
0427	F-B	S-X	0473	F-B	S-Y	1008	F-C	S-U
0428	F-B	S-X	0474	F-B	S-Y	1009	F-C	S-V

UN No.	EmS Fire	EmS Spill	UN No.	EmS Fire	EmS Spill	UN No.	EmS Fire	EmS Spill
1010	F-D	S-U	1067	F-C	S-W	1131	F-E	S-D
1011	F-D	S-U	1069	F-C	S-U	1133	F-E	S-D
1012	F-D	S-U	1070	<u>F-C</u>	S-W	1134	F-E	S-D
1013	F-C	S-V	1071	F-D	S-U	1135	F-E	S-D
1016	F-D	S-U	1072	<u>F-C</u>	<u>S-W</u>	1136	F-E	<u>S-E</u>
1017	F-C	S-U	1073	<u>F-C</u>	<u>S-W</u>	1139	F-E	<u>S-E</u>
1018	F-C	S-V	1075	<u>F-D</u>	S-U	1143	F-E	<u>S-D</u>
1020	F-C	S-V	1076	F-C	S-U	1144	F-E	S-D
1021	F-C	S-V	1077	F-D	S-U	1145	F-E	S-D
1022	F-C	S-V	1078	F-C	S-V	1146	F-E	S-D
1023	F-D	S-U	1079	F-C	S-U	1147	F-E	S-D
1026	F-D	S-U	1080	F-C	S-V	1148	F-E	S-D
1027	F-D	S-U	1081	F-D	S-U	1149	F-E	S-D
1028	F-C	S-V	1082	F-D	S-U	1150	F-E	S-D
1029	F-C	S-V	1083	F-D	S-U	1152	F-E	S-D
1030	F-D	S-U	1085	F-D	S-U	1153	F-E	S-D
1032	F-D	S-U	1086	F-D	S-U	1154	F-E	S-C
1033	F-D	S-U	1087	F-D	S-U	1155	F-E	S-D
1035	F-D	S-U	1088	F-E	S-D	1156	F-E	S-D
1036	F-D	S-U	1089	F-E	S-D	1157	F-E	S-D
1037	F-D	S-U	1090	F-E	S-D	1158	F-E	S-C
1038	<u>F-D</u>	S-U	1091	F-E	S-D	1159	F-E	S-D
1039	F-D	S-U	1092	F-E	<u>S-D</u>	1160	F-E	S-C
1040	F-D	S-U	1093	F-E	S-D	1161	F-E	S-D
1041	F-D	S-U	1098	F-E	<u>S-D</u>	1162	<u>F-E</u>	S-C
1043	F-C	S-V	1099	F-E	<u>S-D</u>	1163	F-E	<u>S-C</u>
1044	F-C	S-V	1100	F-E	S-D	1164	F-E	S-D
1045	F-C	S-W	1104	F-E	S-D	1165	F-E	S-D
1046	F-C	S-V	1105	F-E	S-D	1166	F-E	S-D
1048	F-C	S-U	1106	F-E	S-C	1167	F-E	S-D
1049	F-D	S-U	1107	F-E	S-D	1169	F-E	S-D
1050	F-C	S-U	1108	F-E	S-D	1170	F-E	S-D
1051	F-E	<u>S-D</u>	1109	F-E	S-D	1171	F-E	S-D
1052	F-C	S-U	1110	F-E	S-D	1172	F-E	S-D
1053	F-D	S-U	1111	F-E	S-D	1173	F-E	S-D
1055	F-D	S-U	1112	F-E	S-D	1175	F-E	S-D
1056	F-C	S-V	1113	F-E	S-D	1176	F-E	S-D
1057	F-D	S-U	1114	F-E	S-D	1177	F-E	S-D
1058	F-C	S-V	1120	F-E	S-D	1178	F-E	S-D
1060	F-D	S-U	1123	F-E	S-D	1179	F-E	S-D
1061	F-D	S-U	1125	F-E	S-C	1180	F-E	S-D
1062	F-C	S-U	1126	F-E	S-D	1181	F-E	S-D
1063	F-D	S-U	1127	F-E	S-D	1182	F-E	S-C
1064	F-D	S-U	1128	F-E	S-D	1183	<u>F-G</u>	S-O
1065	F-C	S-V	1129	F-E	S-D	1184	F-E	S-D
1066	F-C	S-V	1130	F-E	S-E	1185	F-E	S-D



UN No.	EmS Fire	EmS Spill	UN No.	EmS Fire	EmS Spill	UN No.	EmS Fire	EmS Spill
1188	F-E	S-D	1247	F-E	S-D	1310	F-B	S-J
1189	F-E	S-D	1248	F-E	S-D	1312	F-A	S-I
1190	F-E	S-D	1249	F-E	S-D	1313	F-A	S-I
1191	F-E	S-D	1250	<u>F-E</u>	S-C	1314	F-A	S-I
1192	F-E	S-D	1251	F-E	S-C	1318	F-A	S-I
1193	F-E	S-D	1259	F-E	<u>S-D</u>	1320	F-B	S-J
1194	F-E	S-D	1261	F-E	S-D	1321	F-B	S-J
1195	F-E	S-D	1262	F-E	S-E	1322	F-B	S-J
1196	F-E	S-C	1263	F-E	<u>S-E</u>	1323	F-G	S-G
1197	F-E	S-D	1264	F-E	S-D	1324	F-A	S-I
1198	F-E	S-C	1265	F-E	S-D	1325	F-A	S-G
1199	F-E	S-D	1266	F-E	S-D	1326	F-A	S-J
1201	F-E	S-D	1267	F-E	S-E	1327	F-A	S-I
1202	F-E	S-E	1268	F-E	S-E	1328	F-A	S-G
1203	F-E	S-E	1272	F-E	S-E	1330	F-A	S-I
1204	F-E	S-D	1274	F-E	S-D	1331	F-A	S-I
1206	F-E	<u>S-D</u>	1275	F-E	S-D	1332	F-A	S-G
1207	F-E	S-D	1276	F-E	S-D	1333	F-G	S-P
1208	F-E	<u>S-D</u>	1277	F-E	S-C	1334	F-A	S-G
1210	F-E	S-D	1278	F-E	S-D	1336	F-B	S-J
1212	F-E	S-D	1279	F-E	S-D	1337	F-B	S-J
1213	F-E	S-D	1280	F-E	S-D	1338	F-A	S-G
1214	F-E	S-C	1281	F-E	S-D	1339	F-G	S-G
1216	F-E	S-D	1282	F-E	S-D	1340	F-G	S-N
1218	F-E	<u>S-D</u>	1286	F-E	S-E	1341	F-A	S-G
1219	F-E	S-D	1287	F-E	S-D	1343	F-G	S-G
1220	F-E	S-D	1288	F-E	S-E	1344	F-B	S-J
1221	F-E	S-C	1289	F-E	S-C	1345	F-A	S-I
1222	F-E	S-D	1292	F-E	S-D	1346	F-A	S-G
1223	F-E	S-E	1293	F-E	S-D	1347	F-B	S-J
1224	F-E	S-D	1294	F-E	S-D	1348	F-B	S-J
1228	F-E	S-D	1295	<u>F-G</u>	<u>S-O</u>	1349	F-B	S-J
1229	F-E	S-D	1296	F-E	S-C	1350	F-A	S-G
1230	F-E	S-D	1297	F-E	S-C	1352	F-A	S-J
1231	F-E	S-D	1298	<u>F-E</u>	S-C	1353	F-A	S-I
1233	F-E	S-D	1299	F-E	S-E	1354	F-B	S-J
1234	F-E	S-D	1300	F-E	S-E	1355	F-B	S-J
1235	F-E	S-C	1301	F-E	S-D	1356	F-B	S-J
1237	F-E	S-D	1302	F-E	S-D	1357	F-B	S-J
1238	F-E	S-C	1303	F-E	<u>S-D</u>	1358	F-G	S-J
1239	F-E	S-D	1304	F-E	S-D	1360	<u>F-G</u>	S-N
1242	<u>F-G</u>	S-O	1305	F-E	S-C	1361	F-A	S-J
1243	F-E	S-D	1306	F-E	S-D	1362	F-A	S-J
1244	F-E	S-C	1307	F-E	S-D	1363	F-A	S-J
1245	F-E	S-D	1308	F-E	S-D	1364	F-A	S-J
1246	F-E	S-D	1309	F-G	S-G	1365	F-A	S-J

UN No.	EmS Fire	EmS Spill	UN No.	EmS Fire	EmS Spill	UN No.	EmS Fire	EmS Spill
1369	F-A	S-J	1420	<u>F-G</u>	S-L	1475	F-H	S-Q
1372	F-A	S-J	1421	<u>F-G</u>	S-L	1476	F-G	S-Q
1373	F-A	S-J	1422	<u>F-G</u>	S-L	1477	F-A	S-Q
1374	F-A	S-J	1423	<u>F-G</u>	S-N	1479	F-A	S-Q
1376	F-G	S-P	1426	<u>F-G</u>	S-O	1481	F-H	S-Q
1378	F-H	S-M	1427	<u>F-G</u>	S-O	1482	F-H	S-Q
1379	F-A	S-J	1428	<u>F-G</u>	S-N	1483	F-G	S-Q
1380	F-G	S-L	1431	F-A	S-L	1484	F-H	S-Q
1381	<u>F-A</u>	S-J	1432	<u>F-G</u>	S-N	1485	F-H	S-Q
1382	F-A	S-J	1433	<u>F-G</u>	S-N	1486	F-A	S-Q
1383	F-G	S-M	1435	F-G	S-O	1487	F-A	S-Q
1384	F-A	S-J	1436 I	<u>F-G</u>	S-O	1488	F-A	S-Q
1385	F-A	S-J	1436 II	F-G	S-O	1489	F-H	S-Q
1386	F-A	S-J	1436 III	F-G	S-O	1490	F-H	S-Q
1387	F-A	S-J	1437	F-A	S-G	1491	F-G	S-Q
1389	<u>F-G</u>	S-N	1438	F-A	S-Q	1492	F-A	S-Q
1390	F-G	S-O	1439	F-H	S-Q	1493	F-A	S-Q
1391	<u>F-G</u>	S-N	1442	F-H	S-Q	1494	F-H	S-Q
1392	<u>F-G</u>	S-N	1444	F-A	S-Q	1495	F-H	S-Q
1393	F-G	S-N	1445	F-H	S-Q	1496	F-H	S-Q
1394	F-G	S-N	1446	F-A	S-Q	1498	F-A	S-Q
1395	F-G	S-N	1447	F-H	S-Q	1499	F-A	S-Q
1396	F-G	S-O	1448	F-H	S-Q	1500	F-A	S-Q
1397	<u>F-G</u>	S-N	1449	F-G	S-Q	1502	F-H	S-Q
1398	F-G	S-N	1450	F-H	S-Q	1503	F-H	S-Q
1400	F-G	S-O	1451	F-A	S-Q	1504	F-G	S-Q
1401	F-G	S-O	1452	F-H	S-Q	1505	F-A	S-Q
1402 I	<u>F-G</u>	S-N	1453	F-H	S-Q	1506	F-H	S-Q
1402 II	F-G	S-N	1454	F-A	S-Q	1507	F-A	S-Q
1403	F-G	S-N	1455	F-H	S-Q	1508	F-H	S-Q
1404	<u>F-G</u>	S-O	1456	F-H	S-Q	1509	F-G	S-Q
1405	F-G	S-N	1457	F-G	S-Q	1510	F-H	S-Q
1407	<u>F-G</u>	S-N	1458	F-H	S-Q	1511	F-A	S-Q
1408	F-G	S-N	1459	F-H	S-Q	1513	F-H	S-Q
1409 I	<u>F-G</u>	S-L	1461	F-H	S-Q	1514	F-H	S-Q
1409 II	F-G	S-L	1462	F-H	S-Q	1515	F-H	S-Q
1410	<u>F-G</u>	S-M	1463	F-A	S-Q	1516	F-G	S-Q
1411	<u>F-G</u>	S-M	1465	F-A	S-Q	1517	F-B	S-J
1413	<u>F-G</u>	S-O	1466	F-A	S-Q	1541	F-A	<u>S-A</u>
1414	<u>F-G</u>	S-N	1467	F-A	S-Q	1544	F-A	S-A
1415	<u>F-G</u>	S-N	1469	F-A	S-Q	1545	F-E	S-D
1417	F-G	S-N	1470	F-H	S-Q	1546	F-A	S-A
1418 I	<u>F-G</u>	S-O	1471	F-H	S-Q	1547	F-A	<u>S-A</u>
1418 II	F-G	S-O	1472	F-G	S-Q	1548	F-A	S-A
1418 III	F-G	S-O	1473	F-H	S-Q	1549	F-A	S-A
1419	<u>F-G</u>	S-N	1474	F-A	S-Q	1550	F-A	S-A

UN No.	EmS Fire	EmS Spill	UN No.	EmS Fire	EmS Spill	UN No.	EmS Fire	EmS Spill
1551	F-A	S-A	1601	F-A	S-A	1655	F-A	S-A
1553	F-A	S-A	1602	F-A	S-A	1656	F-A	S-A
1554	F-A	S-A	1603	F-E	S-D	1657	F-A	S-A
1555	F-A	S-A	1604	F-E	S-C	1658	F-A	S-A
1556	F-A	S-A	1605	F-A	S-A	1659	F-A	S-A
1557	F-A	S-A	1606	F-A	<u>S-A</u>	1660	F-C	S-W
1558	F-A	S-A	1607	F-A	<u>S-A</u>	1661	F-A	S-A
1559	F-A	S-A	1608	F-A	<u>S-A</u>	1662	F-A	S-A
1560	F-A	S-A	1611	F-A	<u>S-A</u>	1663	F-A	S-A
1561	F-A	S-A	1612	F-C	S-U	1664	F-A	S-A
1562	F-A	S-A	1613	F-A	<u>S-A</u>	1665	F-A	S-A
1564	F-A	S-A	1614	F-A	<u>S-U</u>	1669	F-A	<u>S-A</u>
1565	F-A	<u>S-A</u>	1616	F-A	<u>S-A</u>	1670	F-A	<u>S-A</u>
1566	F-A	S-A	1617	F-A	<u>S-A</u>	1671	F-A	S-A
1567	F-G	S-G	1618	F-A	<u>S-A</u>	1672	F-A	S-A
1569	F-E	<u>S-D</u>	1620	F-A	<u>S-A</u>	1673	F-A	S-A
1570	F-A	S-A	1621	F-A	<u>S-A</u>	1674	F-A	<u>S-A</u>
1571	F-B	S-J	1622	F-A	<u>S-A</u>	1677	F-A	S-A
1572	F-A	S-A	1623	F-A	<u>S-A</u>	1678	F-A	S-A
1573	F-A	<u>S-A</u>	1624	F-A	<u>S-A</u>	1679	F-A	<u>S-A</u>
1574	F-A	<u>S-A</u>	1625	F-A	<u>S-A</u>	1680	F-A	<u>S-A</u>
1575	F-A	<u>S-A</u>	1626	F-A	<u>S-A</u>	1683	F-A	<u>S-A</u>
1577	F-A	<u>S-A</u>	1627	F-A	<u>S-A</u>	1684	F-A	<u>S-A</u>
1578	F-A	S-A	1629	F-A	<u>S-A</u>	1685	F-A	S-A
1579	F-A	S-A	1630	F-A	<u>S-A</u>	1686	F-A	S-A
1580	F-A	<u>S-A</u>	1631	F-A	<u>S-A</u>	1687	F-A	S-A
1581	F-C	S-U	1634	F-A	<u>S-A</u>	1688	F-A	S-A
1582	F-C	S-U	1636	F-A	<u>S-A</u>	1689	F-A	<u>S-A</u>
1583	F-A	S-A	1637	F-A	<u>S-A</u>	1690	F-A	S-A
1585	F-A	<u>S-A</u>	1638	F-A	<u>S-A</u>	1691	F-A	S-A
1586	F-A	<u>S-A</u>	1639	F-A	<u>S-A</u>	1692	F-A	<u>S-A</u>
1587	F-A	<u>S-A</u>	1640	F-A	<u>S-A</u>	1693	F-A	S-A
1588 I	F-A	<u>S-A</u>	1641	F-A	<u>S-A</u>	1694	F-A	S-A
1588 II	F-A	<u>S-A</u>	1642	F-A	<u>S-A</u>	1695	F-E	<u>S-C</u>
1588 III	F-A	<u>S-A</u>	1643	F-A	<u>S-A</u>	1697	F-A	S-A
1589	F-C	S-U	1644	F-A	<u>S-A</u>	1698	F-A	<u>S-A</u>
1590	F-A	<u>S-A</u>	1645	F-A	<u>S-A</u>	1699	F-A	<u>S-A</u>
1591	F-A	S-A	1646	F-A	<u>S-A</u>	1700	F-A	S-G
1593	F-A	S-A	1647	F-A	<u>S-A</u>	1701	F-A	S-A
1594	F-A	S-A	1648	F-E	S-D	1702	F-A	<u>S-A</u>
1595	F-A	S-B	1649	F-A	<u>S-A</u>	1704	F-A	<u>S-A</u>
1596	F-A	S-A	1650	F-A	S-A	1707	F-A	<u>S-A</u>
1597	F-A	S-A	1651	F-A	S-A	1708	F-A	<u>S-A</u>
1598	F-A	<u>S-A</u>	1652	F-A	S-A	1709	F-A	S-A
1599	F-A	<u>S-A</u>	1653	F-A	<u>S-A</u>	1710	F-A	S-A
1600	F-A	<u>S-A</u>	1654	F-A	S-A	1711	F-A	S-A

UN No.	EmS Fire	EmS Spill	UN No.	EmS Fire	EmS Spill	UN No.	EmS Fire	EmS Spill
1712	F-A	S-A	1761 II	F-A	<u>S-B</u>	1807	F-A	S-B
1713	F-A	<u>S-A</u>	1761 III	F-A	<u>S-B</u>	1808	F-A	S-B
1714	<u>F-G</u>	S-N	1762	F-A	S-B	1809	F-A	S-B
1715	F-E	S-C	1763	F-A	S-B	1810	F-A	S-B
1716	F-A	S-B	1764	F-A	S-B	1811	F-A	S-B
1717	<u>F-E</u>	S-C	1765	F-A	S-B	1812	F-A	S-A
1718	F-A	S-B	1766	F-A	<u>S-B</u>	1813	F-A	S-B
1719	F-A	S-B	1767	F-E	S-C	1814	F-A	S-B
1722	F-E	S-C	1768	F-A	S-B	1815	F-E	S-C
1723	F-E	S-C	1769	F-A	S-B	1816	F-E	S-C
1724	F-E	S-C	1770	F-A	S-B	1817	F-A	S-B
1725	F-A	S-B	1771	F-A	S-B	1818	F-A	S-B
1726	F-A	S-B	1773	F-A	S-B	1819	F-A	S-B
1727	F-A	S-B	1774	F-A	S-B	1823	F-A	S-B
1728	F-A	S-B	1775	F-A	S-B	1824	F-A	S-B
1729	F-A	S-B	1776	F-A	S-B	1825	F-A	S-B
1730	F-A	S-B	1777	F-A	S-B	1826 I	F-A	S-Q
1731	F-A	S-B	1778	F-A	S-B	1826 II	F-A	S-B
1732	F-A	S-B	1779	F-E	S-C	1827	F-A	S-B
1733	F-A	S-B	1780	F-A	S-B	1828	F-A	S-B
1736	F-A	S-B	1781	F-A	S-B	1829	F-A	S-B
1737	F-A	S-B	1782	F-A	S-B	1830	F-A	S-B
1738	F-A	S-B	1783	F-A	S-B	1831	F-A	S-B
1739	F-A	<u>S-B</u>	1784	F-A	S-B	1832	F-A	S-B
1740	F-A	S-B	1786	F-A	S-B	1833	F-A	S-B
1741	F-C	S-U	1787	F-A	S-B	1834	F-A	S-B
1742	F-A	S-B	1788	F-A	S-B	1835	F-A	S-B
1743	F-A	S-B	1789	F-A	S-B	1836	F-A	S-B
1744	F-A	S-B	1790	F-A	S-B	1837	F-A	S-B
1745	F-A	S-B	1791 I	F-A	<u>S-B</u>	1838	F-A	S-B
1746	F-A	S-B	1791 II	F-A	<u>S-B</u>	1839	F-A	S-B
1747	F-E	S-C	1791 III	F-A	<u>S-B</u>	1840	F-A	<u>S-B</u>
1748	F-H	S-Q	1792	F-A	S-B	1841	F-A	S-B
1749	F-C	S-W	1793	F-A	S-B	1843	F-A	<u>S-A</u>
1750	F-A	S-B	1794	F-A	S-B	1845	F-C	S-V
1751	F-A	S-B	1796 I	F-A	S-Q	1846	F-A	<u>S-A</u>
1752	F-A	S-B	1796 II	F-A	S-B	1847	F-A	S-B
1753	F-A	<u>S-B</u>	1798	F-A	S-B	1848	F-A	S-B
1754	F-A	S-B	1799	F-A	S-B	1849	F-A	S-B
1755	F-A	S-B	1800	F-A	S-B	1851	F-A	S-A
1756	F-A	S-B	1801	F-A	S-B	1854	F-G	S-M
1757	F-A	S-B	1802	F-H	S-Q	1855	F-G	S-M
1758	F-A	S-B	1803	F-A	S-B	1856	F-A	S-J
1759	F-A	S-B	1804	F-A	S-B	1857	F-A	S-J
1760	F-A	S-B	1805	F-A	S-B	1858	F-C	S-V
			1806	F-A	S-B	1859	F-C	S-U

UN No.	EmS Fire	EmS Spill	UN No.	EmS Fire	EmS Spill	UN No.	EmS Fire	EmS Spill
1860	F-D	S-U	1931	F-A	S-J	1987	F-E	S-D
1862	F-E	S-D	1932	F-G	S-L	1988	F-E	S-D
1863	F-E	S-E	1935 I	F-A	<u>S-A</u>	1989	F-E	S-D
1865	F-E	S-D	1935 II	F-A	<u>S-A</u>	1990	F-A	S-A
1866	F-E	<u>S-E</u>	1935 III	F-A	<u>S-A</u>	1991	F-E	S-D
1868	F-A	S-G	1938	F-A	S-B	1992	F-E	S-D
1869	F-G	S-G	1939	F-A	S-B	1993	F-E	<u>S-E</u>
1870	<u>F-G</u>	S-O	1940	F-A	S-B	1994	F-E	S-D
1871	F-A	S-G	1941	F-A	S-A	1999	F-E	S-E
1872	F-A	S-Q	1942	F-H	S-Q	2000	F-A	S-I
1873	F-A	S-Q	1944	F-A	S-I	2001	F-A	S-I
1884	F-A	S-A	1945	F-A	S-I	2002	F-A	S-J
1885	F-A	S-A	1950	F-D	S-U	2004	F-G	S-M
1886	F-A	S-A	1951	F-C	S-V	2006	F-A	S-G
1887	F-A	S-A	1952	F-C	S-V	2008	F-G	S-M
1888	F-A	S-A	1953	F-D	S-U	2009	F-G	S-M
1889	F-A	<u>S-B</u>	1954	F-D	S-U	2010	<u>F-G</u>	S-O
1891	F-A	S-A	1955	F-C	S-U	2011	<u>F-G</u>	S-N
1892	F-A	<u>S-A</u>	1956	F-C	S-V	2012	<u>F-G</u>	S-N
1894	F-A	<u>S-A</u>	1957	F-D	S-U	2013	<u>F-G</u>	S-N
1895	F-A	<u>S-A</u>	1958	F-C	S-V	2014	F-H	S-Q
1897	F-A	<u>S-A</u>	1959	F-D	S-U	2015	F-H	S-Q
1898	F-A	S-B	1961	F-D	S-U	2016	F-A	S-A
1902	F-A	S-B	1962	F-D	S-U	2017	F-A	S-B
1903	F-A	S-B	1963	F-C	S-V	2018	F-A	S-A
1905	F-A	S-B	1964	F-D	S-U	2019	F-A	S-A
1906	F-A	S-B	1965	<u>F-D</u>	S-U	2020	F-A	S-A
1907	F-A	S-B	1966	<u>F-D</u>	S-U	2021	F-A	S-A
1908	F-A	S-B	1967	F-C	S-U	2022	F-A	S-B
1911	F-D	S-U	1968	F-C	S-V	2023	F-E	<u>S-D</u>
1912	F-D	S-U	1969	F-D	S-U	2024 I	F-A	<u>S-A</u>
1913	F-C	S-V	1970	F-C	S-V	2024 II	F-A	<u>S-A</u>
1914	F-E	S-D	1971	F-D	S-U	2024 III	F-A	<u>S-A</u>
1915	F-E	S-D	1972	<u>F-D</u>	S-U	2025 I	F-A	<u>S-A</u>
1916	F-E	S-D	1973	F-C	S-V	2025 II	F-A	<u>S-A</u>
1917	F-E	S-D	1974	F-C	S-V	2025 III	F-A	<u>S-A</u>
1918	F-E	S-E	1975	F-C	S-W	2026 I	F-A	<u>S-A</u>
1919	F-E	S-D	1976	F-C	S-V	2026 II	F-A	<u>S-A</u>
1920	F-E	S-E	1977	F-C	S-V	2026 III	F-A	<u>S-A</u>
1921	F-E	S-D	1978	F-D	S-U	2027	F-A	S-A
1922	F-E	S-C	1982	F-C	S-V	2028	F-A	S-B
1923	F-A	S-J	1983	F-C	S-V	2029	F-E	<u>S-C</u>
1928	<u>F-G</u>	S-L	1984	F-C	S-V	2030	F-A	S-B
1929	F-A	S-J	1986	F-E	S-D	2031 I	F-A	S-Q

\* Applies to NITRIC ACID other than red fuming, with at least 65% but with not more than 70% nitric acid.

† Applies to NITRIC ACID other than red fuming, with less than 65% nitric acid.

UN No.	EmS Fire	EmS Spill	UN No.	EmS Fire	EmS Spill	UN No.	EmS Fire	EmS Spill
2031 II*	F-A	S-Q	2197	F-C	S-U	2251	F-E	S-D
2031 II†	F-A	S-B	2198	F-C	S-U	2252	F-E	S-D
2032	F-A	S-Q	2199	F-D	S-U	2253	F-A	S-A
2033	F-A	S-B	2200	F-D	S-U	2254	F-A	S-I
2034	F-D	S-U	2201	<u>F-C</u>	S-W	2256	F-E	S-D
2035	F-D	S-U	2202	F-D	S-U	2257	<u>F-G</u>	S-N
2036	F-C	S-V	2203	F-D	S-U	2258	F-E	S-C
2037	F-D	S-U	2204	F-D	S-U	2259	F-A	S-B
2038	F-A	<u>S-A</u>	2205	F-A	S-A	2260	F-E	S-C
2044	F-D	S-U	2206	F-A	S-A	2261	F-A	S-A
2045	F-E	S-D	2208	F-H	S-Q	2262	F-A	S-B
2046	F-E	<u>S-D</u>	2209	F-A	S-B	2263	F-E	S-D
2047	F-E	S-D	2210	F-G	<u>S-L</u>	2264	F-E	S-C
2048	F-E	S-D	2211	F-A	S-I	2265	F-E	S-D
2049	F-E	S-D	2212	F-A	S-A	2266	F-E	S-C
2050	F-E	S-D	2213	F-A	S-G	2267	F-A	S-B
2051	F-E	S-C	2214	F-A	S-B	2269	F-A	S-B
2052	F-E	S-E	2215	F-A	S-B	2270	F-E	S-C
2053	F-E	S-D	2216	F-A	S-J	2271	F-E	S-D
2054	F-E	S-C	2217	F-A	S-J	2272	F-A	S-A
2055	F-E	S-D	2218	F-E	<u>S-C</u>	2273	F-A	S-A
2056	F-E	S-D	2219	F-E	S-D	2274	F-A	S-A
2057 II	F-E	<u>S-D</u>	2222	F-E	S-D	2275	F-E	S-D
2057 III	F-E	<u>S-D</u>	2224	F-A	S-A	2276	F-E	S-C
2058	F-E	S-D	2225	F-A	S-B	2277	F-E	S-D
2059	F-E	S-D	2226	F-A	S-B	2278	F-E	S-D
2067	F-H	S-Q	2227	F-E	S-D	2279	F-A	<u>S-A</u>
2071	F-H	S-Q	2232	F-A	S-A	2280	F-A	S-B
2073	F-C	S-U	2233	F-A	S-A	2281	F-A	S-A
2074	F-A	S-A	2234	F-E	S-D	2282	F-E	S-D
2075	F-A	S-A	2235	F-A	<u>S-A</u>	2283	F-E	S-D
2076	F-A	S-B	2236	F-A	S-A	2284	F-E	S-D
2077	F-A	S-A	2237	F-A	<u>S-A</u>	2285	F-E	S-D
2078	F-A	S-A	2238	F-E	S-D	2286	F-E	S-D
2079	F-A	S-B	2239	F-A	S-A	2287	F-E	S-D
2187	F-C	S-V	2240	F-A	S-B	2288	F-E	S-D
2188	F-D	S-U	2241	F-E	<u>S-D</u>	2289	F-A	S-B
2189	F-D	S-U	2242	F-E	S-D	2290	F-A	S-A
2190	F-C	S-W	2243	F-E	S-D	2291	F-A	<u>S-A</u>
2191	F-C	S-U	2244	F-E	S-D	2293	F-E	S-D
2192	F-D	S-U	2245	F-E	S-D	2294	F-A	<u>S-A</u>
2193	F-C	S-V	2246	F-E	S-D	2295	F-E	S-D
2194	F-C	S-U	2247	F-E	S-E	2296	F-E	<u>S-D</u>
2195	F-C	S-U	2248	F-E	S-C	2297	F-E	S-D
2196	F-C	S-U	2249	F-E	S-D	2298	F-E	S-D
			2250	F-A	S-A	2299	F-A	S-A

UN No.	EmS Fire	EmS Spill	UN No.	EmS Fire	EmS Spill	UN No.	EmS Fire	EmS Spill
2300	F-A	S-A	2347	F-E	S-D	2397	F-E	S-D
2301	F-E	S-D	2348	F-E	S-D	2398	F-E	S-D
2302	F-E	S-D	2350	F-E	S-D	2399	F-E	S-C
2303	F-E	S-D	2351	F-E	S-D	2400	F-E	S-D
2304	F-A	S-H	2352	F-E	S-D	2401	F-E	S-C
2305	F-A	S-B	2353	F-E	S-C	2402	F-E	S-D
2306	F-A	<u>S-A</u>	2354	F-E	S-D	2403	F-E	S-D
2307	F-A	<u>S-A</u>	2356	F-E	S-D	2404	F-E	S-D
2308	F-A	S-B	2357	F-E	S-C	2405	F-E	S-D
2309	F-E	S-D	2358	F-E	S-D	2406	F-E	S-D
2310	F-E	S-D	2359	F-E	S-C	2407	F-E	S-C
2311	F-A	S-A	2360	F-E	S-D	2409	F-E	S-D
2312	F-A	S-A	2361	F-E	S-C	2410	F-E	S-D
2313	F-E	S-D	2362	F-E	S-D	2411	F-E	S-D
2315	F-A	<u>S-A</u>	2363	F-E	<u>S-D</u>	2412	F-E	S-D
2316	F-A	<u>S-A</u>	2364	F-E	S-D	2413	F-E	S-D
2317	F-A	<u>S-A</u>	2366	F-E	S-D	2414	F-E	S-D
2318	F-A	S-J	2367	F-E	S-D	2416	F-E	S-D
2319	F-E	S-D	2368	F-E	S-E	2417	F-C	S-U
2320	F-A	S-B	2370	F-E	S-D	2418	F-C	S-U
2321	F-A	<u>S-A</u>	2371	F-E	S-D	2419	F-D	S-U
2322	F-A	<u>S-A</u>	2372	F-E	S-D	2420	F-C	S-U
2323	F-E	S-D	2373	F-E	S-D	2421	F-C	S-W
2324	F-E	S-D	2374	F-E	S-D	2422	F-C	S-V
2325	F-E	<u>S-D</u>	2375	F-E	S-D	2424	F-C	S-V
2326	F-A	S-B	2376	F-E	S-D	2426	F-H	S-Q
2327	F-A	S-B	2377	F-E	S-D	2427	F-H	S-Q
2328	F-A	S-A	2378	F-E	S-D	2428	F-H	S-Q
2329	F-E	S-D	2379	F-E	S-C	2429	F-H	S-Q
2330	F-E	S-E	2380	F-E	S-D	2430	F-A	S-B
2331	F-A	<u>S-B</u>	2381	F-E	<u>S-D</u>	2431	F-A	S-A
2332	F-E	S-D	2382	F-E	<u>S-D</u>	2432	F-A	S-A
2333	F-E	S-D	2383	F-E	S-C	2433	F-A	<u>S-A</u>
2334	F-E	S-D	2384	F-E	S-D	2434	F-A	S-B
2335	F-E	S-D	2385	F-E	S-D	2435	F-A	S-B
2336	F-E	S-D	2386	F-E	S-C	2436	F-E	S-D
2337	F-E	S-D	2387	F-E	S-D	2437	F-A	S-B
2338	F-E	S-D	2388	F-E	S-D	2438	F-E	S-C
2339	F-E	S-D	2389	F-E	S-D	2439	F-A	S-B
2340	F-E	S-D	2390	F-E	S-D	2440	F-A	S-B
2341	F-E	S-D	2391	F-E	S-D	2441	F-G	S-M
2342	F-E	S-D	2392	F-E	S-D	2442	F-A	S-B
2343	F-E	S-D	2393	F-E	S-D	2443	F-A	S-B
2344	F-E	S-D	2394	F-E	S-D	2444	F-A	S-B
2345	F-E	S-D	2395	F-E	S-C	2446	F-A	S-A
2346	F-E	S-D	2396	F-E	S-D	2447	<u>F-A</u>	S-M

UN No.	EmS Fire	EmS Spill	UN No.	EmS Fire	EmS Spill	UN No.	EmS Fire	EmS Spill
2448	F-A	S-H	2508	F-A	S-B	2574	F-A	<u>S-A</u>
2451	F-C	S-W	2509	F-A	S-B	2576	F-A	S-B
2452	F-D	S-U	2511	F-A	S-B	2577	F-A	S-B
2453	F-D	S-U	2512	F-A	S-A	2578	F-A	S-B
2454	F-D	S-U	2513	F-A	S-B	2579	F-A	S-B
2456	F-E	S-D	2514	F-E	<u>S-D</u>	2580	F-A	S-B
2457	F-E	S-D	2515	F-A	<u>S-A</u>	2581	F-A	S-B
2458	F-E	S-D	2516	F-A	<u>S-A</u>	2582	F-A	S-B
2459	F-E	S-D	2517	F-D	S-U	2583	F-A	S-B
2460	F-E	S-D	2518	F-A	<u>S-A</u>	2584	F-A	S-B
2461	F-E	S-D	2520	F-E	S-D	2585	F-A	S-B
2463	<u>F-G</u>	S-O	2521	F-E	S-D	2586	F-A	S-B
2464	F-A	S-Q	2522	F-A	S-A	2587	F-A	S-A
2465	F-A	S-Q	2524	F-E	S-D	2588	F-A	S-A
2466	F-G	S-Q	2525	F-A	S-A	2589	F-E	S-D
2468	F-A	S-Q	2526	F-E	S-C	2590	F-A	S-A
2469	F-H	S-Q	2527	F-E	S-D	2591	F-C	S-V
2470	F-A	S-A	2528	F-E	S-D	2599	F-C	S-V
2471	F-A	<u>S-A</u>	2529	F-E	S-C	2601	F-D	S-U
2473	F-A	S-A	2531	F-A	S-B	2602	F-C	S-V
2474	F-A	S-A	2533	F-A	S-A	2603	F-E	S-D
2475	F-A	S-B	2534	F-D	S-U	2604	F-E	S-C
2477	F-E	S-D	2535	F-E	S-C	2605	F-E	S-D
2478	F-E	S-D	2536	F-E	S-D	2606	F-E	S-D
2480	F-E	S-D	2538	F-A	S-G	2607	F-E	S-D
2481	F-E	S-D	2541	F-E	S-E	2608	F-E	S-D
2482	F-E	S-D	2542	F-A	S-A	2609	F-A	S-A
2483	F-E	S-D	2545	F-G	S-M	2610	F-E	S-C
2484	F-E	S-D	2546	F-G	S-M	2611	F-E	S-D
2485	F-E	S-D	2547	F-G	S-Q	2612	F-E	S-D
2486	F-E	S-D	2548	F-C	S-W	2614	F-E	S-D
2487	F-E	S-D	2552	F-A	S-A	2615	F-E	S-D
2488	F-E	S-D	2554	F-E	S-D	2616	F-E	S-D
2490	F-A	S-A	2555	F-B	S-J	2617	F-E	S-D
2491	F-A	S-B	2556	F-B	S-J	2618	F-E	S-D
2493	F-E	S-C	2557	F-B	S-J	2619	F-E	S-C
2495	F-A	S-Q	2558	F-E	<u>S-D</u>	2620	F-E	S-D
2496	F-A	S-B	2560	F-E	S-D	2621	F-E	S-D
2498	F-E	S-D	2561	F-E	S-D	2622	F-E	S-D
2501	F-A	S-A	2564	F-A	S-B	2623	F-A	S-I
2502	F-E	S-C	2565	F-A	S-B	2624	F-G	S-O
2503	F-A	S-B	2567	F-A	<u>S-A</u>	2626	F-A	S-Q
2504	F-A	<u>S-A</u>	2570	F-A	S-A	2627	F-A	S-Q
2505	F-A	S-A	2571	F-A	S-B	2628	F-A	S-A
2506	F-A	S-B	2572	F-A	S-A	2629	F-A	S-A
2507	F-A	S-B	2573	F-H	S-Q	2630	F-A	S-A



UN No.	EmS Fire	EmS Spill	UN No.	EmS Fire	EmS Spill	UN No.	EmS Fire	EmS Spill
2642	F-A	S-A	2705	F-A	S-B	2761	F-A	S-A
2643	F-A	S-A	2707	F-E	S-D	2762	F-E	S-D
2644	F-A	S-A	2709	F-E	<u>S-D</u>	2763	F-A	S-A
2645	F-A	S-A	2710	F-E	S-D	2764	F-E	S-D
2646	F-A	S-A	2713	F-A	S-A	2771	F-A	S-A
2647	F-A	S-A	2714	F-A	S-I	2772	F-E	S-D
2648	F-A	S-A	2715	F-A	S-I	2775	F-A	S-A
2649	F-A	S-A	2716	F-A	S-A	2776	F-E	S-D
2650	F-A	S-A	2717	F-A	S-I	2777 I	F-A	<u>S-A</u>
2651	F-A	<u>S-A</u>	2719	F-H	S-Q	2777 II	F-A	<u>S-A</u>
2653	F-A	S-A	2720	F-A	S-Q	2777 III	F-A	<u>S-A</u>
2655	F-A	S-A	2721	F-H	S-Q	2778 I	F-E	<u>S-D</u>
2656	F-A	S-A	2722	F-A	S-Q	2778 II	F-E	<u>S-D</u>
2657	F-A	S-A	2723	F-H	S-Q	2779	F-A	S-A
2659	F-A	S-A	2724	F-A	S-Q	2780	F-E	S-D
2660	F-A	S-A	2725	F-A	S-Q	2781	F-A	S-A
2661	F-A	S-A	2726	F-A	S-Q	2782	F-E	S-D
2664	F-A	S-A	2727	F-A	S-Q	2783	F-A	S-A
2667	F-A	S-A	2728	F-A	S-Q	2784	F-E	S-D
2668	F-A	S-A	2729	F-A	S-A	2785	F-A	S-A
2669	F-A	S-A	2730	F-A	S-A	2786 I	F-A	<u>S-A</u>
2670	F-A	S-B	2732	F-A	S-A	2786 II	F-A	<u>S-A</u>
2671	F-A	S-A	2733	F-E	S-C	2786 III	F-A	<u>S-A</u>
2672	F-A	<u>S-B</u>	2734	F-E	S-C	2787 I	F-E	<u>S-D</u>
2673	F-A	S-A	2735	F-A	S-B	2787 II	F-E	<u>S-D</u>
2674	F-A	S-A	2738	F-A	S-A	2788 I	F-A	<u>S-A</u>
2676	F-D	S-U	2739	F-A	S-B	2788 II	F-A	<u>S-A</u>
2677	F-A	S-B	2740	F-E	S-C	2788 III	F-A	<u>S-A</u>
2678	F-A	S-B	2741	F-H	S-Q	2789	F-E	S-C
2679	F-A	S-B	2742	F-E	S-C	2790	F-A	S-B
2680	F-A	S-B	2743	F-E	S-C	2793	F-G	S-J
2681	F-A	S-B	2744	F-E	S-C	2794	F-A	S-B
2682	F-A	S-B	2745	F-A	S-B	2795	F-A	S-B
2683	F-E	S-C	2746	F-A	S-B	2796	F-A	S-B
2684	F-E	S-C	2747	F-A	S-A	2797	F-A	S-B
2685	F-E	S-C	2748	F-A	S-B	2798	F-A	S-B
2686	F-E	S-C	2749	F-E	<u>S-D</u>	2799	F-A	S-B
2687	F-A	S-G	2750	F-A	S-A	2800	F-A	S-B
2688	F-A	S-A	2751	F-A	S-B	2801	F-A	S-B
2689	F-A	S-A	2752	F-E	S-D	2802	F-A	<u>S-B</u>
2690	F-A	S-A	2753	F-A	S-A	2803	F-A	S-B
2691	F-A	S-B	2754	F-A	S-A	2805	F-G	S-N
2692	F-A	S-B	2757	F-A	S-A	2806	F-A	S-O
2693	F-A	S-B	2758	F-E	S-D	2809	F-A	<u>S-B</u>
2698	F-A	S-B	2759	F-A	S-A			
2699	F-A	S-B	2760	F-E	S-D			

UN No.	EmS Fire	EmS Spill	UN No.	EmS Fire	EmS Spill	UN No.	EmS Fire	EmS Spill
2810	F-A	S-A	2870	F-G	S-M	2941	F-A	S-A
2811	F-A	S-A	2871	F-A	S-A	2942	F-A	S-A
2813 I	<u>F-G</u>	S-N	2872	F-A	S-A	2943	F-E	S-D
2813 II	F-G	S-N	2873	F-A	S-A	2945	F-E	S-C
2813 III	F-G	S-N	2874	F-A	S-A	2946	F-A	S-A
2814	F-A	S-T	2875	F-A	S-A	2947	F-E	S-D
2815	F-A	S-B	2876	F-A	S-A	2948	F-A	S-A
2817	F-A	S-B	2878	F-G	S-G	2949	F-A	S-B
2818	F-A	S-B	2879	F-A	S-B	2950	F-G	S-O
2819	F-A	S-B	2880	F-H	S-Q	2956	F-B	S-G
2820	F-A	S-B	2881	F-G	S-M	2965	<u>F-G</u>	S-O
2821	F-A	S-A	2900	F-A	S-T	2966	F-A	S-A
2822	F-A	S-A	2901	F-C	S-W	2967	F-A	S-B
2823	F-A	S-B	2902	F-A	S-A	2968	F-G	<u>S-L</u>
2826	F-E	<u>S-C</u>	2903	F-E	S-D	2969	F-A	S-A
2829	F-A	S-B	2904	F-A	S-B	2977	<u>F-I</u>	<u>S-S</u>
2830	F-G	S-N	2905	F-A	S-B	2978	<u>F-I</u>	<u>S-S</u>
2831	F-A	S-A	2907	F-A	S-J	2983	F-E	S-D
2834	F-A	S-B	2908	F-I	S-S	2984	F-H	S-Q
2835	F-G	S-O	2909	F-I	S-S	2985	<u>F-E</u>	S-C
2837	F-A	S-B	2910	F-I	S-S	2986	F-E	S-C
2838	F-E	S-D	2911	F-I	S-S	2987	F-A	S-B
2839	F-A	S-A	2912	F-I	S-S	2988	<u>F-G</u>	S-N
2840	F-E	S-D	2913	F-I	S-S	2989	F-A	S-G
2841	F-E	S-D	2915	F-I	S-S	2990	F-A	<u>S-V</u>
2842	F-E	S-D	2916	F-I	S-S	2991	F-E	S-D
2844	F-G	S-N	2917	F-I	S-S	2992	F-A	S-A
2845	F-G	S-M	2919	F-I	<u>S-S</u>	2993	F-E	S-D
2846	F-G	S-M	2920	F-E	S-C	2994	F-A	S-A
2849	F-A	S-A	2921	F-A	S-G	2995	F-E	S-D
2850	F-E	S-E	2922	F-A	S-B	2996	F-A	S-A
2851	F-A	S-B	2923	F-A	S-B	2997	F-E	S-D
2852	F-B	S-J	2924	F-E	S-C	2998	F-A	S-A
2853	F-A	S-A	2925	F-A	S-G	3005	F-E	S-D
2854	F-A	S-A	2926	F-A	S-G	3006	F-A	S-A
2855	F-A	S-A	2927	F-A	S-B	3009	F-E	S-D
2856	F-A	S-A	2928	F-A	S-B	3010	F-A	S-A
2857	F-C	S-V	2929	F-E	S-D	3011 I	F-E	<u>S-D</u>
2858	F-G	S-G	2930	F-A	S-G	3011 II	F-E	<u>S-D</u>
2859	F-A	S-A	2931	F-A	S-A	3011 III	F-E	<u>S-D</u>
2861	F-A	S-A	2933	F-E	S-D	3012 I	F-A	<u>S-A</u>
2862	F-A	S-A	2934	F-E	S-D	3012 II	F-A	<u>S-A</u>
2863	F-A	S-A	2935	F-E	S-D	3012 III	F-A	<u>S-A</u>
2864	F-A	S-A	2936	F-A	S-A	3013	F-E	S-D
2865	F-A	S-B	2937	F-A	S-A	3014	F-A	S-A
2869	F-A	S-B	2940	F-A	S-J	3015	F-E	S-D

UN No.	EmS Fire	EmS Spill	UN No.	EmS Fire	EmS Spill	UN No.	EmS Fire	EmS Spill
3016	F-A	S-A	3095	F-A	S-N	3133	F-G	S-L
3017	F-E	S-D	3096	F-G	S-L	3134 I	<u>F-G</u>	S-N
3018	F-A	S-A	3097	F-A	S-Q	3134 II	F-G	S-N
3019 I	F-E	<u>S-D</u>	3098	F-A	S-Q	3134 III	F-G	S-N
3019 II	F-E	<u>S-D</u>	3099	F-A	S-Q	3135 I	<u>F-G</u>	S-N
3019 III	F-E	<u>S-D</u>	3100	F-A	S-Q	3135 II	F-G	S-N
3020 I	F-A	<u>S-A</u>	3101	F-J	S-R	3135 III	F-G	S-N
3020 II	F-A	<u>S-A</u>	3102	F-J	S-R	3136	F-C	S-V
3020 III	F-A	<u>S-A</u>	3103	F-J	S-R	3137	F-G	S-Q
3021	F-E	S-D	3104	F-J	S-R	3138	<u>F-D</u>	S-U
3022	F-E	S-D	3105	F-J	S-R	3139	F-A	S-Q
3023	F-E	S-D	3106	F-J	S-R	3140	F-A	S-A
3024	F-E	S-D	3107	F-J	S-R	3141	F-A	S-A
3025	F-E	S-D	3108	F-J	S-R	3142	F-A	S-A
3026	F-A	S-A	3109	F-J	S-R	3143	F-A	S-A
3027	F-A	S-A	3110	F-J	S-R	3144	F-A	S-A
3028	F-A	S-B	3111	F-F	S-R	3145	F-A	S-B
3048	F-A	S-A	3112	F-F	S-R	3146 I	F-A	<u>S-A</u>
3054	F-E	S-D	3113	F-F	S-R	3146 II	F-A	<u>S-A</u>
3055	F-A	S-B	3114	F-F	S-R	3146 III	F-A	<u>S-A</u>
3056	F-E	S-D	3115	F-F	S-R	3147	F-A	S-B
3057	F-C	S-U	3116	F-F	S-R	3148 I	<u>F-G</u>	S-N
3064	F-E	S-D	3117	F-F	S-R	3148 II	F-G	S-N
3065	F-E	S-D	3118	F-F	S-R	3148 III	F-G	S-N
3066	F-A	S-B	3119	F-F	S-R	3149	F-H	S-Q
3070	F-C	S-V	3120	F-F	S-R	3150	F-D	S-U
3071	F-E	S-D	3121	F-G	S-L	3151	F-A	<u>S-A</u>
3072	F-A	<u>S-V</u>	3122	F-A	S-Q	3152	F-A	<u>S-A</u>
3073	F-E	S-C	3123	F-G	S-N	3153	F-D	S-U
3077	F-A	S-F	3124	F-A	S-J	3154	F-D	S-U
3078	F-G	S-O	3125	F-G	S-N	3155	F-A	<u>S-A</u>
3079	F-E	S-D	3126	F-A	S-J	3156	<u>F-C</u>	S-W
3080	F-E	S-D	3127	F-A	S-J	3157	<u>F-C</u>	S-W
3082	F-A	S-F	3128	F-A	S-J	3158	F-C	S-V
3083	F-C	S-W	3129 I	<u>F-G</u>	S-N	3159	F-C	S-V
3084	F-A	S-Q	3129 II	F-G	S-N	3160	<u>F-D</u>	S-U
3085	F-A	S-Q	3129 III	F-G	S-N	3161	F-D	S-U
3086	F-A	S-Q	3130 I	<u>F-G</u>	S-N	3162	F-C	S-U
3087	F-A	S-Q	3130 II	F-G	S-N	3163	F-C	S-V
3088	F-A	S-J	3130 III	F-G	S-N	3164	F-C	S-V
3089	F-G	S-G	3131 I	<u>F-G</u>	S-L	3165	F-E	S-C
3090	F-A	S-I	3131 II	F-G	S-L	3166		
3091	F-A	S-I	3131 III	F-G	S-L	(for gases)	F-D	S-U
3092	F-E	S-D	3132 I	<u>F-G</u>	S-N	3166		
3093	F-A	S-Q	3132 II	F-G	S-N	(for liquids)	F-E	S-E
3094	F-G	S-L	3132 III	F-G	S-N	3167	F-D	S-U

UN No.	EmS Fire	EmS Spill	UN No.	EmS Fire	EmS Spill	UN No.	EmS Fire	EmS Spill
3168	F-D	S-U	3224	F-J	S-G	3270	F-A	S-I
3169	F-C	S-U	3225	F-J	S-G	3271	F-E	S-D
3170	F-G	S-P	3226	F-J	S-G	3272	F-E	S-D
3171	F-A	S-I	3227	F-J	S-G	3273	F-E	S-D
3172	F-A	S-A	3228	F-J	S-G	3274	F-E	S-C
3174	F-A	S-J	3229	F-J	S-G	3275	F-E	S-D
3175	F-A	S-I	3230	F-J	S-G	3276	F-A	S-A
3176	F-A	S-H	3231	F-F	S-K	3277	F-A	S-B
3178	F-A	S-G	3232	F-F	S-K	3278	F-A	S-A
3179	F-A	S-G	3233	F-F	S-K	3279	F-E	S-D
3180	F-A	S-G	3234	F-F	S-K	3280	F-A	S-A
3181	F-A	S-I	3235	F-F	S-K	3281	F-A	S-A
3182	F-A	S-G	3236	F-F	S-K	3282	F-A	S-A
3183	F-A	S-J	3237	F-F	S-K	3283	F-A	S-A
3184	F-A	S-J	3238	F-F	S-K	3284	F-A	S-A
3185	F-A	S-J	3239	F-F	S-K	3285	F-A	S-A
3186	F-A	S-J	3240	F-F	S-K	3286	F-E	S-C
3187	F-A	S-J	3241	F-J	S-G	3287	F-A	S-A
3188	F-A	S-J	3242	F-J	S-G	3288	F-A	S-A
3189	F-G	S-J	3243	F-A	S-A	3289	F-A	S-B
3190	F-A	S-J	3244	F-A	S-B	3290	F-A	S-B
3191	F-A	S-J	3245	F-A	S-T	3291	F-A	S-T
3192	F-A	S-J	3246	F-A	S-B	3292	F-G	S-P
3194	F-G	S-M	3247	F-A	S-Q	3293	F-A	S-A
3200	F-G	S-M	3248	F-E	S-D	3294	F-E	<u>S-D</u>
3205	F-A	S-J	3249	F-A	S-A	3295	F-E	S-D
3206	F-A	S-J	3250	F-A	S-B	3296	F-C	S-V
3208 I	<u>F-G</u>	S-N	3251	F-F	S-G	3297	F-C	S-V
3208 II	F-G	S-N	3252	F-D	S-U	3298	F-C	S-V
3208 III	F-G	S-N	3253	F-A	S-B	3299	F-C	S-V
3209 I	<u>F-G</u>	S-N	3254	F-A	S-M	3300	F-D	S-U
3209 II	F-G	S-N	3255	F-A	S-M	3301	F-A	S-J
3209 III	F-G	S-N	3256	F-E	S-D	3302	F-A	S-A
3210	F-H	S-Q	3257	F-A	<u>S-P</u>	3303	F-C	S-W
3211	F-H	S-Q	3258	F-A	<u>S-P</u>	3304	F-C	S-U
3212	F-H	S-Q	3259	F-A	S-B	3305	F-D	S-U
3213	F-H	S-Q	3260	F-A	S-B	3306	F-C	S-W
3214	F-H	S-Q	3261	F-A	S-B	3307	F-C	S-W
3215	F-A	S-Q	3262	F-A	S-B	3308	F-C	S-U
3216	F-A	S-Q	3263	F-A	S-B	3309	<u>F-D</u>	S-U
3218	F-A	S-Q	3264	F-A	S-B	3310	F-C	S-W
3219	F-A	S-Q	3265	F-A	S-B	3311	F-C	S-W
3220	F-C	S-V	3266	F-A	S-B	3312	<u>F-D</u>	S-U
3221	F-J	S-G	3267	F-A	S-B	3313	F-A	S-J
3222	F-J	S-G	3268	<u>F-B</u>	S-X	3314	F-A	S-I
3223	F-J	S-G	3269	F-E	S-D	3315	F-A	S-A

UN No.	EmS Fire	EmS Spill	UN No.	EmS Fire	EmS Spill	UN No.	EmS Fire	EmS Spill
3316	F-A	<u>S-P</u>	3365	F-B	S-J	3402	<u>F-G</u>	S-N
3317	F-B	S-J	3366	F-B	S-J	3403	<u>F-G</u>	S-L
3318	F-C	S-U	3367	F-B	S-J	3404	<u>F-G</u>	S-L
3319	F-B	S-J	3368	F-B	S-J	3405	F-H	S-Q
3320	F-A	S-B	3369	F-B	S-J	3406	F-H	S-Q
3321	F-I	S-S	3370	F-B	S-J	3407	F-H	S-Q
3322	F-I	S-S	3371	F-E	S-D	3408	F-H	S-Q
3323	F-I	S-S	3373	F-A	S-T	3409	F-A	S-A
3324	F-I	<u>S-S</u>	3374	<u>F-D</u>	<u>S-U</u>	3410	F-A	S-A
3325	F-I	<u>S-S</u>	3375	F-H	S-Q	3411	F-A	S-A
3326	F-I	<u>S-S</u>	3376	F-B	S-J	3412	F-A	S-B
3327	F-I	<u>S-S</u>	3377	F-A	S-Q	3413 I	F-A	<u>S-A</u>
3328	F-I	<u>S-S</u>	3378	F-A	S-Q	3413 II	F-A	<u>S-A</u>
3329	F-I	<u>S-S</u>	3379	F-E	S-Y	3413 III	F-A	<u>S-A</u>
3330	F-I	<u>S-S</u>	3380	F-B	S-J	3414 I	F-A	<u>S-A</u>
3331	F-I	<u>S-S</u>	3381	F-A	S-A	3414 II	F-A	<u>S-A</u>
3332	<u>F-I</u>	<u>S-S</u>	3382	F-A	S-A	3414 III	F-A	<u>S-A</u>
3333	<u>F-I</u>	<u>S-S</u>	3383	F-E	S-D	3415	F-A	S-A
3336	F-E	S-D	3384	F-E	S-D	3416	F-A	S-A
3337	F-C	S-V	3385	F-G	S-N	3417	F-A	S-G
3338	F-C	S-V	3386	F-G	S-N	3418	F-A	S-A
3339	F-C	S-V	3387	F-A	S-Q	3419	F-A	S-B
3340	F-C	S-V	3388	F-A	S-Q	3420	F-A	S-B
3341	F-A	S-J	3389	F-A	S-B	3421	F-A	S-B
3342	F-A	S-J	3390	F-A	S-B	3422	F-A	S-A
3343	F-E	S-Y	3391	F-G	S-M	3423	F-A	S-B
3344	F-B	S-J	3392	F-G	S-M	3424 II	F-A	<u>S-A</u>
3345	F-A	S-A	3393	F-G	S-M	3424 III	F-A	<u>S-A</u>
3346	F-E	S-D	3394	F-G	S-M	3425	F-A	S-B
3347	F-E	S-D	3395 I	<u>F-G</u>	S-N	3426	F-A	S-A
3348	F-A	S-A	3395 II	F-G	S-N	3427	F-A	<u>S-A</u>
3349	F-A	S-A	3395 III	F-G	S-N	3428	F-A	S-A
3350	F-E	S-D	3396 I	<u>F-G</u>	S-N	3429	F-A	S-A
3351	F-E	S-D	3396 II	F-G	S-N	3430	F-A	S-A
3352	F-A	S-A	3396 III	F-G	S-N	3431	F-A	<u>S-A</u>
3354	F-D	S-U	3397 I	<u>F-G</u>	S-N	3432	F-A	<u>S-A</u>
3355	F-D	S-U	3397 II	F-G	S-N	3434	F-A	S-A
3356	F-H	S-Q	3397 III	F-G	S-N	3436	F-A	S-A
3357	F-E	S-Y	3398 I	<u>F-G</u>	S-N	3437	F-A	S-A
3358	F-D	S-U	3398 II	F-G	S-N	3438	F-A	S-A
3359	F-A	<u>S-D</u>	3398 III	F-G	S-N	3439	F-A	S-A
3360	F-A	S-I	3399 I	<u>F-G</u>	S-N	3440	F-A	S-A
3361	F-A	S-B	3399 II	F-G	S-N	3441	F-A	<u>S-A</u>
3362	F-E	S-C	3399 III	F-G	S-N	3442	F-A	<u>S-A</u>
3363	F-A	<u>S-P</u>	3400	F-A	S-J	3443	F-A	S-A
3364	F-B	S-J	3401	<u>F-G</u>	S-N			

UN No.	EmS Fire	EmS Spill	UN No.	EmS Fire	EmS Spill	UN No.	EmS Fire	EmS Spill
3444	F-A	S-A	3488	F-E	S-D	3534	F-F	S-K
3445	F-A	S-A	3489	F-E	S-D	3535	F-A	S-G
3446	F-A	S-A	3490	F-G	S-N	3536	F-A	S-I
3447	F-A	S-A	3491	F-G	S-N	3537	F-D	<u>S-U</u>
3448	F-A	S-A	3494	F-E	S-E	3538	F-C	<u>S-V</u>
3449	F-A	S-A	3495	F-A	S-B	3539	F-C	<u>S-U</u>
3450	F-A	<u>S-A</u>	3496	F-A	S-I	3540	F-E	<u>S-D</u>
3451	F-A	<u>S-A</u>	3497	F-A	S-J	3541	F-A	<u>S-G</u>
3452	F-A	S-A	3498	F-A	S-B	3542		
3453	F-A	S-B	3499	F-A	S-I	3543	F-G	<u>S-N</u>
3454	F-A	<u>S-A</u>	3500	F-C	S-V	3544	F-A	<u>S-Q</u>
3455	F-A	S-B	3501	<u>F-D</u>	<u>S-U</u>	3545	F-J	<u>S-R</u>
3456	F-A	S-B	3502	F-C	<u>S-V</u>	3546	F-A	<u>S-A</u>
3457	F-A	<u>S-A</u>	3503	F-C	<u>S-V</u>	3547	F-A	<u>S-B</u>
3458	F-A	S-A	3504	<u>F-D</u>	<u>S-U</u>	3548	F-A	<u>S-P</u>
3459	F-A	S-A	3505	<u>F-D</u>	<u>S-U</u>	3549	F-A	S-T
3460	F-A	S-A	3506	F-A	<u>S-B</u>			
3462	F-A	S-A	3507	<u>F-I</u>	<u>S-S</u>			
3463	F-E	S-C	3508	F-A	S-I			
3464	F-A	S-A	3510	F-D	S-U			
3465	F-A	S-A	3511	F-C	S-V			
3466	F-A	S-A	3512	F-C	S-U			
3467	F-A	S-A	3513	<u>F-C</u>	S-W			
3468	F-D	S-U	3514	F-D	S-U			
3469	F-E	S-C	3515	<u>F-C</u>	S-W			
3470	F-E	S-C	3516	F-C	S-U			
3471	F-A	S-B	3517	F-D	S-U			
3472	F-A	S-B	3518	<u>F-C</u>	S-W			
3473	F-E	S-D	3519	F-C	S-U			
3474	F-B	S-J	3520	F-C	S-W			
3475	F-E	S-E	3521	F-C	S-U			
3476	F-G	S-P	3522	F-D	S-U			
3477	F-A	S-B	3523	F-D	S-U			
3478	F-D	S-U	3524	F-C	S-U			
3479	F-D	S-U	3525	F-D	S-U			
3480	F-A	S-I	3526	F-D	S-U			
3481	F-A	S-I	3527	F-A	S-G			
3482	<u>F-G</u>	S-N	3528	F-E	S-E			
3483	F-E	<u>S-D</u>	3529	F-D	S-U			
3484	F-E	<u>S-C</u>	3530	F-A	S-F			
3485	F-H	S-Q	3531	F-J	S-G			
3486	F-H	S-Q	3532	F-J	S-G			
3487	F-H	S-Q	3533	F-F	S-K			

\* F-G, S-M for pyrophoric substances, F-A, S-J for self-heating substances.

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# **MEDICAL FIRST AID GUIDE FOR USE IN ACCIDENTS INVOLVING DANGEROUS GOODS**

**(MFAG)**



## Contents

	<i>Page</i>
Foreword .....	97
Introduction .....	99
How to use this Guide .....	101
 <b>Tables</b>	
Table 1      Rescue .....	105
Table 2      CPR (Cardio-pulmonary resuscitation) .....	108
Table 3      Oxygen administration and controlled ventilation .....	111
Table 4      Chemical-induced disturbances of consciousness .....	113
Table 5      Chemical-induced convulsions (seizures, fits) .....	116
Table 6      Toxic mental confusion .....	117
Table 7      Eye exposure to chemicals .....	118
Table 8      Skin exposure to chemicals .....	120
Table 9      Inhalation of chemicals .....	122
Table 10     Ingestion of chemicals .....	124
Table 11     Shock .....	126
Table 12     Acute kidney failure .....	128
Table 13     Pain relief .....	129
Table 14     Chemical-induced bleeding .....	131
Table 15     Chemical-induced jaundice .....	132
Table 16     Hydrofluoric acid and hydrogen fluoride .....	133
Table 17     Organophosphate and carbamate insecticides .....	135
Table 18     Cyanides .....	137
Table 19     Methanol (methyl alcohol) and ethylene glycol .....	138
Table 20     Radioactive material .....	139
 <b>Appendices</b>	
Appendix 1 <b>Rescue</b> .....	141
Integrated response .....	141
Emergency response plan .....	141
Arrival at the scene .....	141
Establishment of an exclusion or hot zone .....	142
Assessment, decontamination and initial treatment of casualties .....	142
Decontamination .....	142
Considerations for casualty treatment .....	142
Transport of casualty to medical area of ship .....	143
Medical management of casualty .....	143



Appendix 2	CPR (cardio-pulmonary resuscitation)	144
	Assessment of breathing	144
	Assessment of heart function	145
	Breathing, heart is beating, unconscious	146
	Not breathing but heart is beating	147
	Breathing and heart have stopped	150
Appendix 3	Oxygen administration and controlled ventilation	150
	Suffocation	151
	Insertion of Guedel airway	152
	Oxygen for the casualty who is not breathing	152
	Oxygen for the casualty who has difficulty in breathing	153
Appendix 4	Chemical-induced disturbances of consciousness	154
	The unconscious position	154
	Unconscious casualties:	156
Appendix 5	Chemical-induced convulsions (seizures, fits)	157
Appendix 6	Toxic mental confusion	158
Appendix 7	Eye exposure to chemicals	159
Appendix 8	Skin exposure to chemicals	160
Appendix 9	Inhalation of chemicals	160
	Suffocation (asphyxia)	160
	Chemical irritation of the lungs: dry cough, breathlessness and wheezing	161
	Chemical irritation and oedema of the lungs: severe breathlessness and frothy sputum	161
	Chemical irritation and secondary infection of the lungs: productive cough	161
	The chemical hazards from fire	162
	Chemical hazards from welding	162
	Chemical hazards from explosive chemicals	163
Appendix 10	Ingestion of chemicals	163
	Perforation of the gut and peritonitis	164
Appendix 11	Shock	164
	Fainting	164
	Circulatory collapse and shock	164
	Heart failure	165
Appendix 12	Acute kidney failure	166
Appendix 13	Fluid replacement	166
	Oral fluids	166
	Intravenous fluids	167
	Rectal fluids	168
Appendix 14	List of medicines and equipment	170
	List of equipment	171
Appendix 15	List of substances	171
	UN number sortation	172
	Alphabetic sortation	

## Foreword

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The IMO/WHO/ILO *Medical First Aid Guide for Use in Accidents Involving Dangerous Goods* (MFAG) is the Chemicals Supplement to the *International Medical Guide for Ships* (IMGS)<sup>\*</sup> which is published by the World Health Organization (WHO), Geneva.

This revised text of the Guide was adopted by the Maritime Safety Committee in May 1998, for use in association with Amendment 30-00 of the IMDG Code, and will be further amended as and when necessary.

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<sup>\*</sup> *International Medical Guide for Ships*, 3rd edition (World Health Organization, Geneva, 2007), ISBN 978-92-4-154720-8.



# Introduction

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The IMO/WHO/ILO Medical First Aid Guide for Use in Accidents involving Dangerous Goods (MFAG) refers to the substances, material and articles covered by the International Maritime Dangerous Goods (IMDG) Code and the materials covered by appendix B of the International Maritime Solid Bulk Cargoes (IMSBC) Code. It is intended to provide advice necessary for initial management of chemical poisoning and diagnosis within the limits of the facilities available at sea.

This Guide should be used in conjunction with the information provided in the IMDG Code, the IMSBC Code, the Emergency Procedures for Ships Carrying Dangerous Goods (EmS), the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code), and the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code).

The MFAG itself gives general information about the particular toxic effects likely to be encountered. The treatment recommended in this Guide is specified in the appropriate tables and more comprehensive in the appropriate sections of the Appendices. However, differences exist between countries on certain types of treatment and where these differences occur they are indicated in the relevant national medical guide.

Treatments in this guide cater for the accidental human consequences of the carriage of dangerous goods at sea. Accidental ingestion of toxic substances during voyage is rare. The guide does not cover ingestion by intention.

Minor accidents involving chemicals do not usually cause severe effects provided that the appropriate first aid measures are taken. Although the number of reported serious accidents is small, accidents involving those chemicals which are toxic or corrosive may be dangerous, and must be regarded as being potentially serious until either the affected person has completely recovered, or medical advice to the contrary has been obtained.

Information on the treatment of illnesses which are of a general nature and not predominantly concerned with chemical poisoning may be found in the ILO/IMO/WHO International Medical Guide for Ships (IMGS).

## How to use this Guide

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### IN ANY CASE OF EXPOSURE, START WITH EMERGENCY ACTION AND ACT AS ADVISED

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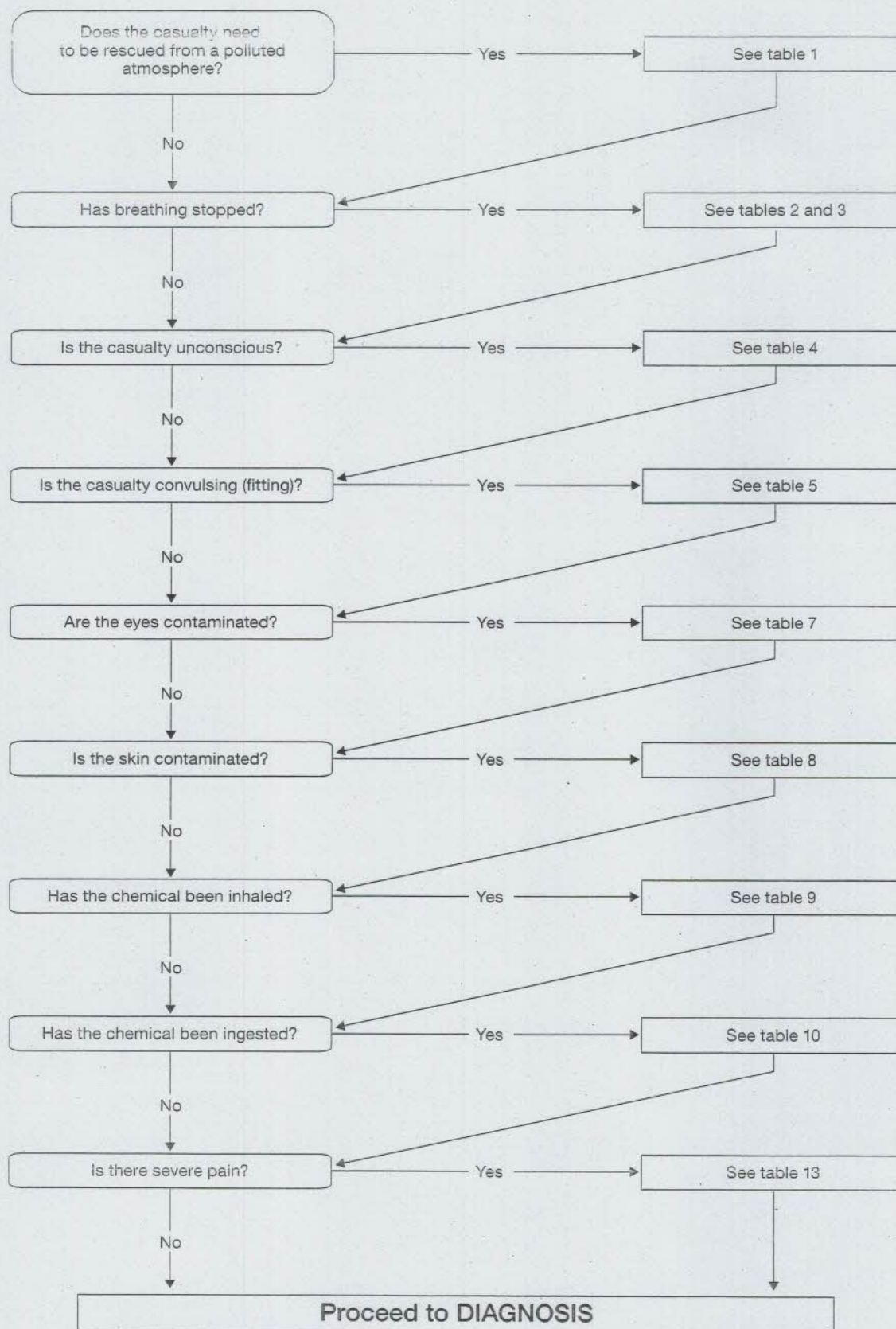
For the convenience of users, and to ensure rapid access to the recommendations in an emergency, this Guide is divided into sections which are grouped to facilitate a three-step approach.

Step 1	Emergency action and diagnosis	Start here.
Step 2	Tables	The tables give brief instructions for special circumstances.
Step 3	Appendices	The appendices provide comprehensive information, a list of medicines/drugs, and a list of chemicals referred to in the tables.

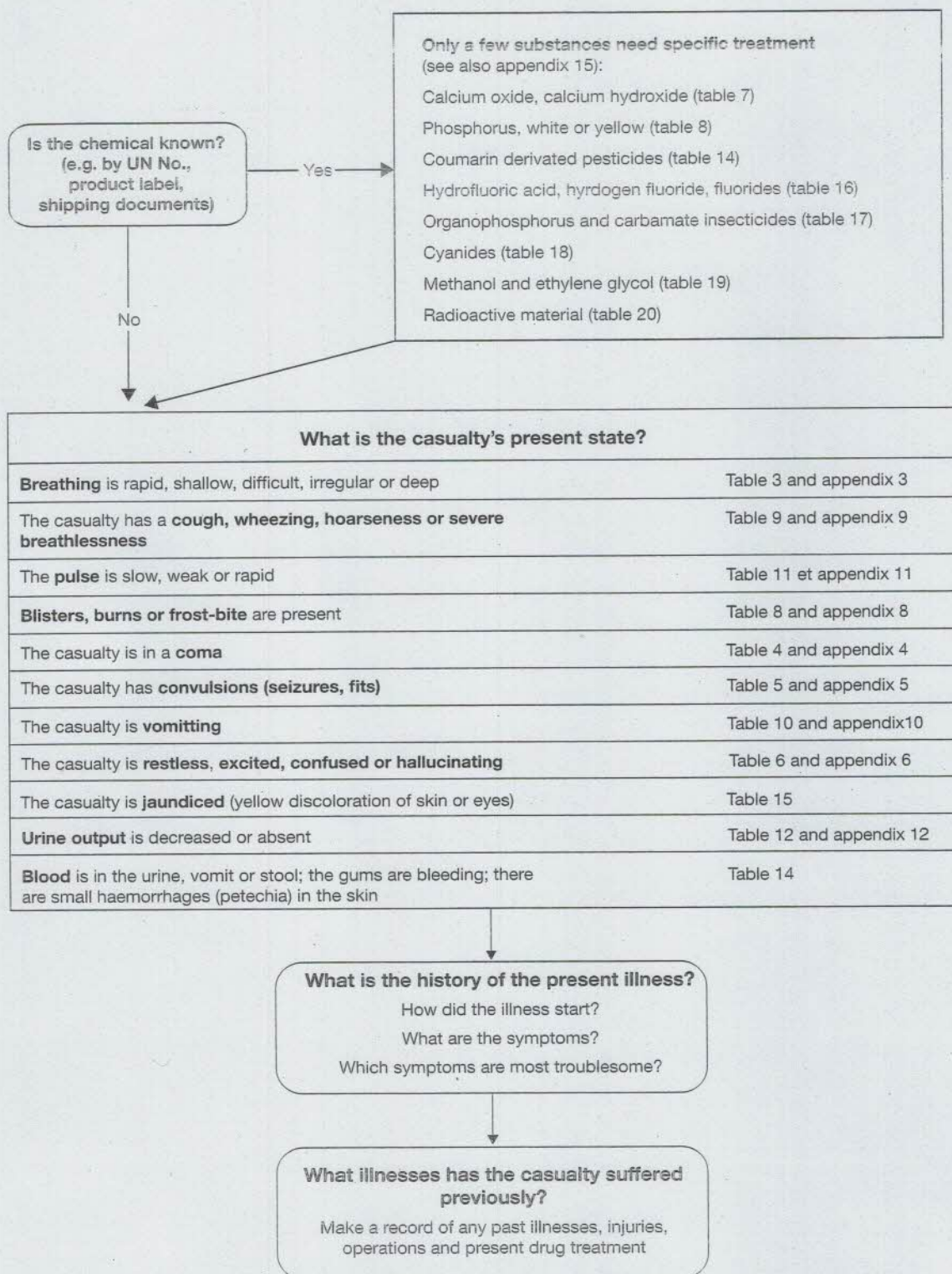
**Note:** The list of chemicals is limited to those few chemicals requiring special treatment. The list is given both in alphabetical and numerical order (UN No.) in appendix 15 to this Guide.



# EMERGENCY ACTION



## DIAGNOSIS





# Tables

Table 1  
**RESCUE**

Rescuers must be adequately protected from exposure before entering a contaminated area in order to avoid injury. When a chemical is unidentified, worst-case assumptions concerning toxicity must be assumed.

## ARRIVAL AT SCENE

- Upon arrival at the scene, an initial assessment of the situation should be made and the size of the incident should be determined.

### Rescuers must NOT:

- Enter a contaminated area without using a pressure-demand self-contained breathing apparatus and wearing full protective clothing;
- Enter an enclosed space unless they are trained members of a rescue team and follow correct procedures;
- Walk through any spilled materials;
- Allow unnecessary contamination of equipment;
- Attempt to recover shipping papers or manifests from contaminated area unless adequately protected;
- Become exposed while approaching a potentially contaminated area;
- Attempt rescue unless trained and equipped with appropriate personal protective equipment (PPE) and protective clothing for the situation.

## QUICKLY ESTABLISH AN EXCLUSION OR HOT ZONE

- Assume that anyone leaving the exclusion zone is contaminated and should be assessed and decontaminated, if necessary.
- Do not remove non-ambulatory casualties from the exclusion zone unless properly trained personnel with the appropriate PPE are available and decontamination has been accomplished.

## INITIAL TRIAGE OF CASUALTIES (SORTING AND PRIORITY)

### *One unconscious casualty*

- Give immediate treatment to the unconscious casualty only, and
- Send for help.

### *Several unconscious casualties*

If there is more than one unconscious casualty:

- Send for help, and
- Give appropriate treatment to the worst casualty in the priority order of:
  1. Casualties who have stopped breathing or have no pulse (see table 2).
  2. Casualties who are unconscious (see table 4).

### *Casualty is unconscious but breathing*

If the casualty is unconscious or cyanotic (bluish skin) but breathing, connect to portable oxygen.

### *Neck or back trauma*

Apply neck and back support before moving casualty if there is any question of neck or back trauma.

**Priority: Airway, Breathing, Circulation (A-B-C)**

Initial management of Airway, Breathing and Circulation (A-B-C, see table 2) is all that should be undertaken while there is potential for further injury to the casualty or to response personnel.

**Gross decontamination**

If the casualty is contaminated with chemicals, gross decontamination should be performed.

- Cut away or remove all suspected contaminated clothing, including jewellery and watches.
- Brush or wipe off any obvious contamination.
- Care should be taken to protect open wounds from contamination.
- Every effort should be made by personnel to avoid contact with potentially contaminated casualties. Rescuers should wear protective clothing, if necessary.
- Cover or wrap casualty to prevent spread of contamination.

**Removal of casualties from exclusion zone**

Once gross decontamination has been performed, the casualties should be removed from the exclusion zone.

- If casualties can walk, lead them out of the exclusion zone to an area where decontamination and further evaluation can take place.
- If casualties are unable to walk, remove them on stretchers. If stretchers are unavailable, carefully carry or drag casualties to an area where decontamination and further evaluation can take place.

---

**DECONTAMINATION**


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**Decontaminate from head down**

- Take care not to introduce contaminants into open wounds.
- Decontaminate exposed wounds and eyes before intact skin areas.
- Cover wounds with a waterproof dressing after decontamination.

**For external contamination, begin with the least aggressive methods**

- Limit mechanical or chemical irritation of the skin.
- Wash contaminated area gently under a stream of water for at least 10 minutes, and wash carefully with soap and warm (never hot) water, scrubbing with a soft brush or surgical sponge.

**Reduce level of contaminants**

- Remove contaminants to the level that they are no longer a threat to casualty or response personnel.
- Isolate the casualty from the environment to prevent the spread of any remaining contaminants.

**Contain runoff; bag contaminated clothing**

- If possible, contain all runoff from decontamination procedures for proper disposal.
- Ensure that all potentially contaminated casualty clothing and belongings have been removed and placed in properly labelled bags.

---

**SUMMARY OF TREATMENT OF CASUALTIES**


---

- Assign highest priorities to Airway, Breathing, Circulation (ABC) and then decontamination.
- Complete primary and secondary assessments as conditions allow.
- Obtain information on chemical(s) to which the casualty has been exposed from shipping papers, labels or other documents.
- If there are multiple casualties, direct attention to the most seriously affected individuals first.
- Treat symptoms and signs as appropriate and when conditions allow.
- Obtain **RADIO MEDICAL ADVICE** when conditions allow.
- Perform invasive procedures only in uncontaminated areas.
- Reassess the casualty frequently, because many chemicals have latent physiological effects.
- Delay preventive measures until the casualty is decontaminated.



---

**TRANSFER TO SHIP'S HOSPITAL**

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Casualties who have been stabilized (airway, breathing and circulation) and decontaminated can be transported to the ship's hospital for further evaluation.

Further advice: see appendix 1.

MFAG

## Table 2 CPR (CARDIO-PULMONARY RESUSCITATION)

Basic life support comprises the "A-B-C" steps which concern the airway, breathing, and circulation respectively.

Basic life support is indicated for:

- Airway obstruction
- Breathing (respiratory) arrest
- Circulatory or cardiac arrest.

Any inadequacy or absence of breathing or circulation must be determined immediately.

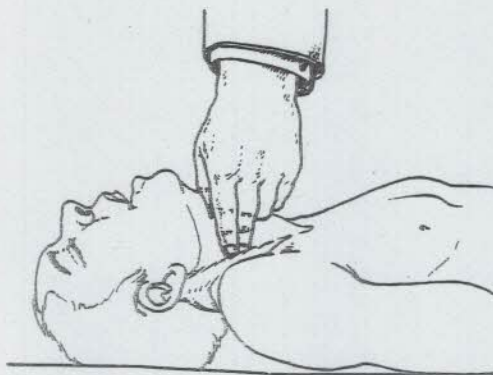
### Assessment of breathing

- Tilt the head firmly backwards with one hand while lifting the neck with the other hand to relieve obstructed breathing.
- Pull the tongue forward.
- Suck or swab out excess secretions.
- Clean any vomit from the mouth and back of the throat. Remove any loose dentures.
- Listen and feel for any movement of air, because the chest and abdomen may move in the presence of an obstructed airway, without moving air. The rescuer's face should be placed close to the casualty's nose and mouth so that any exhaled air may be felt against the cheek. Also the rise and fall of the chest can be observed and the exhaled breath heard.
- Look, listen and feel for five seconds before deciding that breathing is absent.



### Assessment of heart function

- Check for a pulse. The best pulse to feel in an emergency is the carotid. Feel for five seconds before deciding it is absent. If it cannot be felt or is feeble, there is insufficient circulation.



Full advice on CPR: see appendix 2.



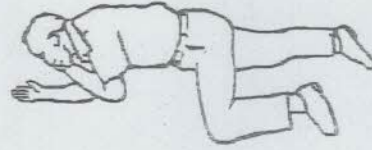
Table 2 – CPR (Cardio-pulmonary resuscitation)

## Signs and symptoms

Breathing, heart is beating, unconscious

## Treatment

- Place casualty in the recovery position.



- Remove any loose dentures.
- Clean any vomit from the mouth and back of the throat.

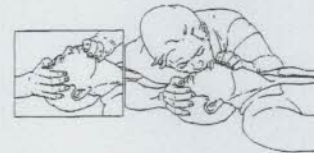
Further advice on the unconscious casualty: see table 4.

- Once a clear and open airway is established, insert a Guedel airway: see appendix 3.



Not breathing but heart is beating

- Begin artificial respiration; mouth-to-mouth or mouth-to-nose respiration



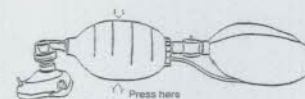
- Give four quick breaths and continue at a rate of 12 inflations per minute.
- Chest should rise and fall. If it does not, check to make sure the casualty's airway is clear and open.



- Do not use mouth-to-mouth respiration if the casualty was exposed to cyanides, organophosphates or radiation to prevent rescuer from being exposed.



Meanwhile, install bag-valve-mask and oxygen supply for continued controlled ventilation. Give oxygen unless there is a danger of fire or explosion.



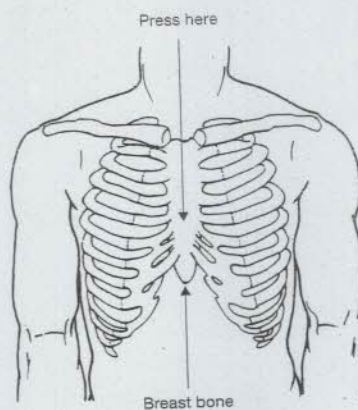
Further advice on oxygen administration: see table 3.

## Signs and symptoms

Breathing and heart have stopped

## Treatment

- Begin CPR immediately. If possible, use two rescuers. Don't delay. One rescuer can do the job.  
Locate the pressure point (lower half of breast bone: about 4 cm from the tip of the breast bone).  
Depress breast bone 4 to 5 cm (80 to 100 times per minute).



**If one rescuer:**

15 heart compressions and 2 very quick lung inflations.

**If two rescuers:**

5 heart compressions and 1 lung inflation.



Table 3

**OXYGEN ADMINISTRATION AND CONTROLLED VENTILATION**

Oxygen is necessary for life. Some intoxications may interfere with normal oxygenation of the blood or tissues. In particular, oxygen can be lifesaving to casualties who have inhaled smoke and other toxic gases but it needs to be given with all speed. Basic training is required to administer oxygen.

**Diagnosis**

- There is difficulty in breathing with an increased rate at first (over 30 per minute). Later it may become slow and stop.
- The pulse is rapid, usually over 100 per minute.
- There is blueness of the skin with purple lips and tongue.
- The casualty may be agitated at first but become apathetic, with muscular weakness. Unconsciousness may follow this.
- The pupils of the eyes will react to light at first. If they become large and do not react to light, life is in danger.

**LACK OF OXYGEN IS AN EMERGENCY****Treatment**

- Give oxygen by means of a face mask. It makes assisted or controlled ventilation possible. It is better to have the casualty well oxygenated with controlled artificial respiration than to have him poorly oxygenated from breathing spontaneously.
- Place a mask over the nose and mouth. It is essential that the face mask is held firmly in place so as to avoid leakage.



- Check that the equipment is correctly assembled according to the manufacturer's instructions and that sufficient oxygen is contained in the cylinder (a cylinder of 2.5 L capacity, filled under a pressure of 200 bar, delivers 500 L oxygen).

Full advice on oxygen administration: see appendix 3.

The commonest emergency requiring medical assistance on board is toxic gas inhalation from fires or specific toxic gases. Combustion in fires on board may well involve substantial release of carbon monoxide and hydrogen cyanide. In these cases, oxygen should be given at a flow rate of 8 L per minute.

In life-threatening conditions, such as lung oedema or circulatory failure, oxygen should also be given at a flow rate of 8 L per minute.

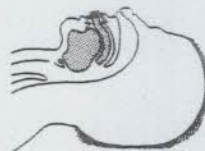
**Warning:** Smoking, a naked flame or light or fires must not be allowed in the same room during the administration of oxygen because of the risk of fire.

## Signs and symptoms

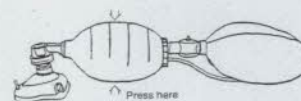
### Not breathing but heart is beating

## Treatment

- Ensure that a clear airway has been established.
- A Guedel airway should be inserted. If insertion of an airway cannot be achieved, the chin should be pulled forward throughout the administration of oxygen. If the casualty has seizures due to the lack of oxygen, administration of oxygen may be difficult but is essential.



- Use a positive-pressure manual operated oxygen resuscitator in accordance with manufacturer's instruction.



- Give oxygen at a flow rate of 8 L per minute. The bag should be squeezed steadily and firmly and released about 12 times a minute.
- Always maintain a regular check on the pulse in the neck. The absence of a pulse indicates the need for 15 chest compressions to every two inflations.
- If gagging occurs, remove the airway.
- Once the casualty is breathing spontaneously, put him in the recovery position.
- Make sure difficulty in breathing is not due to airway obstruction: **see table 2.**
- The casualty should be connected to an oxygen-giving set through a simple disposable face mask (non-venturi type) placed securely over the face.
- Oxygen should be used at a flow rate of 6 to 8 L per minute.
- Oxygen should be continued until the casualty no longer has difficulty in breathing and has a normal healthy colour.

### Breathing is difficult



Table 4

## CHEMICAL-INDUCED DISTURBANCES OF CONSCIOUSNESS

Chemicals, whether inhaled, ingested or absorbed through the skin, can either depress or excite the brain. In cases of severe poisoning, the casualty may not only be unconscious but breathing may also be depressed or absent. Fortunately, in most cases, symptoms usually resolve rapidly when the casualty is removed from the polluted environment.

## Signs and symptoms

Drowsy but breathing adequately

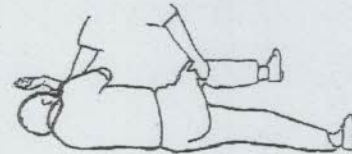
Increasing loss of consciousness  
but breathing adequately

## Treatment

- After removal of the casualty from the polluted environment, eye and skin decontamination should be undertaken, if necessary.
- After decontamination the casualty should be observed in a place of safety for at least 8 hours. Usually no specific treatment is necessary.
- Place casualty in the recovery position.



- Remove any loose dentures.
- Clean any vomit from the mouth and back of the throat.
- Turn casualty face down, head to one side as pictured; no pillows should be used under the head.
- Clear out any vomit in the mouth as soon as vomiting occurs.
- The casualty must never be left alone or unwatched in case he vomits, has a fit or may fall out of his bunk.
- Turn the casualty gently every 3 hours and roll him smoothly from one side to the other.



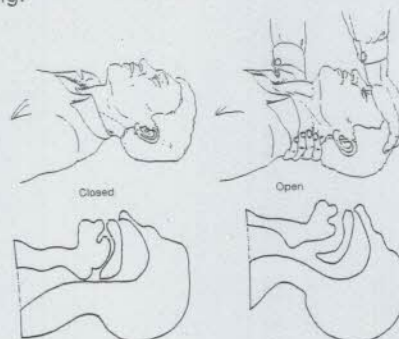
- The head must always be kept back with a chin-up position when actually turning, and, at no time must the head be allowed to bend forwards with the chin sagging.
- If possible, insert a Guedel airway.
- RADIO FOR MEDICAL ADVICE IN ALL CASES.

## Signs and symptoms

Unconsciousness with less than eight respirations of normal depth per minute

## Treatment

- Place the casualty on his back.
- Tilt the head firmly backwards with one hand while lifting the neck with the other hand to relieve obstructed breathing.



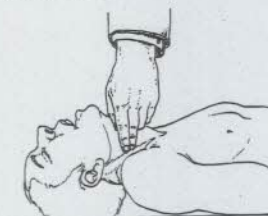
- Once a clear and open airway is established, insert a Guedel airway: see appendix 3.



- Administer controlled ventilation.

Further advice on controlled ventilation: see table 3.

- Check for a pulse. The best pulse to feel in an emergency is the carotid. Feel for five seconds before deciding it is absent. If it cannot be felt or is feeble, there is insufficient circulation.



- It should be felt after the first minute of artificial respiration and checked every 2 minutes thereafter.
- If morphine has been administered: see table 13.
- **RADIO FOR MEDICAL ADVICE IN ALL CASES.**

Prolonged coma with or without breathing difficulty

- **RADIO FOR MEDICAL ADVICE IN ALL CASES.**
- Regularly assess that breathing is adequate. Give ventilation support with 8 L of oxygen per minute if the victim does not breathe adequately.

Further advice on care of unconscious casualties: see appendix 4.



Table 4 – Chemical-induced disturbances of consciousness

Signs and symptoms	Treatment
<p>Toxic mental confusion (agitation, hallucinations)</p> <p>Further advice on treatment of agitation and hallucinations: see table 6.</p>	<ul style="list-style-type: none"> <li>• If the casualty is difficult to manage, give diazepam 10 mg as rectal solution.</li> </ul>
<p>Convulsions (seizures, fits)</p>	<ul style="list-style-type: none"> <li>• Ensure that there are no hard or sharp objects in the vicinity so that the victim will not injure himself.</li> <li>• Give diazepam 10 mg as rectal solution.</li> <li>• <b>RADIO FOR MEDICAL ADVICE.</b></li> <li>• If medical advice is unavailable and seizures continue, give a further 10 mg diazepam as rectal solution after 30 minutes.</li> </ul> <p>Further advice on treatment of convulsions: see table 5.</p>

## Table 5 CHEMICAL-INDUCED CONVULSIONS (SEIZURES, FITS)

The main risk of convulsions is impaired ventilation (leading to inadequate oxygen supply to tissues). During a convulsion, the casualty may hurt himself. Convulsions may be delayed for hours after exposure to certain chemicals.

Further information on convulsions: see appendix 5.

### Signs and symptoms

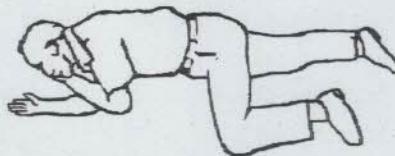
#### Single convulsions of short duration

Convulsions may also occur in regular heavy drinkers within about two days after sharply decreased alcohol consumption. Other signs, such as hyperexcitability, sleep disturbances, or generalized tremor, may indicate a withdrawal syndrome.

#### Frequent or continuous convulsions

### Treatment

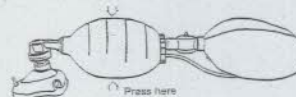
- Remove the casualty to the ship's hospital.
- Prevent the casualty from hurting himself.
- Never restrain the casualty forcibly, as this may cause injury.
- Ensure that there are no hard or sharp objects in the vicinity so that the victim will not injure himself.
- Surround him with pillows, clothing or other soft material.
- Protect the airway from being blocked by the tongue or secretions.
- After the fit is over, let the casualty sleep it off, as he may be rather confused and dazed when he comes round. Reassure him, and do not leave him until you are sure he is aware of his surroundings, and knows what he is doing.
- **RADIO FOR MEDICAL ADVICE.**
- Place casualty in the recovery position.



- Give diazepam 10 mg as rectal solution.
- **RADIO FOR MEDICAL ADVICE.**
- If medical advice is unavailable and seizures continue, give a further 10 mg diazepam as rectal solution after 30 minutes.
- Stabilize the cervical spine with a collar if trauma is suspected.

Further advice on convulsions: see appendix 5.

- Give ventilation support with 8 L of oxygen per minute if the victim does not breathe adequately.
- Administer controlled ventilation.



Further advice on oxygen administration: see table 3.

- After the fit is over, let the casualty sleep it off, as he may be rather confused and dazed when he comes round. Reassure him, and do not leave him until you are sure he is aware of his surroundings, and knows what he is doing.



Table 6  
TOXIC MENTAL CONFUSION

Exposure to chemicals and solvents, including alcohol and illicit substances, may result in disorientation in time and space. In these circumstances, the casualty will usually develop the signs and symptoms within 15 to 30 minutes of exposure. Sudden cessation of heavy alcohol consumption may also cause toxic mental confusion.

Signs and symptoms	Treatment
The casualty confuses the day of the week, the month of the year or where they are at that moment in time	<ul style="list-style-type: none"> <li>• There is a risk of loss overboard. The person should be kept under close observation in a locked well lit cabin and given repeated reassurance.</li> <li>• After removal of the casualty from the polluted atmosphere, no specific treatment is usually necessary.</li> </ul>
Agitation (mental agitation, aggressive and sometimes violent behaviour)	<ul style="list-style-type: none"> <li>• If the casualty is difficult to manage, give diazepam 10 mg as rectal solution.*</li> <li>• Repeat, if necessary, 10 mg diazepam 30 minutes later if medical advice is not immediately available and <b>SEEK RADIO MEDICAL ADVICE</b>.</li> </ul>
Agitation, convulsions	<ul style="list-style-type: none"> <li>• Protect the airway from being blocked by the tongue or secretions.</li> <li>• Give diazepam 10 mg as rectal solution.*</li> <li>• <b>RADIO FOR MEDICAL ADVICE.</b></li> </ul>
Excessive exposure to chemicals may lead to convulsions (fits).	
Further advice on treatment of convulsions: see table 5.	
Hallucinations (hearing voices and/or seeing terrifying images)	<ul style="list-style-type: none"> <li>• If the casualty is difficult to manage, give diazepam 10 mg as rectal solution.*</li> <li>• Repeat, if necessary, 10 mg diazepam 30 minutes later if medical advice is not immediately available and <b>SEEK RADIO MEDICAL ADVICE.</b></li> <li>• If there is a history of previous mental illness: <b>SEEK RADIO MEDICAL ADVICE.</b></li> </ul>
Sometimes mental illness may confuse the issue. Schizophrenia often results in hearing voices that are not there.	

\*Note: If administration of diazepam as rectal solution is not possible, give haloperidol 5 mg intramuscularly. Haloperidol (e.g. HALDOL™) may be available in the ship's ordinary medicine chest.

## Table 7 EYE EXPOSURE TO CHEMICALS

Chemical splashes involving the eye may cause local irritation, inflammation, pain and, in severe cases, blindness.  
**TREATMENT IS URGENT**

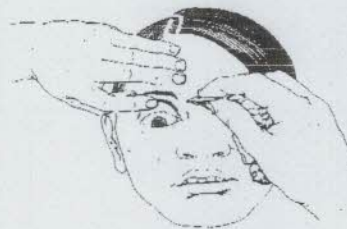
### DECONTAMINATION in all cases of eye contact, regardless of symptoms

#### Eye contamination with solid CALCIUM OXIDE and CALCIUM HYDROXIDE (quicklime; slaked lime)

- To avoid "lime burns", try to swab particles mechanically from the eye before washing.



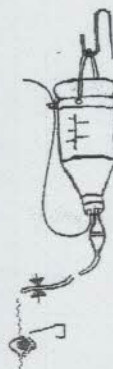
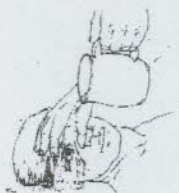
A cotton bud, match or similar object is held over the closed eyelid.



The eyelid is turned inside out over the cotton bud.

#### Eye contamination with other chemicals

- IMMEDIATE** washing of the eye with copious amounts of water.
- Keep the eyelids widely apart as illustrated.
- Remove contact lens.
- Direct water flow from inner to outer corner of the eye. Washing must be done thoroughly for ten minutes, timed by the clock.



- If available, use a 1 L bag of sodium chloride 0.9% with a drip set to irrigate the eye.
- Don't delay. Use water until drip is ready.

#### Signs and symptoms

Pain, redness and watering of the eye

#### Treatment

- Anaesthetic eye drops should be instilled in the eye to ensure adequate irrigation of the eye.
- If pain is severe, anaesthetic eye drops should be instilled in the eye to relieve pain.
- If the eye continues to be painful, give two tablets of paracetamol every 6 hours until the pain is relieved.
- RADIO FOR MEDICAL ADVICE.**



## Signs and symptoms

## Treatment

## Unrelieved severe pain

- If severe pain continues despite 10 minutes irrigation of the eye with water, repeat the eye wash for a further 10 minutes after instilling anaesthetic eye drops and **RADIO FOR MEDICAL ADVICE**.
- Give 10 mg morphine sulphate and 10 mg metoclopramide intramuscularly, if advised medically.

Further advice on pain relief: see table 13.

## Loss of vision

- This is a **MEDICAL EMERGENCY**.
- Irrigate the eye as described above and seek **URGENT** medical advice.

Further advice on the treatment of eye injury: see appendix 7.

Table 8  
**SKIN EXPOSURE TO CHEMICALS**

Skin exposure to chemicals may cause local damage of either chemical burn or frost-bite. Chemical burns resemble thermal burns, with redness, irritation, swelling, pain, blistering and ulceration.

The chemical may be absorbed through the skin, causing general symptoms of poisoning; these symptoms may be delayed for several hours.

Limited exposure to leaking refrigerator gases, compressed gases or solid carbon dioxide (dry ice) may cause local frost-bite that, in principle, will cause the same damage as chemical or thermal burns and is treated accordingly. No special treatment instructions are needed – refer to chemical burns.

In extended burns, fluid loss may be serious.

**DECONTAMINATION in all cases of skin exposure,  
regardless of chemical or symptoms**

- Chemical protective gloves and clothing should be used while washing the casualty's skin. After decontamination, it is not necessary to use protective clothing.
- Carefully remove and double-bag contaminated clothing and personal belongings. Cut off the clothes, if necessary.
- If the chemical has affected eyes and skin, **the eyes should have PRIOR attention.**
- **IMMEDIATE** washing with copious amounts of water for at least 10 minutes while removing contaminated clothing, rings, wristwatches, etc. **Don't delay.**
- Do not use neutralizing substances.
- Remove the casualty to the ship's hospital.
- Continue washing the skin for additional 10 minutes with soap or shampoo and water.

**Exposure to PHOSPHORUS (WHITE OR YELLOW) which ignites in air**

- Keep the injured part of the body under water or covered with wet dressings.
- Using chemical protective gloves, remove the phosphorus with a clean spoon or forceps.

**Exposure to HYDROFLUORIC ACID**

- Using latex gloves, massage exposed area with calcium gluconate gel for at least 15 minutes or until pain is relieved. Leave the gel on the skin. The gel should be re-applied 4 to 6 times daily for 3 to 4 days if a chemical burn is present.

Further advice: see table 16.

**Signs and symptoms**

Burning pain with redness and/or swelling of contaminated skin, irritating rash

Chemical burns

**Treatment**

- After washing with water, wash exposed areas thoroughly (including skin folds, nail beds and hair) with soap or shampoo and water. Clean away from the burn in every direction. **DO NOT** use cotton wool for cleaning as it is likely to leave bits in the burn.
- Dab gently any remaining dirt using a swab soaked in warm water. **BE GENTLE** as this may cause pain.
- Cover burns with a sterile dressing (e.g. perforated silicone dressing or vaseline gauze), overlapping the burn or scald by 5 to 10 cm (2 to 4 inches). Then apply a covering of absorbent material (e.g. a layer of sterile cotton wool) and a suitable bandage.

Further advice on chemical burns: see appendix 8.



**Signs and symptoms****Blisters****Pain**

Further advice on pain relief: see table 13.

**Blisters and ulcers**

Blisters, ulcers covering an area exceeding 9% of body surface (corresponding to 9 times the size of the palm of the hand)

**Treatment**

- Leave blisters intact.
- If blisters have burst, clip off the dead skin by using a sterilized pair of scissors. Flood area with clean, lukewarm (previously boiled) water from a clean receptacle to remove debris.
- Cover blisters with a sterile dressing (e.g. perforated silicone dressing or vaseline gauze), overlapping the burn or scald by 5 to 10 cm (2 to 4 inches). Then apply a covering of absorbent material (e.g. a layer of sterile cotton wool) and a suitable bandage.
- Give two tablets of paracetamol every six hours until the pain is relieved.
- If there is very severe pain, give 10 mg morphine sulphate and 10 mg metoclopramide intramuscularly, if advised medically.
- **SEEK MEDICAL ADVICE**
- If breakthrough pain persists after 15 minutes or more, give a second injection of 10 mg morphine sulphate intramuscularly.

- Dressings should be left undisturbed for 3 to 4 days unless the dressing becomes smelly or very dirty, or the temperature is raised. Redress such areas as described above.
- Provide adequate relief for continuing pain (see above).
- In addition to normal food and fluid intake give:  
**The first 24 hours:** For every 10% of the body surface area with burns, give 3 L of salted water (1½ teaspoonfuls of table salt in 1 L) intermittently to help replace fluid loss.  
**24 to 48 hours:** For every 10% of the body surface area with burns, give 1½ L of fluids (preferably oral rehydration salt solution – ORS) intermittently.
- **RADIO FOR MEDICAL ADVICE.**  
**After 48 hours** the fluid intake should in principle be normal.
- Check for urine output that should be approximately 30 to 50 mL per hour (approximately 1 L per 24 hours).

Further advice on fluid replacement: see appendix 13.

**FOLLOW-UP**

- › A patient who has had significant exposure or any symptoms related to exposure should be kept warm in bed and closely observed for 48 hours and **RADIO MEDICAL ADVICE OBTAINED**.
- › Emergency transport for on-shore hospital evaluation will usually be required.

## Table 9 INHALATION OF CHEMICALS

Inhalation of chemicals may cause suffocation (asphyxia) due to:

- Obstruction to breathing in the throat or the air passage through spasm of the air tubes or by swelling of the linings of the voice box due to irritant fumes;
- Fluid in the lung air spaces caused by irritant fumes;
- Poisoning of the blood which prevents the carriage or use of oxygen in the body caused by, for example, carbon monoxide and cyanide;
- Poisoning of the mechanism of breathing in the chest (e.g. by organophosphate pesticides) or the brain (e.g. by chlorinated hydrocarbons);
- Gases which do not support life because they replace oxygen in the atmosphere (e.g. carbon dioxide, nitrogen).

Vapours of volatile liquids often have a pleasant or disagreeable odour. They may cause lightheadedness, dizziness, headache or nausea.

A few gases have delayed corrosive effects on the lungs.

For advice on CPR in cases of suffocation: see table 2.

For advice on chemical hazards of fire: see appendix 9.

For advice on chemical hazards of welding: see appendix 9.

**WARNING:** Any casualty who has been gassed and has impaired consciousness must **NOT** be treated with morphine.

### Signs and symptoms

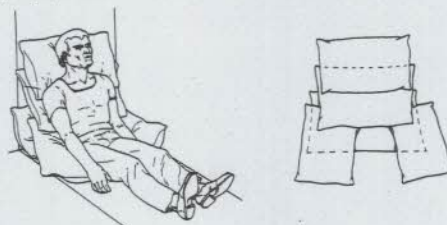
Soreness of throat, hoarseness or cough

Dry cough, mild breathlessness and wheezing

Severe breathlessness and wheezing

### Treatment

- Remove the casualty from the polluted atmosphere, have him rinse his mouth and give one glass of water to drink.
- The casualty should be put to bed and placed in the high sitting-up position.



- If breathlessness or wheezing are present, give oxygen at a flow rate of 8 L per minute until symptoms resolve.
- Additionally, administer by spacer device:  
200 µg salbutamol or 500 µg terbutaline and  
250 µg beclomethasone or 400 µg budesonide every  
15 minutes for the first hour.
- At the same time: **RADIO FOR MEDICAL ADVICE.**
- If breathlessness and wheezing persist after the first hour, continue with oxygen and repeat administration of salbutamol/terbutaline and beclomethasone/budesonide every 2 hours for the next 10 hours, and then 4 times a day until symptoms resolve.



**Signs and symptoms**

Severe breathlessness and frothy sputum, blue discoloration of the skin, anxiety and sweating (pulmonary oedema)

**Treatment**

- Casualties must be handled extremely carefully. All strain must be avoided.
- **RADIO FOR MEDICAL ADVICE.**
- Arrange for evacuation. The casualty will need to be transferred to a shore hospital as soon as possible.

Further advice on breathing difficulty: see appendix 9.

- Give oxygen, salbutamol/terbutaline and beclomethasone/budesonide as above.
- Use a sucker, if available, to get rid of the frothy secretions.
- If the casualty is very breathless, give 50 mg furosemide (frusemide) by intramuscular injection to increase the urine output.
- If symptoms persist, continue with oxygen and repeat administration of salbutamol/terbutaline and beclomethasone/budesonide every 2 hours for the next 10 hours, and then 4 times a day until symptoms resolve.

Fever, breathlessness, productive cough, increased pulse rate (over 110 per minute)

- **RADIO FOR MEDICAL ADVICE.**
- The casualty should be put to bed and placed in the high sitting-up position.

Further advice on diagnosis of breathing problems: see appendix 9.

- Give 500 mg amoxicillin every 8 hours.

**Note:** Some are allergic to penicillins, including amoxicillin. In such cases, give 500 mg erythromycin 4 times daily.

- If the patient is breathless, wheezing or blue, oxygen should be given continuously together with 200 µg salbutamol or 500 µg terbutaline 4 times daily by spacer device, until the symptoms and signs improve.

**FOLLOW-UP**

A patient who has had significant exposure or any symptoms related to exposure should be kept warm in bed and closely observed for 48 hours and **RADIO MEDICAL ADVICE OBTAINED.**

## Table 10 INGESTION OF CHEMICALS

Ingestion of hazardous materials at sea is rare but can occur through attempted suicide, contaminated food or water, or through poor personal hygiene.

Ingestion of a toxic material can cause retching, vomiting (sometimes the vomit is blood-stained), abdominal pain, colic and later diarrhoea. Particularly severe symptoms are caused by corrosives, strong acids, alkalis or disinfectants which burn the lips and mouth and cause intense pain, and rarely perforation of the gut.

Ingested poisons can also produce general toxic effects (e.g. impaired consciousness, convulsions, or heart, liver and acute kidney failure) with or without irritation of the gastrointestinal tract, and such effects can be delayed.

**In all cases of ingestion, if the casualty is completely alert and able to swallow, treat as follows:**

- Have the casualty rinse mouth with water. Give one glass of water to drink.
- Observe in a place of safety for at least 8 hours.
- If a significant amount of material has been ingested and the casualty complains of pain in the mouth or the stomach, give two tablets of paracetamol every 6 hours until the pain is relieved. **RADIO FOR MEDICAL ADVICE.**

Further advice on ingestion of chemicals: see appendix 10.

- Vomiting should not be induced!
- Do not give salt water to induce vomiting, as it may be dangerous to do so.
- Inducing vomiting by stimulating the back of the throat is usually ineffective and may cause aspiration of the chemical into the lungs, and therefore should not be attempted.
- Dilution with large amounts of water or other liquid is not recommended as it may increase the absorption of the chemical.
- Syrup of Ipecac is not recommended, as it may cause aspiration of the chemical into the lungs and there is no evidence of clinical benefit from its use.
- Activated charcoal is usually not recommended at sea because if unconsciousness occurs it may be inhaled into the lungs. Its use in a given case should always be discussed with the radio medical advice.

Refer to IMGS or equivalent national medical guide.

### Signs and symptoms

Frequent vomiting

Bleeding (bright red blood, dark brown "coffee ground" vomit or black, tarry, foul-smelling faeces)

### Treatment

- Frequent and prolonged vomiting is a bad sign. Give 10 mg metoclopramide intramuscularly; repeat 2 hours later if vomiting persists.
- Do not give solid food.
- If severe bleeding occurs, there may be circulatory collapse: see table 11.
- **RADIO FOR MEDICAL ADVICE.**



## Signs and symptoms

Perforation of the gut (severe pain all over the abdomen, board-like rigidity of the abdominal wall, shock)

Note: No bowel sounds are heard on listening to the abdomen with a stethoscope.

Further advice on pain relief: see table 13.

## Treatment

- **RADIO FOR MEDICAL ADVICE.**
- Arrange for evacuation. The casualty will need to be transferred to a shore hospital as soon as possible.
- Give 10 mg morphine sulphate and 10 mg metoclopramide intramuscularly, if advised medically.
- If advised medically, give cefuroxime 750 mg intramuscularly every 8 hours and a metronidazole 1 g suppository every 8 hours.
- Institute a rectal infusion with rehydration salts while awaiting the transfer of the casualty to shore hospital.
- The intravenous administration of fluids may be required.

Further advice on rectal infusion and other fluid replacement: see appendix 13.

## FOLLOW-UP

- If the casualty is free of symptoms 8 hours after ingestion, no further action is usually required.
- Remember that vomit may be inhaled into the lungs, causing difficulty in breathing; if this occurs, treat as for inhalation: see table 9.
- A patient who has had significant exposure or any symptoms related to exposure should be kept warm in bed and closely observed for 48 hours and **RADIO MEDICAL ADVICE OBTAINED.**
- If ingestion was intentional, continuous observation and medical advice is required. Put casualty ashore as soon as possible for hospital evaluation.

Table 11  
**SHOCK**

Chemical burns and chemical-induced bleeding from the gut may cause circulatory collapse and shock with diversion of the blood from the limbs to maintain an adequate blood (and oxygen) supply to the brain and heart. Severe pain from chemical burns may also contribute to shock.

There are also a number of chemicals which are toxic to the heart directly and result in reduced pump action of the heart.

Severe shock may threaten the life of the casualty.

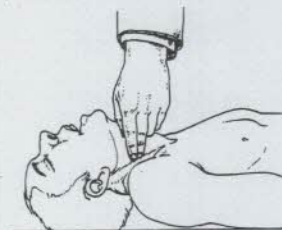
If shock is prolonged, acute kidney failure may result: see table 12 and appendix 12.

### Signs and symptoms

Pale, cold skin, often moist; later the skin may develop a bluish, ashen colour; rapid and shallow or irregular and deep breathing; rapid, weak but false pulse; anxiety and sweating

### Treatment

- The casualty should be placed in a horizontal position. His legs should be elevated approximately 30 cm unless there is injury to the head, pelvis, spine, or chest, or difficulty in breathing.
- Loosen clothing around the neck.
- Check for a pulse. The best pulse to feel in an emergency is the carotid. Feel for five seconds before deciding it is absent. If it cannot be felt or is feeble, there is insufficient circulation and CPR may be necessary: see table 2.



- Measure and record pulse and blood pressure every 15 minutes.
- Give oxygen at a flow rate of 8 L per minute until symptoms resolve.
- Keep the casualty warm.
- Within the first 24 hours, give for every 10% of the body surface area with burns 3 L of salted water (1½ teaspoonfuls of table salt in 1 L) intermittently as often as the casualty tolerates (e.g. one glass every 10 minutes).
- Liquids should not be given by mouth if the patient is drowsy, convulsing, or about to have surgery.
- The intravenous or rectal administration of fluids may be required.
- **RADIO FOR MEDICAL ADVICE.**

### Shock due to chemical burns

### Shock due to chemical-induced bleeding from the gut

Further advice on fluid replacement: table 8 and appendix 13.

Further advice on pain relief: see table 13.

### Breathing has stopped, no pulse

- Institute CPR: see table 2.



## FOLLOW-UP

## Signs and symptoms

A reduction in the amount of urine passed

No urine is passed

## Treatment

This may be due to the onset of acute kidney failure.

- Measure and keep a record of the urine passed. Adjust the fluid intake until transfer to hospital is possible: see table 12.
- **RADIO FOR MEDICAL ADVICE IN ALL CASES.**
- Seek **URGENT RADIO MEDICAL ADVICE**. Arrange for evacuation. The casualty will need to be transferred to a shore hospital as soon as possible.

Table 12  
ACUTE KIDNEY FAILURE

Most chemicals are excreted by the kidneys, which may be damaged in the process. In severe poisoning, acute kidney failure may develop after 24 hours, and if it does not improve, the casualty may die after 7 to 14 days.

- Acute kidney failure must not be confused with retention of urine in the bladder.
- Acute kidney failure may arise for reasons other than chemical poisoning.

Further advice on acute kidney failure: see appendix 12.

### Signs and symptoms

A steady reduction in the amount of urine passed

No urine is passed

### Treatment

This may be a warning of the onset of acute kidney failure.

- Record casualty's fluid intake and urine output carefully on a chart as shown in appendix 12.
- Volume of urine passed, if any, should be measured and recorded every 2 hours.
- If less than 125 mL of urine is passed in 6 hours, check whether bladder is over-full.
- If not full, then acute kidney failure is present.
- This may be due either to an over-full bladder or acute kidney failure.
- **RADIO FOR MEDICAL ADVICE.**
- If medical advice is not available, insert a urinary catheter into the bladder: refer to IMGS or equivalent national medical guide.
- If bladder is over-full (retention), leave the catheter in place and **SEEK RADIO MEDICAL ADVICE.**
- If there is less than 125 mL of urine in the bladder and the casualty has not passed urine for more than 6 hours, **SEEK URGENT RADIO MEDICAL ADVICE.**



**Table 13**  
**PAIN RELIEF**

The use of analgesics (pain-killing drugs) is a very important step in the treatment of poisoning associated with severe tissue damage. Pain relief calms the casualty and stabilizes his condition. Paracetamol is a mild analgesic and morphine is used to treat severe pains. As morphine often causes vomiting, it should be combined with an anti-emetic such as metoclopramide.

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**Mild to moderate pain**

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- Give two tablets of paracetamol every 6 hours until the pain is relieved.
- 

**Severe pain**

---

*Casualty is breathing normally:*

- **RADIO FOR MEDICAL ADVICE.**
- If advice is not available:
  - 1 Give morphine sulphate 10 mg and metoclopramide 10 mg intramuscularly.
  - 2 If breakthrough pain persists after 15 minutes or more, give a second injection of 10 mg of morphine sulphate intramuscularly.
  - 3 After 4 hours, if pain persists or recurs, give 10 to 20 mg morphine sulphate with a further dose of 10 mg metoclopramide intramuscularly.
  - 4 Where pain persists, the third and subsequent doses of 10 to 20 mg morphine sulphate must not be given more frequently than every 4 hours with metoclopramide 10 mg but the total dose of metoclopramide must not exceed 30 mg each 24 hours.
- Follow medical advice if available.

*Casualty is breathing poorly:*

- Administer oxygen at a flow rate of 6 to 8 L per minute.
  - **RADIO FOR MEDICAL ADVICE.** Evacuation to shore hospital is likely to be needed.
  - If medical advice is not available and the pain is excruciating, give morphine sulphate 10 mg and metoclopramide 10 mg intramuscularly.
  - If breakthrough pain persists after 15 minutes or more, give a second injection of 10 mg of morphine sulphate intramuscularly. **OBSERVE CAREFULLY FOR FURTHER DETERIORATION.**
  - **RADIO FOR MEDICAL ADVICE** if not received previously.
- 

**Slow irregular breathing after morphine**

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- The following signs may indicate over-treatment with morphine:
  - Irregular breathing pattern;
  - Shallow and slow breathing;
  - Development of unconsciousness if the casualty was conscious at first;
  - Small pin-point pupils.
- If breathing is inadequate, give ventilation support and administer oxygen: see table 3.
- **RADIO FOR MEDICAL ADVICE**
- If medical advice is not available, give 0.4 mg naloxone intramuscularly. Naloxone counteracts the side effects of morphine.
- Repeat the dose within 15 minutes if the casualty's condition does not improve and medical advice is not available.

- If there is no improvement after these two injections (total dose of 0.8 mg) of naloxone, it is very unlikely the deterioration is due to an overdose of morphine.
- If there is a response, and then further deterioration occurs, give a further dose of 0.4 mg of naloxone.

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### **Morphine is a controlled substance as it is an addiction-producing drug**

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- Obtain **RADIO MEDICAL ADVICE** if at all possible prior to the use of morphine. Keep an exact record of morphine use.
- Keep an exact record of morphine use.
- Keep stock locked away.
- Discontinue as soon as the pain can be relieved by paracetamol.
- If, under certain radio conditions, radio medical advice is not feasible, it is up to the master's discretion to ensure that adequate morphine is administered when pain is excruciating.



Table 14

**CHEMICAL-INDUCED BLEEDING**

Some anti-coagulant pesticides ("super-warfarine") inhibit the normal blood clotting and lead to bleeding which may rarely be life-threatening, particularly if it occurs from the stomach. These effects may be delayed for 24 to 48 hours after exposure and can last for several weeks.

**Signs and symptoms**

Bleeding from the nose and gums,  
blood in the urine, vomiting blood,  
vomiting "coffee grounds",  
black and tarry diarrhoea

**Treatment**

- Remove the casualty to the ship's hospital.
- **RADIO FOR MEDICAL ADVICE.**
- Arrange for evacuation. The casualty will need to be transferred to a shore hospital as soon as possible.
- Give 10 mg phytomenadione (vitamin K<sub>1</sub>) intramuscularly, if there is any delay in evacuation.
- If bleeding persists **RADIO FOR MEDICAL ADVICE** and give a further 10 mg phytomenadione intramuscularly, if advised.
- Massive bleeding can only be counteracted by infusion of plasma expanders.

Further advice on fluid replacement: see appendix 13.

Table 15  
**CHEMICAL-INDUCED JAUNDICE**

Jaundice refers to the yellow discoloration of the skin and eyes. The condition can be caused by liver disease or the breakdown of red blood cells (haemolysis).

#### LIVER DISEASE

The liver is the chemical factory where the body attempts to destroy all poisons. The most common cause of liver injury is the excessive intake of ethyl alcohol. Infectious agents can also cause liver disease (hepatitis) and jaundice.

The liver can rarely be damaged by certain chemicals, e.g. chlorinated hydrocarbons, metal salts and phosphorus. Chemical-induced liver injury does not show itself until two to three days after poisoning.

In severe cases, rapid and progressive failure of the liver can lead to increasing drowsiness followed by loss of consciousness and death after several days.

#### HAEMOLYSIS

Haemolysis of red blood cells can occur when there is either mechanical destruction of the cells (e.g. in certain heart conditions) or in certain types of blood disorders. Rarely, haemolysis can also result from overexposure to certain chemicals. There is no specific therapy of haemolysis on board a marine vessel but potential complications of kidney dysfunction due to the heavy overload of haemolytic products should be mitigated by high fluid intake. Urine output should be closely monitored.

#### Signs and symptoms

Yellowing of skin and eyes;  
pain or tenderness in the right upper abdomen;  
urine becomes dark brown,  
and the stool pale in colour

#### Treatment

- **RADIO FOR MEDICAL ADVICE.**
- The casualty should be transferred to a shore hospital as soon as possible.
- The casualty should rest in bed and be kept warm.
- Although the casualty may be feeling sick, he should be encouraged to take a high-carbohydrate diet in the form of liquids and bread. Liquids should contain at least two teaspoonfuls of sugar in a glass of water every 2 hours.
- No drugs should be given unless there is severe vomiting, in which case give 10 mg metoclopramide intramuscularly; repeat 2 hours later if vomiting persists.
- Alcoholic beverages should be completely avoided until on-shore clinical evaluation is obtained.

#### FOLLOW-UP

If there is a rapid onset of the symptoms and signs, associated with drowsiness or coma, then the damage is likely to be severe: **RADIO FOR MEDICAL ADVICE.** Arrange for evacuation. The casualty will need to be transferred to a shore hospital as soon as possible.



Table 16

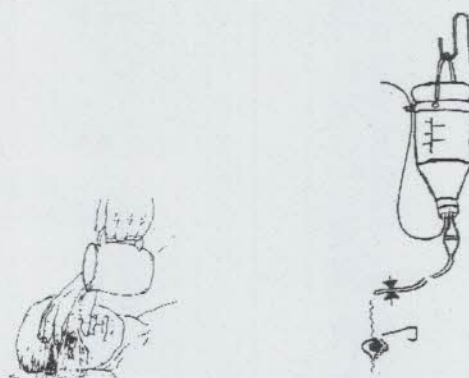
**HYDROFLUORIC ACID AND HYDROGEN FLUORIDE**

These chemicals are corrosive to living tissue. They may cause deep, slowly healing, and painful burns. Systemically, damage to the heart and convulsions may occur. Several fluorides react with water forming hydrogen fluoride.

The onset of local reactions, pain and other symptoms may be delayed up to 24 hours after exposure to lower concentrations. The surface of the skin may not be destroyed for several hours, but the increasing pain and redness indicate a continuing destruction of tissues underneath the skin.

**Treatment for EYE CONTACT in all cases of exposure, regardless of symptoms**

- **IMMEDIATE** washing of the eye with copious amounts of water.
- Remove contact lens.
- Keep the eyelids widely apart as illustrated.
- Direct water flow from inner to outer corner of the eye. Washing must be done thoroughly for 10 minutes, timed by the clock.



- Anaesthetic eye drops should be instilled in the eye to ensure adequate irrigation of the eye.

Further advice on eye treatment: see table 7.

**Treatment for SKIN CONTACT in all cases of exposure, regardless of symptoms**

- Chemical protective gloves and clothing should be used while washing the casualty's skin. After decontamination, it is not necessary to use protective clothing.
- Cut, if necessary, the clothes by using shears.
- **IMMEDIATE** washing with copious amounts of water for at least 10 minutes while removing contaminated clothing, rings, wristwatches, etc.
- After washing with water for 10 minutes, dry skin.
- Using latex gloves, massage exposed area with calcium gluconate gel for at least 15 minutes or until pain is relieved. Leave the gel on the skin. The gel should be re-applied 4 to 6 times daily for 3 to 4 days if a chemical burn is present.

If skin exposure exceeds 1% of body surface (approximately the size of the palm of the hand)  
and local symptoms (redness, pain, blisters)

- Give 5 g calcium gluconate, as effervescent tablets in 250 mL (half a pint) of water, to drink immediately and repeat 2 hours later.
- If calcium gluconate is not available, give milk.
- **RADIO FOR MEDICAL ADVICE.**

Further advice on treatment of skin burns: see table 8.

### Treatment for INHALATION in all cases of exposure, regardless of symptoms

- Remove the casualty from the polluted atmosphere, have him rinse his mouth and give one glass of water to drink.
- If breathlessness or wheezing are present, give oxygen at a flow rate of 8 L per minute until symptoms resolve.
- RADIO FOR MEDICAL ADVICE.

Further advice on breathing problems: see table 9.

### Treatment for INGESTION in all cases of exposure, regardless of symptoms

- RADIO FOR MEDICAL ADVICE.
- Have the casualty rinse mouth with water.
- Give 5 g calcium gluconate, as effervescent tablets in 250 mL (half a pint) of water, to drink immediately and repeat 2 hours later.
- If calcium gluconate is not available, give milk.

#### Signs and symptoms

Vomiting, abdominal pain, diarrhoea

Shock

Convulsions (seizures, fits)

#### Treatment

- RADIO FOR MEDICAL ADVICE and see table 10.
- RADIO FOR MEDICAL ADVICE and see table 11.

See table 5.



Table 17

**ORGANOPHOSPHATE AND CARBAMATE INSECTICIDES**

Organophosphorus and carbamate insecticides cause disturbances in the transmission of nerve impulses to target organs such as muscles and glands by inhibiting the enzyme acetylcholinesterase.

Signs and symptoms may include:

- Headache, nausea, dizziness, fatigue
- Blurred vision, pin-point pupils
- Confusion
- Vomiting, abdominal cramps and diarrhoea
- Sweating, salivation, watering of the eyes, and increased nasal and lung secretions
- Muscle twitching, weakness, tremor, convulsions
- Tightness in the chest, wheezing, slow pulse, respiratory and cardiac arrest.

Symptoms usually develop during exposure or within 12 hours after contact. The acute intoxication stage usually does not last longer than 48 hours unless exposure has been prolonged or the insecticide has been ingested. Recovery from exposure to carbamate insecticides usually occur within 24 hours.

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**Treatment for EYE CONTACT in all cases of exposure, regardless of symptoms**


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- **IMMEDIATE** washing of the eye with copious amounts of water.

Further advice on eye treatment: see table 7.

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**Treatment for SKIN CONTACT in all cases of exposure, regardless of symptoms**


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- **IMMEDIATE** washing with soap or shampoo and copious amounts of water for at least 10 minutes while removing contaminated clothing, rings, wristwatches, etc.
- The casualty should shower thoroughly.
- Chemical protective gloves should be worn by those attending the exposed individual to prevent self-contamination.

Further advice in cases of skin burns: see table 8.

- Contaminated clothing should be kept in properly labelled bags until washing.
- Remove the casualty to the ship's hospital.
- **RADIO FOR MEDICAL ADVICE** if symptoms develop.

---

**Treatment for INHALATION in all cases of exposure, regardless of symptoms**


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(Toxic effects may be expected particularly after inhalation of dust and mist)

- Remove the casualty from the polluted atmosphere, have him rinse his mouth and give one glass of water to drink.
- Remove clothes and shower thoroughly.
- **RADIO FOR MEDICAL ADVICE** if symptoms develop.

---

**Treatment for INGESTION in all cases of exposure, regardless of symptoms**


---

- Have the casualty rinse his mouth thoroughly with water.
- **RADIO FOR MEDICAL ADVICE.**



### Signs and symptoms irrespective of routes of exposure

Blurred vision, headache, nausea, fatigue or dizziness

Vomiting, cramp-like abdominal pains, excessive sweating and salivation, tightness in the chest or twitching of the muscles

Respiratory difficulty with excessive lung secretions, paralysis with complete loss of muscle function, slow pulse, or unconsciousness

### Treatment

- Observe in a place of safety.
- **RADIO FOR MEDICAL ADVICE.**
- If the casualty becomes free of symptoms, no further action is required.
- **RADIO FOR MEDICAL ADVICE.**
- Inject 1 mg atropine intramuscularly. If the skin and mouth have not become dry within 30 minutes, give a further dose of 1 mg atropine intramuscularly. In casualties severely poisoned with an organophosphorus insecticide, very large doses (10 to 15 mg) of atropine may be required.
- **CAUTION:** Overdosage of atropine may lead to fever, restlessness, hallucinations and disorientation, followed by depression, respiratory arrest and death. If atropine toxicity is suspected, discontinue further treatment with atropine.
- Administer controlled ventilation with oxygen at a flow rate of 8 L per minute and heart compression as warranted.
- If a medically trained individual is available, atropine should be given intravenously as follows: 1 to 2 mg repeated every 15 minutes until lung secretions have dried up.
- Transfer to shore hospital is **URGENT**.

Further advice: see table 2 and table 3.

### FOLLOW-UP

- A patient who has had significant exposure or any symptoms related to exposure should be kept warm in bed and closely observed for 48 hours and **RADIO MEDICAL ADVICE OBTAINED**.
- Since atropine has a short action, vomiting, cramp-like pains, excessive sweating and salivation or tightness of the chest may reappear after initial improvement with atropine therapy.
- If these symptoms recur, repeat injection of atropine as described above. In very severe poisoning this may be necessary for 24 to 48 hours.
- Some organophosphorus insecticides may damage the nerves in the limbs after the casualty's recovery from acute poisoning. The muscles controlled by those nerves may become weak, and paralysis with complete loss of muscle function may occur.
- **RADIO FOR MEDICAL ADVICE AND TRANSFER THE CASUALTY TO A SHORE HOSPITAL AS SOON AS POSSIBLE.**

**Table 18**  
**CYANIDES**

Cyanides are fast acting, highly poisonous materials. They may be fatal if inhaled, swallowed, or absorbed through the skin and are extremely hazardous when in liquid and vapour form under pressure.

Signs and symptoms may include:

- Headache, nausea and dizziness
- Drowsiness, drop in blood pressure, rapid pulse
- Convulsions, unconsciousness
- Impaired respiration

With prompt rescue and treatment following exposure, recovery is normally quick and complete. Mouth-to-mouth resuscitation should be avoided in CPR to prevent the rescuer from being exposed.

#### **Treatment for EYE CONTACT in all cases of exposure, regardless of symptoms**

- **IMMEDIATE** washing of the eye with copious amounts of water.

Further advice on eye treatment: see table 7.

#### **Treatment for SKIN CONTACT in all cases of exposure, regardless of symptoms**

- **IMMEDIATE** washing with soap or shampoo and copious amounts of water for at least 10 minutes while removing contaminated clothing, rings, wristwatches, etc.
- Remove the casualty to the ship's hospital.

#### **Treatment for INHALATION in all cases of exposure, regardless of symptoms**

- Remove the casualty from the polluted atmosphere. Ensure that rescuers are equipped with respiratory protection so that they do not become poisoned also.
- After removal of the casualty from the polluted atmosphere, usually no specific treatment is necessary unless breathing is depressed or absent.

If breathing is absent, give CPR and oxygen: see table 2 and table 3.

#### **Treatment for INGESTION in all cases of exposure, regardless of symptoms**

- Have the casualty rinse his mouth with water.
- **RADIO FOR MEDICAL ADVICE.**

#### **Signs and symptoms irrespective of routes of exposure**

Nausea or dizziness; slurred speech, confusion or drowsiness; difficulty in breathing and impaired consciousness

#### **Treatment**

- Give oxygen at a flow rate of 8 L per minute until symptoms resolve.
- Observe in a place of safety for 8 hours.
- **RADIO FOR MEDICAL ADVICE.**
- If the casualty becomes free of symptoms within 8 hours after exposure, no further action is required.



Table 19

**METHANOL (METHYL ALCOHOL) AND ETHYLENE GLYCOL**

Methanol and ethylene glycol ("antifreeze") are particularly dangerous when swallowed. Poisoning by methanol absorption through the intact skin may also occur if methanol-soaked clothes are worn. The administration of alcohol (ethyl alcohol, ethanol) will reduce the risk of toxicity.

Signs and symptoms may include:

- Drunkenness, headache, nausea
- Blurred vision, avoidance of daylight (in methanol poisoning)
- Unconsciousness, impaired breathing

Onset of signs and symptoms may be delayed, particularly if alcohol (ethyl alcohol, ethanol) has been drunk at the same time.

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**Treatment for SKIN CONTACT in all cases of exposure, regardless of symptoms**


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- The casualty should remove contaminated clothing and wash with soap and water.

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**INGESTION**


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**Signs and symptoms**

If a mouthful or more is swallowed, regardless of symptoms

Drunkenness, headache, fatigue, blurred vision, photophobia (avoidance of daylight)

Unconsciousness with less than eight respirations of normal depth per minute or respiratory arrest

**Treatment**

- **RADIO FOR MEDICAL ADVICE IN ALL CASES.**
- Give 25 mL of ethyl alcohol 99.5% in 250 to 300 mL water or soft drink.
- This is a **MEDICAL EMERGENCY**. The casualty should be transferred to a shore hospital as soon as possible.
- Continue to give water or soft drink with ethyl alcohol as above every 3 hours until the casualty can be evacuated.
- Administer controlled ventilation with oxygen at a flow rate of 8 L per minute and heart compression as warranted.

Further advice on CPR and oxygen administration: see table 2 and table 3.

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**FOLLOW-UP**


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- If the casualty cannot be evacuated, and if medically advised, continue treatment with alcohol (ethyl alcohol).

Further advice on prolonged unconsciousness: see table 4.

- If ingestion was intentional, continuous observation and medical advice is required. Put casualty ashore as soon as possible for hospital evaluation.



## Table 20 RADIOACTIVE MATERIAL

Hazards may come from either the radioactive nature of the material or its chemical nature. The radioactive nature of the material may result in external radiation or internal radiation if the substance is inhaled, ingested or absorbed through the skin.

The acute effects of radiation exposure may include:

- Vomiting
- Weakness
- Headache
- Diarrhoea

Onset and severity of signs indicate the course of illness. After a period of one to three weeks with few symptoms, loss of hair, complicating infections, diffuse bleeding and uncontrollable diarrhoea may be seen in severe cases.

**LIFE IS IN DANGER.**

- Rescue personnel should wear full chemically protective clothing and breathing apparatus.

### In all cases of contamination, treat the casualty as follows:

- Remove persons from the source of radiation as far away as possible.
- Give first aid to any immediate life-threatening problems such as not breathing, heart stopped or serious bleeding.
- Institute CPR, if necessary. Use an oxygen resuscitator. **Do not use mouth-to-nose or mouth-to-mouth resuscitation** to prevent the rescuer from being exposed.
- Wrap stabilised or less injured casualties in blankets to contain contamination whilst you treat any seriously injured casualties.
- Remove the casualty's clothing and personal items which may be contaminated and place them in a plastic bag or sealed box. Label and hold it in a secure place that is not near any occupied space on board until the assistance of radiation experts is available to evaluate them. Treat non-life-threatening injuries at this time. Allow wounds/cuts that are not life-threatening to bleed briefly and then treat.
- Have the casualty blow his nose and gently swab the nasal passages and ears to remove any contaminated particles. Save swabs and nose blows, treat as if contaminated. Rinse the mouth thoroughly.
- If the injuries of an exposed person do not prevent it, have the casualty shower or wash thoroughly, including body hair and eyes, as soon as possible after being removed from the affected area. Hair shampoo may be used during the showering. Take care not to damage the skin when washing.
- Care should be taken to prevent the spread of contaminated washing water. Store any towels, blankets, brushes, etc., used in the decontamination.
- Apply first aid dressings to minor injuries after the decontamination washing.
- Rescue personnel wearing protective clothing and breathing apparatus should be hosed down with water for 10 minutes and should remove and store their clothing, as above, and thoroughly shower, using shampoo, after completing assistance to casualties.
- As soon as possible, take a specimen of urine from every person who has been in direct or indirect contact with the radioactive substance. Keep the urine in a closed receptacle for further analysis.
- **RADIO FOR MEDICAL ADVICE.**
- Do not give any treatment for possible ingestion, inhalation or absorption through the skin of radioactive material except on the advice of a physician.

### Signs and symptoms

Nausea, weakness, sleepiness, loss of appetite

### Treatment

- **RADIO FOR MEDICAL ADVICE.**
- The casualty should be kept at rest under observation in a warm cabin or in the ship's hospital.
- If no vomiting occurs during 2 to 3 days, the casualty should be put under medical supervision at the next port of call.

### Signs and symptoms

Vomiting within 2 to 3 days after exposure

### Treatment

- Give 10 mg metoclopramide intramuscularly; repeat 2 hours later if vomiting persists. An earlier onset of frequent and prolonged vomiting is a bad sign.
- Be prepared to administer shock treatment.
- **RADIO FOR MEDICAL ADVICE AND TRANSFER THE CASUALTY TO A SHORE HOSPITAL AS SOON AS POSSIBLE.**



# Appendices

## Appendix 1 RESCUE

### Integrated response

The potential for hazardous chemical exposures and subsequent injury to personnel exists on board ships that carry hazardous materials. While occurring infrequently, chemical incidents are capable of endangering the health of exposed individuals and emergency personnel directed to assist them. People who have been seriously injured by a hazardous material have a greater chance of recovery without complications when appropriate emergency treatment is provided by trained personnel at the scene, and when the casualty is safely transported to an area where further care can be given. This requires an integrated emergency medical response involving the ship's master and all individuals who may be called upon to rescue and provide medical assistance after an exposure incident.

### Emergency response plan

A common characteristic of the successful management of chemical incidents is adequate contingency planning. Planning requires the involvement of all personnel on board the ship who might be called upon to provide emergency response and first aid to injured individuals.

Every ship carrying dangerous goods should have an emergency response plan which includes the following:

- A listing of individuals who are trained to respond to an exposure incident and administer first aid.
- Methods and procedures for response which are specific for the particular ship, including procedures and equipment for casualty decontamination.
- Location of personal protective equipment and transport equipment.
- Content and frequency of training programmes and drills.
- Location of Material Safety Data Sheets (MSDS), papers related to ship inventories and other documents that might help identify chemicals present at an incident.

### Arrival at the scene

Many first responders are accustomed to immediately attending an injured casualty and may disregard the possibility of danger to themselves. Without proper protection, a rescuer entering a contaminated area risks exposure and the potential for becoming a casualty. Even though rescue of any casualty is important, it should only be attempted after it is certain that the responders, themselves, will not become injured.

Whenever a chemical is unidentified, worst-case assumptions concerning toxicity must be assumed.

Rescuers therefore must NOT:

- Enter a contaminated area without using a pressure-demand self-contained breathing apparatus and wearing full protective clothing;
- Enter an enclosed space unless they are trained members of a rescue team and follow correct procedures;
- Walk through any spilled materials;
- Allow unnecessary contamination of equipment;
- Attempt to recover shipping papers or manifests from contaminated area unless adequately protected;
- Become exposed while approaching a potentially contaminated area;
- Attempt rescue unless trained and equipped with appropriate personal protective equipment (PPE) and protective clothing for the situation.



## Establishment of an exclusion or hot zone

The first rescuer at the site should establish an exclusion zone that encompasses all contaminated areas, but should not become exposed in doing so. No one should be allowed to cross into the zone without wearing a self-contained breathing apparatus and full protective clothing.

## Assessment, decontamination and initial treatment of casualties

Primary goals for emergency personnel in a hazardous materials incident include termination of exposure to the casualty, removal of the casualty from danger, and casualty treatment – while not jeopardizing the safety of rescue personnel.

Termination of exposure can best be accomplished by removing the casualty from the exposure area and removing contaminants from the casualty. If the casualty is removed from the possibility of additional exposure or other dangers and the casualty is no longer contaminated, the level of protection for personnel can be downgraded to a level that will better facilitate the provision of casualty care.

The potential for additional danger to casualty and responder prohibits any medical treatment inside the exclusion zone other than basic life support. The probability of contact with hazardous substances either by subsequent release of materials still in the area, along with dangers of fire or explosion, and the restriction of movement by necessary PPE outweigh the time saved by attempting casualty care in the exclusion or hot zone.

Priority should be given to the Airway, Breathing, and Circulation (ABC, see table 2). Once life-threatening matters have been addressed, rescue personnel can then direct attention to secondary casualty assessment. It is important to remember that appropriate personal protective equipment and clothing must be worn until the threat of secondary exposure is no longer a danger. Therefore, the sooner the casualty becomes decontaminated the sooner response personnel may reduce protective measures or downgrade the level of protection.

During initial casualty stabilization, a gross decontamination should simultaneously be performed. This consists of cutting away or otherwise removing all suspected contaminated clothing, including jewellery and watches, and the brushing or wiping off any obvious contamination. Care should be taken to protect any open wounds from contamination. Every effort should be made by personnel to avoid contact with any potentially hazardous substance.

## Decontamination

Decontamination includes the reduction of external contamination, containment of the contamination that is present, and prevention of the further spread of potentially dangerous substances. In other words, remove what you can and contain what you can't.

Table 7 (EYE EXPOSURE TO CHEMICALS) and table 8 (SKIN EXPOSURE TO CHEMICALS) provide detailed instructions for decontamination.

With a few exceptions, intact skin is less absorptive than injured flesh, mucous membranes, or eyes. Therefore, decontamination should begin at the head of the casualty and proceed downward with initial attention to contaminated eyes and open wounds. Once wounds have been cleaned, care should be exercised so as not to recontaminate them. This can be aided by covering the wounds with a waterproof dressing. For some chemicals, such as strong alkali, it may be necessary to flush exposed eyes with water or normal saline for an extended period of time.

External decontamination should be performed using the least aggressive methods. Mechanical or chemical irritation to the skin should be limited to prevent increased permeability. Contaminated areas should be carefully cleaned under a gentle spray of water with a soft sponge and a mild soap such as dishwashing liquid. Warm water (never hot) should be used. The degree of decontamination should be completed based on the nature of the contaminant, the form of contaminant, the casualty's condition, environmental conditions, and resources available.

Responders should try to contain all runoff from decontamination procedures for proper disposal. The casualty should be isolated from the environment to prevent the spread of any remaining contaminants.

All potentially contaminated casualty clothing and belongings should be removed and placed within properly labelled bags.

## Considerations for casualty treatment

A contaminated casualty is like any other casualty and may be treated as such except that responders must protect themselves and others from dangers due to contamination. Response personnel must first address life-threatening issues and then decontamination and supportive measures. The initial assessment can be accomplished simultaneously with decontamination and additional management completed as conditions allow. The chemical-specific information which is obtained from shipping papers and labels should be incorporated into the proper casualty treatment procedures.



When more than one casualty is involved, proper triage procedures should be implemented.

- If there is only one unconscious casualty (irrespective of the total number of casualties):
  - 1 give immediate treatment to the unconscious casualty only; and
  - 2 send for help.
- If there is more than one unconscious casualty:
  - 1 send for help; and
  - 2 give appropriate treatment to the worst casualty in the priority order of:
    - a casualties who have stopped breathing or have no pulse (see table 2);
    - b casualties who are unconscious (see table 4).
- If the casualty is unconscious or cyanotic (bluish skin) but breathing, connect to portable oxygen.

Presenting signs and symptoms can then be treated as appropriate and when conditions allow. The sooner a casualty has been decontaminated the sooner he or she can be treated like a “normal” casualty. Unless required by life-threatening conditions, preventive invasive procedures, such as intravenous injections, should be performed only in fully decontaminated areas where conditions permit. These procedures may create a direct route for introducing the hazardous material into the casualty.

Oxygen should be given using a bag valve mask with reservoir device (rebreather). The contaminated atmosphere should not mix with the oxygen if possible.

The casualty should be frequently reassessed because many hazardous materials have latent physiological effects. While some cases may require treatment with antidotes, most cases will be handled with symptomatic care.

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### Transport of casualty to medical area of ship

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The casualty should be as clean as possible before transport, and further contact with contaminants should be avoided. Special care should be exercised in preventing contamination of stretchers and others who will subsequently come in contact with the casualty. Protective clothing should be worn by response personnel as appropriate. If decontamination cannot be performed adequately, responders should make every attempt to prevent the spread of contamination and at the very least remove casualty clothing, wrap the casualty in blankets, followed by body bags or plastic or rubber sheets to lessen the likelihood of contamination to equipment and others. Minimize contamination from shoes.

If casualties can walk, lead them out of contaminated area.

If casualties are unable to walk, remove them on backboards or stretchers. Fibreglass backboards and disposable sheeting are recommended.

If a wood backboard is used, it should be covered with disposable sheeting or it may have to be discarded afterwards. Equipment that comes in contact with the casualty should be segregated for disposal or decontamination.

If no other means of removal are available, carefully carry or drag casualties to safety.

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### Medical management of casualty

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If the route of exposure to the casualty is known, the appropriate table should be consulted for guidance.

If the chemical has a specific treatment procedure (see appendix 15), the appropriate table should be consulted.

If the casualty has signs or symptoms, the appropriate table should be consulted.

## Appendix 2 CPR (CARDIO-PULMONARY RESUSCITATION)

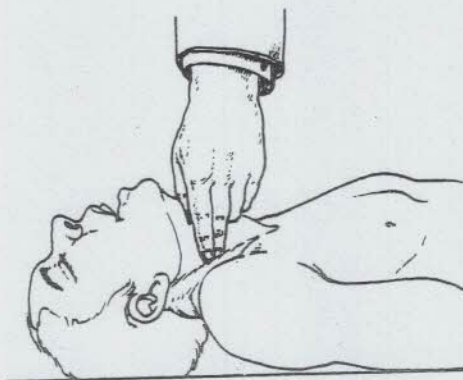
### Assessment of breathing

- Tilt the head firmly backwards with one hand while lifting the neck with the other hand to relieve obstructed breathing.
- Pull the tongue forward.
- Suck or swab out excess secretions.
- Clean any vomit from the mouth and back of the throat.
- Remove any loose dentures.
- Listen and feel for any movement of air, because the chest and abdomen may move in the presence of an obstructed airway, without moving air. The rescuer's face should be placed close to the casualty's nose and mouth so that any exhaled air may be felt against the cheek. Also the rise and fall of the chest can be observed and the exhaled breath heard.
- Look, listen and feel for five seconds before deciding that breathing is absent.



### Assessment of heart function

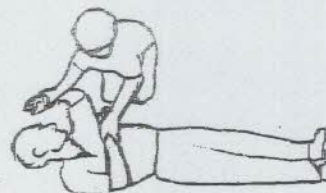
- Check for a pulse. The best pulse to feel in an emergency is the carotid. Feel for five seconds before deciding it is absent. If it cannot be felt or is feeble, there is insufficient circulation.





## Breathing, heart is beating, unconscious

- Insert a Guedel airway (see appendix 3) to prevent the tongue slipping back and obstructing the upper air passage; it should be left in place until the casualty becomes conscious again.
- Place casualty in the recovery position; no pillows should be used under the head:
  - Place the arm nearest to you out at right angles to his body, elbow bent with the hand palm upmost.
  - Bring the far arm across the chest and place the hand, palm down, on the shoulder nearest to you.



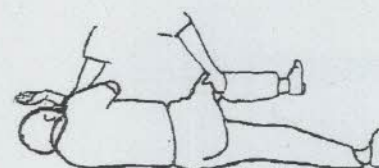
- Grasp the far leg just above the knee and pull it up, keeping the foot on the ground.



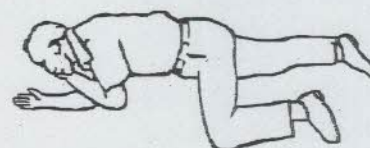
- With your other hand on the far shoulder, pull on the leg to roll the casualty towards you onto his side.



- Adjust the upper leg so that both the hip and knee are bent at right angles.



- Tilt the head back to make sure the airway remains open.



*Guidelines for resuscitation,  
European Resuscitation Council, 1996*

- If the casualty has breathing difficulties and his lips turn blue, give oxygen at a flow rate of 6 to 8 L per minute until symptoms resolve (see appendix 3).
- Keep the casualty warm.
- **RADIO FOR MEDICAL ADVICE.**

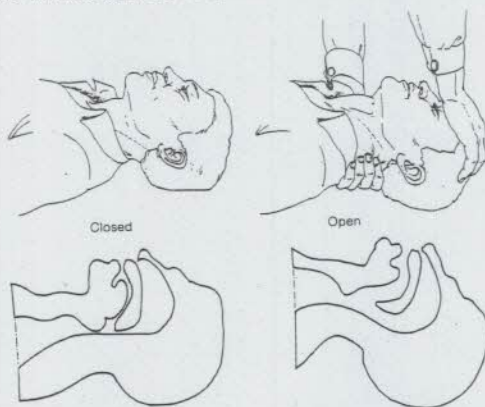
Further advice on subsequent treatment for an unconscious person: see appendix 4.

## Not breathing but heart is beating

### Airway

Establishing an OPEN AIRWAY IS THE MOST IMPORTANT STEP IN ARTIFICIAL RESPIRATION. Spontaneous breathing may occur as a result of this simple measure.

- Place the casualty in a face-up position on a hard surface.
- Put one hand beneath the casualty's neck and the other hand on the forehead. Lift the neck with the one hand, and apply pressure to the forehead with the other to tilt the head backward. This extends the neck and moves the base of the tongue away from the back of the throat. The head should be maintained in this position during the entire artificial respiration and heart compression procedure.



- If only one rescuer is available, the head should be fixed in the shown position by means of a rolled blanket or similar object pushed under the casualty's shoulders.
- If the airway is still obstructed, any foreign material in the mouth or throat should be removed immediately with the fingers.

### Artificial respiration

If the casualty does not resume adequate, spontaneous breathing promptly after his head has been tilted backward, artificial respiration should be given by the mouth-to-mouth or mouth-to-nose method or other techniques. Regardless of the method used, preservation of an open airway is essential.

Before starting artificial respiration, the casualty's clothes should be removed as far as feasible. Otherwise, the rescuer might become poisoned by inhaling vapour or gases emanating from contaminated clothes.

In some circumstances, mouth-to-mouth respiration should be used cautiously. The rescuer should be aware of getting in touch with toxic and caustic materials around the casualty's mouth.

As the artificial respiration must be continued as long as there are signs of life, a resuscitator should be made available as soon as possible.

### Mouth-to-mouth respiration

- Keep the casualty's head at a maximum backward tilt with one hand under the neck.
- Place the heel of the other hand on the forehead, with the thumb and index finger towards the nose. Pinch together the casualty's nostrils with the thumb and index finger to prevent air from escaping. Continue to exert pressure on the forehead with the palm of the hand to maintain the backward tilt of the head.





- Take a deep breath, then form a tight seal with your mouth over and around the casualty's mouth.
- Blow in until the casualty's chest rises.
- Watch the casualty's chest while inflating the lungs. If adequate respiration is taking place, the chest should rise and fall.
- Remove your mouth and allow the casualty to exhale passively. If in the right position, the casualty's exhalation will be felt on your cheek.

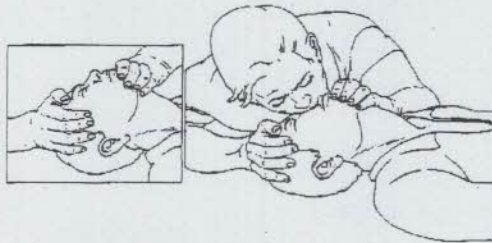


- Take another deep breath, form a tight seal around the casualty's mouth and blow into the mouth again. Repeat this procedure 10 to 12 times a minute, once every 5 seconds.
- If there is no air exchange, and an airway obstruction exists, reach into the casualty's mouth and throat to remove any foreign matter with your fingers; and resume artificial respiration. A foreign body should be suspected if you are unable to inflate the lungs, despite proper positioning and a tight air-seal around the mouth or nose.

#### *Mouth-to-nose respiration*

The mouth-to-nose technique should be used when it is impossible to open the casualty's mouth, when the mouth is severely injured, or a tight seal around the lips cannot be obtained.

- Keep the casualty's head tilted back with one hand. Use the other hand to lift up the casualty's lower jaw to seal the lips.
- Take a deep breath, seal your lips around the casualty's nose, and blow in until the casualty's chest rises.



- Remove your mouth and allow the casualty to exhale passively.
- Repeat the cycle 10 to 12 times per minute.

Artificial respiration should be continued for 2 hours if necessary; longer if there are signs of life.

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### **Breathing and heart have stopped**

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Heart compression (external cardiac compression) should be applied together with artificial respiration throughout any attempt to resuscitate a casualty whose breathing and heart have stopped. Unless circulation is restored, the brain will be without oxygen and the person will suffer cerebral damage within 4 to 6 minutes, and may die.

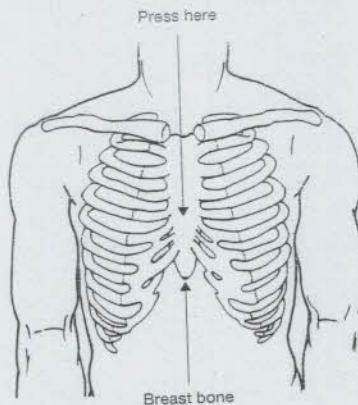
Artificial respiration will bring oxygen-containing air to the lungs of the casualty. From there, oxygen is transported with circulating blood to the brain and to other organs, and the effective heart compression will – for some time – artificially restore the blood circulation, until the heart starts beating.

#### *Technique for heart compression*

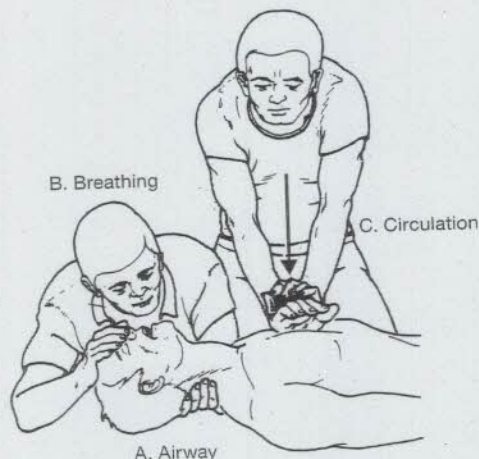
Compression of the breast bone produces some artificial ventilation, but not enough for adequate oxygenation of the blood. For this reason, artificial respiration is always required whenever heart compression is used.

Effective heart compression requires sufficient pressure to depress the casualty's lower breast bone about 4 to 5 cm (in an adult). For heart compression to be effective, the casualty must be on a firm surface. If he is in bed, a board or improvised support should be placed under his back. However, chest compression must not be delayed to look for a firmer support.

- Kneel close to the side of the casualty and place only the heel of one hand over the lower half of the breast bone. Avoid placing the hand over the tip of the breast bone which extends down over the upper abdomen. Pressure on the tip may tear the liver and lead to severe internal bleeding.



- Feel the tip of the breast bone and place the heel of the hand about 4 cm towards the head of the casualty. Your fingers must never rest on the casualty's ribs during compression. This increases the possibility of rib fractures.
- Place the heel of the other hand on top of the first one.
- Rock forward so that your shoulders are almost directly above the casualty's chest.
- Keep your arms straight and exert adequate pressure almost directly downward to depress an adult's lower sternum 4 to 5 cm.



- Depress the sternum 80 to 100 times per minute for an adult (when two rescuers are used). This is usually rapid enough to maintain blood flow, and slow enough to allow the heart to fill with blood. The compression should be regular, smooth, and uninterrupted, with compression and relaxation being of equal duration. Under no circumstances should compression be interrupted for more than 5 seconds.

#### Two-rescuer heart compressions and artificial respiration:

- Five heart compressions:
  - at a rate of 80 to 100 per minute
  - no pause for ventilation.
- One respiration:
  - after each 5 compressions
  - interposed between compressions.

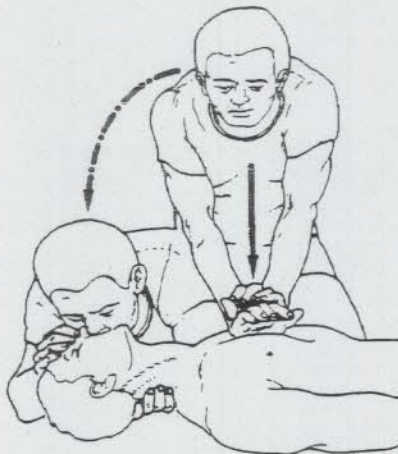


It is preferable to have two rescuers because artificial circulation must be combined with artificial respiration. The most effective artificial respiration and heart compression are achieved by giving one lung inflation quickly after each five heart compressions (5:1 ratio). The compression rate should be 80 to 100 per minute for two rescuers.

One rescuer performs heart compression while the other remains at the casualty's head, keeps it tilted back, and continues rescue breathing (artificial respiration). Supplying the breaths without any pauses in heart compression is important, because every interruption in this compression results in a drop of blood flow and blood pressure to zero.

#### *Single-rescuer heart compressions and artificial respiration:*

A single rescuer must perform both artificial respiration and artificial circulation using a 15:2 ratio. The head should be kept in the shown position by means of a rolled blanket or similar object pushed under the casualty's shoulders. Two very quick lung inflations should be delivered after each 15 chest compressions, without waiting for full exhalation of the casualty's breath.



- Fifteen heart compressions at a rate of 80 to 100 per minute.
- Two very quick lung inflations.

#### *Checking effectiveness of heart compression: pupils and pulse*

*Check the reaction of the pupils:* a pupil that narrows when exposed to light indicates that the brain is receiving adequate oxygen and blood. If the pupils remain widely dilated and do not react to light, serious brain damage is likely to occur soon or has occurred already. Dilated but reactive pupils are a less serious sign.

*The carotid (neck) pulse* should be felt after the first minute of the heart compression and artificial respiration, and every 2 minutes thereafter. The pulse will indicate the effectiveness of the heart compression or the return of a spontaneous effective heartbeat.

Other indicators of this effectiveness are the following:

- Expansion of the chest each time the operator blows air into the lung.
- A pulse which can be felt each time the chest is compressed.
- Return of colour to the skin.
- A spontaneous gasp for breath.
- Return of a spontaneous heartbeat.

#### *Terminating heart compression*

Deep unconsciousness, the absence of spontaneous respiration, and fixed, dilated pupils for 15 to 30 minutes indicate cerebral death of the casualty, and further efforts to restore circulation and breathing are usually futile, unless it is a case of hypothermia in which cerebral death can be delayed.

In the absence of a physician, artificial respiration and heart compression should be continued until:

- The heart of the casualty starts beating again and breathing is restored.
- The casualty is transferred to the care of the doctor, or other health personnel responsible for emergency care.
- The rescuer is unable to continue because of fatigue.

## Appendix 3 OXYGEN ADMINISTRATION AND CONTROLLED VENTILATION

### Suffocation

Suffocation (asphyxia) causes a lack of tissue oxygen in the blood. It has many causes other than those arising from chemical poisoning. The latter are principally:

- The air passage may be blocked by vomit, blood or secretions.
- Obstruction to breathing in the throat or the air passage through spasm of the air tubes or by swelling of the linings of the voice box due to irritant fumes.
- Fluid in the lung air spaces (pulmonary oedema) caused by irritant fumes, e.g. by ammonia or chlorine.
- Poisoning of the blood which prevents the carriage or use of oxygen in the body caused by, for example, carbon monoxide, cyanides, or aniline.
- Poisoning of the mechanisms of breathing in the chest (e.g. by organophosphate insecticides) or the brain (chlorinated hydrocarbons).
- Gases which do not support life because they replace oxygen in the atmosphere, e.g. carbon dioxide, nitrogen, hydrogen.

#### Diagnosis

- There is difficulty in breathing with an increased rate at first (over 30 per minute). Later it may become slow and stop.
- The pulse is rapid, usually over 100 per minute.
- There is blueness of the skin with purple lips and tongue.
- The casualty may be agitated at first but become apathetic, with muscular weakness. Unconsciousness may follow this.
- The pupils of the eyes will react to light at first. If they become large and do not react to light, life is in danger.

#### Dangers of oxygen

- Spontaneous combustion occurs in the presence of oxygen. For example, a glowing cigarette will burst into flames in an oxygen atmosphere. **Smoking, naked lights or fires must not be allowed in any place where oxygen is being administered because of the fire risk.**
- Oxygen treatment prolonged over many hours can be particularly dangerous to persons with chronic breathing disorders. Too much oxygen impedes the breathing time clock that triggers the natural breathing bellows mechanism.

Radio medical advice should always be sought when giving oxygen treatment. Prolonged oxygen treatment should only be given in a shore hospital where laboratory blood gas analysis can be undertaken. Therefore all cases requiring prolonged oxygen treatment should be hospitalized ashore as soon as possible.

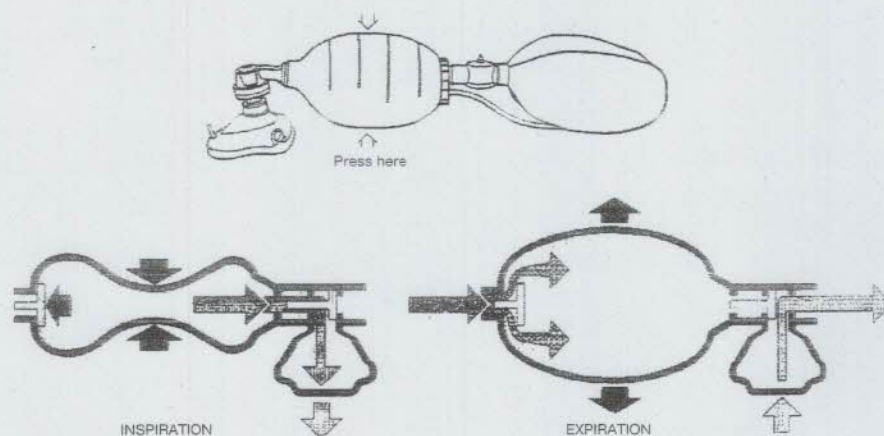
#### Oxygen resuscitation kits

Valve and bag oxygen resuscitation kits are primarily applicable to people who are not breathing. They are intended for use only by trained persons. There are a number of manufacturers marketing these products and training must be related to the manufacturers' instructions relating to the specific model carried on board.

The basic parts of the kit need to be stored assembled correctly in accordance with the manufacturers' instructions and ready for use. Generally they comprise:

- Face mask (sizes varying depending on the size of the face, but for adults usually there are only two sizes, large and small).
- The bag with valve to which the oxygen intake is attached.
- The oxygen reservoir also attached to the bag and valve.





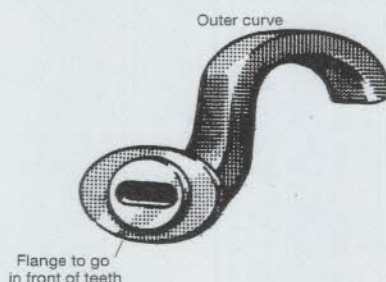
The oxygen supply needs to comprise:

- A cylinder containing medical oxygen (industrial oxygen may contain unsafe impurities).
- A reducing valve with wheel control.
- A pressure gauge and valve with "on" "off" knob.
- Hose connecting the bag to the "on" "off" knob for the valve.

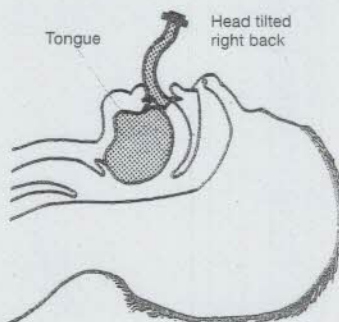
**Note:** When the kit is operating successfully, oxygen will be heard to be flowing through the tubing. If the cylinder is empty or there is a kink in the oxygen supply tube, the casualty receives air only (21% oxygen). But this is similar to giving ordinary mouth-to-mouth ventilation.

### Insertion of Guedel airway

This airway is for use in an unconscious casualty. Select the appropriate size; males usually require the largest size. The function of the airway is to ensure a clear passage between the lips and the back of the throat.

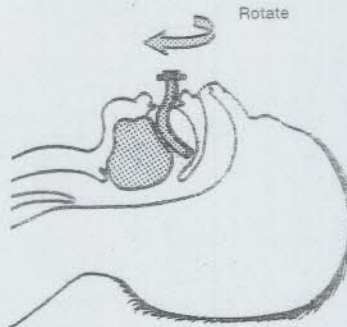


- First remove any dentures and any debris or vomit from the mouth with the fingers. If an electric or manual suction pump with catheter attached is immediately available, use this to clear the air passage. Then, with the head fully back, slide the airway gently into the mouth with the outer curve of the airway towards the tongue. This operation will be easier if the airway is wetted.

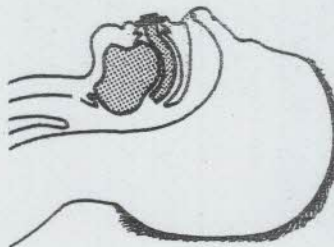


- If there is any attempt by the casualty to gag, retch or vomit, it is better not to proceed with the insertion of the airway. If necessary, try again later to insert it.

- Continue to slide the airway in until the flange of the airway reaches the lips. Then rotate the airway through 180° so that the outer curve is towards the roof of the mouth.



- Bring the jaw upwards and push the airway in until the flange at the end of the airway is outside the teeth (or gums) and inside the lips. If necessary, tape one or both lips so that the end of the airway is not covered by them.



### Oxygen for the casualty who is not breathing

- If the casualty does not have a pulse or heart beat, CPR should be performed immediately by a second rescuer. Administration of oxygen as soon as possible is critical.
- A Guedel airway should be inserted. If insertion of an airway cannot be achieved, the chin should be pulled forward throughout the administration of oxygen. If the casualty has seizures due to the lack of oxygen, administration of oxygen may be difficult but is essential.
- Use a positive-pressure manual operated oxygen resuscitator in accordance with manufacturer's instruction. It makes assisted or controlled ventilation possible.
- Oxygen should be used at a flow rate of 8 L per minute. The bag should be squeezed steadily and firmly and released about 12 times a minute. As the bag is squeezed, watch the chest rise and listen for the sound of escaping air which indicates that the face mask seal needs adjusting. It is essential that the face mask is held firmly in place so as to avoid leakage.



- If gagging occurs, remove the airway. Always maintain a regular check on the pulse in the neck. The absence of a pulse indicates the need for 15 chest compressions to every two inflations. Once the casualty is breathing spontaneously, put him in the recovery position.

### Oxygen for the casualty who has difficulty in breathing

- Make sure difficulty in breathing is not due to airway obstruction (see appendix 2).
- The casualty should be connected to an oxygen-giving set through a simple disposable face mask (non-venturi type) placed securely over the face.
- Oxygen should be used at a flow rate of 6 to 8 L per minute (see appropriate table for recommended setting).
- Oxygen should be continued until the casualty no longer has difficulty in breathing and has a normal healthy colour.



## Appendix 4

## CHEMICAL-INDUCED DISTURBANCES OF CONSCIOUSNESS

Some chemicals, particularly if inhaled, can act rapidly on the brain to cause either depression of consciousness (coma) or toxic mental confusion (see table 6). Prolonged skin contact or accidental ingestion can cause similar effects, though they are more gradual in onset.

Symptoms will usually resolve very quickly when the casualty is removed from the polluted atmosphere.

Other causes of unconsciousness include:

- Serious traumatic injury
- Fits
- Diabetes
- Stroke.

Immediate danger to life is from failure of, or obstruction to, breathing.

*Diagnosis*

Symptoms and signs include:

- No reactions to rousing stimuli;
- Weak or irregular pulse in serious cases;
- Breathing is often slow and shallow;
- If pupils are large and do not react to light, **LIFE IS IN DANGER.**

Watch for any signs of difficulty in breathing, which may be due to:

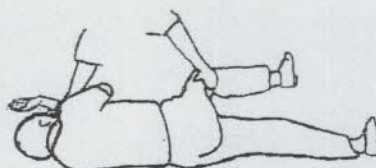
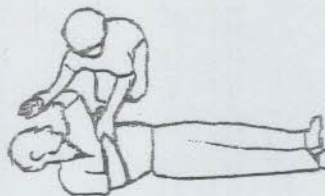
- Suffocation (asphyxia)
- Chemical irritation or infection of the lungs
- Heart failure.

**DO NOT GIVE ALCOHOL OR INJECT MORPHINE OR ANY STIMULANT.**

## The unconscious position

Turn casualty face down, head to one side; no pillows should be used under the head.

- Place the arm nearest to you out at right angles to his body, elbow bent with the hand palm uppermost.
- Bring the far arm across the chest and place the hand, palm down, on the shoulder nearest to you.
- Grasp the far leg just above the knee and pull it up, keeping the foot on the ground.
- With your other hand on the far shoulder, pull on the leg to roll the casualty towards you onto his side.
- Adjust the upper leg so that both the hip and knee are bent at right angles.
- Tilt the head back to make sure the airway remains open.



*Guidelines for resuscitation,  
European Resuscitation Council, 1996*

## Unconscious casualties

- Must have a clear air passage.
- Must have their loose dentures removed.
- Must have any vomit removed from the mouth and back of the throat.
- Should have a Guedel airway inserted, if possible.
- Should be kept in the unconscious position.
- Must not be left alone or unwatched in case vomiting or a fit occur, or they fall out of their bunk.
- Should be turned from one side to the other at least every 3 hours to prevent bedsores. Turn the casualty gently and roll him smoothly from one side to the other.
- When being turned, should always have their heads kept back with a chin-up position. At no time must their heads be allowed to bend forwards with the chin sagging.
- Should have their breathing checked. Ensure that the Guedel airway is securely in place after the casualty has been turned.
- Make sure that all limb joints are neither fully straight nor fully bent. Ideally they should all be kept in mid-position. Place pillows under and between the bent knees and between the feet and ankles.



- Use a bed-cage (a large stiff cardboard box will make a good improvised cage) to keep the bedclothes from pressing on the feet and ankles.
- Check that elbows, wrists and fingers are in a relaxed mid-position after turning. Do not pull, strain or stretch any joint at any time.
- Make quite sure that the eyelids are closed and that they remain closed at all times, otherwise preventable damage to the eyeball can easily occur.
- Moisten the eyes every 2 hours with saline (sodium chloride 0.9%) by opening the lids slightly and dripping some saline solution gently into the corner of each eye in such a way that the saline will run across each eye and drain from the inner to outer corner. If available, use a 1 L bag of sodium chloride 0.9% with a drip set to irrigate the eyes (a saline solution can be made by dissolving one teaspoonful of salt in half a litre (one pint) of boiled water which has been allowed to cool).

**After 12 hours of unconsciousness, further problems will arise:**

- Unconscious casualties must be given nothing by mouth in case it chokes them and they suffer from obstructed breathing. However, after 12 hours of unconsciousness fluid will have to be given per rectum (see appendix 13), particularly in hot climates and/or if the casualty is obviously sweating.
- The mouth, cheeks, tongue and teeth should be moistened every 3 hours, using a small swab moistened with water. Carry out mouth care every time the casualty is turned.

**After 48 hours of unconsciousness, move the limb joints at least once a day:**

- All the joints in all the limbs should be moved very gently in such a way as to put each joint through a full range of movements, provided that other considerations such as fracture do not prevent this. Watch that the exercise of the arms does not interfere unduly with the casualty's breathing;
- Do the job systematically. Begin on the side of the casualty which is most accessible. Start with the fingers and thumb, then move the wrist, the elbow and the shoulder. Now move the toes, the foot and the ankle. Then bend the knee and move the hip round;
- Next, turn the casualty, if necessary with the help of another person, and move the joints on the other side;
- Remember that unconscious casualties may be very relaxed and floppy – so do not let go of their limbs until you have placed the limbs safely back on the bed. Hold the limbs firmly but not tightly and do everything slowly and with the utmost gentleness. Take your time in moving each joint fully before going on to the next.

## Appendix 5 CHEMICAL-INDUCED CONVULSIONS (SEIZURES, FITS)

Chemically induced convulsions may occur in poisoning by substances directly irritating the brain. They may be preceded by mental agitation.

Convulsions are involuntary contractions of the muscles. There is a variation in severity from twitching of the muscles to general heaving of the body. During a seizure the casualty is often unconscious for a short time and then confused with a headache – sleep usually follows. In severe cases, the casualty does not regain consciousness between attacks.

Convulsions may occur at any time after poisoning and recur several times. The more frequent and longer the attacks, the greater the danger to life. After exposure to certain chemicals, convulsions may occur after a time delay of hours, especially after skin exposure.

The main risk of convulsions is impaired ventilation (leading to inadequate oxygen supply to tissues).

- Give ventilation support with 8 L of oxygen per minute if the victim does not breathe adequately.
- Administer controlled ventilation.
- The casualty may hurt himself during convulsions. Never restrain him forcibly, as this may cause injury, but remove hard objects and surround him with pillows, clothing or other soft material.
- After the fit is over, let the casualty sleep it off, as he may be rather confused and dazed when he comes round. Reassure him, and do not leave him until you are sure he is aware of his surroundings, and knows what he is doing.



## Appendix 6

## TOXIC MENTAL CONFUSION

Mental confusion state is the name given to the condition where a casualty becomes confused and disoriented after being poisoned by a chemical, including alcohol and illicit substances. Even hallucinations (hearing voices and/or seeing terrifying images) can occur either as a direct result of the chemical on the brain, e.g. chlorinated hydrocarbons, or indirectly, when the function of vital organs such as heart, liver, or kidney is severely disturbed by poisons.

*Diagnosis*

- If the mental confusion state is due to a direct action of the chemical on the brain, the casualty will develop the signs and symptoms within 15 to 30 minutes after exposure.
- The casualty may be disorientated as to the date, time and place, and be unable to speak coherently. He may be unable to recognize friends, or perform simple tasks which he does in everyday life.
- On occasions, the casualty may appear drowsy and can only be roused with difficulty.

Look for signs of

- Suffocation (see table 9)
- Shock (see table 11)
- Jaundice (see table 15)
- Acute kidney failure (see table 12)

and treat for these if appropriate.

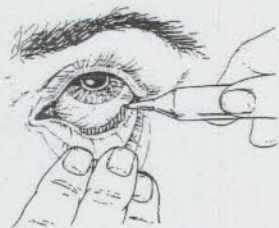
- In severe cases, the casualty may become unconscious.
- Some chemicals may cause confusion with mental agitation and aggressive violent behaviour.

## Appendix 7 EYE EXPOSURE TO CHEMICALS

After a chemical injury, and if advised medically, it can be useful to stain the eye with fluorescein to highlight any area of corneal or conjunctival damage.

- The paper strip, which contains the dye, should be drawn gently across the everted (rolled back) lower lid with the casualty looking upwards;
- If there is an area of the eye which stains green with fluorescein, apply antibiotic eye ointment to prevent the eyelid sticking to the eyeball.

### RADIO FOR MEDICAL ADVICE.



- Apply antibiotic eye ointment every 2 hours and cover the eye with a dry sterile eye dressing pad. Hold in place securely by using sticking plaster.
- Treatment should be continued for 24 hours after the eye is no longer inflamed, and is white.

After 48 hours, reapply the fluorescein paper strip as above. If there is an area of the eye which continues to stain green, reapply antibiotic eye ointment and a sterile eye dressing pad, and **urgently evacuate the casualty to a hospital with eye treatment facilities.**



## Appendix 8

# SKIN EXPOSURE TO CHEMICALS

Many chemicals may produce burns when in contact with the skin or eyes or mucous membranes. These are very similar to burns from fire or electricity.

Moreover, the chemical may be absorbed through the skin, causing general symptoms of poisoning such as nausea, vomiting, headache, breathing difficulties, cramps and gradual loss of consciousness.

### Diagnosis

Depending on the chemical, the site and duration of contact, symptoms and signs may include:

- Irritating rash.
- Burning pain with redness and/or swelling of contaminated skin.
- Blistering or a loss of skin and/or underlying tissue.

### Decontamination

In all cases of skin exposure, decontamination must be performed.

Further advice: see table 8.

### Treatment

If exposure was to hydrofluoric acid or hydrogen fluoride: see table 16.

If exposure was to anything else: see table 8.

In general, after decontamination has been performed, treatment of burns should be undertaken as follows:

- Wash your hands and forearms thoroughly and then remove the first-aid dressing to expose either a single burned area (in multiple burns) or a portion of a large single burn. The aim is to limit the areas of burned skin exposed at any one time to lessen both the risk of infection and the seepage of fluid. Clean the skin around the edges of the burn with soap, water and swabs. Clean away from the burn in every direction. **DO NOT** use cotton wool for cleaning as it is likely to leave bits in the burn.
- Leave blisters intact but clip off the dead skin by using a sterilized pair of scissors if blisters have burst. Flood the area with clean, lukewarm (previously boiled) water from a clean receptacle to remove debris. With a soaked swab, dab gently at any remaining dirt or foreign matter in the burned area. **Be gentle** as this will inevitably cause pain.
- Next cover the burn with a sterile dressing (e.g. perforated silicone dressing or vaseline gauze), overlapping the burn or scald by 5 to 10 cm (2 to 4 inches). Now apply a covering of absorbent material, e.g. a layer of sterile cotton wool, to absorb any fluid leaking from the burn. This is held in place by a suitable bandage – tubular dressings or crepe bandage are useful for limbs and elastic net dressings for other areas.
- Thoroughly wash hands and arms before proceeding to deal as above with the remainder of a large burn, or with another burn in the case of multiple burns.
- Dressings should be left undisturbed for 3 to 5 days unless the dressing becomes smelly or very dirty, or the temperature is raised. Redress such areas as described above.
- If there is persistent pain, give two tablets of paracetamol every 6 hours until the pain is relieved.
- If there is severe pain, not relieved by the paracetamol, give 10 mg morphine sulphate and 10 mg metoclopramide intramuscularly, if advised medically.

Further advice on pain relief: see table 13.

- If the burn is other than small in area (i.e. more than 9 times the size of the palm of the hand), give a full glass of water (preferably oral rehydration salt solution) every 10 minutes to help replace fluid loss.

Further advice on fluid replacement: see appendix 13.

## Appendix 9 INHALATION OF CHEMICALS

### Suffocation (asphyxia)

#### THIS IS AN EMERGENCY

It may be due to:

- Obstruction to breathing in the throat or the air passage through spasm of the air tubes or by swelling of the linings of the voice box due to irritant fumes.
- Fluid in the lung air spaces caused by irritant fumes.
- Poisoning of the blood which prevents the carriage or use of oxygen in the body, caused, for example, by carbon monoxide and cyanide.
- Poisoning of the mechanism of breathing in the chest (e.g. by organophosphorus insecticides) or the brain (e.g. by chlorinated hydrocarbons).
- Gases which do not support life because they replace oxygen in the atmosphere (e.g. carbon dioxide, nitrogen).

#### Diagnosis

Symptoms and signs include:

- Difficulty in breathing with an increased rate at first (over 30 per minute). Later it may become slow and stop.
- A rapid pulse, usually over 100 per minute.
- Blueness of the skin with purple lips and tongue.
- Agitation at first but later the casualty becomes apathetic, with muscular weakness. Unconsciousness may follow this.
- Large pupils which will not react to light. **LIFE IS IN DANGER.**

Further advice: see table 2, table 3 and table 4.

### Chemical irritation of the lungs: dry cough, breathlessness and wheezing

Shortly after exposure to smoke, fumes or some gases, the casualty may develop irritation and inflammation of the throat, windpipe and bronchi (the branches of the windpipe inside the lungs). Sometimes this inflammation is delayed for several hours or, rarely, for some days after exposure.

#### Diagnosis

Symptoms and signs include:

- A harsh, dry cough;
- A feeling of rawness in the windpipe in the neck and under the breastbone, which is made worse by coughing;
- Breathlessness and wheezing.

Further advice: see table 9.

Usually, these symptoms subside within a few hours of exposure. If they do not, **RADIO FOR MEDICAL ADVICE.**



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### Chemical irritation and oedema of the lungs: severe breathlessness and frothy sputum

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This occurs after inhalation of some irritant gases and fumes, and may be delayed for up to 48 hours after exposure, and rarely, for longer. The lung air spaces become filled with tissue fluid so that the casualty is drowning in his own secretions.

**THIS IS AN EMERGENCY. RADIO FOR MEDICAL ADVICE IN ALL CASES.** Every effort should be made to get medical help on board, or to transfer the casualty to hospital if there is not rapid improvement in symptoms.

#### Diagnosis

Symptoms and signs include:

- Severe difficulty in breathing;
- Increase in breathing rate to 30 to 40 per minute;
- Cough with the production of frothy sputum, which is sometimes pink in colour with flecks of blood;
- Difficulty in lying flat;
- Gurgling noise in the throat when the casualty is breathing;
- Blue discoloration of the skin;
- Anxiety and sweating;
- In severe cases, acute circulatory collapse, unconsciousness, and convulsions may occur. Breathing and the heart may both stop suddenly.

Further advice: see table 9.

---

### Chemical irritation and secondary infection of the lungs: productive cough (sticky white, yellow or green phlegm [sputum])

---

In cases of significant exposure to smoke, fumes or some gases, secondary infection may occur several days later.

#### Diagnosis

Symptoms and signs include:

- Fever (usually mild);
- Productive cough. Phlegm (sputum, spit) is coughed up, at first sticky, white and difficult to bring up, later greenish yellow, thicker and more copious. The phlegm is occasionally tinged with blood;
- Breathlessness and wheezing;
- A pulse rate over 110 per minute with blueness of the skin, ears and lips indicates severe infection.

Further advice: see table 9.

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### The chemical hazards from fire

---

Combustion of many chemicals may produce a wide range of substances which are toxic. These may be present at a distance from the main site of the fire, and may have no odour. Self-contained breathing apparatus should be used in approaching chemical fires.

The main toxic chemicals which may be produced are:

- Carbon dioxide
- Carbon monoxide
- Hydrogen chloride (hydrochloric acid fumes)
- Hydrogen cyanide
- Nitrogen oxides (particularly produced in smouldering fires)

Hypoxia due to "consumption" of oxygen by fire may occur. Oxygen must only be administered to a casualty in a place of safety.

Further advice: see table 2 and table 3.

### Diagnosis

Symptoms and signs include:

- Dizziness
- Headache
- Nausea and vomiting
- A persistent cough and difficulty in breathing
- Unconsciousness

Inhalation of fumes may result in rapid collapse and unconsciousness.

Further advice on disturbed consciousness: see table 4.

Further advice on inhalational injuries: see table 9.

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### Chemical hazards from welding

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If adequate precautions are not taken, symptoms of poisoning may arise during welding in confined spaces.

The main danger is from nitrogen oxides.

Certain metal alloys, in particular those containing zinc or cadmium, also give off fumes, causing characteristic symptoms known as "metal fume fever". These usually do not develop for a period of 6 to 12 hours after exposure, and comprise:

- Shivering
- Fever, headache and muscle pains
- Nausea
- A dry cough

These symptoms usually resolve spontaneously without any treatment over the following 12 hours. Lung oedema, however, may occur as a very rare complication.

Further advice on lung oedema: see table 9.

---

### Chemical hazards from explosive chemicals

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The main hazard is injury from explosion.

Contact with explosives does not normally cause a medical problem from the chemicals themselves, unless they are in a decomposed state, when they may produce fumes, particularly of nitrogen oxides, which may be inhaled.



## Appendix 10

# INGESTION OF CHEMICALS

The swallowing of a chemical is one of the less probable events on board a ship. In general, it happens by mistake, such as after drinking from the wrong bottle. Usually this mistake is noticed at once.

Chemicals may act as local irritants on the stomach and intestines. The more severe corrosive chemicals, e.g. acids and alkalis, may cause bleeding or perforation of the gut. Remember that other illnesses, e.g. food poisoning, peptic ulcer, alcohol excess, may cause similar symptoms.

Chemicals may also be absorbed, and cause general symptoms.

### Diagnosis

- There may be chemical burns around the lips and the mouth and throat.
- Nausea and vomiting usually occur, but there may be symptoms of more general poisoning.
- Diarrhoea may occur; it is important to note whether the faeces become black, tarry, foul smelling after poisoning since this is likely to be caused by **BLEEDING** from the gut.
- The casualty may vomit up bright red blood, or dark brown “coffee grounds” which is blood that has been altered in the stomach.
- If an intense pain develops in the stomach accompanied by a rigid abdomen when touched, then a **PERFORATION OF THE GUT** may have occurred.
- Thirst may become intense after severe diarrhoea and vomiting.
- There may also be general symptoms which may occur after a time delay.

**RADIO FOR MEDICAL ADVICE.**

Further advice: see table 10.

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### Perforation of the gut and peritonitis

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If an intense pain develops in the stomach and the abdomen is rigid when touched, then perforation of the gut may have occurred.

This causes peritonitis, which is an inflammation of the thin layer of tissue (the peritoneum) which covers the intestines and lines the inside of the abdomen.

### Diagnosis

- The onset of peritonitis may be assumed when there is a general worsening of the condition of a casualty already seriously ill following ingestion of corrosive chemicals.
- Peritonitis commences with severe pain all over the abdomen – pain which is made worse by the slightest movement. The abdomen becomes hard and extremely tender, and the casualty draws up his knees to relax the abdominal muscles.
- Vomiting occurs and becomes progressively more frequent, large quantities of brown fluid being brought up without any effort.
- The temperature is raised (up to 39.40°C [103°F]).
- The pulse is feeble and rapid (110 to 120 per minute), gradually increasing in rate.
- The pallid anxious face, the sunken eyes and extreme general weakness all confirm the gravely ill state of the casualty.
- If hiccoughs begin, this must be regarded as a very serious sign.

**RADIO FOR MEDICAL ADVICE.**

Further advice: see table 10.

## Appendix 11

# SHOCK

MFAG

### Fainting

Fainting is the emotional response of some individuals to trivial injuries so that they feel weak and nauseated and may faint. This reaction is not serious and will disappear quickly if the casualty lies down.

#### Diagnosis

Symptoms and signs include:

- Pale, waxy skin which is cold and clammy to the touch;
- Pulse is usually slow at first and then becomes rapid during recovery;
- Unconsciousness lasts only a few minutes, and the casualty recovers rapidly after he lies down.

### Circulatory collapse and shock

Circulatory collapse is a disturbed distribution of blood within the body. Severe circulatory disturbances are called "shock" and result in serious impairment of vital organ functions due to an insufficient supply of blood.

Chemical burns and chemically induced bleeding from the gut may cause circulatory collapse and shock.

There are also a number of chemicals which are toxic to the heart directly and result in reduced pump action of the heart and shock within a few hours; acute kidney failure may result.

#### Diagnosis

Symptoms and signs include:

- Pale, waxy skin which is cold and clammy to the touch;
- Rapid, weak pulse;
- Agitation at first but later the casualty becomes apathetic. Unconsciousness may follow this;
- Large pupils which do not react to light. **LIFE IS IN DANGER;**
- A reduction in the amount of urine passed, if this condition persists for more than one or two hours.

Further advice: see table 11.

### Heart failure

Heart failure may occur within a few hours of chemical poisoning or may develop gradually over a period of 24 to 48 hours following exposure to an irritant gas.

It should be remembered that a casualty may already be under treatment for a heart condition.

#### Diagnosis

Symptoms and signs include:

- Weakness, apathy and headache;
- Breathing rapid and shallow;
- Sweating and restlessness with a rapid pulse;
- Blue lips, tongue and ears;
- Swelling of feet and legs;
- Prominent veins in the neck in severe cases;
- A reduction in the amount of urine passed, if this condition persists for more than one or two hours.

Further advice: see table 11.



## Appendix 12

# ACUTE KIDNEY FAILURE

Acute kidney failure is a disorder characterized by an abrupt decline in the amount of urine passed. That impairs the kidney's capacity to maintain metabolic balance.

It is important to distinguish acute kidney failure from urinary retention. Urinary retention occurs when the bladder becomes over-full and is common in cases of prolonged unconsciousness, but it may also occur in a conscious casualty. If retention is present, the bladder becomes increasingly distended, with the casualty complaining of pain in the lower abdomen.

Chemical-induced acute kidney failure may be caused directly by a variety of chemicals, including ethylene glycol and halogenated hydrocarbons. In addition, it may occur secondary to shock due to severe chemical burns or chemical-induced bleeding.

### Diagnosis

Symptoms and signs include:

- A steady reduction in the amount of urine passed;
- Insert a urinary catheter into the bladder. If there is less than 125 mL of urine in the bladder, or the casualty has not passed urine for more than 6 hours, the casualty is in acute kidney failure.
- Nausea, vomiting, diarrhoea;
- Persistent hiccoughing;
- Fatigue.

**RADIO FOR MEDICAL ADVICE.** Arrange for evacuation. The casualty will need to be transferred to a shore hospital as soon as possible.

Record casualty's fluid intake and output carefully on a chart as follows (amounts given in mL):

Date and time	Type of fluid	In*	Out		
		Mouth	Urine	Vomit	Other
12/8/96					
11.00	Clear soup	250			
11.15				200	very sweaty for 1 hour
12.00			500	60	
12.30	Milk	125			
13.00				120	runny diarrhoea
14.00	Oral rehydration salt (ORS) solution	180			
17.00	ORS solution	200			
20.00	ORS solution	200			
20.15			20		
23.00	ORS solution	200			
12-hourly balance:		1155	520 + 380		?
			900		
		difference: plus 255 mL (but the casualty lost fluid by sweating and diarrhoea, probably more than 255 mL)			

\* Fluid given intravenously or by rectum also counts for input.

## Appendix 13

# FLUID REPLACEMENT

An average daily intake of fluids from food and drink is about 2.5 L. Body fluid is lost through unseen perspiration, obvious sweating, the breath, the urine and the faeces. In temperate climates it is possible to manage for a short time on as little as 1 L (just under 2 pints). In very hot climates where there is a large fluid loss through sweating, an intake of 6 L per day may be necessary.

If extensive chemical burns (see table 8) are present or chemical-induced bleeding (see table 14) from the gut occurs, there will be substantial loss of fluid (more than 3 L per day). If this fluid is not replaced, circulatory collapse, shock (see table 11) and acute kidney failure (see table 12) may follow. Although fluid may be replaced orally in the case of chemical burns, intravenous fluid replacement is preferable in all cases if a person is trained in the technique. Alternatively, rectal fluid replacement may be used.

### Oral fluids

Use oral rehydration salts, which, when reconstituted with water according to instruction, will provide all necessary salts to maintain metabolic balance.

- In mild cases of fluid loss, give intermittently 1 L of the solution each day;
- In more severe cases, give 2 L each day;
- In very severe cases of fluid loss, give at least 3 L each day.

Monitor pulse and blood pressure regularly.

In cases of extended chemical burns:

**the first 24 hours:** give – in addition to normal food and fluid intake – for every 10% of the body surface area with burns, 3 L of salted water (1.5 teaspoonfuls of table salt in 1 L) intermittently.

**24 to 48 hours:** For every 10% of the body surface area with burns, give 1.5 L of fluids (preferably oral rehydration salt solution – ORS) intermittently.

**After 48 hours** the fluid intake should, in principle, be normal.

Check for urine output, that should be approximately 30 to 50 mL per hour (approximately 1 L per 24 hours).

### Intravenous fluids

If advised medically and a trained person is available, give 1 to 3 L (or more) of sodium chloride (0.9%) intravenous infusion via an infusion set, depending on the severity of fluid loss and the **RADIO MEDICAL ADVICE**.

In very severe cases of shock, a gelatine-based plasma expander may be advised:

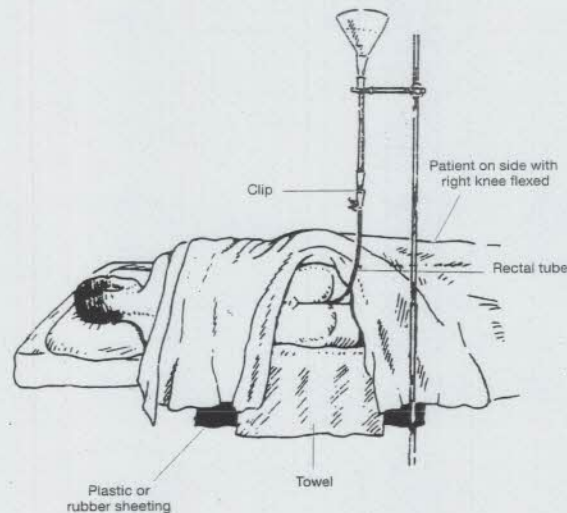
- Give 500 mL plasma expander via an infusion set and monitor pulse and blood pressure regularly.
- Seek **RADIO MEDICAL ADVICE** again.
- If advised, give a further 500 mL plasma expander and monitor pulse and blood pressure regularly.



## Rectal fluids

Fluid may also be given via rectum, though it is difficult to administer more than 1 L of fluid per day by this route.

To prepare the bed, place two pillows, one on top of the other, across the middle of the undersheet. Protect the pillows with a width of rubber or plastic sheeting covered by a wide clean towel. Allow the ends of the sheeting and towel to hang over the side of the bed to drain any possible leakage. The casualty should be placed lying on his left side with his buttocks raised on the pillows and with his right knee flexed. He should be made comfortable but only one pillow should be allowed to support his head so that the tilt can be maintained. He should then be covered by a sheet, leaving only the buttocks exposed.



The importance of the treatment should have been explained to the casualty and he should be encouraged to relax and not to resist. The buttocks should be separated gently, then a catheter (26 French gauge) well lubricated with petroleum jelly (vaseline) should be passed slowly and gently through the anus into the rectum for a distance of about 23 cm (9 inches). After the catheter has been inserted, its external end should be taped to the skin in a convenient position to attach to a tube and drip set.

Give 200 mL of water slowly through the tube, taking about 10 to 15 minutes to drip the water in. This amount will usually be retained. Leave the catheter in position and block its end with a spigot, or small cork, or compression clip.

Give the casualty a further 200 mL of water every 3 to 4 hours. This should give a fluid intake of about 1,000 mL (1 L) per day. The rectum will not retain large amounts of fluid, and fluid must be retained in order to be absorbed. Occasionally the rectum will not accept fluid readily, especially if it is loaded with faeces. Smaller quantities at more frequent intervals should be tried in these cases. Careful observation will show whether the fluid is being retained.

Aim to give at least 1 L of fluid per day if possible. Giving fluid by rectum should be continued until the casualty can safely take fluid by mouth, or medical assistance becomes available.

## Appendix 14

# LIST OF MEDICINES AND EQUIPMENT

MFAG

### Preamble

- Medicines and equipment already available in the ship's medicine chest may be counted towards the MFAG numerical requirements outlined below.
- In some cases, alternatives are given. This means that one of the given alternatives should be chosen.
- Not all drugs and antidotes on the list may be licensed as pharmaceutical specialities in all Member States and thus available for general purchase. In such cases, the national authorities may issue a modified list, also in English, where drugs on the below list not available are substituted with analogous drugs in corresponding quantities.
- In countries with official lists on contents of ship's medicine chests, the national authorities can decide to substitute some of the drugs on the below list with analogous drugs available in the ordinary ship's medicine chest.
- The recommended minimum quantities are based on an estimate of risk to persons on board and the time within which full treatment on shore can be given.
- National authorities can decide on exemption from carrying these medicines for vessels making short regular voyages of 10 minutes or less.

Labelling, storage and dispensing should, in general, conform to the relevant specifications in the IMGS. Contents and storage conditions should be checked at least once a year, taking account of manufacturers expiry date and instructions. Medicines used should be replaced as soon as possible.

**Column A** of the following table shows the recommended minimum requirements for ships when casualties **cannot** be hospitalized on shore within 24 hours.

**Column B** shows the recommended minimum requirements for ships when casualties can be hospitalized on shore within 24 hours.

**Column C** shows the recommended minimum requirements for ships when casualties can be hospitalized on shore within 2 hours.

Medicine	Format/ Standard unit	Recommended minimum quantity			Dosage	Reference
		A	B	C		
amoxycillin	capsules 500 mg	30 capsules	none	none	500 mg × 3	Table 9
anaesthetic eye drops	eye drops (bottle)	5 bottles	5 bottles	5 bottles	several drops × several	Table 7
antibiotic eye ointment	eye ointment (tube)	5 tubes	5 tubes	none	apply 2 to 4 times daily or more frequently if required	Appendix 7
atropine	injection fluid 1 (or 0.5) mg/mL (1 mL ampoule)	15 (or 30) × 1 mL	15 (or 30) × 1 mL	none	1 mg × several	Table 17
beclomethasone (including inhalation device)	inhalation aerosol 50 µg/dose (200 doses) or 250 µg/dose (200 doses)	5 × 200 doses	5 × 200 doses	none	250 µg × several (5 puffs of 50 µg/dose) or (1 puff of 250 µg/dose)	Table 9
or budesonide (including inhalation device)	inhalation aerosol 200 µg/dose (100 doses)	5 × 100 doses	5 × 100 doses	none	400 µg × several (2 puffs of 200 µg/dose)	
calcium gluconate gel	gel 2% (25 g tube)	5 tubes	5 tubes	5 tubes	apply several times	Tables 8, 16
calcium gluconate	effervescent tablets 1 g	20 tablets	20 tablets	none	5 g × 2	Table 16



Medicine	Format/ Standard unit	Recommended minimum quantity			Dosage	Reference
		A	B	C		
cefuroxime	injection substance 750 mg (750 mg bottle)	10 × 750 mg	none	none	750 mg × 3	Table 10
charcoal, activated	powder (50 g bottle) or effervescent granules (5 g sachet)	2 × 50 g or 10 × 5 g	2 × 50 g or 10 × 5 g	none	50 g × 1	Table 10
diazepam	rectal solution 10 mg (ampoule)	5 × 10 mg	5 × 10 mg	none	10 mg × 1 to 5	Tables 4, 5, 6
erythromycin	tablets 500 mg	30 × 500 mg	none	none	500 mg × 4	Table 9
ethyl alcohol	solution 99.5% (500 mL bottle)	3 × 500 mL	1 × 500 mL	none	25 mL × 8 (25 mL 99.5% in 250 to 300 mL water or soft drink)	Table 19
fluorescein	eye test strip	1 package	none	none	1 test strip × 2	Appendix 7
furosemide (frusemide)	injection fluid 10 mg/mL (5 mL ampoule)	5 × 5 mL	none	none	50 mg × 3	Tables 2, 9
metoclopramide	injection fluid 5 mg/mL (2 mL ampoule)	30 × 2 mL	10 × 2 mL	5 × 2 mL	10 mg × 3	Tables 7, 8, 10, 13, 15, 20
metronidazole	suppositories 1 g	10 × 1 g	none	none	1 g × 3	Table 10
morphine sulphate	injection fluid 10 mg/mL (1 mL ampoule)	40 × 1 mL	10 × 1 mL	5 × 1 mL	10 to 20 mg × 6 or 7	Tables 7, 8, 10, 13
naloxone	injection fluid 0.4 mg/mL (1 mL ampoule)	5 × 1 mL	5 × 1 mL	2 × 1 mL	0.4 mg × 1 to 5	Tables 4, 13
oral rehydration salts (ORS)	sachets or tablets to dissolve in water	ORS to give 18 L solution	ORS to give 6 L solution	none	1 L × 3 or more	Tables 8, 10, 11
paracetamol	tablets 0.5 g	200 tablets	100 tablets	20 tablets	1 g × 4	Tables 7, 8, 13
phytomenadione	injection fluid 10mg/mL (1 mL ampoule)	10 × 1 mL	none	none	10 mg × 2 or more	Table 14
plasma expander (gelatine-based)	infusion fluids (500 mL bottles)	3 × 500 mL	3 × 500 mL	none	500 mL × 1 to 3	Appendix 13
rehydration salts – see oral rehydration salts						Tables 8, 10, 11
Salbutamol (including inhalation device) or terbutaline (including inhalation device)	inhalation aerosol 100 µg/dose (200 doses)  inhalation aerosol 500 µg/dose (50 doses)	5 × 200 doses  5 × 50 doses	5 × 200 doses  5 × 50 doses	1 × 200 doses  1 × 50 doses	200 µg × several (2 puffs of 100 µg/dose)  500 µg × several (1 puff of 500 µg/dose)	Table 9
sodium chloride, isotonic (saline) terbutaline – see salbutamol	9 mg/mL (0.9%) (1 L bottle)	5 × 1 L	3 × 1 L	1 × 1 L	1 L × 1 to 3	Table 7

## List of equipment

- Column A** of the following table shows the recommended minimum requirements for ships when casualties cannot be hospitalized on shore within 24 hours.
- Column B** shows the recommended minimum requirements for ships when casualties can be hospitalized on shore within 24 hours.
- Column C** shows the recommended minimum requirements for ships when casualties can be hospitalized on shore within 2 hours.

Equipment	Recommended minimum quantity			Reference
	A	B	C	
Guedel airway size 2 size 3 size 4	2 2 2	2 2 2	2 2 2	Appendix 3
IV cannula (size 1.2)	10	10	none	Appendix 13
IV set	10	10	none	Appendix 13
Needles size 0.8	100	50	10	
Simple face mask (allowing up to 60% oxygen), disposable	10	10	2	Appendix 3
Valve and bag manual resuscitator	2	2	2	Appendix 3
Oxygen cylinder	40 L/200 bar*	40 L/200 bar*	none	Appendix 3
Portable oxygen-giving set ready for use	1* (2 L/200 bar)	1* (2 L/200 bar)	1	
Spare portable oxygen cylinder	1* (2 L/200 bar)	1* (2 L/200 bar)	1	
Rectal infusion set catheter (26 French gauge)	1 6	none none	none none	Appendix 13
Syringes 2 mL 5 mL	100 10	50 10	10 none	

\* A minimum of 44 L/200 bar oxygen of which there should be at least:

- One complete portable set with 2 L/200 bar oxygen ready for use with a spare cylinder of 2 L/200 bar and
- One oxygen cylinder of 40 L/200 bar (at ship's hospital, assembled for direct use) with one flowmeter unit (two ports) for supplying of oxygen for two persons at the same time. If more than one non-portable oxygen cylinder is used, there must be two flowmeter units for supplying of oxygen for two persons at the same time.



## Appendix 15

## LIST OF SUBSTANCES

Chemicals allocated to specific treatment may be found under the following UN entries:

## UN NUMBER SORTATION

UN No.	Substance	Table No.
1008	BORON TRIFLUORIDE	16
1051	1614	18
1052		16
1171		19
1172		19
1188		19
1189		19
1230		19
1381	2447	8
1565		18
1575		18
1587		18
1613		18
1620		18
1626		18
1636		18
1679		18
1680		18
1689		18
1732		16
1749		16
1786		16
1790		16
1859		16
1910		7
2198		16
2417		16
2495		16
2548		16
2604		16
2851		16
2908		20
2965		16
2991		17
3017		17
3024		14
3294		18

## ALPHABETIC SORTATION

UN No.		Substance	Table No.
1732		ANTIMONY PENTAFLUORIDE	16
1565		BARIUM CYANIDE	18
1008		BORON TRIFLUORIDE	16
2604		BORON TRIFLUORIDE DIETHYL ETHERATE	16
2851		BORON TRIFLUORIDE DIHYDRATE	16
2965		BORON TRIFLUORIDE DIMETHYL ETHERATE	16
1575		CALCIUM CYANIDE	18
1910		CALCIUM OXIDE	7
2991	2992, 2757, 2758	CARBAMATE PESTICIDE, ...	17
2417		CARBONYL FLUORIDE	16
2548		CHLORINE PENTAFLUORIDE	16
1749		CHLORINE TRIFLUORIDE	16
1587		COPPER CYANIDE	18
3024	3025, 3026, 3027	COUMARIN DERIVATIVE PESTICIDE, ...	14
1171		ETHYLENE GLYCOL MONOETHYL ETHER	19
1172		ETHYLENE GLYCOL MONOETHYL ETHER ACETATE	19
1188		ETHYLENE GLYCOL MONOMETHYL ETHER	19
1189		ETHYLENE GLYCOL MONOMETHYL ETHER ACETATE	19
1613		HYDROCYANIC ACID, AQUEOUS SOLUTION, ...	18
1786		HYDROFLUORIC ACID AND SULPHURIC ACID MIXTURE	16
1790		HYDROFLUORIC ACID, solution ...	16
3294		HYDROGEN CYANIDE, SOLUTION IN ALCOHOL, ...	18
1051	1614	HYDROGEN CYANIDE, STABILIZED, ...	18
1052		HYDROGEN FLUORIDE, ANHYDROUS	16
2495		IODINE PENTAFLUORIDE	16
1620		LEAD CYANIDE	18
1626		MERCURIC POTASSIUM CYANIDE	18
1636		MERCURY CYANIDE	18
1230		METHANOL	19
3017	3018, 2783, 2784	ORGANOPHOSPHORUS PESTICIDE, ...	17
2198		PHOSPHORUS PENTAFLUORIDE	16
1381	2447	PHOSPHORUS, WHITE or YELLOW, ...	8
1679		POTASSIUM CUPROCYANIDE	18
1680		POTASSIUM CYANIDE	18
2908	2908-2919, 2977, 2978, 3321-3333	RADIOACTIVE MATERIAL ...	20
1859		SILICON TETRAFLUORIDE	16
1689		SODIUM CYANIDE	18