

Subject

Introduction to the Outcomes of MSC 100

# **ClassNK**

## ***Technical Information***

No. TEC-1180  
Date 1 April 2019

To whom it may concern

The one hundredth session of the Maritime Safety Committee (MSC 100) was held at the IMO in London, U.K. from 3 to 7 December 2018. Since the minutes, resolutions and circulars of the meeting were recently released from the IMO, a summary of the decisions taken at MSC 100 is provided as below for your information.

1. Adopted mandatory requirements

Mandatory requirement adopted at MSC 100 is as follows:

Amendments to SPS Code (See attachment 1)

Amendments to SPS Code (Code of Safety for Special Purpose Ships) were adopted in order to comprehensively consolidate the related resolutions and amendments (MSC/Circ.739, MSC.183(79), MSC.439(99)) into one resolution.

Applied: on or after 1 January 2020

2. Approved mandatory requirement

The following mandatory requirements were approved at this session, and are expected to be considered for adoption at MSC 101 in June 2019.

(1) Amendments to IBC Code (See attachment 3)

Amendments to IBC Code Chapter 17 (minimum requirements), 18 (list of chemicals to which this Code does not apply), 19 (Index of Products Carried in Bulk), 21 (Criteria for assigning carriage requirements for products subject to the IBC Code), etc. were approved following a comprehensive review of carriage requirements for products subject to the IBC Code. The draft amendments are expected to be adopted at MSC 101 and MEPC 74.

(2) Amendments to IGF Code (See attachment 4)

Amendments to regulations of IGF Code, on alternative fuel tank locations (5.3.4 of IGF Code), loading limit for liquefied gas fuel tanks (6.8.2bis of the Code), fuel piping (9.5.3-9.5.6 of the Code), internal combustion engines of piston type (10.3.1.1bis of the Code) and fire protection (11.3.3, 11.3.3bis of the Code), were approved.

(To be continued)

NOTES:

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- (3) Amendments to LSA Code (See attachment 5 and 10)

Amendments to LSA Code 6.1.1.3 were approved, in order to accept launch of a rescue boat with manual hoisting from the stowed position and turning out to the embarkation position by one person instead of stored mechanical power on cargo ships equipped with the rescue boat which is not one of the ship's survival craft, having a mass not more than 700 kg in fully equipped condition.

Amendments to LSA Code 4.4.8.1 in order that the requirement of buoyant oars and related equipment is not applicable for lifeboats equipped with two independent propulsion systems, were approved. In addition, a unified interpretation was approved as a tentative measure until the entry into force of the amendments, as mentioned in below item 3.1(1).
  - (4) Amendments to FSS Code (See attachment 6 and 9)

Amendments to FSS Code Chapter 15, replacing the wording "forward of" with "downstream of" to avoid misunderstanding on design of inert gas system, were approved. In addition, amendments to MSC.1/Circ.1582 were issued as a tentative measure until the entry into force of the amendments, as mentioned in below item 3.1(2).
  - (5) Amendments to Forms C, E and P in the appendix to SOLAS certificates (See attachment 7)

Amendments to item 8.1 "Details of navigational systems and equipment - Rudder, propeller, thrust, pitch and operational mode indicator" in the Record of Equipment as an appendix to Safety Certificate (Forms C and P) for cargo and passenger ships, and Safety Equipment Certificate (Form E) for cargo ships were approved, in order to uniform the indication in case the equipment is not on board.
3. The following unified interpretations (UIs) and guidelines were approved during MSC 100.
- 3.1 Unified interpretations (UIs)
- (1) Unified interpretation on LSA Code 4.4.8.1 (See attachment 10)

In conjunction with amendments to LSA Code which are mentioned in above item 2.(3), the interpretation on the relevant provisions were approved for the purpose that the amendments to the Code are practically effective.
  - (2) Amendments to unified interpretation on FSS Code Chapter 15 (MSC.1/Circ.1582) (See attachment 9)

In conjunction with amendments to FSS Code which are mentioned in above item 2.(4), amendments to the interpretation on the relevant provisions were approved for the purpose that the amendments to the Code are practically effective.

(To be continued)

### 3.2 Guidelines

- (1) Amendments to guidelines for the design and approval of fixed water-based fire-fighting systems for ro-ro spaces and special category spaces (MSC.1/Circ.1430) (See attachment 8)  
Amendments to guidelines for the design and approval of fixed water-based fire-fighting systems for ro-ro spaces and special category spaces were approved, in order to specify location of control of deluge (simultaneous watering) systems and revise design criteria for arrangement of sprinklers and nozzles.
- (2) Interim guidelines on the application of high manganese austenitic steel for cryogenic service (See attachment 11)  
Interim guidelines on requirements to utilize high manganese austenitic steel, which is not indicated in IGC Code and IGF Code, to tanks for cryogenic liquefied natural gas (LNG) were approved.

### 4. Others

- (1) GBS (Goal-based Standards) (See attachment 2)  
GBS, as stipulated in SOLAS II-1/3-10, is applied to oil tankers and bulk carriers of more than 150m in length\*. Design and construction of these ships shall comply with rules deemed as compliant with GBS. Further, GBS requires initial verification and maintenance of verification to the rules as conforming to the goals and functional requirements of GBS based on the GBS Verification Guidelines (MSC.296(87)).  
At this session, report of the GBS maintenance of verification audit on the rules of each IACS member and related corrective action plans of IACS were considered. Subsequently, it was confirmed that the rules maintain to be complied with GBS.  
In addition, consideration on amendments to the guidelines was made for finalization. In conclusion, the amendments to the guidelines including how to address application for verification audit with diverting third party's rules, were adopted.

\*Ships those which are contracted for construction on or after 1 July 2016. In the absence of contract, whose keel is laid on or after 1 July 2017, or delivered on or after 1 July 2020.

(To be continued)

- (2) Consideration of requirements for Maritime Autonomous Surface Ships (MASS) (See attachment 12)

Taking into account recent investigation of automation surrounding a ship, conventional requirements of safety and environmental protection relating to MASS have been discussed at MSC.

At this session, based on the report from the Correspondence Group on MASS, the framework and methodology for Regulatory Scoping Exercise (RSE) were revisited. Following the discussion, it was decided that first step (identification of provisions in IMO instruments) of the RSE will be carried out by assigned IMO member States in a convention or chapter basis, with a view to report to the intersessional meeting to be held in September 2019. Besides, development of interim guidelines for MASS trials was initiated.

- (3) Consideration of safety matters on use of low sulphur fuel

Triggered from the global 0.5% sulphur limit, which will enter into force on 1 January 2020, the consideration of safety matters on use of low sulphur fuel was initiated, in order to develop SOLAS requirements in addition to requirements of MARPOL.

In conclusion, the necessity of developing safety requirements was agreed, and the deliberation on the safety matters by various approaches including revision of existing regulations will be conducted at future session, taking account of MARPOL requirements.

For any questions about the above, please contact:

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Attachment:

1. RESOLUTION MSC.453(100)
2. RESOLUTION MSC.454(100)
3. DRAFT AMENDMENTS TO THE IBC CODE
4. DRAFT AMENDMENTS TO PARTS A AND A-1 OF THE IGF CODE
5. DRAFT AMENDMENTS TO THE LSA CODE
6. DRAFT AMENDMENTS TO CHAPTER 15 OF THE FSS CODE
7. DRAFT AMENDMENTS TO THE APPENDIX (CERTIFICATES) TO THE SOLAS CONVENTION
8. MSC.1/Circ.1430/Rev.1
9. MSC.1/Circ.1582/Rev.1
10. MSC.1/Circ.1597
11. MSC.1/Circ.1599
12. FRAMEWORK FOR THE REGULATORY SCOPING EXERCISE FOR THE USE OF MARITIME AUTONOMOUS SURFACE SHIPS (MASS)

## ANNEX 1

### **RESOLUTION MSC.453(100)** **(adopted on 7 December 2018)**

#### **AMENDMENTS TO THE CODE OF SAFETY FOR SPECIAL PURPOSE SHIPS (SPS CODE)**

THE MARITIME SAFETY COMMITTEE,

RECALLING Article 28(b) of the Convention on the International Maritime Organization concerning the functions of the Committee,

RECALLING ALSO resolution A.534(13), by which the Assembly, at its thirteenth session, adopted the Code of Safety for Special Purpose Ships ("the SPS Code"),

RECALLING FURTHER that the Assembly authorized it to amend the SPS Code as may be necessary,

RECALLING amendments to the SPS Code adopted by:

- .1 circular MSC/Circ.446, which became effective on 13 October 1986;
- .2 circular MSC/Circ.478, which became effective on 28 July 1987;
- .3 circular MSC/Circ.739, which became effective on 28 June 1996; and
- .4 resolution MSC.183(79), which became effective on 1 July 2006,

NOTING that it adopted, at its ninety-ninth session, amendments to SOLAS chapter IV and the appendix (Certificates) by resolution MSC.436(99),

HAVING CONSIDERED, at its 100th session, consequential amendments to the Record of Equipment of the SPS Code,

1 ADOPTS amendments to the SPS Code, the text of which is set out in the annex to the present resolution, also incorporating the amendments previously adopted by circular MSC/Circ.739 (which includes the amendments adopted by MSC/Circ.446 and MSC/Circ.478) and resolution MSC.183(79), and the consequential amendments to the Record of Equipment;

2 DETERMINES that the said consequential amendments to the Record of Equipment should become effective on 1 January 2020, in conjunction with the entry into force of amendments to SOLAS chapter IV and the appendix (Certificates) adopted by resolution MSC.436(99).

ANNEX

**AMENDMENTS TO THE CODE OF SAFETY FOR SPECIAL PURPOSE SHIPS (SPS CODE)  
(RESOLUTION A.534(13))**

1 The existing text of section 1.2 is amended to read as follows:

"Except as provided in 8.3, the Code applies to every new special purpose ship of not less than 500 gross tonnage. The Administration may also apply these provisions as far as reasonable and practicable to special purpose ships of less than 500 gross tonnage."

2 The existing paragraph 1.3.4 is amended to read as follows:

"1.3.4 Except as provided in 8.3, "special purpose ship" means a mechanically self-propelled ship which, by reason of its function, carries on board more than 12 special personnel including passengers. Special purpose ships to which this Code applies include the following types:

- .1 ships engaged in research, expeditions and survey;
- .2 ships for training of marine personnel;
- .3 whale and fish factory ships not engaged in catching;
- .4 ships processing other living resources of the sea, not engaged in catching; and
- .5 other ships with design features and modes of operation similar to ships referred to in .1 to .4 which in the opinion of the Administration may be referred to this group."

3 The existing chapter 8 is replaced with the following:

**"CHAPTER 8 – LIFE-SAVING APPLIANCES"**

8.1 The requirements of chapter III of the 1974 SOLAS Convention, as amended, should be applied with the specifications given hereunder.

8.2 A special purpose ship carrying more than 50 special personnel should comply with the requirements contained in chapter III of the 1974 SOLAS Convention for passenger ships engaged in international voyages which are not short international voyages.

8.3 Notwithstanding the provisions of 8.2, sail training ships, whether mechanically self-propelled or not and irrespective of their gross tonnage, carrying more than 50 special personnel (trainees), may in lieu of meeting the requirements of regulations 20.1.1, 20.1.2 or 20.1.3 of chapter III of the 1974 SOLAS Convention:

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\* All references in this chapter are references to regulations of the 1974 SOLAS Convention, as amended in 1983.

- .1 comply with the requirements of regulation 20.1.5 of chapter III of the 1974 SOLAS Convention including the provision of at least one rescue boat in accordance with regulation 20.2.2 of chapter III; and
- .2 in addition, carry one immersion suit complying with regulation 33 of chapter III of the 1974 SOLAS Convention for each person on board, unless:
  - .1 davits are provided for launching the liferafts; or
  - .2 the ship is constantly engaged on voyages in warm climates where, in the opinion of the Administration, immersion suits are unnecessary.

8.4 A special purpose ship carrying not more than 50 special personnel should comply with the requirements contained in chapter III of the 1974 SOLAS Convention for cargo ships other than tankers. Such ships may however carry life-saving appliances in accordance with 8.2, if they comply with the subdivision requirements for ships carrying more than 50 special personnel.

8.5 Regulations 2, 18.3.3, 20.1.2, 20.1.3, 26.1.6, 26.1.7, 45 and 46 of chapter III of the 1974 SOLAS Convention are not applicable to special purpose ships.

8.6 Where in chapter III of the 1974 SOLAS Convention the term "passenger" is used, it should be read to mean "special personnel" for the purpose of this Code."

- 4 The existing chapter 9 is replaced with the following:

#### **"CHAPTER 9 – RADIOCOMMUNICATIONS**

Special purpose ships should comply with the provisions of chapter IV of the 1974 SOLAS Convention, as amended."

- 5 The existing "Form of Safety Certificate for Special Purpose Ships" is replaced with the revised form given in the attached appendix which has been supplemented by a "Record of Equipment for Special Purpose Ship Safety Certificate (Form SPS)".

**APPENDIX**

**FORM OF SAFETY CERTIFICATE FOR SPECIAL PURPOSE SHIPS**

SPECIAL PURPOSE SHIP SAFETY CERTIFICATE

This Certificate should be supplemented by a Record of Equipment (Form SPS)

(Official seal)

(State)

Issued in compliance with the provisions of the  
CODE OF SAFETY FOR SPECIAL PURPOSE SHIPS  
under the authority of the Government of

(name of the State)

by

(person or organization authorized)

Particulars of ship\*

Name of ship .....

Distinctive number or letters .....

Port of registry .....

Gross tonnage .....

Sea areas in which ship is certificated  
to operate (SOLAS regulation IV/2) .....

IMO number\*\* .....

Ship's special purpose .....

Date on which keel was laid or ship was of a similar  
stage of construction or, where applicable, date on  
which work for a conversion or an alteration or  
modification of a major character was commenced .....

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\* Alternatively, the particulars of the ship may be placed horizontally in boxes.

\*\* Refer to the IMO Ship Identification Number Scheme, adopted by the Organization by resolution A.1117(30).



THIS IS TO CERTIFY:

- 1 That the ship has been surveyed in accordance with the requirements of regulation 1.6 of the Code.
- 2 That the survey showed that:
  - 2.1 the ship complied with the provisions of the Code as regards:
    - .1 the structure, main and auxiliary machinery, boilers and other pressure vessels; and
    - .2 the watertight subdivision arrangements and details;
  - 2.2 the ship complied with the provisions of the Code as regards structural fire protection, fire safety systems and appliances, and fire control plans;
  - 2.3 the life-saving appliances and the equipment of the lifeboats, liferafts and rescue boats were provided in accordance with the provisions of the Code;
  - 2.4 the ship was provided with a line-throwing appliance and radio installations used in life-saving appliances in accordance with the provisions of the Code;
  - 2.5 the ship complied with the provisions of the Code as regards radio installations;
  - 2.6 the functioning of the radio installations used in life-saving appliances complied with the provisions of the Code;
  - 2.7 the ship complied with the provisions of the Code as regards shipborne navigational equipment, means of embarkation for pilots and nautical publications;
  - 2.8 the ship was provided with lights, shapes and means of making sound signals and distress signals, in accordance with the provisions of the Code and the International Regulations for Preventing Collisions of Sea in force; and
  - 2.9 in all other respects the ship complied with the relevant provisions of the Code.
- 3 That an Exemption Certificate has/has not\* been issued.
- 4 That the ship has/has not\* been provided with Certificates issued under the 1974 SOLAS Convention, as amended.

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\* Delete as appropriate.

This certificate is valid until .....

Completion date of the survey on which this certificate is based: .....  
(dd/mm/yyyy)

Issued at .....  
(Place of issue of certificate)

.....  
(Date of issue)

.....  
(Signature of authorized official  
issuing the certificate)

(Seal or stamp of the issuing authority, as appropriate)

ENDORSEMENT FOR ANNUAL SURVEYS RELATING TO HULL, MACHINERY AND  
EQUIPMENT REFERRED TO IN SECTION 2.1 OF THIS CERTIFICATE

THIS IS TO CERTIFY that, at a survey required by 1.6 of the Code, the ship was  
found to comply with the relevant provisions of the Code.

Annual survey: Signed .....  
(Signature of authorized official)

Place .....

Date .....

(Seal or stamp of the Authority, as appropriate)

Annual survey: Signed .....  
(Signature of authorized official)

Place .....

Date .....

(Seal or stamp of the Authority, as appropriate)

Annual survey: Signed .....  
(Signature of authorized official)

Place .....

Date .....

(Seal or stamp of the Authority, as appropriate)

Annual survey: Signed .....  
(Signature of authorized official)

Place .....

Date .....

(Seal or stamp of the Authority, as appropriate)



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ENDORSEMENT FOR PERIODICAL SURVEYS RELATING TO RADIO INSTALLATIONS  
REFERRED TO IN SECTION 2.5 OF THIS CERTIFICATE

THIS IS TO CERTIFY that, at a survey required by 1.6 of the Code, the ship was found to comply with the relevant provisions of the Code:

Periodical survey: Signed .....  
(Signature of authorized official)

Place .....

Date .....

(Seal or stamp of the Authority, as appropriate)

Periodical survey: Signed .....  
(Signature of authorized official)

Place .....

Date .....

(Seal or stamp of the Authority, as appropriate)

Periodical survey: Signed .....  
(Signature of authorized official)

Place .....

Date .....

(Seal or stamp of the Authority, as appropriate)

Annual survey: Signed .....  
(Signature of authorized official)

Place .....

Date .....

(Seal or stamp of the Authority, as appropriate)

ENDORSEMENT FOR THE EXTENSION OF THE CERTIFICATE

The ship complies with the relevant provisions of the Code and this Certificate should, in accordance with 1.7.3, be accepted as valid until .....

Signed .....  
(Signature of authorized official)

Place .....

Date .....

(Seal or stamp of the Authority, as appropriate)

ANNEX

**RECORD OF EQUIPMENT FOR THE SPECIAL PURPOSE SHIP SAFETY CERTIFICATE  
(FORM SPS)**

This Record should be permanently attached to the  
Special Purpose Ship Safety Certificate.

**RECORD OF EQUIPMENT FOR COMPLIANCE WITH THE  
CODE OF SAFETY FOR SPECIAL PURPOSE SHIPS**

**1 Particulars of ship**

Name of ship .....

Distinctive number or letters .....

Number of persons on board (including passengers)  
for which certified .....

Minimum number of persons on board with required qualifications to operate  
the radio installations .....

**2 Details of life-saving appliances**

1	Total number of persons for which life-saving appliances are provided	.....	
		Port side	Starboard side
2	Total number of lifeboats	.....	.....
2.1	Total number of persons accommodated by them	.....	.....
2.2	Number of partially enclosed lifeboats (SOLAS regulation III/42)	.....	.....
2.3	Number of self-righting partially enclosed lifeboats (SOLAS regulation III/43)	.....	.....
2.4	Number of totally enclosed lifeboats (SOLAS regulation III/44)	.....	.....
2.5	Other lifeboats	.....	.....
2.5.1	Number	.....	.....
2.5.2	Type	.....	.....

3	Number of motor lifeboats (included in the total lifeboats shown above)	.....
3.1	Number of lifeboats fitted with searchlights	.....
4	Number of rescue boats	.....
4.1	Number of boats which are included in the total lifeboats shown above	.....
5	Liferafts	.....
5.1	Those for which approved launching appliances are required	.....
5.1.1	Number of liferafts	.....
5.1.2	Number of persons accommodated by them	.....
5.2	Those for which approved launching appliances are not required	.....
5.2.1	Number of liferafts	.....
5.2.2	Number of persons accommodated by them	.....
6	Buoyant apparatus	.....
6.1	Number of apparatus	.....
6.2	Number of persons capable of being supported	.....
7	Number of lifebuoys	.....
8	Number of lifejackets	.....
9	Immersion suits	.....
9.1	Total number	.....
9.2	Number of suits complying with the requirements for lifejackets	.....
10	Number of thermal protective aids*	.....
11	Radio installations used in life-saving appliances	.....
11.1	Number of radar transponders	.....
11.2	Number of two-way VHF radiotelephone apparatus	.....

\* Excluding those required by SOLAS regulations III/38.5.1.24, III/41.8.31 and III/47.2.2.13.

**3 Details of radio facilities**

Item	Actual provision
1 Primary systems	.....
1.1 VHF radio installation	.....
1.1.1 DSC encoder	.....
1.1.2 DSC watch receiver	.....
1.1.3 Radiotelephony	.....
1.2 MF radio installation	.....
1.2.1 DSC encoder	.....
1.2.2 DSC watch receiver	.....
1.2.3 Radiotelephony	.....
1.3 MF/HF radio installation	.....
1.3.1 DSC encoder	.....
1.3.2 DSC watch receiver	.....
1.3.3 Radiotelephony	.....
1.3.4 Direct-printing radiotelegraphy	.....
1.4 Ship earth station providing a recognized mobile satellite service	.....
2 Secondary means of alerting	.....
3 Facilities for reception of maritime safety information	.....
3.1 NAVTEX receiver	.....
3.2 EGC receiver	.....
3.3 HF direct-printing radiotelegraph receiver	.....
4 Satellite EPIRB	.....
4.1 COSPAS-SARSAT	.....
5 VHF EPIRB	.....
6 Ship's radar transponder	.....



- 4 **Methods used to ensure availability of radio facilities (SOLAS regulations IV/15.6 and 15.7)**
- 4.1 Duplication of equipment .....
- 4.2 Shore-based maintenance .....
- 4.3 At-sea maintenance capability .....
- 5 **Special Purpose Ships constructed before 1 February 1995 which do not comply with all the applicable requirements of chapter IV of the SOLAS Convention, as amended\***

	Requirements of regulations	Actual provision
Hours of listening by operator	.....	.....
Number of operators	.....	.....
Whether auto alarm fitted	.....	.....
Whether main installation fitted	.....	.....
Whether reserve installation fitted	.....	.....
Whether main and reserve transmitters electrically separated or combined	.....	.....

- 6 **Special Purpose Ships constructed before 1 February 1992 which do not comply with the applicable requirements of chapter III of the SOLAS Convention, as amended\*\***

	Actual provision
Radiotelegraph installation for lifeboat	.....
Portable radio apparatus for survival craft	.....
Survival craft EPIRB (121.5 MHz and 243.0 MHz)	.....
Two-way radiotelephone apparatus	.....

THIS IS TO CERTIFY that this Record is correct in all respects.

Issued at .....

(Place of issue of the Record)

.....  
(Date of issue)

.....  
(Signature of authorized official  
issuing the Record)

(Seal or stamp of the issuing authority, as appropriate)

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\* This section need not be reproduced on the record attached to certificates issued after 1 February 1999.

\*\* This section need not be reproduced on the record attached to certificates issued after 1 February 1995.

### ANNEX 3

#### **RESOLUTION MSC.454(100)** **(adopted on 7 December 2018)**

#### **REVISED GUIDELINES FOR VERIFICATION OF CONFORMITY WITH GOAL-BASED SHIP CONSTRUCTION STANDARDS FOR BULK CARRIERS AND OIL TANKERS**

THE MARITIME SAFETY COMMITTEE,

RECALLING Article 28(b) of the Convention on the International Maritime Organization concerning the functions of the Committee,

HAVING ADOPTED, by resolution MSC.287(87), the International Goal-Based Ship Construction Standards for Bulk Carriers and Oil Tankers (hereinafter referred to as "the Standards") and, by resolution MSC.290(87), SOLAS regulations II-1/2.28 and II-1/3-10 to make the Standards mandatory,

NOTING that section 6 of the Standards requires that the rules for the design and construction of bulk carriers and oil tankers of an organization which is recognized by an Administration in accordance with the provisions of SOLAS regulation XI-1/1, or national rules of an Administration used as an equivalent to the rules of a recognized organization according to SOLAS regulation II-1/3-1, shall be verified as conforming to the goals and functional requirements of the Standards, based on the guidelines developed by the Organization,

RECOGNIZING the need for revision of the *Guidelines for verification of conformity with goal-based ship construction standards for bulk carriers and oil tankers*, adopted by resolution MSC.296(87), in light of the experience gained with their application and the recommendations made by the GBS Audit teams and to support their implementation,

HAVING CONSIDERED, at its 100th session, the proposed Revised guidelines for verification of conformity with goal-based ship construction standards for bulk carriers and oil tankers,

1. ADOPTS the Revised guidelines for verification of conformity with goal-based ship construction standards for bulk carriers and oil tankers, the text of which is set out in the annex to the present resolution;
2. REQUESTS Administrations and organizations recognized by Administrations in accordance with the provisions of SOLAS regulation XI-1/1 to utilize the Revised guidelines when applying for verification that their design and construction rules for bulk carriers and oil tankers conform to the Standards;
3. INVITES Contracting Governments to note that these Revised guidelines should take effect on documentation submitted for initial verification and on rule and/or documentation changes undergoing the maintenance of verification process on or after 1 January 2020;
4. RESOLVES to review these Revised guidelines, as necessary, in view of experience gained with their application;
5. REVOKES resolution MSC.296(87) on 1 January 2020.

## ANNEX

### REVISED GUIDELINES FOR VERIFICATION OF CONFORMITY WITH THE INTERNATIONAL GOAL-BASED SHIP CONSTRUCTION STANDARDS FOR BULK CARRIERS AND OIL TANKERS

#### INTRODUCTION

1 The Organization adopted, by resolution MSC.287(87), the *International goal-based ship construction standards for bulk carriers and oil tankers* (hereinafter referred to as "the Standards"), specifying goals, functional requirements and verification of conformity to ensure that ships are constructed in such a manner that, when properly operated and maintained, they can remain safe for their design life, and that all parts of a ship can be easily accessed to permit proper inspection and ease of maintenance.

2 These Revised guidelines for verification of conformity with goal-based ship construction standards for bulk carriers and oil tankers (hereinafter referred to as "the Guidelines") provide the procedures necessary for demonstrating and verifying that the ship design and construction rules for bulk carriers and oil tankers of an Administration or its recognized organization conform to the Standards, including both the method and criteria to be applied during the verification process.

3 The Guidelines are composed of two parts:

- .1 Part A establishes the procedures to be followed in order to verify that ship design and construction rules conform to the Standards. It includes sections on initial verification and maintenance of verification of the rules.
- .2 Part B provides detailed documentation requirements and evaluation criteria that should be used to verify that the rules conform to the Standards.

4 Those rules having been verified as conforming to the Standards, according to previous version of the Guidelines (resolution MSC.296(87)), should not be re-verified based on an updated version of the Guidelines.

#### Definitions

5 For the purpose of the Guidelines, the following definitions apply:

- .1 *Conformity* means fulfilment of Tier I goal(s) and Tier II functional requirement(s) of the Standards.
- .2 *Corrective action*: action intended to eliminate the cause(s) of a non-conformity.
- .3 *Improvement action*: action intended to address an observation.
- .4 *Finding* means an observation or a non-conformity.
- .5 *Non-conformity* means non-fulfilment of a Tier I goal(s) and Tier II functional requirement(s) of the Standards or lack of information or documentation requirements that prevent the evaluation criteria from being applied when conducting the audit.

- .6 *Objective evidence* means quantitative or qualitative information, records or statement of fact which are based on observation, measurement or historical service data and which can be verified.
- .7 *Observation* means statements of facts or proposals made during an audit which are based on objective evidence but are not a non-conformity, and that may provide the basis for improvement.
- .8 *Organization* means the International Maritime Organization.
- .9 *Rules or rule set* means requirements for hull design and construction of bulk carriers and/or oil tankers operating in unrestricted worldwide service. Within the verification audit process, any information and/or documentation, either supporting or included in the rule development process, which may include guidelines, interpretations and internal procedures considered necessary to assess the conformity of the rules may be interpreted as a part of the rule set.
- .10 *Secretary-General* means the Secretary-General of the International Maritime Organization.
- .11 *Self-assessment* means the Submitter assesses its rules for the design and construction of bulk carriers and/or oil tankers for conformity with the goals and functional requirements as set out in the Standards.
- .12 *SOLAS* means the International Convention for the Safety of Life at Sea, 1974, as amended.
- .13 *Standards* means the *International goal-based ship construction standards for bulk carriers and oil tankers*, adopted by the Organization by resolution MSC.287(87).
- .14 *Submitter* means any Administration or recognized organization that requests the Organization to verify that its ship design and construction rules for bulk carriers and/or oil tankers conform to the Standards.
- .15 *Third party* means a party that is neither the Organization nor the Submitter.
- .16 *Verification* (and any variation of the word *verify*) means the rules for the design and construction of bulk carriers and oil tankers have been compared to the Standards and have been found to be in conformity or are consistent with the goals and functional requirements as set out in the Standards.
- .17 *Verification audit* or *audit* means the process of evaluating the Submitter's rules, self-assessment and supporting documentation to ascertain the validity and reliability of information. The purpose of the audit is to assess the conformity of the submitted rules with the Standards based on work done on a sampling basis.
- .18 *Validation* means the act of examining methodologies, assessments, procedures, hypothesis or criteria used in requirements or calculations in order to make them acceptable.

- .19 *Benchmarking* means the act of measuring the performance of methodologies, assessments, criteria and requirements by using indicators that can be compared with an accepted standard or with experimental and/or service history data, performance levels or outcomes known to be reliable.
- .20 *Rule change* means any text change to an existing rule or rule set already verified as conforming to the Standards.
- .21 *Categorization of rule changes* means assigning a new rule or rule change to one of the following categories for the purpose of maintenance of verification:

Category	Designation	Explanation
1	Corrigenda and follow-up change	Editorial corrigenda; or rule changes reflecting amendments to IMO mandatory instruments
2	Minor change	Change or deletion of a rule requirement or addition of new requirements not belonging to categories 1 or 3
3	Major change	Change of basic methodology or technology or basic assumptions, e.g. changing the basis for load determination; introduction of new technologies which will require change of permissible values (acceptance criteria), etc.

## PART A VERIFICATION PROCESS

### Scope of verification

6 This part establishes the procedures to be followed in order to verify that rules for the design and construction of bulk carriers and/or oil tankers conform to the Standards. The verification process consists of two main elements: self-assessment of the rules by the Submitter and an audit of the rules, the self-assessment and the supporting documentation by the Organization.

### Initial verification

#### *Initiation*

7 Any Administration or recognized organization wishing to have its rules verified as conforming to the Standards should initiate the process with a letter to the Secretary-General, requesting a verification audit of their rules. The letter should be accompanied by a complete technical documentation package (see paragraph 10) and a supporting letter from an Administration that has recognized the Submitter, if applicable.

8 The Secretary-General notifies the Submitter of his decision to accept or reject the request and, if accepted, advises the expected date for establishment of the GBS audit team

(the Team) to audit the submission. If the request is rejected, the Secretary-General will include the reason for doing so.

9 The Submitter may withdraw the application at any time prior to consideration by the Maritime Safety Committee.

### ***Submission***

10 The Submitter should provide a technical documentation package for review in electronic form in English (to each member of the Team and the Secretariat), including:

- .1 the rule set to be verified as conforming to the Standards;
- .2 all items listed under information and documentation requirements in part B of these Guidelines which are not included in .1 above and are included in the internal quality management system or the rule development process as applicable;
- .3 a self-assessment, addressing all items listed under information and documentation requirements and evaluation criteria in part B of these Guidelines;
- .4 a clear indication of any instance where a functional requirement, or portions of it, are satisfied by IMO mandatory instruments that are not part of the submitted rules (e.g. SOLAS or MARPOL requirements);
- .5 any other documentation which, in the Submitter's opinion, supports their assessment that the rules conform to the Standards;
- .6 a completed Submission Template (see appendix 1);
- .7 a clear indication of any confidential and/or proprietary information submitted with the documentation package; and
- .8 in case a Submitter uses third-party rules, procedures and technical documentation, the following should be submitted in addition to sub-paragraphs .1 to .7 above:
  - .1 a clear statement that the use of such rules, procedures and technical documentation does not infringe any copyright material;
  - .2 clear procedures, as part of the internal quality management system, for the regular review and continuous improvement of the submitted rules, procedures and technical documentation; and
  - .3 details of processes, procedures and associated documentation that ensure proper monitoring and implementation of the third-party rules.

### ***Audit process***

- 11 The initial verification audit (audit) is an iterative process based on the following steps:
- .1 the Secretary-General verifies that the submitted technical documentation package includes all of the elements specified in paragraph 10;
  - .2 the Secretary-General establishes the GBS audit team and forwards the request for audit and technical documentation package to the Team with the instructions given in paragraph 12;
  - .3 the Team reviews the information, confirms completeness of the documentation submitted, exchanges views and establishes an audit plan;
  - .4 the Team conducts the audit;
  - .5 the Team prepares an interim audit report for the Submitter that contains the preliminary findings of the audit, requests for additional information as needed, and possible non-conformities, using the report format specified in appendix 2. Where the Team has identified a possible non-conformity, they should explain the reasons for reaching that conclusion;
  - .6 upon receipt of the interim report, the Submitter may respond by submitting additional documentation through the IMO Secretariat to the Team to address the reported non-conformities and/or requests for additional information;
  - .7 the Team prepares a final audit report with a recommendation, using the report format specified in appendix 2, and provides it to the Secretary-General with a copy to the Submitter. Where the Team has identified an unresolved non-conformity, they should explain the reasons for reaching that conclusion;
  - .8 the Submitter should prepare corrective action plans to address any non-conformities reported by the Team and submit them to the Secretary-General;
  - .9 the Team reviews the corrective action plans and sends its recommendation to the Secretary-General; and
  - .10 the Team's comments and suggestions related to the audit process should be submitted in a separate report to the Secretary-General.

12 The Team is expected to conduct an audit to determine whether the submitted rules conform to the Tier I goals and each of the Tier II functional requirements, based on the criteria in part B of the Guidelines. In undertaking this task, the Team should exercise their professional judgement in determining the depth of the audit.

13 Where the Submitter can clearly indicate that a functional requirement, or portions of it, are covered by IMO mandatory instruments (e.g. SOLAS or MARPOL requirements), but are not part of the submitted rules, the Team should accept this as part of the verification, provided that it does not affect other covered functional requirements. Mandatory IMO instruments used to satisfy functional requirements should be applied in a manner consistent with IMO interpretations.

14 Timescales for the initial verification audit process should be agreed between the Secretary-General, the Team and the Submitter at an early stage. Deviations to agreed timescales can be considered by the Secretary-General upon timely request.

### ***Appeal***

15 The Submitter, through their supporting Administration, can appeal a finding of the GBS audit team to the Secretary-General. Notification of intent to appeal must be made within 30 days after receiving the Team's final audit report. The appeal request should follow within six months of the notification with the documentation to support the appeal request. After the supporting documentation is received, the Secretary-General should establish an appeal board, independent of the original Team, to adjudicate the request. This appeal board should be comprised of three or five members and be selected by the Secretary-General from the same list of experts described in paragraph 37. These members should not have participated in the Team that conducted the audit that is being appealed.

### ***Approval***

16 The Secretary-General forwards the final audit report of the Team, any corrective action plans, supplemented by any appeal report and any auditors' recommendations on the corrective action plans, if applicable, to the Committee for consideration and final decision.

17 Ships contracted for construction to any new rules or rule changes to rules already verified as conforming to the Standards may be deemed to meet the Standards until a final decision is made by the Committee.

18 The Committee considers the submission from the Secretary-General, with a view to confirming that the information provided by the Submitter demonstrates that the rules conform to the Standards.

19 Where non-conformities have been found and corrective action plans have been submitted, the rules and/or the documentation should be revised as necessary and the documentation to demonstrate rectification of non-conformities according to the agreed corrective action plans should be submitted for audit (see paragraphs 26.1, 27.1 and 27.3). During this process, ships contracted for construction to any new rules or rule changes to rules already verified as conforming to the Standards may be deemed to meet the Standards until a final decision is made by the Committee unless the Committee agrees that there is a non-conformity that compromises safety.

20 Upon final decision by the Committee, the Secretary-General notifies the relevant Administration and recognized organization as to whether the submitted rules conform to the Tier I goals and Tier II functional requirements of the Standards. In the case of non-conformity, the notification letter should include specific details to support the determination of non-conformity.

21 The Secretary-General circulates the results of successful verifications to Member Governments by appropriate means and maintains a list of all rule sets that have been verified for conformity as well as the original copy of the documentation package submitted.

### ***Common submissions by groups of Submitters***

22 Where documentation is common to more than one recognized organization or Administration, Submitters may make a request to the Secretary-General to submit a single package containing all the common documents.



23 Individual recognized organizations and Administrations should also submit their own documentation demonstrating how the common documents have been incorporated into their own requirements. The individual package should also include any additional information which is relevant to the audit. For an initial audit, the individual submission should be supported by an Administration which has recognized the Submitter, as required by paragraph 7.

24 Supporting Administrations should receive from the individual Submitter a copy of any common submission made on behalf of the recognized organization they are supporting.

25 The Secretary-General may establish a separate Team to evaluate the common submission. If such a team is established, it should liaise with the Team that is considering the individual submissions to ensure that findings identified in the individual package that are related to the common package are addressed.

### **Maintenance of verification**

26 The addition of new rules or changes to rules already verified as conforming to the Standards may be introduced as a result of:

- .1 the application of corrective actions emanating from previous verification audits; or
- .2 a continuous improvement process, which may take into account the experience gained and the due consideration by the Administration or the recognized organization the rules of which have been verified as conforming to the Standards, which also includes the addressing of observations stemming from previous verification audits.

27 Addition of new rules or changes to rules already verified as conforming to the Standards should be processed as follows:

- .1 if they are as a result of paragraph 26.1 above, each Submitter should notify and make available any new rules or rule changes, including the necessary documentation regarding the completion of corrective actions for the non-conformities reported, to the Secretary-General and to all Administrations that have recognized them. The notification should include, at least (see also appendix 3):
  - .1 an extract from the original rule linkage summary table related to the non-conformity;
  - .2 a copy of the text of the original non-conformity;
  - .3 an explanation of the investigation related to the non-conformity;
  - .4 a copy of the detailed action plan applied, including how the non-conformity has been rectified and any impact of the corrective actions;
  - .5 a self-assessment (rule linkage) addressing all non-conformities; and
  - .6 any supporting documentation, e.g. rule change proposals, updated technical background documents, changed procedures, etc.

- .2 If they are as a result of paragraph 26.2 above, at least annually, each recognized organization whose rules have been verified as conforming to the Standards should make available any new rules or rule changes, including any errata, corrigenda or clarifications, to the Secretary-General and to all Administrations that have recognized them. The Secretary-General should also be provided with a rule commentary. All changes should be listed in the rule commentary including their categorization as per paragraph 5.21 and, for categories 2 and 3 changes, the rule commentary must clearly indicate the impact of the changes on conformity with the Standards of those rules already verified. The commentary should include, but not be limited to:
- .1 an explanation of why the changes were considered necessary, including a description of the issues under consideration;
  - .2 the extent to which the changes address the issues under consideration;
  - .3 an explanation of the way the rules were formulated/drafted;
  - .4 an indication of any impact on and/or contribution to safety, security or environmental protection; and
  - .5 an indication of any impact on net and gross scantlings.
- .3 The Organization should audit all new rules and rule changes received per sub-paragraph .1 above. To such an extent, the new rules, rule changes and the necessary documentation should be submitted in a timely manner. The Secretary-General should establish a Team accordingly and forward the compilation of new rules and changes received per sub-paragraph .1 to it for consideration. The Team should conduct a preliminary review of the new rules and changes, exchange views and establish an audit plan. The Team conducts the audit and prepares a verification audit report with a recommendation and provides it to the Secretary-General with a copy to the Submitter. Where the Team has identified a non-conformity or an unresolved non-conformity, it should explain the reasons for reaching that conclusion. The findings of the Team should be forwarded by the Secretary-General to the Committee for further consideration and final disposition at the earliest opportunity after the Committee session that had considered the final audit report and had decided upon conformity. The Secretary-General should notify the relevant Submitter(s) as to whether the non-conformity has been rectified.
- .4 The Organization should review and audit the rule changes received per sub-paragraph .2 every three years. The Secretary-General should establish a Team and forward the compilation of annual changes received per sub-paragraph .2 to it for consideration. Using their professional judgement, the team should conduct a review of all the changes taking into account the information submitted, particularly the Submitters' categorization of the rule changes and the impact assessment, exchange views and establish an audit plan. Category 3 changes should be subject to audit; category 2 changes may require an audit depending on the impact of the change; category 1 changes need not be audited unless the team deems it necessary. The Team should provide the audit plan to the Secretary-General for submission to the Committee, and to the Submitters for information.

The Team conducts the audit and prepares a maintenance of verification audit report with a recommendation and provides it to the Secretary-General. Where the Team has identified a non-conformity, it should explain the reasons for reaching that conclusion. The findings of the Team should be forwarded by the Secretary-General to the Committee for further consideration and final disposition.

- .5 When an Administration considers a new rule or rule change described in sub-paragraph .2 above to result in non-conformity with the Standards, it may request the Secretary-General to conduct a review of the rule or the change, respectively. The request should include supporting justification why such a review is necessary. The Secretary-General should establish a Team to assess the request of the Administration and the impact of the change(s) on conformity with the Standards, and then assess the necessity of conducting an audit, regardless of the three-year cycle. The recommendations of the Team should be forwarded to the Committee by the Secretary-General, along with the request from the Administration and supporting documentation, for further consideration and final disposition.
- .6 The Submitter may request the Secretary-General to conduct a review of the rule or the change, respectively. The request should include supporting justification why such a review is necessary. The Secretary-General should establish a Team to assess the request of the Submitter and the impact of the change(s) on conformity with the Standards, and then assess the necessity of conducting an audit, regardless of the three-year cycle. The recommendations of the Team should be forwarded to the Committee by the Secretary-General, along with the request from the Submitter and supporting documentation, for further consideration and final disposition.
- .7 Any Administration the rules of which have been verified against the Standards should be subject to the process described in sub-paragraphs .1 to .5 above, as applicable.
- .8 Rules should be considered to be in conformity unless sub-paragraphs .3, .4 or .5 above result in non-conformities. During the subsequent process ships contracted for construction to the revised rules may be deemed to meet the Standards.

#### ***Rectification of non-conformities after initial or maintenance audits***

28 Where non-conformities are identified and corrective action plans submitted, the Submitter should prepare a further submission to demonstrate that the non-conformity has been rectified.

29 The submission should contain the following information (see also appendix 3):

- .1 an extract from the original rule linkage summary table related to the non-conformity;
- .2 a copy of the text of the original non-conformity;
- .3 a copy of the submitted corrective action plan;
- .4 details of how the non-conformity has been rectified; and

- .5 any supporting documentation, e.g. rule change proposals, updated technical background documents, changed procedures, etc.

30 The Secretary-General will establish an audit team to review the submission and forwards the documentation package to the Team for the following course of action:

- .1 The Team should conduct a preliminary review of the new rules and the changes, exchange views and establish an audit plan. The Team conducts the audit. The Team may interact with the Submitters for clarification or requests for additional material.
- .2 The Team prepares an audit report with a recommendation and provides it to the Secretary-General with a copy to the Submitter. Where the Team has identified a non-conformity or an unresolved non-conformity, they should explain the reasons for reaching that conclusion.
- .3 The Secretary-General forwards the audit report to the Committee for consideration and final decision.
- .4 The Committee considers the report prepared by the Team with a view to confirming that the information provided by the Submitter demonstrates that the non-conformity has been rectified.

31 Upon final decision by the Committee, the Secretary-General notifies the relevant Submitter as to whether the non-conformity has been rectified.

#### ***Follow up of observations***

32 Notwithstanding the provisions in paragraphs 26 and 27 above, where observations are identified, the Submitter should prepare a further submission to demonstrate that an observation has been recognized and will be addressed.

33 The submission should contain the following information:

- .1 the original documentation related to the observation(s);
- .2 a copy of the text of the observation(s);
- .3 a copy of the improvement action(s); and
- .4 any supporting documentation.

34 During the maintenance of verification audit, any improvement action plans should be made available to the auditor(s).

35 The Committee may request re-verification of rules if significant changes are made to the Standards or other IMO mandatory instruments or if there is a compelling need.

#### **GBS audit team**

36 A GBS audit team, established under the auspices of the Committee, will conduct an audit of the Submitter's documentation package to verify whether the rules conform to the Standards.

The Team will serve as an independent panel of technical experts which are not considered to be representing any Member State of the Organization or any organization in consultative status. The Team should consist of three (3) or five (5) members, depending on the complexity of the submission(s) and/or the necessary time to review the documentation package(s), e.g. in case of common submissions. A simple majority will be required to recommend a finding of non-conformity for a functional requirement. The voting of individual members will be kept confidential, with the resulting outcome considered as a decision of the Team. In any case, the view of the minority should be fully documented in the final audit report of the Team.

37 Administrations and non-governmental organizations in consultative status with the Organization may nominate individuals for inclusion in a list of experts, maintained by the Secretary-General, from which the members of the Team will be selected. Nominations should be provided to the Secretary-General and should be accompanied by a curriculum vitae.

38 Nominees should have adequate knowledge of, and experience in, ship structural design and construction, the Standards and classification society rules and rule development and be able to correctly interpret the rules for correlation with relevant regulatory requirements. Additionally, nominees should satisfy at least some of the following requirements:

- .1 engineering degree in naval architecture and/or structural engineering;
- .2 scientific or engineering knowledge of technical subjects addressed in ship structural standards including strength of materials, structural analysis, fatigue analysis, hydrodynamics and load calculations, and structural reliability;
- .3 design, construction or operating experience with the type of ship addressed by the ship rules being verified;
- .4 knowledge of ship safety construction requirements, including SOLAS requirements and industry standards, guidelines and practices;
- .5 knowledge of environmental protection requirements related to ship structures;
- .6 knowledge and experience in survey, inspection and maintenance of ship structures;
- .7 knowledge and experience in shipbuilding and ship construction practices;
- .8 knowledge and experience in auditing; and
- .9 research experience in any of the areas referred to in subparagraphs .1 to .7 above.

39 The members of the Team will be selected by the Secretary-General as needed from the list of experts, giving due consideration to the qualifications listed in paragraph 38 and ensuring appropriate and balanced representation and expertise for the specific rules being considered. Additionally, the Secretary-General will select one of the members of the Team to be responsible for overall coordination of the audit. The Team should exercise their professional judgement in concluding compliance with the Standards. Until reports are issued to the Committee, this audit process is understood to be between the auditors and the Submitters and information related to the process should be maintained in confidence between these parties. Team members should not have any conflict of interest relating to the rules being verified. In addition, Team members should act in a neutral manner.

40 Each member of the GBS audit team or of the appeal board should sign a confidentiality agreement with the Secretary-General, stating that they will not disclose any proprietary information that is provided to them for the purpose of verifying rules, with the exception of the documentation required for the interim or final reports.

41 The Team should consider the need for transparency throughout their deliberations. The Team should meet in person with the Submitter at least once during the audit process at a mutually agreed location and date to address any questions and issues that may arise during the audit process, review any additional documentation needed to complete the audit, and to share their preliminary findings.

42 The Secretary-General will provide the GBS audit team with adequate administrative assistance to support the verification process, including a permanent secretary.

## **PART B INFORMATION/DOCUMENTATION REQUIREMENTS AND EVALUATION CRITERIA**

### **INTRODUCTION**

43 This part provides detailed information and documentation requirements and evaluation criteria to assist the Submitter to conduct a self-assessment that the rules conform to the Tier I goal(s) and Tier II functional requirement(s) of the Standards, as outlined in part A. It includes a statement of intent, information and documentation requirements, and evaluation criteria for each Tier II functional requirement. Additionally, the information and documentation requirements and evaluation criteria serve as the auditing standard for the GBS audit team.

44 The statement of intent links Tier II functional requirement(s) to Tier III verification of conformity by providing an overview of what the verification of the particular functional requirement should achieve.

45 The information and documentation requirements establish specific items that should be included and addressed in the submission supporting the verification.

46 The evaluation criteria should be considered as the basis for conducting the self-assessment and audit.

47 One or more information and documentation requirements may be applicable to one or more evaluation criteria. This relationship will depend upon the nature and extent of the information and documentation required, as well as the scope and extent of the evaluation criteria.

48 Justification means providing the supporting data, analysis or other study that demonstrates the adequacy of the methodology, process or requirement. It should include:

- .1 basis for the assumptions made;
- .2 description of the uncertainties associated with them; and
- .3 any sensitivity analyses carried out.

It includes documented rationale on which the validity of the hypothesis or criteria used in the requirements or calculations are based. These may be the results of research work, historical data, statistics, etc. For example, justification of safety factors should describe how the many related assumptions and uncertainties, such as environmental conditions, loads, structural analysis methodology and strength criteria, are accounted for.

49 Where commentary or data are requested, it is sufficient for such information to be contained in a rule commentary or other supporting documentation.

50 Where the rules establish a process to evaluate and accept alternatives, the submission should clearly identify the process for determining that an equivalent level of safety is achieved.

## **INFORMATION AND DOCUMENTATION REQUIREMENTS AND EVALUATION CRITERIA**

### ***DESIGN***

#### **1 Design life**

##### **1.1 *Statement of intent***

Confirm that the specified design life is at least 25 years and incorporated in the rules.

##### **1.2 *Information and documentation requirements***

1.2.1 Statement of the design life in years used in developing the rules.

1.2.2 Description of the assumptions and methods used to incorporate design life into the rules. This should include, but not be limited to, consideration of extreme loads, design loads, fatigue and corrosion.

##### **1.3 *Evaluation criteria***

1.3.1 Are structural strength, fatigue and corrosion additions, and any other design parameters used in the rules based upon the specified design life?

1.3.2 Has the design life been applied in sections of the rules where specified?

#### **2 Environmental conditions**

##### **2.1 *Statement of intent***

Confirm that the wave data and associated ship motions and loads are developed on the basis of North Atlantic environmental conditions and the relevant long-term sea state scatter diagrams for the specified design life.

##### **2.2 *Information and documentation requirements***

2.2.1 Source of sea state data (scatter diagrams, etc.) including method and date of data collection and geographical location represented by the data.

2.2.2 Justification that sea state data and predictions used to develop motions and loads are representative of North Atlantic environmental conditions.

2.2.3 Justification of the methodology used to develop ship motions and loads, including assumptions related to speed, distribution of headings, number of cycles of wave encounters, probability of exceedance of design values, sea states, wave spectral shapes, hull form and other relevant parameters. Clearly define limits of applicability and provide guidance for assessment when outside this range.

2.2.4 Description of how the methodology used to develop ship motions and loads has been validated against experimental or service history data.

### **2.3 Evaluation criteria**

2.3.1 Does the wave data properly represent North Atlantic conditions and include the regions where the most severe conditions are expected?

2.3.2 Do the rules specify the wave spectrum and statistical analysis methods used to obtain the design extreme value, including its probability of exceedance?

2.3.3 Are the design extreme motions and loads based on appropriate number of cycles of wave encounters corresponding to at least a 25-year design life?

2.3.4 Are the ship speeds and headings used for assessment of ship motions and loads based upon speeds and headings that can be expected in the sea states under consideration?

2.3.5 Do the rules properly specify the range of applicability of ship motions and loads, and when further analysis, such as direct seakeeping analysis or model testing, is required? Do the rules clearly state the assumptions used in the methodologies to develop ship motions and loads?

2.3.6 Are the methodologies used to develop ship motions and loads validated by experimental or service history data?

## **3 Structural strength**

### **3.1 Statement of intent**

Confirm that the rules require a ship to be designed to withstand at net scantlings the operational and environmental loads for its specified design life. Confirm that the rules include the appropriate safety margins which reflect the degree of uncertainty.

### **3.2 Information and documentation requirements**

3.2.1 Description of how the rules provide net scantlings that are sufficient to avoid excessive deformation (either elastic or plastic, as appropriate) and prevent failure modes including, but not limited to, those involving yielding and buckling of hull girder and structural members. Include the following:

- .1 Description of the strength assessment methodology.
- .2 Explanation of how the net scantlings concept is applied in the rules for structural design.
- .3 Justification of the methodologies used to obtain the global and local, static and dynamic design loads.



- .4 Justification of the acceptable limits of yielding and buckling.
- .5 Explanation of how the rules prevent deformation from compromising the integrity of the ship's structure. The term "deformation" means translational and/or rotational displacement.
- .6 Explanation of the requirements for finite element structural modelling, including load application, boundary conditions, element selection and mesh size. Explanation of how primary, secondary and tertiary stresses are considered.
- .7 List of the loading conditions considered in the rules that are to be included in the structural evaluation. Justification of the loading conditions especially in terms of what parts of the structure may be critically loaded and stressed.
- .8 Description of how construction tolerances and procedures, and material imperfections are accounted for in the rules.
- .9 Justification of the rationale of the rules for weld design and procedures.
- .10 Justification of how structural continuity is taken into account in the rules, including termination of primary structures at the fore and aft ends of the cargo block.
- .11 Explanation of how the rules consider deformations or vibration levels that may damage or impair the ship structure, equipment or machinery.
- .12 Description of the safety factors in conjunction with assumed design load(s) and justification as to why they are appropriate.
- .13 Description of how the strength assessment methodology has been validated against experimental and service history data.
- .14 Example(s) of the rules applied to representative design(s). The example(s) should include an illustration of the midships section and of the cargo region showing net and gross scantlings, as well as a summary of the background calculations used to develop the scantlings.

3.2.2 Explanation of how the rules consider structural integrity at net scantlings for typical loading/discharging and ballast exchange scenarios, including criteria to determine acceptability and provide reasonably attainable sequences of loading, discharging and ballasting.

3.2.3 Justification of the methodology used for the calculation of local stresses, including stress concentration factors, if utilized.

3.2.4 Justification of how the rules account for sloshing effects.

3.2.5 Description of how the rules determine that the net scantlings are sufficient to provide adequate ultimate strength. Include the following:

- .1 description of the ultimate strength assessment methodology;
- .2 justification of how the net scantlings concept is applied in the rules for ultimate strength;

- .3 justification of the loads considered for the ultimate strength analysis;
- .4 explanation of the methodology used for calculating hull girder capacity and ultimate strength of plates and stiffeners, individually and in combination;
- .5 description of acceptable limits of ultimate strength, including safety factors, with justification why they are appropriate; and
- .6 description of how the ultimate strength assessment methodology has been validated against experimental and service history data.

3.2.6 Description of any protective arrangements and/or reinforcements required to avoid damage caused by loading/unloading equipment that would compromise the ship's structural integrity.

### **3.3 Evaluation criteria**

3.3.1 Do the rules specify the probability of exceedance for which global and local dynamic loads are calculated?

3.3.2 Are the limits of yielding, buckling and ultimate strength set at levels that will maintain the structural integrity?

3.3.3 Do the rules satisfactorily consider deformations that may compromise the integrity of the ship's structure?

3.3.4 Do the rules adequately specify the required extent of finite element models and how ship structures should be modelled, including how boundary conditions and loads are to be applied, and elements and mesh size selected? Are primary, secondary and tertiary stresses properly accounted for?

3.3.5 Are the following loading conditions included: homogeneous, partial, alternate loads, multi-port, ballast conditions including ballast management, and loading and offloading sequences and intermediate conditions? Are these, and any other conditions identified in the loading or stability manuals, considered without exceeding allowable bending moments, shear forces and stresses?

3.3.6 Is the methodology for developing the lightship and deadweight load distributions clearly defined, in a way that it will be consistently applied?

3.3.7 Do the rules satisfactorily consider workmanship standards and construction tolerances?

3.3.8 Do weld designs and procedures provide a level of strength of welds in their net condition to withstand the expected loads on the joints?

3.3.9 Are the requirements for tapering primary structures, including transitions fore and aft of the cargo block, defined in sufficient detail in the rules?

- .1 Where prescriptive measures are specified, do these measures provide for adequate continuity and termination of primary structure and primary supporting members?

- .2 Where analytical methods are allowed for evaluating structural continuity, is the methodology sufficiently defined to enable adequate assessment of the proposed arrangements for the termination of primary structure and primary supporting members? Do these analytical methods include both the local stress evaluation and the effect of the relative stiffness of the members at the termination?

3.3.10 Do the rules satisfactorily consider deformations or vibration levels that may damage or impair the ship structure, equipment or machinery?

3.3.11 Do the rules include adequate safety factors?

3.3.12 Do the rules include methodology for the development of local loads, including specifying the characteristics of intended cargoes relevant to loading (cargo arrangement, minimum density, angle of repose for bulk cargo) and minimum density of ballast to be applied?

3.3.13 Do the rules specify procedures for direct calculation of local stresses in structural details. If direct calculation is not required, do the rules include definition and application of stress concentration factors? If stress concentration factors are utilized, a justification of the definition and application of these factors should be included.

3.3.14 With regard to local strength:

- .1 Do the rules require the structure in way of cargo and ballast spaces to be suitable for any level of filling, from empty to maximum capacity (where maximum capacity is either full or the clearly defined operational limit on filling height or cargo mass)?
- .2 Do the rules define loading conditions for evaluation, including the loaded/empty condition of adjacent cargo and/or ballast spaces, and the draughts to be considered for each loading condition?
- .3 For oil tankers, do the rules consider any reasonable combination of cargo or ballast space loading, including asymmetric loading and loading in any one athwartships row across to be empty at or near the scantling draught?
- .4 Do the assumed draught limits and assumed densities and other cargo characteristics cover the expected operational range?
- .5 Do the local strength evaluations consider the effects of maximum allowable still water and wave bending and shear loads on the structure?
- .6 Are sloshing effects adequately covered by the rules?

3.3.15 Do the rules require adequate protective arrangements and/or reinforcements to avoid damage caused by loading/unloading equipment that would compromise the ship's structural integrity?

3.3.16 Have the results from the strength and ultimate strength assessments been benchmarked? Do they compare favourably with service history and other standards?

3.3.17 Do the illustrations of the representative designs show net and gross scantlings? Do the background calculations show how the structure at net scantlings withstands the operational and environmental loads for the specified design life?

## **4 Fatigue life**

### **4.1 Statement of intent**

Confirm that the fatigue life is not less than the specified design life.

### **4.2 Information and documentation requirements**

4.2.1 Description of how the rules provide that structural arrangement and net scantlings are sufficient to meet a calculated fatigue life not less than the specified design life. Include the following:

- .1 Description of the fatigue assessment methodology used in the rules including sea state data, long-term statistics of wave data applied in fatigue calculations, derivation of cyclic loads, calculation of stress ranges, modelling of their distribution functions, S-N curves used and factors of safety or margins taken.
- .2 Explanation of where and how the net scantlings concept is applied in the rules for fatigue. Justification of the values of the scantlings used in the calculations.
- .3 List of the loading conditions required by the rules to be considered as part of the fatigue evaluation. Justification of the selection of loading conditions.
- .4 Justification of how the rules take into account dynamic loads and their combinations, including the probability level for which dynamic loads are calculated.
- .5 Justification of the process for the selection of the structural members and typical critical design details required to be included in evaluation of ship's fatigue life.
- .6 Justification of procedures for the calculation of cyclic stresses and stress ranges in structural details. Explanation of the method used to take into account stress concentrations, as may be applicable to the detail analysed.
- .7 Explanation of the requirements for finite element structural modelling, including load application, boundary conditions, element selection and mesh size. Explanation of how primary, secondary and tertiary stresses are considered.
- .8 Description of how construction tolerances and procedures are accounted for in the rules. Description of how surface treatment, such as grinding and peening, is addressed in the rules.
- .9 Description of how the rules consider the effect on fatigue life of unprotected structural details in seawater (e.g. when the breakdown of coating leads to exposure to seawater).
- .10 Description of how the rules take into consideration slamming (e.g. whipping) and vibratory-induced fatigue effects (e.g. springing or propeller induced vibrations). Justification should be provided if not explicitly considered in fatigue assessment.

- .11 Explanation of the effect of uncertainties/assumptions on fatigue life, highlighting any margins used in fatigue calculations, taking into consideration the consequence of failure of the particular structural member.
- .12 Description of how the fatigue assessment methodology has been validated against experimental and/or service history data.

### **4.3 Evaluation criteria**

4.3.1 Is the methodology used in fatigue life assessment properly justified? Are the explanations provided to cover the sea state data used, long-term statistics of wave data applied, derivation of cyclic loads, method of calculation of the stress ranges and their distribution functions, S-N curves used and the factors of safety or margins taken, satisfactory?

4.3.2 Are the values of the scantlings required to be used in the calculations properly justified according to the net scantlings concept?

4.3.3 Are the assumed operating conditions (e.g. loaded and ballast) specified by the rules in the long-term fatigue response analysis adequate for a representative ship's operating profile? Are the stress ranges so obtained appropriate to represent the long-term fatigue response?

4.3.4 Are the internal/external dynamic loads and their combinations based on the North Atlantic environment? Is the probability level for which these loads are calculated properly justified?

4.3.5 Do the rules require the systematic identification of areas prone to fatigue throughout the entire ship that are required to be included in the evaluation of the ship's fatigue life?

4.3.6 Are the procedures for the calculation of cyclic stresses and stress ranges in structural details properly justified?

4.3.7 Do the rules properly take into account stress concentrations, as may be applicable to the detail analysed?

4.3.8 Do the rules specify the required extent of finite element models and how ship structures should be modelled, including how boundary conditions and loads are to be applied, and elements and mesh size selected? Are primary, secondary and tertiary stresses properly accounted for?

4.3.9 Do the rules satisfactorily consider construction tolerances and procedures? Is surface treatment, such as grinding and peening, adequately considered?

4.3.10 Do the fatigue life calculations consider degradation of coating performance under seawater environment?

4.3.11 Do the rules take slamming (e.g. whipping) and vibratory-induced fatigue effects (e.g. springing or propeller induced vibrations) into consideration? If not explicitly considered in fatigue assessment, is adequate justification provided?

4.3.12 Do the rules satisfactorily account for uncertainties or assumptions on fatigue life assessment?

4.3.13 Have the results from the fatigue life assessment methodology been benchmarked? Do the results compare favourably with service history and other standards?

## **5 Residual strength**

### **5.1 Statement of intent**

Confirm that the rules provide a reasonable level of residual strength after damage (e.g. collision, grounding and flooding).

### **5.2 Information and documentation requirements**

5.2.1 Description of how ships designed to the rules with intact structure at net scantlings have sufficient ultimate strength to sustain flooding as defined in relevant IMO instruments.

5.2.2 Justification that ships designed to the rules have adequate residual strength to survive a casualty event. Include the following:

- .1 Description of the methodology used to assess residual strength.
- .2 Description of the flooding scenarios and the corresponding structural damage. Explanation of the relationship of the flooding scenarios with IMO instruments.
- .3 Description of the environmental conditions and period of exposure representative of the sea states expected for collision and grounding scenarios, and justification why they are appropriate.
- .4 Description of the acceptance criteria for residual strength of the ship in damaged condition, and justification if different from ultimate strength.
- .5 Where it is determined that the rules inherently provide adequate residual strength, justification should be provided that demonstrates through analysis of a range of representative ship designs and loading conditions.

5.2.3 Description of how the residual strength assessment procedure has been validated with experimental and/or casualty history data.

### **5.3 Evaluation criteria**

5.3.1 Can a ship designed to the rules sustain flooding as defined in relevant IMO instruments and survive with intact structure at net scantlings?

5.3.2 Does a ship designed to the rules have sufficient residual strength to survive a more significant casualty event (e.g. flooding with structural damage due to collision or grounding) under environmental conditions consistent with the likelihood of occurrence? Are the assumed damage scenarios representative of the intent of damage in relevant IMO instruments?

5.3.3 Has the residual strength assessment procedure been validated with experimental and/or casualty data?

## **6 Protection against corrosion**

### **6.1 Coating life**

#### **6.1.1 *Statement of intent***

Confirm that the coatings are properly selected and applied to protect the structure throughout the target useful life of the coating.

#### **6.1.2 *Information and documentation requirements***

6.1.2.1 Provision of information on coating life and mandatory use of coatings, including:

- .1 mandatory locations and/or spaces where coatings are required to be used;
- .2 types of coating to be used for the various spaces;
- .3 required target useful life of the coating and explanation for selection; and
- .4 the coating performance standard to be followed (e.g. IMO PSPC<sup>1</sup> where mandated).

6.1.2.2 Description of the requirements to be followed in spaces where other corrosion prevention systems are used.

6.1.2.3 Description of the procedures used to verify that the selected coating system with associated surface preparation and application methods is compatible with the shipyard production processes.

6.1.2.4 Description of the procedures used to verify that the specified coating procedures have been followed.

6.1.2.5 If an alternative is proposed to that prescribed by IMO instruments, justification to support the selection of coating standards and target useful life of the coating or areas of application.

#### **6.1.3 *Evaluation criteria***

6.1.3.1 Do the rules include appropriate requirements to achieve stated target useful life of the coating and fulfil SOLAS requirements as a minimum?

6.1.3.2 Do alternative or additional requirements allowed by the rules provide protection levels at least equivalent to those required by SOLAS?

6.1.3.3 Are the procedures indicated in 6.1.2.3 and 6.1.2.4 adequately documented in the rules?

6.1.3.4 Is adequate justification provided to support the use of alternatives to SOLAS or other IMO instruments?

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<sup>1</sup> Performance standard for protective coatings for dedicated seawater ballast tanks in all types of ships and double-side skin spaces of bulk carriers, adopted by the Organization by resolution MSC.215(82), as amended.

## **6.2 Corrosion addition**

### **6.2.1 *Statement of intent***

Confirm that the rules for corrosion addition values are rationally based and adequate for the specified design life.

### **6.2.2 *Information and documentation requirements***

6.2.2.1 Description of the methodology used to determine values for the design corrosion additions so that the scantlings remain above net scantlings over the specified design life.

6.2.2.2 Description of how assumed corrosion rates and rule design corrosion additions are determined based on ship type and location within the hull. Description should address how stress corrosion and any other modes of accelerated corrosion have been taken into consideration.

6.2.2.3 Description of any additional rule requirements that provide special consideration for other parameters such as unusual cargoes, loadings, trading patterns, material properties, etc.

6.2.2.4 Description of how corrosion of welds and heat-affected zones are considered.

6.2.2.5 Description of the steel/structure renewal criteria.

6.2.2.6 Description of how the methodology to determine corrosion addition and establish steel/structure renewal criteria has been validated against experimental and service history data.

### **6.2.3 *Evaluation criteria***

6.2.3.1 Does the methodology and supporting statistical data justify the corrosion additions?

6.2.3.2 Confirm that reductions in the rule design corrosion additions are prohibited.

6.2.3.3 Is consideration given to the corrosion of welds and heat-affected zones?

6.2.3.4 Do the rules clearly establish the steel/structure renewal criteria? For ships in service, do the renewal criteria provide for scantlings that are not less than the required net scantlings and that produce a hull girder section modulus within SOLAS requirements?

6.2.3.5 Has the methodology used to determine corrosion addition and establish steel/structure renewal criteria been benchmarked? Does it compare favourably with experimental and service history data?

## **7 Structural redundancy**

### **7.1 *Statement of intent***

Confirm that the rules require sufficient redundancy to withstand localized damage in any one stiffening structural member.

### **7.2 *Information and documentation requirements***

7.2.1 Demonstration that the rules have adequate requirements to provide ship structural redundancy.



7.2.2 Description of the requirements for localized damage assessments, including where applicable, modelling in finite element structural analysis.

7.2.3 Description of how the methodology used to assess structural redundancy has been validated against experimental and/or service history data.

### **7.3 Evaluation criteria**

7.3.1 Does a ship designed to the rules have sufficient structural redundancy to survive localized damage to a stiffening member?

7.3.2 Are the methods for assessing the consequences of localized damage satisfactorily described?

7.3.3 Has the methodology used to assess structural redundancy been validated? Does it compare favourably with experimental or casualty history data?

## **8 Watertight and weathertight integrity**

### **8.1 Statement of intent**

Confirm that the rules require adequate watertight and weathertight integrity for North Atlantic environmental conditions, including adequate strength for the closing arrangements and adequate redundancy for the securing devices.

### **8.2 Information and documentation requirements**

8.2.1 Description of the rule requirements for watertight and weathertight integrity.

8.2.2 Description of how the rules consider criteria from IMO instruments for determining which openings in the hull envelope are required to be watertight or weathertight.

8.2.3 Explanation of the criteria used in the development of the rules to determine that the strength and redundancy for closing arrangements, if appropriate, of the watertight and weathertight openings is adequate for the environmental conditions and specified design life.

### **8.3 Evaluation criteria**

8.3.1 Do the rules satisfy all relevant IMO watertight and weathertight integrity requirements?

8.3.2 Do the rules require sufficient strength for closing arrangements and securing devices to meet environmental conditions, design loads and specified design life? Do the rules require securing devices to have adequate redundancy?

## **9 Human element considerations**

### **9.1 Statement of intent**

Confirm that the rules incorporate human element and ergonomic considerations into the structural design and arrangement to facilitate operations, inspection and maintenance activity.

## **9.2 Information and documentation requirements**

9.2.1 Description of how the rules consider human element and ergonomics during the structural design and arrangement of the ship, including:

- .1 stairs, vertical ladders, ramps, walkways and work platforms used for permanent means of access and/or for inspection and maintenance operations;
- .2 structural arrangements to facilitate the provision of adequate lighting and ventilation, and to minimize noise and vibration in spaces normally occupied or manned by shipboard personnel;
- .3 structural arrangements to facilitate the provision of adequate lighting and ventilation in tanks or closed spaces (e.g. duct keels, pipe tunnels, etc.) for periodic inspections, survey and maintenance; and
- .4 structural arrangements to facilitate emergency egress of inspection personnel or ships' crew from tanks, holds, voids, etc.

9.2.2 Description of how ergonomic design principles are factored into the design rules, including any guidance information provided to designers.

## **9.3 Evaluation criteria**

9.3.1 Are human element and ergonomic considerations accounted for in the design of stairs, vertical ladders, ramps, walkways and work platforms?

9.3.2 Do the rules address structural or other arrangements to facilitate adequate lighting and ventilation in spaces normally manned or occupied by the crew?

9.3.3 Do the rules address structural or other measures to reduce the generation and transmission of vibration to a level at or below the acceptable ergonomic standards for spaces normally manned or occupied by the crew?

9.3.4 Do the rules address structural or other arrangements to facilitate adequate lighting and ventilation for the purposes of inspection, survey and maintenance?

9.3.5 Do the rules require structural arrangements to facilitate emergency egress from tanks or closed spaces?

## **10 Design transparency**

### **10.1 Statement of intent**

Confirm that the design and construction process is transparent, and that design information is clearly stated and made available to the classification society, the owner and the flag State, with due consideration to intellectual property rights.

## **10.2 Information and documentation requirements**

10.2.1 Description of how the rules require design specific information as required by SOLAS regulation II-1/3-10 to be included in the Ship Construction File (SCF), including:

- .1 areas requiring special attention throughout the ship's life;
- .2 all design parameters limiting the operation of a ship;
- .3 any alternatives to the rules, including structural details and equivalency calculations;
- .4 "as built" drawings and information which are verified to incorporate all alterations approved by the recognized organization or flag State during the construction process;
- .5 procedures for updating the SCF throughout the ship's life;
- .6 net (renewal) scantlings for all the structural constituent parts; and
- .7 minimum hull girder section modulus along the length of the ship which has to be maintained throughout the ship's life.

10.2.2 Description of the process, requirements and criteria to be followed when assessing, documenting and communicating alternative methods as being equivalent to specific rule requirements.

10.2.3 Description of procedures for ensuring that all relevant design and construction information, including correspondence exchanged between shipyard and recognized organization, is available to the owner and flag State during the construction process.

## **10.3 Evaluation criteria**

10.3.1 Do the rules establish requirements for including and updating design specific and critical information, including limitations, in the SCF?

10.3.2 Do the rules establish clear criteria and techniques for assessing alternative methods used in the design? Do the rules require that all equivalencies are documented in the SCF and are made available to the owner and/or flag State?

10.3.3 Do the rules establish procedures to provide all relevant design and construction information, including correspondence exchanged between shipyard and recognized organization, e.g. on net scantlings, corrosion margins used, etc., to be made available to the owner and flag State during the construction process?

## **CONSTRUCTION**

### **11 Construction quality procedures**

#### **11.1 Statement of intent**

Confirm that the rules contain provisions for ensuring that construction tolerances and procedures assumed during rule formulation are implemented during construction.

## **11.2 Information and documentation requirements**

11.2.1 Demonstration that the rules require the shipyard's construction procedures and standards to meet a minimum level of quality. Include the following:

- .1 procedures for specifying the materials and their tracking;
- .2 assembly requirements, including alignment, joining, welding, surface preparation, coating, castings, heat treatment, etc.;
- .3 approval scheme of welding procedures;
- .4 qualification scheme of welders; and
- .5 requirements for yard fit-up and other quality control inspections.

11.2.2 Description of actions taken when a shipyard is determined as not meeting the minimum level of quality construction.

11.2.3 Description of the procedures followed when the "as built" is different than "design". Include the following:

- .1 Criteria for determining when review of the "as built" drawings is required.
- .2 Criteria for determining when re-evaluation for strength and/or fatigue life is required. This should include consideration of net scantlings where appropriate.

11.2.4 Description of the procedures for ensuring that construction tolerances are verified and maintained.

11.2.5 Description of the procedures used to continuously update the rules based on construction and in-service experience.

11.2.6 Description of how the quality construction requirements have been benchmarked with recognized international shipbuilding and repair quality standards.

## **11.3 Evaluation criteria**

11.3.1 Are the construction tolerances used in rule formulations and calculations incorporated in the construction plan and verified during construction?

11.3.2 Do the quality requirements include continuous design improvement based on experience?

11.3.3 Have the rules' quality construction requirements been benchmarked? Do they compare favourably with recognized international shipbuilding and repair quality standards?

## **12 Survey during construction**

### **12.1 Statement of intent**

Confirm that the rules include provisions to ensure that the construction of ships is carried out to an acceptable quality level.

## **12.2 Information and documentation requirements**

12.2.1 Description of the construction survey procedure requirements, including:

- .1 types of surveys (visual, non-destructive examination, etc.) depending on location, materials, welding, casting, coatings, etc.;
- .2 establishment of a construction survey schedule for all assembly stages from the kick-off meeting, through all major construction phases, up to delivery;
- .3 inspection/survey plan, including provisions for critical areas identified during design approval;
- .4 survey criteria for acceptance;
- .5 interaction with shipyard, including notification and documentation of survey results;
- .6 correction procedures to remedy construction defects;
- .7 list of items that would require scheduling or formal surveys;
- .8 qualification of surveyors;
- .9 determination and documentation of areas that need special attention throughout ship's life, including criteria used in making the determination; and
- .10 procedures for determining the number and qualifications of surveyors for a project.

12.2.2 Description of procedures for providing shipowner and/or flag Administration representatives results of construction surveys.

12.2.3 Description of the requirements for testing during survey, including test criteria.

12.2.4 Description of how the construction survey requirements have been benchmarked with recognized international shipbuilding and repair quality standards.

## **12.3 Evaluation criteria**

12.3.1 Do the rules require the development of a Survey Plan that is reviewed during the initial kick-off meeting? Does the survey plan address activities during ship construction sufficient to verify the ship is built in accordance with the appropriate rules or standards and address all elements in 12.2.1?

12.3.2 Do the rules contain provisions that areas of high stress or fatigue risk identified during design approval are surveyed with adequate detail and extent during construction?

12.3.3 Do the rules have procedures to provide for an adequate number of qualified surveyors to carry out proposed surveys in accordance with the size of the project?

12.3.4 Is survey related correspondence between shipyard and recognized organization relating to ship design and construction made available to the owner and flag Administration?

12.3.5 Do the rules include acceptance criteria for all tests required? Are the test criteria based on rule formulation parameters?

12.3.6 Have the rules' construction survey requirements been benchmarked? Do they compare favourably with recognized international shipbuilding and repair quality standards?

***IN-SERVICE CONSIDERATIONS***

**13 Survey and maintenance**

**13.1 *Statement of intent***

Verify that the rules provide for spaces of adequate size to facilitate survey and maintenance. Confirm that the rules provide for the identification of areas requiring special attention over the life of the ship based on design parameter selection.

**13.2 *Information and documentation requirements***

13.2.1 Description of the rule requirements to provide for spaces of adequate size to facilitate ship survey and maintenance.

13.2.2 Description of rule requirements to identify items for inclusion in an in-service Survey Plan, including:

- .1 areas of high stress and with special fatigue considerations;
- .2 any other areas that need special attention throughout the ship's life, including criteria used in making the determination (e.g. wave impact loading, mechanical impact areas, special materials, etc.); and
- .3 structural design features that were selected on the basis of special in-service requirements.

**13.3 *Evaluation criteria***

13.3.1 Do the rules include design requirements to provide for spaces of adequate size for ship survey and maintenance?

13.3.2 Do the rules contain provisions for the identification of areas of high stress or fatigue risk that require monitoring while in service?

13.3.3 Do the rules include provisions for the identification of structural design features selected on the basis of special in-service requirements?

13.3.4 Do the rules include provisions for the identification of any other areas needing special attention during the ship's life?

**14 Structural accessibility**

**14.1 *Statement of intent***

Confirm that the rules include provisions to facilitate access for internal structural inspection and thickness measurements.

## **14.2 Information and documentation requirements**

Description of rule requirements to facilitate overall and close-up inspections and thickness measurements of the internal structure. Include the following:

- .1 standards for access; and
- .2 requirements for development of an Access Plan.

## **14.3 Evaluation criteria**

14.3.1 Are there provisions to provide for safe access to critical areas referred to in 13.2.2?

## **RECYCLING CONSIDERATIONS**

## **15 Recycling**

### **15.1 Statement of intent**

Confirm that the rules require the listing of materials used for the construction of the hull structure with a view toward identification of environmentally acceptable or recyclable materials and the development of an inventory list.

### **15.2 Information and documentation requirements**

15.2.1 Description of the rule requirements for listing of materials, including:

- .1 list of materials used for the construction of the hull structure;
- .2 provisions for listing of materials in the Ship Construction File; and
- .3 provisions for documenting changes to any of the above during the ship's service life.

### **15.3 Evaluation criteria**

15.3.1 Do the rules include provisions for the listing of materials used for the construction of the hull structure within the scope of the Standard, including:

- .1 list of materials used for the construction of the hull structure; and
- .2 provisions for listing of materials in the Ship Construction File?

15.3.2 Do the rules include provisions for documenting changes to any of the above during the ship's service life?

**APPENDIX 1**  
**SUBMISSION TEMPLATE**

<b>1      FLAG STATE INFORMATION</b>	
1 Name of flag State:	
2 Full contact details for the designated single point of contact:	
Name and title:	
Address:	
Telephone No.:	
Fax No.:	
Email address:	
3 Organization recognized by flag State:	

<b>2      RECOGNIZED ORGANIZATION INFORMATION</b>	
1 Name of recognized organization:	
2 Full contact details for the designated single point of contact:	
Name and title:	
Address:	
Telephone No.:	
Fax No.:	
Email address:	
3 Rules coverage:	Oil tanker
	Bulk carrier



<b>3 SELF-ASSESSMENT SUMMARY</b>			
<b>Functional requirement</b>	<b>Fully covered in rules</b>	<b>Not covered in rules</b>	<b>Comments</b>
<b><i>Design</i></b>			
1 Design life			
2 Environmental conditions			
3 Structural strength			
4 Fatigue life			
5 Residual strength			
6 Protection against corrosion			
6.1 Coating life			
6.2 Corrosion addition			
7 Structural redundancy			
8 Watertight and weathertight integrity			
9 Human element considerations			
10 Design transparency			
<b><i>Construction</i></b>			
11 Construction quality procedures			
12 Survey during construction			
<b><i>In-service considerations</i></b>			
13 Survey and maintenance			
14 Structural accessibility			
<b><i>Recycling considerations</i></b>			
15 Recycling			

*Note: The Submitter declares that the above Self-Assessment Summary Table has been compiled without infringing any confidential and/or proprietary information and represents a true self-assessment of the rules submitted for verification with the GBS functional requirements.*

**4 RULE LINKAGE SUMMARY TABLE**

1 (Title and text of the relevant functional requirement)

1.1 (Text of the Statement of intent)

Information and documentation requirement		Regulation submitted (2)	Rule type (3)	Reference (4)
1.2.1	(Text) (1)			

Justification (If applicable) (5):

Evaluation criterion		Summarized comment (7)	Satisfied by rules (8)	Rule linkage (9)
1.3.1	(Text) (6)		(YES/NO)	

Detailed technical explanation (10):

Information and documentation requirement		Regulation submitted (2)	Rule type (3)	Reference (4)
1.2(n)	(Text) (1)			

Justification (If applicable) (5):

Evaluation criterion		Summarized comment (7)	Satisfied by rules (8)	Rule linkage (9)
1.3(n)	(Text) (6)		(YES/NO)	

Detailed technical explanation (10):

*Note: The Submitter declares that the above Rule Linkage Summary Table has been compiled without infringing any confidential and/or proprietary information and represents a true reflection of its rules in relation to the GBS functional requirements.*

**Notes:**

Section 4 of the submission template should be filled for each information and documentation element and its associated evaluation criterion, for each functional requirement.

- (1) Copy text of the relevant information and documentation requirement established in the Guidelines.
- (2) Indicate the file name or internet link or title of the hard copy where the information/documentation provided is found in the documentation package.
- (3) Specify type of information/documentation provided (public rule, internal procedure, unified requirement, guidelines, etc.).
- (4) Indicate the reference in the rules where the information is found.
- (5) Develop the justification required. If a justification is not required, detailed technical explanation should be submitted in any case.
- (6) Copy text of the evaluation criterion established in the Guidelines for the relevant information and documentation requirement.
- (7) Include a short comment explaining why the relevant evaluation criterion is satisfied.
- (8) Indicate if the relevant evaluation criterion is satisfied by rules according to self-assessment.
- (9) Specify all the rules locations where the relevant criterion is applied.
- (10) Provide a technical explanation showing why the evaluation criterion is said to be satisfied or why it is not satisfied.

## **APPENDIX 2**

### **FORMAT FOR GBS AUDIT TEAM REPORTS**

#### **1 EXECUTIVE SUMMARY**

- 1.1 Subject of audit
- 1.2 Scope of verification audit (e.g. audit plan)
- 1.3 Findings of audit
- 1.4 Recommendation of the GBS audit team

#### **2 SUBMISSION OF PARTICULARS**

- 2.1 Submitting Administration(s)
- 2.2 Recognized organization name (if applicable)
- 2.3 Title and revision date of rules submitted
- 2.4 Submission date
- 2.5 Report type: [Interim] [Final]
- 2.6 GBS audit team members

### 3 AUDIT SUMMARY

Functional requirement	Conforming	Not conforming	Summary comment
<b><i>Design</i></b>			
1 Design life			
2 Environmental conditions			
3 Structural strength			
4 Fatigue life			
5 Residual strength			
6 Protection against corrosion			
6.1 Coating life			
6.2 Corrosion addition			
7 Structural redundancy			
8 Watertight and weathertight integrity			
9 Human element considerations			
10 Design transparency			
<b><i>Construction</i></b>			
11 Construction quality procedures			
12 Survey during construction			
<b><i>In-service considerations</i></b>			
13 Survey and maintenance			
14 Structural accessibility			
<b><i>Recycling considerations</i></b>			
15 Recycling			

**4 MODEL FORM FOR AUDIT FINDINGS**

<b>FINDINGS</b>	
<b>Recognized organization:</b>	<b>Functional requirement:</b>
<b>Audit date:</b>	
<b>Non-conformity No.:</b>	<b>Observation No.:</b>
<b>FINDINGS:</b>	
<b>APPLICABLE PROVISION OF THE AUDIT STANDARD:</b>	
<b>Auditor:</b>	<b>Date:</b>
<b>Team leader:</b>	<b>Date:</b>
<b>Recognized organization:</b>	<b>Date received:</b>

### APPENDIX 3

#### FORMAT FOR SUBMISSION ON RECTIFICATION OF NON-CONFORMITY

**Non-conformity No.:** XXXX/YYYY/NCxx (as given in audit report)

Extract from rule linkage summary table (as applicable to show original submission information)

Information and documentation	Regulation submitted	Information/Documentation type	Reference

Justification  
(if applicable):

Evaluation criteria	Summarized comment	Satisfied by information/documentation	Rule linkage

Detailed technical explanation:

**AUDIT FINDINGS** (extract from audit report with details of non-conformity):

**Statement of facts**

**Non-conformity**

**INVESTIGATION AND ACTION TAKEN:**

(list what has been done to address the non-conformity)

**ANNEXES:**

(list and attach the detailed action plan, rule changes/other evidence, rule linkage addressing all non-conformities)

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## ANNEX 4

### DRAFT AMENDMENTS TO THE IBC CODE

#### Chapter 15

##### Special requirements

- 1 Section 15.15 is replaced by the following:

**"15.15 Hydrogen sulphide (H<sub>2</sub>S) detection equipment for bulk liquids**

Hydrogen sulphide (H<sub>2</sub>S) detection equipment shall be provided on board ships carrying bulk liquids prone to H<sub>2</sub>S formation. It should be noted that scavengers and biocides, when used, may not be a 100% effective in controlling the formation of H<sub>2</sub>S."

#### Chapter 16

##### Operational requirements

- 2 Paragraph 16.2.7 is replaced by the following:

"16.2.7 Where *column o* in the table of chapter 17 refers to this paragraph, the cargo is subject to the prewash requirements in regulation 13.7.1.4 of Annex II of MARPOL"

- 3 The complete text of chapters 17, 18 and 19 is replaced by the following:

#### "Chapter 17

##### Summary of minimum requirements

17.1 Mixtures of noxious liquid substances presenting pollution hazards only, and which are assessed or provisionally assessed under regulation 6.3 of MARPOL Annex II, may be carried under the requirements of the Code applicable to the appropriate position of the entry in this chapter for Noxious Liquid Substances, not otherwise specified (n.o.s.).

#### 17.2 EXPLANATORY NOTES

Product name ( <i>column a</i> )	The product name shall be used in the shipping document for any cargo offered for bulk shipments. Any additional name may be included in brackets after the product name. In some cases, the product names are not identical with the names given in previous issues of the Code.
UN Number ( <i>column b</i> )	Deleted
Pollution Category ( <i>column c</i> )	The letter X, Y, Z means the Pollution Category assigned to each product under MARPOL Annex II.



Hazards (column d)	"S" means that the product is included in the Code because of its safety hazards; "P" means that the product is included in the Code because of its pollution hazards; and "S/P" means that the product is included in the Code because of both its safety and pollution hazards.
Ship type (column e)	1: ship type 1 (2.1.2.1) 2: ship type 2 (2.1.2.2) 3: ship type 3 (2.1.2.3)
Tank type (column f)	1: independent tank (4.1.1) 2: integral tank (4.1.2) G: gravity tank (4.1.3) P: pressure tank (4.1.4)
Tank vents (column g)	Cont.: controlled venting Open: open venting
Tank environmental control (column h)	Inert: inerting (9.1.2.1) Pad: liquid or gas padding (9.1.2.2) Dry: drying (9.1.2.3) Vent: natural or forced ventilation (9.1.2.4) No: no special requirements under this Code (inerting may be required under SOLAS)
Electrical equipment (column i)	Temperature classes (i ' ) T1 to T6 - indicates no requirements blank no information  Apparatus group (i ' ') IIA, IIB or IIC: - indicates no requirements blank no information  Flash point (i ' ' ') Yes: flashpoint exceeding 60°C (10.1.6) No: flashpoint not exceeding 60°C (10.1.6) NF: nonflammable product (10.1.6)
Gauging (column j)	O: open gauging (13.1.1.1) R: restricted gauging (13.1.1.2) C: closed gauging (13.1.1.3)
Vapour detection (column k)	F: flammable vapours T: toxic vapours No: indicates no special requirements under this Code
Fire protection (column l)	A: alcohol-resistant foam or multi-purpose foam B: regular foam; encompasses all foams that are not of an alcohol-resistant type, including fluoro-protein and aqueous-film-forming foam (AFFF) C: water-spray D: dry chemical No: no special requirements under this Code
Materials of construction (column m)	Deleted
Emergency equipment (column n)	Yes: see 14.3.1 No: no special requirements under this Code
Specific and operational requirements (column o)	When specific reference is made to chapters 15 and/or 16, these requirements shall be additional to the requirements in any other column.

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o
Acetic acid	Z	S/P	3	2G	Cont	No	T1	IIA	No	C	F	AC	Yes	15.11.2, 15.11.3, 15.11.4, 15.11.6, 15.11.7, 15.11.8, 15.17, 15.19, 16.2.9
Acetic anhydride	Z	S/P	2	2G	Cont	No	T2	IIA	No	R	FT	AC	Yes	15.11.2, 15.11.3, 15.11.4, 15.11.6, 15.11.7, 15.11.8, 15.12.3, 15.12.4, 15.19.6
Acetochlor	X	S/P	2	2G	Open	No			Yes	O	No	AC	No	15.19.6, 16.2.6, 16.2.9
Acetone cyanohydrin	Y	S/P	1	1G	Cont	No	-	-	Yes	C	T	AC	Yes	15.12, 15.13, 15.17, 15.19, 16.6.1, 16.6.2, 16.6.3
Acetonitrile	Z	S/P	3	2G	Cont	No	T2	IIA	No	R	FT	AC	No	15.12.3, 15.12.4, 15.19.6
Acetonitrile (Low purity grade)	Y	S/P	3	2G	Cont	No	T1	IIA	No	R	FT	AC	No	15.12.3, 15.12.4, 15.19.6
Acid oil mixture from soyabean, corn (maize) and sunflower oil refining	Y	S/P	2	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.7, 16.2.9
Acrylamide solution (50% or less)	Y	S/P	3	2G	Cont	No			NF	C	T	No	No	15.12, 15.13, 15.17, 15.19, 16.2.9, 16.6.1
Acrylic acid	Y	S/P	2	2G	Cont	No	T2	IIA	No	C	FT	AC	Yes	15.11.2, 15.11.3, 15.11.4, 15.11.6, 15.11.7, 15.11.8, 15.12.3, 15.12.4, 15.13, 15.17, 15.19, 16.2.9, 16.6.1
Acrylic acid/ethenesulphonic acid copolymer with phosphonate groups, sodium salt solution copolymer with phosphonate groups, sodium salt solution	Z	P	3	2G	Open	No			Yes	O	No	ABC	No	
Acrylonitrile	Y	S/P	2	2G	Cont	No	T1	IIB	No	C	FT	AC	Yes	15.12, 15.13, 15.17, 15.19
Acrylonitrile-Styrene copolymer dispersion in polyether polyol	Y	P	3	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.6
Adiponitrile	Z	S/P	2	2G	Cont	No	-	-	Yes	C	T	AC	Yes	15.12, 15.17, 15.19, 16.2.9

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o
Alachlor technical (90% or more)	X	S/P	2	2G	Cont	No			Yes	C	T	AC	No	15.12, 15.17, 15.19.6, 16.2.9
Alcohol (C9-C11) poly (2.5-9) ethoxylate	Y	S/P	3	2G	Cont	No			Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6, 16.2.9
Alcohol (C6-C17) (secondary) poly(3-6)ethoxylates	Y	S/P	2	2G	Cont	No			Yes	C	T	AC	Yes	15.12, 15.17, 15.19, 16.2.9
Alcohol (C6-C17) (secondary) poly(7-12)ethoxylates	Y	S/P	2	2G	Cont	No			Yes	C	T	AC	Yes	15.12, 15.17, 15.19, 16.2.6, 16.2.9
Alcohol (C10-C18) poly(7) ethoxylate	Y	S/P	3	2G	Cont	No			Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6, 16.2.9
Alcohol (C12-C16) poly(1-6)ethoxylates	Y	S/P	2	2G	Cont	No			Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6, 16.2.9
Alcohol (C12-C16) poly(20+)ethoxylates	Y	S/P	3	2G	Cont	No			Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6, 16.2.9
Alcohol (C12-C16) poly(7-19)ethoxylates	Y	S/P	2	2G	Cont	No			Yes	C	T	AC	Yes	15.12, 15.17, 15.19, 16.2.9
Alcohols (C13+)	Y	P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.9
Alcohols (C12+), primary, linear	Y	S/P	2	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9
Alcohols (C8-C11), primary, linear and essentially linear	Y	S/P	2	2G	Cont	No	-	-	Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6, 16.2.9
Alcohols (C12-C13), primary, linear and essentially linear	Y	S/P	2	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9
Alcohols (C14-C18), primary, linear and essentially linear	Y	S/P	2	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6
Alkanes (C5-C7), linear and branched	Y	S/P	2	2G	Cont	No	T3	IIA	No	C	FT	ABC	No	15.12, 15.17, 15.19.6
Alkanes (C6-C9)	X	S/P	2	2G	Cont	No	T3	IIA	No	C	FT	AC	No	15.12, 15.17, 15.19.6
Alkanes (C10-C17), linear and branched	Y	S/P	2	2G	Cont	Inert	T3	IIB	No	R	F	ABC	No	15.19
Alkanes (C10-C26), linear and branched (flashpoint ≤60°C)	Y	S/P	3	2G	Cont	No	T3	IIA	No	R	F	ABC	No	15.19.6

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o
Iso- and cyclo-alkanes (C10-C11)	Y	S/P	3	2G	Cont	No	T3	IIA	No	R	F	AC	No	15.19.6
Iso- and cyclo-alkanes (C12+)	Y	S/P	3	2G	Cont	No	T3	IIA	No	R	F	AC	No	15.19.6
Alkanes (C10-C26), linear and branched, (flashpoint >60°C)	Y	S/P	3	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6
n-Alkanes (C9-C11)	Y	S/P	3	2G	Cont	No	T3	IIA	No	R	F	ABC	No	15.19.6
n-Alkanes (C10 – C20)	Y	P	2	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9
Alkaryl polyethers (C9-C20)	Y	S/P	2	2G	Cont	No			Yes	C	T	ABC	Yes	15.12, 15.17, 15.19, 16.2.6
Alkenoic acid, polyhydroxy ester borated	Y	S/P	2	2G	Cont	No	-	-	Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6
Alkenyl (C11+) amide	X	S/P	2	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9
Alkenyl (C16-C20) succinic anhydride	Z	S/P	3	2G	Cont	No			Yes	C	T	ABC	Yes	15.12, 15.17, 15.19
Alkyl acrylate/vinylpyridine copolymer in toluene	Y	S/P	2	2G	Cont	No	T1	IIB	No	C	FT	ABC	No	15.12, 15.17, 15.19.6, 16.2.9
Alkylaryl phosphate mixtures (more than 40% Diphenyl tolyl phosphate, less than 0.02% ortho-isomers)	X	S/P	2	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6
Alkylated (C4-C9) hindered phenols	Y	S/P	2	2G	Cont	No	-	-	Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6, 16.2.9
Alkylbenzene, alkylindane, alkylindene mixture (each C12-C17)	Z	P	3	2G	Open	No			Yes	O	No	AC	No	
Alkyl benzene distillation bottoms	Y	S/P	2	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6
Alkylbenzene mixtures (containing at least 50% of toluene)	Y	S/P	3	2G	Cont	No	T1	IIA	No	C	FT	ABC	No	15.12, 15.17, 15.19.6

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o
Alkylbenzenes mixtures (containing naphthalene)	X	S/P	2	2G	Cont	No			Yes	C	T	ABC	No	15.12, 15.17, 15.19.6
Alkyl (C3-C4) benzenes	Y	S/P	2	2G	Cont	No	T1	IIA	No	R	FT	ABC	No	15.12.3, 15.12.4, 15.19.6
Alkyl (C5-C8) benzenes	X	S/P	2	2G	Cont	No			Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6
Alkyl(C9+)benzenes	Y	S/P	3	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6
Alkyl (C11-C17) benzene sulphonic acid	Y	S/P	2	2G	Cont	No	-	-	Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6
Alkylbenzene sulphonic acid, sodium salt solution	Y	S/P	2	2G	Cont	No	-	-	NF	C	T	No	Yes	15.12, 15.17, 15.19, 16.2.6, 16.2.9
Alkyl/cyclo (C4-C5) alcohols	Y	S/P	3	2G	Cont	No	T2	IIB	No	R	FT	AC	No	15.12.3, 15.12.4, 15.19.6
Alkyl (C10-C15, C12 rich) phenol poly (4-12) ethoxylate	Y	S/P	2	2G	Cont	No			Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6
Alkyl (C12+) dimethylamine	X	S/P	1	2G	Cont	No	-	-	Yes	C	T	ABC	Yes	15.12, 15.17, 15.19
Alkyl dithiocarbamate (C19-C35)	Y	P	3	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9
Alkyldithiothiadiazole (C6-C24)	Y	P	3	2G	Open	No	-	-	Yes	O	No	AC	No	15.19.6, 16.2.6
Alkyl ester copolymer (C4-C20)	Y	P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9
Alkyl (C7-C9) nitrates	Y	S/P	2	2G	Cont	No			Yes	C	T	ABC	Yes	15.12, 15.17, 15.19, 15.20, 16.6.1, 16.6.2, 16.6.3
Alkyl (C8-C10)/(C12-C14):(40% or less/60% or more) polyglucoside solution (55% or less)	Y	S/P	3	2G	Cont	No			Yes	C	T	AC	Yes	15.12, 15.17, 15.19, 16.2.6, 16.2.9
Alkyl (C8-C10)/(C12-C14):(60% or more/40% or less) polyglucoside solution(55% or less)	Y	S/P	3	2G	Cont	No			Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6, 16.2.9
Alkyl(C7-C11)phenol poly(4-12) ethoxylate	Y	S/P	2	2G	Cont	No			Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o
Alkyl (C8-C40) phenol sulphide	Z	S/P	3	2G	Open	No			Yes	O	No	ABC	No	
Alkyl (C8-C9) phenylamine in aromatic solvents	Y	S/P	2	2G	Cont	No	T1	IIB	No	R	FT	ABC	No	15.12.3, 15.12.4, 15.19.6
Alkyl (C9-C15) phenyl propoxylate	Z	S/P	3	2G	Cont	No			Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6
Alkyl (C8-C10) polyglucoside solution (65% or less)	Y	S/P	3	2G	Cont	No			Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6
Alkyl (C8-C10)/(C12-C14):(50%/50%) polyglucoside solution (55% or less)	Y	S/P	3	2G	Cont	No			Yes	C	T	AC	Yes	15.12, 15.17, 15.19, 16.2.6, 16.2.9
Alkyl (C12-C14) polyglucoside solution (55% or less)	Y	S/P	3	2G	Cont	No			Yes	C	T	AC	Yes	15.12, 15.17, 15.19, 16.2.9
Alkyl (C12-C16) propoxyamine ethoxylate	X	S/P	2	2G	Cont	No	-	-	Yes	C	T	AC	Yes	15.12, 15.17, 15.19, 16.2.6
Alkyl (C10-C20, saturated and unsaturated) phosphite	Y	P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.9
Alkyl sulphonic acid ester of phenol	Y	P	3	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.6
Alkyl (C18+) toluenes	Y	S/P	2	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.9
Alkyl(C18-C28) toluenesulphonic acid	Y	S/P	2	2G	Cont	No	-	-	Yes	C	T	ABC	Yes	15.11.2, 15.11.3, 15.11.4, 15.11.6, 15.11.7, 15.11.8, 15.12, 15.17, 15.19, 16.2.6, 16.2.9
Alkyl(C18-C28) toluenesulphonic acid, calcium salts, borated	Y	S/P	3	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6
Alkyl (C18-C28) toluenesulfonic acid, calcium salts, low overbase	Y	S/P	2	2G	Cont	No	-	-	Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6
Alkyl (C18-C28) toluenesulphonic acid, calcium salts, high overbase	Y	S/P	3	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6
Allyl alcohol	Y	S/P	2	2G	Cont	No	T2	IIB	No	C	FT	AC	Yes	15.12, 15.17, 15.19
Allyl chloride	Y	S/P	2	2G	Cont	No	T2	IIA	No	C	FT	AC	No	15.12, 15.17, 15.19

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o
Aluminium chloride/Hydrogen chloride solution	Y	S/P	2	2G	Cont	No	-	-	NF	C	T	No	Yes	15.11, 15.12, 15.17, 15.19
Aluminium hydroxide, sodium hydroxide, sodium carbonate solution (40% or less)	Y	S/P	2	2G	Cont	No			NF	C	T	No	Yes	15.12, 15.17, 15.19
Aluminium sulphate solution	Y	S/P	2	2G	Cont	No			NF	C	T	No	Yes	15.12, 15.17, 15.19
2-(2-Aminoethoxy) ethanol	Z	S/P	3	2G	Cont	No			Yes	C	T	AD	Yes	15.12, 15.17, 15.19
Aminoethyldiethanolamine/Aminoethylethanolamine solution	Z	S/P	3	2G	Cont	No	-	-	Yes	C	T	AC	Yes	15.12, 15.17, 15.19, 16.2.9
Aminoethyl ethanolamine	Z	S/P	3	2G	Cont	No	-	-	Yes	C	T	AC	Yes	15.12, 15.17, 15.19
N-Aminoethylpiperazine	Z	S/P	3	2G	Cont	No			Yes	C	T	AC	Yes	15.12, 15.17, 15.19
2-Amino-2-methyl-1-propanol	Z	S/P	3	2G	Cont	No			Yes	C	T	AC	Yes	15.12, 15.17, 15.19
Ammonia aqueous (28% or less)	Y	S/P	2	2G	Cont	No			NF	C	T	No	Yes	15.12, 15.17, 15.19
Ammonium chloride solution (less than 25%) (*)	Z	S/P	3	2G	Open	No	-	-	NF	O	No	No	No	
Ammonium hydrogen phosphate solution	Z	P	3	2G	Open	No			Yes	O	No	AC	No	
Ammonium lignosulphonate solutions	Z	P	3	2G	Open	No	-	-	Yes	O	No	AC	No	16.2.9
Ammonium nitrate solution (93% or less) (*)	Z	S/P	2	1G	Cont	No			NF	R	T	No	No	15.2, 15.11.4, 15.11.6, 15.12.3, 15.12.4, 15.18, 15.19.6, 16.2.9
Ammonium polyphosphate solution	Z	P	3	2G	Open	No	-	-	Yes	O	No	AC	No	

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o
Ammonium sulphate solution	Z	P	3	2G	Open	No			NF	O	No	No	No	
Ammonium sulphide solution (45% or less) (*)	Y	S/P	2	2G	Cont	Inert	T4	IIB	No	C	FT	AC	No	15.12, 15.17, 15.19, 16.6.1, 16.6.2, 16.6.3
Ammonium thiosulphate solution (60% or less)	Z	S/P	3	2G	Open	No			NF	O	No	No	No	
Amyl acetate (all isomers)	Y	S/P	3	2G	Cont	No	T2	IIA	No	R	F	ABC	No	15.19.6
n-Amyl alcohol	Z	S/P	2	2G	Cont	No	T2	IIA	No	C	FT	ABC	Yes	15.12, 15.17, 15.19
Amyl alcohol, primary	Z	S/P	3	2G	Cont	No	T2	IIA	No	R	FT	ABC	No	15.12.3, 15.12.4, 15.19.6
sec-Amyl alcohol	Z	S/P	3	2G	Cont	No	T2	IIA	No	R	FT	ABC	No	15.12.3, 15.12.4, 15.19.6
tert-Amyl alcohol	Z	S/P	3	2G	Cont	No	T2	IIA	No	R	F	AC	No	15.19.6
tert-Amyl ethyl ether	Z	P	3	2G	Cont	No	T3	IIA	No	R	F	ABC	No	15.19.6
tert-Amyl methyl ether	X	S/P	2	2G	Cont	No	T2	IIB	No	R	FT	AC	No	15.12.3, 15.12.4, 15.19.6
Aniline	Y	S/P	2	2G	Cont	No	T1	IIA	Yes	C	T	AC	Yes	15.12, 15.17, 15.19
Aryl polyolefins (C11-C50)	Y	P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9
Aviation alkylates (C8 paraffins and iso-paraffins BPT 95 - 120°C)	X	S/P	2	2G	Cont	No	T3	IIA	No	R	F	ABC	No	15.19.6
Barium long chain (C11-C50) alkaryl sulphonate	Y	S/P	2	2G	Cont	No			Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19, 16.2.6, 16.2.9



a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o
Benzene and mixtures having 10% benzene or more (i)	Y	S/P	3	2G	Cont	No	T1	IIA	No	C	FT	ABC	No	15.12, 15.17, 15.19.6, 16.2.9
Benzene sulphonyl chloride	Y	S/P	3	2G	Cont	No			Yes	C	T	ABC	Yes	15.12, 15.17, 15.19, 16.2.9
Benzenetricarboxylic acid, trioctyl ester	Y	S/P	2	2G	Cont	No			Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6
Benzyl acetate	Y	S/P	2	2G	Cont	No			Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6
Benzyl alcohol	Y	S/P	3	2G	Cont	No			Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6
Benzyl chloride	Y	S/P	2	2G	Cont	No	T1	IIA	No	C	FT	ABC	Yes	15.12, 15.13, 15.17, 15.19
Bio-fuel blends of Diesel/gas oil and Alkanes (C10-C26), linear and branched with a flashpoint >60°C (>25% but <99% by volume)	X	S/P	2	2G	Cont	No	-	-	Yes	C	T	ABC	No	15.12, 15.17, 15.19.6
Bio-fuel blends of Diesel/gas oil and Alkanes (C10-C26), linear and branched with a flashpoint ≤ 60°C (>25% but <99% by volume)	X	S/P	2	2G	Cont	No	T3	IIA	No	C	FT	ABC	No	15.12, 15.17, 15.19.6
Bio-fuel blends of Diesel/gas oil and FAME (>25% but <99% by volume)	X	S/P	2	2G	Cont	No	-	-	Yes	C	T	ABC	No	15.12, 15.17, 15.19.6
Bio-fuel blends of Diesel/gas oil and vegetable oil (>25% but <99% by volume)	X	S/P	2	2G	Cont	No	-	-	Yes	C	T	ABC	No	15.12, 15.17, 15.19.6
Bio-fuel blends of Gasoline and Ethyl alcohol (>25% but <99% by volume)	X	S/P	2	2G	Cont	No	T3	IIA	No	R	FT	AC	No	15.12, 15.17, 15.19.6
Bio-fuel blends of jet fuels and Alkanes (C10-C17), linear and branched (>25% but <99% by volume)	X	S/P	2	2G	Cont	No	T3	IIB	No	C	FT	ABC	No	15.12, 15.17, 15.19.6
Bis(2-ethylhexyl) terephthalate	Y	S/P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.6

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o
Brake fluid base mix: Poly(2-8)alkylene (C2-C3) glycols/Polyalkylene (C2-C10) glycols monoalkyl (C1-C4) ethers and their borate esters	Z	P	3	2G	Open	No	-	-	Yes	O	No	AC	No	
Bromochloromethane	Z	P	3	2G	Open	No			NF	O	No	No	No	
Butene oligomer	X	P	2	2G	Cont	No	T4	IIB	No	R	F	ABC	No	15.19.6
2-Butoxyethanol (58%)/Hyperbranched polyesteramide (42%) (mixture)	Y	S/P	2	2G	Cont	No			Yes	C	T	AC	No	15.12.3, 15.12.4, 15.19
Butyl acetate (all isomers)	Y	P	3	2G	Cont	No	T2	IIA	No	R	F	AC	No	15.19.6
Butyl acrylate (all isomers)	Y	S/P	3	2G	Cont	No	T2	IIB	No	R	F	ABC	No	15.13, 15.19.6, 16.6.1, 16.6.2
tert-Butyl alcohol	Z	P	3	2G	Cont	No	T1	IIA	No	R	F	AC	No	15.19.6
Butylamine (all isomers)	Y	S/P	2	2G	Cont	No	T2	IIA	No	C	FT	AC	Yes	15.12, 15.17, 15.19
Butylbenzene (all isomers)	X	S/P	2	2G	Cont	No	T2	IIA	No	R	FT	ABC	No	15.12.3, 15.12.4, 15.19.6
Butyl benzyl phthalate	X	S/P	2	2G	Cont	No			Yes	C	T	AC	No	15.12, 15.17, 15.19.6
Butyl butyrate (all isomers)	Y	S/P	3	2G	Cont	No	T1	IIA	No	R	F	ABC	No	15.19.6
Butyl/Decyl/Cetyl/Eicosyl methacrylate mixture	Y	S/P	2	2G	Open	No	T3	IIA	No	R	F	ABC	No	15.13, 15.19.6, 16.6.1, 16.6.2
Butylene glycol	Z	S/P	3	2G	Open	No			Yes	O	No	AC	No	

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o
1,2-Butylene oxide	Y	S/P	3	2G	Cont	Inert	T2	IIB	No	C	FT	AC	No	15.8.1 to 15.8.7, 15.8.12, 15.8.13, 15.8.16, 15.8.17, 15.8.18, 15.8.19, 15.8.21, 15.8.25, 15.8.27, 15.8.29, 15.12, 15.17, 15.19.6
n-Butyl ether	Y	S/P	3	2G	Cont	Inert	T4	IIB	No	R	F	AC	No	15.4.6, 15.19
Butyl methacrylate	Z	S/P	3	2G	Cont	No	T3	IIA	No	R	F	ABC	No	15.13, 15.19.6, 16.6.1, 16.6.2
n-Butyl propionate	Y	P	3	2G	Cont	No	T2	IIA	No	R	F	ABC	No	15.19.6
Butyraldehyde (all isomers)	Y	S/P	3	2G	Cont	No	T3	IIA	No	R	F	AC	No	15.19.6
Butyric acid	Y	S/P	3	2G	Cont	No			Yes	O	No	AC	No	15.11.2, 15.11.3, 15.11.4, 15.11.6, 15.11.7, 15.11.8, 15.19.6
gamma-Butyrolactone	Y	S/P	3	2G	Cont	No			Yes	C	T	ABC	No	15.12, 15.17, 15.19.6
Calcium alkaryl sulphonate (C11-C50)	Z	S/P	3	2G	Open	No	-	-	Yes	O	No	ABC	No	
Calcium alkyl (C10-C28) salicylate	Y	S/P	2	2G	Cont	No	-	-	Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6, 16.2.9
Calcium hydroxide slurry	Y	S/P	2	2G	Cont	No	-	-	Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6, 16.2.9
Calcium hypochlorite solution (15% or less)	Y	S/P	2	2G	Cont	No			NF	R	T	No	No	15.12.3, 15.12.4, 15.19.6
Calcium hypochlorite solution (more than 15%)	X	S/P	1	2G	Cont	No			NF	R	T	No	No	15.12.3, 15.12.4, 15.19
Calcium lignosulphonate solutions	Z	P	3	2G	Open	No	-	-	NF	O	No	No	No	16.2.9

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o
Calcium long-chain alkyl (C5-C10) phenate	Y	P	3	2G	Open	No			Yes	O	No	AC	No	15.19.6
Calcium long-chain alkyl (C11-C40) phenate	Y	S/P	2	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6
Calcium long-chain alkyl phenate sulphide (C8-C40)	Y	S/P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.6
Calcium long-chain alkyl salicylate (C13+)	Y	S/P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9
Calcium long-chain alkyl (C18-C28) salicylate	Y	S/P	2	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9
Calcium nitrate/Magnesium nitrate/Potassium chloride solution	Z	S/P	3	2G	Open	No	-	-	NF	O	No	No	No	16.2.9
Calcium nitrate solution (50% or less)	Z	S	3	2G	Open	No	-	-	NF	O	No	No	No	16.2.9
Camelina oil	Y	S/P	2(k)	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.7
epsilon-Caprolactam (molten or aqueous solutions)	Z	S/P	3	2G	Cont	No			Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6
Carbolic oil	Y	S/P	2	2G	Cont	No			Yes	C	FT	ABC	Yes	15.12, 15.17, 15.19, 16.2.9
Carbon disulphide	Y	S/P	1	1G	Cont	Pad+inert	T6	IIC	No	C	FT	C	Yes	15.3, 15.12, 15.17, 15.18, 15.19
Carbon tetrachloride	Y	S/P	2	2G	Cont	No			NF	C	T	No	No	15.12, 15.17, 15.19.6
Cashew nut shell oil (untreated)	Y	S/P	2	2G	Cont	No			Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6, 16.2.7, 16.2.9
Castor oil	Y	S/P	2(k)	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.7, 16.2.9
Cesium formate solution (*)	Y	S/P	3	2G	Open	No	-	-	NF	O	No	No	No	15.19.6
Cetyl/Eicosyl methacrylate mixture	Y	S/P	2	2G	Open	No			Yes	O	No	ABC	No	15.13, 15.19.6, 16.2.9, 16.6.1, 16.6.2

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o
Chlorinated paraffins (C10-C13)	X	S/P	1	2G	Cont	No			NF	C	T	No	No	15.12, 15.17, 15.19, 16.2.6
Chlorinated paraffins (C14-C17) (with 50% chlorine or more, and less than 1% C13 or shorter chains)	X	S/P	1	2G	Cont	No	-	-	Yes	C	T	AC	No	15.12, 15.17, 15.19
Chloroacetic acid (80% or less)	Y	S/P	2	2G	Cont	No			NF	C	T	No	Yes	15.11.2, 15.11.3, 15.11.4, 15.11.6, 15.11.7, 15.11.8, 15.12, 15.17, 15.18, 15.19, 16.2.9
Chlorobenzene	Y	S/P	2	2G	Cont	No	T1	IIA	No	R	FT	ABC	No	15.12.3, 15.12.4, 15.19.6
Chloroform	Y	S/P	3	2G	Cont	No			NF	C	T	No	No	15.12, 15.17, 15.19.6
Chlorohydrins (crude)	Y	S/P	2	2G	Cont	No	T3	IIA	No	C	FT	AC	Yes	15.12, 15.17, 15.19
4-Chloro-2-methylphenoxyacetic acid, dimethylamine salt solution	Y	S/P	2	2G	Cont	No			NF	R	T	No	No	15.12.3, 15.12.4, 15.19.6, 16.2.9
o-Chloronitrobenzene	Y	S/P	2	2G	Cont	No			Yes	C	T	ABC	No	15.12.3, 15.12.4, 15.19, 16.2.6, 16.2.9
1-(4-Chlorophenyl)-4,4- dimethyl-pentan-3-one	Y	S/P	2	2G	Open	No			Yes	O	No	ABD	No	15.19.6, 16.2.6, 16.2.9
2- or 3-Chloropropionic acid	Z	S/P	2	2G	Cont	No			Yes	C	T	AC	No	15.11.2, 15.11.3, 15.11.4, 15.11.6, 15.11.7, 15.11.8, 15.12.3, 15.12.4, 15.19, 16.2.9
Chlorosulphonic acid	Y	S/P	1	2G	Cont	No			NF	C	T	No	Yes	15.11.2, 15.11.3, 15.11.4, 15.11.5, 15.11.6, 15.11.7, 15.11.8, 15.12, 15.16.2, 15.17, 15.18, 15.19
m-Chlorotoluene	Y	S/P	2	2G	Cont	No	T4	IIA	No	R	FT	ABC	No	15.12.3, 15.12.4, 15.19
o-Chlorotoluene	Y	P	2	2G	Cont	No	T1	IIA	No	R	F	ABC	No	15.19.6
p-Chlorotoluene	Y	P	2	2G	Cont	No	T1	IIA	No	R	F	ABC	No	15.19.6, 16.2.9

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o
Chlorotoluenes (mixed isomers)	Y	P	2	2G	Cont	No	T4	IIA	No	R	F	ABC	No	15.19.6
Choline chloride solutions	Z	P	3	2G	Open	No			Yes	O	No	AC	No	
Citric acid (70% or less)	Z	S/P	3	2G	Cont	No			Yes	C	T	AC	Yes	15.12, 15.17, 15.19
Coal tar	X	S/P	2	2G	Cont	No	T2	IIA	Yes	C	T	BD	No	15.12, 15.17, 15.19.6, 16.2.6, 16.2.9
Coal tar naphtha solvent	Y	S/P	2	2G	Cont	No	T3	IIA	No	C	FT	ABC	No	15.12, 15.17, 15.19.6, 16.2.9
Coal tar pitch (molten) (*)	X	S/P	2	1G	Cont	No	T2	IIA	Yes	C	T	ABCD	No	15.12, 15.17, 15.19.6, 16.2.6, 16.2.9
Cocoa butter	Y	S/P	2(k)	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.7, 16.2.9
Coconut oil	Y	S/P	2(k)	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.7, 16.2.9
Coconut oil fatty acid	Y	S/P	2	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.7, 16.2.9
Coconut oil fatty acid methyl ester	Y	P	2	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6
Copper salt of long chain (C17+) alkanolic acid	Y	P	2	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9
Corn Oil	Y	S/P	2(k)	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.7, 16.2.9
Cotton seed oil	Y	S/P	2(k)	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.7, 16.2.9
Creosote (coal tar)	X	S/P	1	2G	Cont	No	T2	IIA	Yes	C	T	AD	No	15.12, 15.17, 15.19.6, 16.2.6, 16.2.9
Cresols (all isomers)	Y	S/P	1	2G	Cont	No	T1	IIA	Yes	C	T	ABC	Yes	15.12, 15.18, 15.19, 16.2.9
Cresol/Phenol/Xylenol mixture	Y	S/P	2	2G	Cont	No			Yes	C	T	AC	Yes	15.12, 15.17, 15.19

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o
Cresylic acid, dephenolized	Y	S/P	2	2G	Cont	No			Yes	C	T	ABC	Yes	15.12, 15.17, 15.19
Cresylic acid, sodium salt solution	Y	S/P	2	2G	Cont	No	T4	IIB	No	C	FT	AC	Yes	15.12, 15.17, 15.19, 16.2.9
Crotonaldehyde	X	S/P	1	1G	Cont	No	T3	IIB	No	C	FT	AC	Yes	15.12, 15.17, 15.18, 15.19
1,5,9-Cyclododecatriene	X	S/P	2	2G	Open	No			Yes	O	No	AC	No	15.13, 15.19.6, 16.6.1, 16.6.2
Cycloheptane	X	S/P	2	2G	Cont	No	T4	IIA	No	R	F	AC	No	15.19.6
Cyclohexane	Y	S/P	2	2G	Cont	No	T3	IIA	No	R	F	AC	No	15.19.6, 16.2.9
Cyclohexane-1,2-dicarboxylic acid, diisononyl ester	Y	S/P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.6
Cyclohexane oxidation products, sodium salts solution	Z	P	3	2G	Open	No			NF	O	No	No	No	
Cyclohexanol	Y	P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.9
Cyclohexanone	Z	S/P	3	2G	Cont	No	T2	IIA	No	R	F	AC	No	15.19.6
Cyclohexanone, Cyclohexanol mixture	Y	S/P	3	2G	Cont	No			Yes	R	F	AC	No	15.19.6
Cyclohexyl acetate	Y	S/P	3	2G	Cont	No	T2	IIA	No	R	FT	AC	No	15.12.3, 15.12.4, 15.19.6
Cyclohexylamine	Y	S/P	3	2G	Cont	No	T3	IIA	No	C	FT	AC	Yes	15.12, 15.17, 15.19
1,3-Cyclopentadiene dimer (molten)	Y	S/P	2	2G	Cont	No	T1	IIB	No	R	FT	AC	No	15.12.3, 15.12.4, 15.19, 16.2.6, 16.2.9
Cyclopentane	Y	P	2	2G	Cont	No	T2	IIA	No	R	F	AC	No	15.19.6
Cyclopentene	Y	S/P	3	2G	Cont	No	T2	IIA	No	R	F	AC	No	15.19.6
p-Cymene	Y	S/P	2	2G	Cont	No	T2	IIA	No	R	F	AC	No	15.19.6
Decahydronaphthalene	Y	S/P	2	2G	Cont	No	T3	IIA	No	R	FT	ABC	No	15.12.3, 15.12.4, 15.19.6

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o
Decanoic acid	X	S/P	2	2G	Cont	No			Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6, 16.2.9
Decene	X	P	2	2G	Cont	No	T3	IIA	No	R	F	AC	No	15.19.6
Decyl acrylate	X	S/P	1	2G	Cont	No	-	-	Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.13, 15.19, 16.6.1, 16.6.2
Decyl alcohol (all isomers)	Y	P	2	2G	Open	No			Yes	O	No	AC	No	15.19.6, 16.2.9(e)
Decyl/Dodecyl/Tetradecyl alcohol mixture	Y	S/P	2	2G	Cont	No	-	-	Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6, 16.2.9
Decyloxytetrahydrothiophene dioxide	X	S/P	2	2G	Open	No			Yes	O	No	AC	No	15.19.6, 16.2.9
Diacetone alcohol	Z	S/P	3	2G	Cont	No	T1	IIA	No	R	FT	AC	No	15.12.3, 15.12.4, 15.19.6
Dialkyl (C8-C9) diphenylamines	Z	P	3	2G	Open	No			Yes	O	No	ABC	No	
Dialkyl (C7-C13) phthalates	X	S/P	2	2G	Cont	No			Yes	C	T	ABC	No	15.12, 15.17, 15.19.6, 16.2.6
Dialkyl (C9-C10) phthalates	Y	S/P	2	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6
Dialkyl thiophosphates sodium salts solution	Y	S/P	2	2G	Cont	No	-	-	Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6, 16.2.9
2,6-Diaminohexanoic acid phosphonate mixed salts solution	Z	S/P	3	2G	Cont	No			NF	R	No	No	No	15.11, 15.17, 15.19.6
Dibromomethane	Y	S/P	2	2G	Open	No			NF	O	No	No	No	15.19.6
Dibutylamine	Y	S/P	2	2G	Cont	No	T2	IIA	No	C	FT	ABC	Yes	15.12, 15.17, 15.19
Dibutyl hydrogen phosphonate	Y	S/P	2	2G	Cont	No			Yes	C	T	AC	Yes	15.12, 15.17, 15.19, 16.2.9
2,6-Di-tert-butylphenol	X	S/P	2	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.9



a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o
Dibutyl phthalate	X	S/P	2	2G	Cont	No			Yes	C	T	AC	No	15.12, 15.17, 15.19.6
Dibutyl terephthalate	Y	P	2	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.9
Dichlorobenzene (all isomers)	X	S/P	2	2G	Cont	No	T1	IIA	Yes	C	T	ABD	No	15.12, 15.17, 15.19.6
3,4-Dichloro-1-butene	Y	S/P	2	2G	Cont	No	T1	IIA	No	R	FT	ABC	No	15.12.3, 15.12.4, 15.19.6
1,1-Dichloroethane	Z	S/P	3	2G	Cont	No	T2	IIA	No	R	F	AC	No	15.19.6
Dichloroethyl ether	Y	S/P	2	2G	Cont	No	T2	IIA	No	C	FT	AC	Yes	15.12, 15.17, 15.18, 15.19
1,6-Dichlorohexane	Y	P	2	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6
2,2'-Dichloroisopropyl ether	Y	S/P	2	2G	Cont	No			Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19
Dichloromethane	Y	S/P	3	2G	Cont	No	T1	IIA	No	C	FT	ABC	No	15.12, 15.17, 15.19.6
2,4-Dichlorophenol	Y	S/P	2	2G	Cont	Dry			Yes	C	T	AD	Yes	15.12, 15.16.2, 15.17, 15.19, 16.2.6, 16.2.9
2,4-Dichlorophenoxyacetic acid, diethanolamine salt solution	Y	S/P	3	2G	Cont	No			NF	C	T	No	Yes	15.12, 15.17, 15.19, 16.2.9
2,4-Dichlorophenoxyacetic acid, dimethylamine salt solution (70% or less)	Y	S/P	3	2G	Cont	No			NF	C	T	No	Yes	15.12, 15.17, 15.19, 16.2.9
2,4-Dichlorophenoxyacetic acid, triisopropanolamine salt solution	Y	S/P	3	2G	Cont	No			NF	C	T	No	Yes	15.12, 15.17, 15.19, 16.2.6, 16.2.9
1,1-Dichloropropane	Y	S/P	2	2G	Cont	No	T1	IIA	No	R	F	ABC	No	15.19.6
1,2-Dichloropropane	Y	S/P	3	2G	Cont	No	T1	IIA	No	R	FT	ABC	No	15.12.3, 15.12.4, 15.19.6
1,3-Dichloropropene	X	S/P	2	2G	Cont	No	T2	IIA	No	C	FT	ABC	Yes	15.12, 15.17, 15.19
Dichloropropene/Dichloropropane mixtures	X	S/P	2	2G	Cont	No	T2	IIA	No	C	FT	ABD	No	15.12, 15.17, 15.19

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o
2,2-Dichloropropionic acid	Y	S/P	2	2G	Cont	Dry			Yes	C	T	AD	Yes	15.11.2, 15.11.4, 15.11.6, 15.11.7, 15.11.8, 15.12, 15.16.2, 15.17, 15.19, 16.2.9
Dicyclopentadiene, Resin Grade, 81-89%	Y	S/P	2	2G	Cont	Inert	T2	IIB	No	C	FT	ABC	Yes	15.12, 15.13, 15.17, 15.19
Diethanolamine	Y	S/P	3	2G	Cont	No	T1	IIA	Yes	C	T	AC	No	15.12, 15.17, 15.19.6, 16.2.6, 16.2.9
Diethylamine	Y	S/P	3	2G	Cont	No	T2	IIA	No	C	FT	AC	Yes	15.12, 15.17, 15.19
Diethylaminoethanol	Y	S/P	2	2G	Cont	No	T2	IIA	No	R	FT	AC	No	15.12.3, 15.12.4, 15.19.6
2,6-Diethylaniline	Y	S/P	2	2G	Cont	No			Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6, 16.2.9
Diethylbenzene	Y	S/P	2	2G	Cont	No	T2	IIA	No	R	FT	AC	No	15.12.3, 15.12.4, 15.19.6
Diethylene glycol	Z	S/P	3	2G	Cont	No			Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6
Diethylene glycol dibutyl ether	Z	S/P	3	2G	Open	No	-	-	Yes	O	No	AC	No	
Diethylene glycol diethyl ether	Z	S/P	3	2G	Cont	No	-	-	Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6
Diethylene glycol phthalate	Y	S/P	3	2G	Cont	No	-	-	Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6
Diethylenetriamine	Y	S/P	3	2G	Cont	No	-	-	Yes	C	T	ABC	No	15.12, 15.17, 15.19
Diethylenetriaminepentaacetic acid, pentasodium salt solution	Z	P	3	2G	Open	No	-	-	Yes	O	No	AC	No	
Diethyl ether (*)	Z	S/P	2	1G	Cont	Inert	T4	IIB	No	R	F	AC	No	15.4, 15.14, 15.19
Di-(2-ethylhexyl) adipate	Y	S/P	2	2G	Cont	No			Yes	C	T	ABC	No	15.12, 15.17, 15.19.6
Di-(2-ethylhexyl) phosphoric acid	Y	S/P	2	2G	Cont	No			Yes	R	T	AD	No	15.12.3, 15.12.4, 15.19.6

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o
Diethyl phthalate	Y	S/P	2	2G	Open	No			Yes	O	No	AC	No	15.19.6
Diethyl sulphate	Y	S/P	2	2G	Cont	No			Yes	C	T	AC	Yes	15.12, 15.17, 15.19
Diglycidyl ether of bisphenol A	X	S/P	2	2G	Cont	No			Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6, 16.2.9
Diglycidyl ether of bisphenol F	Y	S/P	2	2G	Cont	No			Yes	C	T	AC	No	15.12, 15.17, 15.19.6, 16.2.6
Diheptyl phthalate	Y	S/P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6
Di-n-hexyl adipate	X	S/P	1	2G	Open	No			Yes	O	No	AC	No	15.19
Dihexyl phthalate	Y	S/P	2	2G	Cont	No			Yes	C	T	ABC	No	15.12, 15.17, 15.19.6
Diisobutylamine	Y	S/P	2	2G	Cont	No	T4	IIB	No	C	FT	ABC	No	15.12.3, 15.12.4, 15.19
Diisobutylene	Y	P	2	2G	Cont	No	T2	IIA	No	R	F	AC	No	15.19.6
Diisobutyl ketone	Y	S/P	3	2G	Cont	No	T2	IIA	No	R	FT	AC	No	15.12.3, 15.12.4, 15.19.6
Diisobutyl phthalate	X	S/P	2	2G	Cont	No			Yes	C	T	AC	No	15.12, 15.17, 15.19.6
Diisononyl adipate	Y	S/P	2	2G	Open	No	-	-	Yes	O	No	AC	No	15.19.6
Diisooctyl phthalate	Y	S/P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.6
Diisopropanolamine	Z	P	3	2G	Open	No	-	-	Yes	O	No	AC	No	16.2.9
Diisopropylamine	Y	S/P	3	2G	Cont	No	T2	IIA	No	R	FT	AC	No	15.12.3, 15.12.4, 15.17, 15.19.6
Diisopropylbenzene (all isomers)	X	S/P	2	2G	Cont	No			Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6
Diisopropyl naphthalene	Y	S/P	2	2G	Open	No	-	-	Yes	O	No	AC	No	15.19.6
N,N-Dimethylacetamide	Z	S/P	3	2G	Cont	No	-	-	Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6
N,N-Dimethylacetamide solution (40% or less)	Z	S/P	3	2G	Cont	No			NF	R	T	No	No	15.12.3, 15.12.4, 15.19.6
Dimethyl adipate	Y	P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.9

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Dimethylamine solution (45% or less)	Y	S/P	3	2G	Cont	No	T2	IIA	No	R	FT	AC	No	15.12.3, 15.12.4, 15.19
Dimethylamine solution (greater than 45% but not greater than 55%)	Y	S/P	3	2G	Cont	No	T2	IIB	No	R	FT	AC	No	15.12.3, 15.12.4, 15.19
Dimethylamine solution (greater than 55% but not greater than 65%)	Y	S/P	3	2G	Cont	No	T2	IIB	No	R	FT	AC	No	15.12.3, 15.12.4, 15.14, 15.19
N,N-Dimethylcyclohexylamine	Y	S/P	2	2G	Cont	No	T3	IIB	No	C	FT	AC	Yes	15.12, 15.17, 15.19
Dimethyl disulphide	Y	S/P	2	2G	Cont	No	T3	IIA	No	R	FT	ABC	No	15.12.3, 15.12.4, 15.19.6
N,N-Dimethyldodecylamine	Y	S/P	2	2G	Cont	No			Yes	C	T	ABC	Yes	15.12, 15.17, 15.19
Dimethylethanolamine	Y	S/P	3	2G	Cont	No	T3	IIA	No	R	FT	AC	No	15.12.3, 15.12.4, 15.19.6
Dimethylformamide	Y	S/P	3	2G	Cont	No	T2	IIA	No	C	FT	AC	No	15.12, 15.17, 15.19.6
Dimethyl glutarate	Y	S/P	3	2G	Cont	No			Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6
Dimethyl hydrogen phosphite	Y	S/P	3	2G	Cont	No	T4	IIB	No	R	F	AC	No	15.19.6
Dimethyl octanoic acid	Y	S/P	2	2G	Cont	No			Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6, 16.2.9
Dimethyl phthalate	Y	S/P	3	2G	Open	No			Yes	O	No	AC	No	15.19.6, 16.2.9
Dimethylpolysiloxane	Y	P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6
2,2-Dimethylpropane-1,3-diol (molten or solution)	Z	P	3	2G	Open	No	-	-	Yes	O	No	ABC	No	16.2.9
Dimethyl succinate	Y	P	2	2G	Open	No			Yes	O	No	AC	No	15.19.6, 16.2.9

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o
Dinitrotoluene (molten)	X	S/P	2	2G	Cont	No			Yes	C	T	AC	No	15.12, 15.17, 15.19, 15.21, 16.2.6, 16.2.9, 16.6.4
Dinonyl phthalate	Y	S/P	2	2G	Open	No	-	-	Yes	O	No	AC	No	15.19.6
Diocetyl phthalate	Y	S/P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6
1,4-Dioxane	Y	S/P	3	2G	Cont	No	T2	IIB	No	C	FT	AC	No	15.12, 15.17, 15.19.6, 16.2.9
Dipentene	Y	S/P	2	2G	Cont	No	T3	IIA	No	C	FT	AC	No	15.12.3, 15.12.4, 15.19.6
Diphenyl	X	S/P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9
Diphenylamine (molten)	Y	S/P	2	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9
Diphenylamine, reaction product with 2,2,4-Trimethylpentene	Y	S/P	2	2G	Open	No			Yes	O	No	AC	No	15.19, 16.2.6
Diphenylamines, alkylated	Y	S/P	2	2G	Open	No			Yes	O	No	AC	No	15.19, 16.2.6, 16.2.9
Diphenyl/Diphenyl ether mixtures	X	S/P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.9
Diphenyl ether	X	P	2	2G	Open	No			Yes	O	No	AC	No	15.19.6, 16.2.9
Diphenyl ether/Diphenyl phenyl ether mixture	X	P	2	2G	Open	No			Yes	O	No	AC	No	15.19.6, 16.2.9
Diphenylmethane diisocyanate	Y	S/P	2	2G	Cont	Dry	-	-	Yes(a)	C	T(a)	AB(b)D	Yes	15.12, 15.16.2, 15.17, 15.19, 16.2.6, 16.2.9
Diphenylol propane-epichlorohydrin resins	X	S/P	2	2G	Cont	No			Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6, 16.2.9
Di-n-propylamine	Y	S/P	2	2G	Cont	No	T3	IIB	No	C	FT	AC	Yes	15.12.3, 15.12.4, 15.17, 15.19.6
Dipropylene glycol	Z	P	3	2G	Open	No			Yes	O	No	AC	No	
Dithiocarbamate ester (C7-C35)	X	S/P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6

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Ditridecyl adipate	Y	S/P	2	2G	Cont	No	-	-	Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6
Ditridecyl phthalate	Y	S/P	2	2G	Open	No	-	-	Yes	O	No	AC	No	15.19.6
Diundecyl phthalate	Y	S/P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9
Dodecane (all isomers)	Y	S/P	2	2G	Cont	No	T3	IIA	No	R	F	ABC	No	15.19.6
tert-Dodecanethiol	Y	S/P	3	2G	Cont	No			Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6
1-Dodecene	Y	S/P	3	2G	Open	No			Yes	O	No	ABC	No	15.19.6
Dodecene (all isomers)	X	S/P	2	2G	Cont	No			Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6
Dodecyl alcohol	Y	S/P	2	2G	Open	No			Yes	O	No	AC	No	15.19.6, 16.2.9
n-Dodecyl mercaptan	X	S/P	1	2G	Cont	No			Yes	C	T	ABC	Yes	15.12, 15.17, 15.19
Dodecylamine/Tetradecylamine mixture	Y	S/P	2	2G	Cont	No			Yes	C	T	ABC	Yes	15.12, 15.17, 15.19, 16.2.9
Dodecylbenzene	Y	S/P	2	2G	Cont	No	-	-	Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6
Dodecyl diphenyl ether disulphonate solution	X	S/P	2	2G	Cont	No			NF	C	T	No	Yes	15.12, 15.17, 15.19, 16.2.6
Dodecyl hydroxypropyl sulphide	X	P	2	2G	Open	No			Yes	O	No	AC	No	15.19.6
Dodecyl methacrylate	Y	S/P	3	2G	Open	No			Yes	O	No	AC	No	15.13, 15.19.6
Dodecyl/Octadecyl methacrylate mixture	Y	S/P	2	2G	Open	No	-	-	Yes	O	No	AC	No	15.13, 15.19.6, 16.2.6, 16.6.1, 16.6.2
Dodecyl/Pentadecyl methacrylate mixture	Y	S/P	2	2G	Open	No			Yes	O	No	ABC	No	15.13, 15.19.6, 16.6.1, 16.6.2
Dodecyl phenol	X	S/P	2	2G	Cont	No			Yes	C	T	AC	Yes	15.12, 15.17, 15.19, 16.2.6
Dodecyl Xylene	Y	S/P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.6

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o
Drilling brines (containing zinc chloride)	X	S/P	2	2G	Open	No			NF	O	No	No	Yes	15.19.6
Drilling brines (containing calcium bromide)	Z	S/P	3	2G	Open	No			NF	O	No	No	No	15.19.6
Epichlorohydrin	Y	S/P	2	2G	Cont	No	T2	IIB	No	C	FT	AC	Yes	15.12, 15.17, 15.19
Ethanolamine	Y	S/P	3	2G	Cont	No	T2	IIA	Yes	C	FT	AC	Yes	15.12, 15.17, 15.19, 16.2.9
2-Ethoxyethyl acetate	Y	S/P	3	2G	Cont	No	T2	IIA	No	C	FT	AC	No	15.12, 15.17, 15.19.6
Ethoxylated long chain (C16+) alkyloxyalkylamine	Y	S/P	2	2G	Cont	No	-	-	Yes	C	T	ABC	Yes	15.12, 15.17, 15.19, 16.2.9
Ethoxylated tallow amine (>95%)	X	S/P	2	2G	Cont	Inert	-	-	Yes	C	T	ABC	Yes	15.12, 15.17, 15.19, 16.2.6, 16.2.9
Ethyl acetate	Z	S/P	3	2G	Cont	No	T2	IIA	No	R	F	ABC	No	15.19.6
Ethyl acetoacetate	Z	S/P	3	2G	Open	No			Yes	O	No	AC	No	
Ethyl acrylate	Y	S/P	2	2G	Cont	No	T2	IIB	No	C	FT	AC	No	15.12, 15.13, 15.17, 15.19, 16.6.1, 16.6.2
Ethylamine (*)	Y	S/P	2	1G	Cont	No	T2	IIA	No	C	F	AC	No	15.12.3.2, 15.14, 15.19
Ethylamine solutions (72% or less)	Y	S/P	3	2G	Cont	No	T2	IIA	No	C	F	AC	No	15.12.3.2, 15.14, 15.19
Ethyl amyl ketone	Y	S/P	2	2G	Cont	No	T2	IIA	No	R	FT	AC	No	15.12.3, 15.12.4, 15.19.6
Ethylbenzene	Y	S/P	2	2G	Cont	No	T2	IIA	No	C	FT	AC	No	15.12, 15.17, 15.19.6
Ethyl tert-butyl ether	Y	S/P	2	2G	Cont	No	T2	IIB	No	R	FT	AC	No	15.12.3, 15.12.4, 15.19.6
Ethyl butyrate	Y	S/P	2	2G	Cont	No	T2	IIA	No	R	FT	AC	No	15.12.3, 15.12.4, 15.19.6
Ethylcyclohexane	Y	S/P	2	2G	Cont	No	T3	IIA	No	R	F	AC	No	15.19.6
N-Ethylcyclohexylamine	Y	S/P	2	2G	Cont	No	T3	IIB	No	C	FT	AC	No	15.12.3, 15.12.4, 15.19
S-Ethyl dipropylthiocarbamate	Y	S/P	2	2G	Cont	No			Yes	C	T	AC	No	15.12, 15.17, 15.19.6, 16.2.9

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o
Ethylene carbonate	Z	S/P	3	2G	Cont	No			Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6, 16.2.9
Ethylene chlorohydrin	Y	S/P	1	2G	Cont	No	T2	IIA	No	C	FT	AC	Yes	15.12, 15.17, 15.18, 15.19
Ethylene cyanohydrin	Y	S/P	2	2G	Cont	No		IIB	Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6
Ethylenediamine	Y	S/P	2	2G	Cont	No	T2	IIA	No	C	FT	AC	Yes	15.12, 15.17, 15.19, 16.2.9
Ethylenediaminetetraacetic acid, tetrasodium salt solution	Y	S/P	3	2G	Cont	No	-	-	Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6
Ethylene dibromide	Y	S/P	2	2G	Cont	No			NF	C	T	No	No	15.12, 15.17, 15.19, 16.2.9
Ethylene dichloride	Y	S/P	3	2G	Cont	No	T2	IIA	No	C	FT	ABC	No	15.12, 15.17, 15.19
Ethylene glycol	Z	S/P	3	2G	Open	No			Yes	O	No	AC	No	15.19.6
Ethylene glycol acetate	Y	S/P	3	2G	Cont	No	-	-	Yes	C	T	AC	Yes	15.12, 15.17, 15.19
Ethylene glycol butyl ether acetate	Y	S/P	3	2G	Open	No			Yes	O	No	AC	No	15.19.6
Ethylene glycol diacetate	Y	S/P	2	2G	Open	No			Yes	O	No	AC	No	15.19.6
Ethylene glycol methyl ether acetate	Y	S/P	3	2G	Cont	No			Yes	C	T	AC	No	15.12, 15.17, 15.19.6
Ethylene glycol monoalkyl ethers	Y	S/P	3	2G	Cont	No	T2	IIB	No	C	FT	AC	No	15.12.3, 15.12.4, 15.19, 16.2.9
Ethylene glycol phenyl ether	Z	S/P	3	2G	Open	No	-	-	Yes	O	No	AC	No	16.2.9,
Ethylene glycol phenyl ether/Diethylene glycol phenyl ether mixture	Z	S/P	3	2G	Cont	No	-	-	Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6, 16.2.9



a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o
Ethylene glycol (>75%)/sodium alkyl carboxylates/borax mixture	Y	S/P	3	2G	Cont	No			Yes	C	T	AC	No	15.12, 15.17, 15.19.6
Ethylene glycol (>85%)/sodium alkyl carboxylates mixture	Z	S/P	3	2G	Open	No	-	-	Yes	O	No	AC	No	15.19.6
Ethylene oxide/Propylene oxide mixture with an ethylene oxide content of not more than 30% by mass	Y	S/P	2	1G	Cont	Inert	T2	IIB	No	C	FT	AC	Yes	15.8, 15.12, 15.14, 15.17, 15.19
Ethylene-vinyl acetate copolymer (emulsion)	Y	S/P	3	2G	Cont	No	-	-	Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6, 16.2.9
Ethyl-3-ethoxypropionate	Y	P	2	2G	Cont	No	T2	IIA	No	R	F	AC	No	15.19.6
2-Ethylhexanoic acid	Y	S/P	3	2G	Cont	No			Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6
2-Ethylhexyl acrylate	Y	S/P	3	2G	Cont	No	-	-	Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.13, 15.19.6, 16.6.1, 16.6.2
2-Ethylhexylamine	Y	S/P	2	2G	Cont	No	T3	IIA	No	C	FT	AC	Yes	15.12, 15.17, 15.19.6
2-Ethyl-2-(hydroxymethyl) propane-1,3-diol (C8-C10) ester	Y	P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9
Ethylidene norbornene	Y	S/P	2	2G	Cont	No	T3	IIB	No	R	FT	ABC	No	15.12.3, 15.12.4, 15.19.6
Ethyl methacrylate	Y	S/P	3	2G	Cont	No	T2	IIA	No	R	F	ABC	No	15.13, 15.19.6, 16.6.1, 16.6.2
N-Ethylmethylallylamine	Y	S/P	2	2G	Cont	No	T2	IIB	No	C	FT	AC	No	15.12.3, 15.12.4, 15.19
Ethyl propionate	Y	S/P	3	2G	Cont	No	T1	IIA	No	R	FT	AC	No	15.12.3, 15.12.4, 15.19.6
2-Ethyl-3-propylacrolein	Y	S/P	3	2G	Cont	No	T3	IIA	No	R	F	AC	No	15.19.6, 16.2.9
Ethyl toluene	Y	P	2	2G	Cont	No	T1	IIA	No	R	F	ABC	No	15.19.6
Fatty acid (saturated C13+)	Y	S/P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.9
Fatty acid methyl esters (m)	Y	S/P	2	2G	Cont	No	-	-	Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6, 16.2.9

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o
Fatty acids, (C8-C10)	Y	S/P	2	2G	Cont	No	-	-	Yes	C	T	ABC	Yes	15.12, 15.17, 15.19, 16.2.6, 16.2.9
Fatty acids, (C12+)	Y	S/P	2	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.7, 16.2.9
Fatty acids, (C16+)	Y	P	2	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6
Fatty acids, essentially linear (C6-C18) 2-ethylhexyl ester	Y	S/P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6
Ferric chloride solutions	Y	S/P	3	2G	Cont	No			NF	C	T	No	Yes	15.11, 15.12, 15.17, 15.19, 16.2.9
Ferric nitrate/Nitric acid solution	Y	S/P	2	2G	Cont	No			NF	C	T	No	Yes	15.11, 15.12, 15.17, 15.19
Fish oil	Y	S/P	2(k)	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.7, 16.2.9
Fish silage protein concentrate (containing 4% or less formic acid)	Y	P	2	2G	Open	No			NF	O	No	No	No	15.19.6, 16.2.6
Fish protein concentrate (containing 4% or less formic acid)	Z	P	3	2G	Open	No	-	-	NF	O	No	No	No	
Fluorosilicic acid solution (20-30%)	Y	S/P	3	2G	Cont	No			NF	C	T	No	Yes	15.11, 15.12, 15.17, 15.19
Formaldehyde solutions (45% or less)	Y	S/P	3	2G	Cont	No	T2	IIB	No	C	FT	AC	Yes	15.12, 15.17, 15.19, 16.2.9
Formamide	Y	S/P	3	2G	Cont	No			Yes	C	T	AC	No	15.12, 15.17, 15.19.6, 16.2.9
Formic acid (85% or less acid)	Y	S/P	3	2G	Cont	No	-	-	Yes	C	T(g)	AC	Yes	15.11.2, 15.11.3, 15.11.4, 15.11.6, 15.11.7, 15.11.8, 15.12.3, 15.12.4, 15.17, 15.19, 16.2.9
Formic acid (over 85%)	Y	S/P	3	2G	Cont	No	T1	IIA	No	C	FT(g)	AC	Yes	15.11.2, 15.11.3, 15.11.4, 15.11.6, 15.11.7, 15.11.8, 15.12.3, 15.12.4, 15.17, 15.19, 16.2.9

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o
Formic acid mixture (containing up to 18% propionic acid and up to 25% sodium formate)	Z	S/P	3	2G	Cont	No	-	-	Yes	R	T(g)	AC	No	15.11.2, 15.11.3, 15.11.4, 15.11.6, 15.11.7, 15.11.8, 15.12.3, 15.12.4, 15.19.6
Furfural	Y	S/P	3	2G	Cont	No	T2	IIB	No	C	FT	AC	Yes	15.12, 15.17, 15.19
Furfuryl alcohol	Y	S/P	3	2G	Cont	No	-	-	Yes	C	T	AC	Yes	15.12, 15.17, 15.19
Glucitol/glycerol blend propoxylated (containing less than 10% amines)	Z	S/P	3	2G	Cont	No	-	-	Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6
Glucitol/glycerol blend propoxylated (containing 10% or more amines)	Y	S/P	2	2G	Cont	No			Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6
Glutaraldehyde solutions (50% or less)	Y	S/P	3	2G	Cont	No			NF	C	T	No	Yes	15.12, 15.17, 15.19
Glycerine	Z	S	3	2G	Open	No			Yes	O	No	AC	No	16.2.9
Glycerol monooleate	Y	S/P	2	2G	Open	No	-	-	Yes	O	No	AC	No	15.19.6, 16.2.6, 16.2.9
Glycerol propoxylated	Z	S/P	3	2G	Cont	No	-	-	Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6
Glycerol, propoxylated and ethoxylated	Z	P	3	2G	Open	No	-	-	Yes	O	No	ABC	No	
Glycerol/sucrose blend propoxylated and ethoxylated	Z	P	3	2G	Open	No	-	-	Yes	O	No	ABC	No	
Glyceryl triacetate	Z	S/P	3	2G	Open	No			Yes	O	No	ABC	No	15.19.6
Glycidyl ester of C10 trialkylacetic acid	Y	S/P	2	2G	Cont	No			Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6
Glycine, sodium salt solution	Z	S/P	3	2G	Open	No			NF	O	No	No	No	
Glycolic acid solution (70% or less)	Z	S/P	3	2G	Cont	No	-	-	NF	C	T	No	Yes	15.12.3, 15.12.4, 15.17, 15.19, 16.2.9
Glyoxal solution (40% or less)	Y	S/P	3	2G	Cont	No			Yes	C	T	AC	Yes	15.12, 15.17, 15.19, 16.2.9

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Glyoxylic acid solution (50% or less)	Y	S/P	3	2G	Cont	No	-	-	Yes	C	T	ACD	Yes	15.11.2, 15.11.3, 15.11.4, 15.11.6, 15.11.7, 15.11.8, 15.12, 15.17, 15.19, 16.2.9, 16.6.1, 16.6.2, 16.6.3
Glyphosate solution (not containing surfactant)	Y	S/P	2	2G	Cont	No			Yes	C	T	AC	Yes	15.12, 15.17, 15.19, 16.2.9
Grape Seed Oil	Y	S/P	2(k)	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.7
Groundnut oil	Y	P	2(k)	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.7, 16.2.9
Heptane (all isomers)	X	P	2	2G	Cont	No	T3	IIA	No	R	F	AC	No	15.19.6
n-Heptanoic acid	Z	S/P	3	2G	Cont	No			Yes	R	No	ABC	No	15.19.6, 15.17
Heptanol (all isomers) (d)	Y	S/P	3	2G	Cont	No	T3	IIA	No	R	FT	ABC	No	15.12.3, 15.12.4, 15.19.6
Heptene (all isomers)	Y	P	2	2G	Cont	No	T3	IIA	No	R	F	ABC	No	15.19.6
Heptyl acetate	Y	S/P	2	2G	Cont	No			Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6
1-Hexadecylnaphthalene / 1,4-bis(hexadecyl)naphthalene mixture	Y	S/P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.6
Hexamethylenediamine (molten)	Y	S/P	3	2G	Cont	No	-	-	Yes	C	T	AC	Yes	15.12, 15.17, 15.19, 16.2.9
Hexamethylenediamine adipate (50% in water)	Z	P	3	2G	Open	No			Yes	O	No	AC	No	
Hexamethylenediamine solution	Y	S/P	3	2G	Cont	No			Yes	C	T	AC	Yes	15.12, 15.17, 15.19
Hexamethylene diisocyanate	Y	S/P	2	2G	Cont	Dry	T1	IIB	Yes	C	T	AC(b)D	Yes	15.12, 15.16.2, 15.17, 15.18, 15.19
Hexamethylene glycol	Z	S/P	3	2G	Open	No			Yes	O	No	AC	No	
Hexamethyleneimine	Y	S/P	2	2G	Cont	No	T2	IIB	No	R	FT	AC	No	15.12.3, 15.12.4, 15.19
Hexamethylenetetramine solutions	Z	S	3	2G	Open	No			Yes	O	No	AC	No	15.19.6
Hexane (all isomers)	Y	S/P	2	2G	Cont	No	T3	IIA	No	C	FT	AC	No	15.12, 15.17, 15.19.6

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1,6-Hexanediol, distillation overheads	Y	S/P	3	2G	Cont	No	-	-	Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6, 16.2.9
Hexanoic acid	Y	S/P	3	2G	Cont	No			Yes	C	T	ABC	Yes	15.12, 15.17, 15.19
Hexanol	Y	S/P	2	2G	Cont	No			Yes	C	T	ABC	Yes	15.12, 15.17, 15.19
Hexene (all isomers)	Y	S/P	3	2G	Cont	No	T3	IIA	No	R	F	AC	No	15.19.6
Hexyl acetate	Y	S/P	2	2G	Cont	No	T2	IIA	No	R	F	AC	No	15.19.6
Hexylene glycol	Z	S	3	2G	Cont	No			Yes	C	T	AC	Yes	15.12, 15.17, 15.19
Hydrocarbon wax	X	S/P	2	2G	Cont	No	-	-	Yes	C	T	ABC	No	15.12, 15.17, 15.19.6, 16.2.6, 16.2.9
Hydrochloric acid (*)	Z	S/P	3	1G	Cont	No			NF	C	T	No	Yes	15.11, 15.12, 15.17, 15.19
Hydrogen peroxide solutions (over 60% but not over 70% by mass)	Y	S/P	2	2G	Cont	No			NF	R	T	No	No	15.5.1, 15.12.3, 15.12.4, 15.19.6
Hydrogen peroxide solutions (over 8% but not over 60% by mass)	Y	S/P	3	2G	Cont	No			NF	R	T	No	No	15.5.2, 15.18, 15.12.3, 15.12.4, 15.19.6
2-Hydroxyethyl acrylate	Y	S/P	2	2G	Cont	No			Yes	C	T	AC	Yes	15.12, 15.13, 15.17, 15.19, 16.6.1, 16.6.2
N-(Hydroxyethyl)ethylenediaminetriacetic acid, trisodium salt solution	Y	S/P	3	2G	Cont	No			Yes	C	T	AC	No	15.12, 15.17, 15.19.6
2-Hydroxy-4-(methylthio)butanoic acid	Z	S/P	3	2G	Cont	No			Yes	C	T	AC	Yes	15.12, 15.17, 15.19
Illipe oil	Y	P	2(k)	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.7, 16.2.9
Isoamyl alcohol	Z	S/P	3	2G	Cont	No	T2	IIA	No	R	FT	ABC	No	15.12.3, 15.12.4, 15.19.6
Isobutyl alcohol	Z	S/P	3	2G	Cont	No	T2	IIA	No	R	F	ABC	No	15.19.6
Isobutyl formate	Z	P	3	2G	Cont	No	T2	IIA	No	R	F	ABC	No	15.19.6
Isobutyl methacrylate	Z	S/P	3	2G	Cont	No	T1	IIA	No	R	F	ABC	No	15.13, 15.19.6, 16.6.1, 16.6.2
Isophorone	Y	S/P	3	2G	Cont	No			Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6

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Isophoronediamine	Y	S/P	3	2G	Cont	No			Yes	C	T	AC	Yes	15.12, 15.17, 15.19, 16.2.9
Isophorone diisocyanate	Y	S/P	2	2G	Cont	Dry			Yes	C	T	ABD	Yes	15.12, 15.16.2, 15.17, 15.19
Isoprene	Y	S/P	2	2G	Cont	No	T3	IIB	No	C	FT	ABC	No	15.12, 15.13, 15.14, 15.17, 15.19.6, 16.6.1, 16.6.2
Isopropanolamine	Y	S/P	3	2G	Cont	No	T2	IIA	Yes	R	No	AC	No	15.19.6, 16.2.6, 16.2.9
Isopropyl acetate	Z	P	3	2G	Cont	No	T1	IIA	No	R	F	ABC	No	15.19.6
Isopropylamine	Y	S/P	3	2G	Cont	No	T2	IIA	No	C	FT	AC	No	15.12.3.2, 15.14, 15.19
Isopropylamine (70% or less) solution	Y	S/P	3	2G	Cont	No	T2	IIA	No	C	FT	AC	No	15.12.3.2, 15.19
Isopropylcyclohexane	Y	S/P	2	2G	Cont	No	T3	IIA	No	R	F	AC	No	15.19.6, 16.2.9
Isopropyl ether	Y	S/P	3	2G	Cont	Inert	T2	IIA	No	R	F	AC	No	15.4.6, 15.13, 15.19.6, 16.6.1, 16.6.2
Jatropha oil	Y	P	2(k)	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.7
Lactic acid	Z	S/P	3	2G	Cont	No			Yes	C	T	AC	Yes	15.12, 15.17, 15.19
Lactonitrile solution (80% or less)	Y	S/P	1	1G	Cont	No			NF	C	T	No	Yes	15.12, 15.13, 15.17, 15.18, 15.19, 16.6.1, 16.6.2, 16.6.3
Lard	Y	S/P	2(k)	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.7, 16.2.9
Latex, ammonia (1% or less)- inhibited	Y	S/P	2	2G	Open	No	-	-	Yes	O	No	AC	No	15.19.6, 16.2.6, 16.2.9
Latex: Carboxylated styrene-Butadiene copolymer; Styrene-Butadiene rubber	Z	S/P	3	2G	Open	No	-	-	Yes	O	No	AC	No	16.2.9
Lauric acid	X	S/P	2	2G	Cont	No			Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6, 16.2.9
Ligninsulphonic acid, magnesium salt solution	Z	P	3	2G	Open	No	-	-	Yes	O	No	AC	No	

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Ligninsulphonic acid, sodium salt solution	Z	P	3	2G	Open	No	-	-	Yes	O	No	AC	No	16.2.9
Linseed oil	Y	S/P	2(k)	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9
Liquid chemical wastes	X	S/P	2	2G	Cont	No			No	C	FT	AC	No	15.12, 15.17, 15.19, 20.5.1, 20.7
Long-chain alkaryl polyether (C11-C20)	Y	S/P	2	2G	Cont	No			Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6, 16.2.9
Long-chain alkaryl sulphonic acid (C16-C60)	Y	S/P	2	2G	Cont	No	-	-	Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6, 16.2.9
Long-chain alkylphenate/Phenol sulphide mixture	Y	S/P	2	2G	Cont	No	-	-	Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6, 16.2.9
Long-chain alkylphenol (C14-C18)	Y	S/P	2	2G	Cont	No			Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6
Long-chain alkylphenol (C18-C30)	Y	S/P	2	2G	Cont	No			Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6
L-Lysine solution (60% or less)	Z	P	3	2G	Open	No			Yes	O	No	AC	No	
Magnesium chloride solution	Z	P	3	2G	Open	No			Yes	O	No	AC	No	
Magnesium hydroxide slurry	Z	S	3	2G	Open	No	-	-	NF	O	No	No	No	16.2.9
Magnesium long-chain alkaryl sulphonate (C11-C50)	Y	S/P	2	2G	Cont	No	-	-	Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6, 16.2.9
Magnesium long-chain alkyl salicylate (C11+)	Y	S/P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9
Maleic anhydride	Y	S/P	3	2G	Cont	No			Yes	C	T	AC(f)	Yes	15.12, 15.17, 15.19, 16.2.9

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Maleic anhydride-sodium allylsulphonate copolymer solution	Z	P	3	2G	Open	No			Yes	O	No	ABC	No	
Mango kernel oil	Y	P	2(k)	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.7, 16.2.9
Mercaptobenzothiazol, sodium salt solution	X	S/P	2	2G	Open	No			NF	O	No	No	No	15.19.6, 16.2.9
Mesityl oxide	Z	S/P	3	2G	Cont	No	T2	IIB	No	R	FT	AC	No	15.12.3, 15.12.4, 15.19.6
Metam sodium solution	X	S/P	2	2G	Cont	No	-	-	NF	C	T	No	No	15.12.3, 15.12.4, 15.19
Methacrylic acid	Y	S/P	3	2G	Cont	No			Yes	C	T	AC	No	15.13, 15.12.3, 15.12.4, 15.19, 16.2.9, 16.6.1
Methacrylic acid - alkoypoly (alkylene oxide) methacrylate copolymer, sodium salt aqueous solution (45% or less)	Z	S/P	3	2G	Open	No	-	-	NF	O	No	No	No	16.2.9
Methacrylic resin in ethylene dichloride	Y	S/P	3	2G	Cont	No	T2	IIA	No	C	FT	ABC	No	15.12, 15.17, 15.19, 16.2.9
Methacrylonitrile	Y	S/P	2	2G	Cont	No	T1	IIA	No	C	FT	AC	Yes	15.12, 15.13, 15.17, 15.19
3-Methoxy-1-butanol	Z	S/P	3	2G	Cont	No	T2	IIA	No	R	F	AC	No	15.19.6
3-Methoxybutyl acetate	Y	S/P	3	2G	Open	No			Yes	O	No	ABC	No	15.19.6
N-(2-Methoxy-1-methyl ethyl)-2-ethyl-6-methyl chloroacetanilide	X	S/P	1	2G	Cont	No			Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19, 16.2.6
Methyl acetate	Z	P	3	2G	Cont	No	T1	IIA	No	R	F	AC	No	15.19.6
Methyl acetoacetate	Z	S/P	3	2G	Cont	No			Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6
Methyl acrylate	Y	S/P	3	2G	Cont	No	T1	IIB	No	C	FT	AC	No	15.12, 15.17, 15.13, 15.19
Methyl alcohol (*)	Y	S/P	3	2G	Cont	No	T1	IIA	No	C	FT	AC	No	15.12.1, 15.12.2, 15.12.3.2, 15.12.3.3, 15.12.4, 15.17, 15.19



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Methylamine solutions (42% or less)	Y	S/P	2	2G	Cont	No	T2	IIA	No	C	FT	AC	Yes	15.12, 15.17, 15.19
Methylamyl acetate	Y	P	2	2G	Cont	No	T2	IIA	No	R	F	ABC	No	15.19.6
Methylamyl alcohol	Z	S/P	3	2G	Cont	No	T2	IIA	No	R	FT	ABC	No	15.12.3, 15.12.4, 15.19.6
Methyl amyl ketone	Z	S/P	3	2G	Cont	No	T2	IIA	No	R	F	ABC	No	15.19.6
N-Methylaniline	Y	S/P	2	2G	Cont	No	-	-	Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6
alpha-Methylbenzyl alcohol with acetophenone (15% or less)	Y	S/P	2	2G	Cont	No	-	-	Yes	C	T	ABC	Yes	15.12, 15.17, 15.19, 16.2.6, 16.2.9
Methylbutenol	Y	S/P	3	2G	Cont	No	T4	IIA	No	R	FT	AC	No	15.12.3, 15.12.4, 15.19.6, 16.2.9
Methyl tert-butyl ether	Z	P	3	2G	Cont	No	T1	IIA	No	R	F	ABC	No	15.19.6
Methyl butyl ketone	Y	S/P	3	2G	Cont	No	T2	IIA	No	C	FT	ABC	No	15.12, 15.17, 15.19.6
Methylbutynol	Z	S/P	3	2G	Cont	No	T4	IIB	No	R	F	AC	No	15.19.6
Methyl butyrate	Y	S/P	3	2G	Cont	No	T4	IIA	No	R	FT	AC	No	15.12.3, 15.12.4, 15.19.6
Methylcyclohexane	Y	S/P	2	2G	Cont	No	T3	IIA	No	R	F	AC	No	15.19.6
Methylcyclopentadiene dimer	Y	S/P	2	2G	Cont	No	T4	IIB	No	R	FT	ABC	No	15.12.3, 15.12.4, 15.19.6
Methylcyclopentadienyl manganese tricarbonyl	X	S/P	2	2G	Cont	No	-	-	Yes	C	T	ABC	Yes	15.12, 15.17, 15.18, 15.19, 16.2.9
Methyl diethanolamine	Y	S/P	3	2G	Cont	No			Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6
2-Methyl-6-ethyl aniline	Y	S/P	3	2G	Cont	No			Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6
Methyl ethyl ketone	Z	S/P	3	2G	Cont	No	T1	IIA	No	R	F	AC	No	15.19.6

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2-Methyl-5-ethyl pyridine	Y	S/P	2	2G	Cont	No	-	-	Yes	C	T	ABC	Yes	15.12, 15.17, 15.19
Methyl formate	Z	S/P	2	2G	Cont	No	T1	IIA	No	R	FT	AC	No	15.12.3, 15.12.4, 15.14, 15.19.6
2-Methylglutaronitrile with 2-Ethylsuccinonitrile (12% or less)	Z	S/P	3	2G	Cont	No	-	-	Yes	C	T	ABC	Yes	15.12, 15.17, 15.19
2-Methyl-2-hydroxy-3-butyne	Z	S/P	3	2G	Cont	No	T3	IIA	No	R	F	AC	No	15.19.6, 16.2.9
Methyl isobutyl ketone	Z	S/P	3	2G	Cont	No	T1	IIA	No	R	FT	ABC	No	15.12.3, 15.12.4, 15.19.6
Methyl methacrylate	Y	S/P	3	2G	Cont	No	T2	IIA	No	R	F	AC	No	15.13, 15.19.6
3-Methyl-3-methoxybutanol	Z	S/P	3	2G	Cont	No			Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6
Methyl naphthalene (molten)	X	S/P	2	2G	Cont	No			Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6
N-Methylglucamine solution (70% or less)	Z	S	3	2G	Cont	No			Yes	C	T	AC	Yes	15.12, 15.17, 15.19, 16.2.9
2-Methyl-1,3-propanediol	Z	P	3	2G	Open	No	-	-	Yes	O	No	AC	No	
2-Methylpyridine	Z	S/P	3	2G	Cont	No	T1	IIA	No	C	F	AC	No	15.12.3.2, 15.19
3-Methylpyridine	Z	S/P	3	2G	Cont	No	T1	IIA	No	C	FT	AC	No	15.12.3, 15.12.4, 15.19
4-Methylpyridine	Z	S/P	3	2G	Cont	No	T1	IIA	No	C	FT	AC	No	15.12.3, 15.12.4, 15.19, 16.2.9
N-Methyl-2-pyrrolidone	Y	S/P	3	2G	Cont	No			Yes	C	T	AC	No	15.12, 15.17, 15.19.6
Methyl propyl ketone	Z	S	3	2G	Cont	No	T1	IIA	No	R	FT	ABC	No	15.12.3, 15.12.4, 15.19.6
Methyl salicylate	Y	S/P	3	2G	Cont	No			Yes	C	T	AC	No	15.12, 15.17, 15.19.6
alpha-Methylstyrene	Y	S/P	2	2G	Cont	No	T1	IIB	No	C	FT	AD(j)	No	15.12, 15.13, 15.17, 15.19.6, 16.6.1, 16.6.2
3-(methylthio)propionaldehyde	Y	S/P	2	2G	Cont	No	T3	IIA	No	R	FT	ABC	No	15.12, 15.17, 15.19.6

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Molybdenum polysulfide long chain alkyl dithiocarbamide complex	Y	S/P	2	2G	Cont	No	-	-	Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6, 16.2.9
Morpholine	Y	S/P	3	2G	Cont	No	T2	IIA	No	C	FT	AC	No	15.12.3, 15.12.4, 15.19
Motor fuel anti-knock compound (containing lead alkyls)	X	S/P	1	1G	Cont	Inert	T4	IIA	No	C	FT	AC	Yes	15.6, 15.12, 15.17, 15.18, 15.19
Myrcene	X	S/P	2	2G	Cont	No	T3	IIA	No	R	FT	AC	No	15.12.3, 15.12.4, 15.19.6, 16.2.9
Naphthalene (molten)	X	S/P	2	2G	Cont	No	T1	IIA	Yes	C	T	ABC	No	15.12, 15.17, 15.19.6, 16.2.9
Naphthalene crude (molten)	Y	S/P	2	2G	Cont	No			Yes	C	T	ABC	No	15.12, 15.17, 15.19.6, 16.2.6, 16.2.9
Naphthalenesulphonic acid-Formaldehyde copolymer, sodium salt solution	Z	S/P	3	2G	Open	No	-	-	Yes	O	No	AC	No	16.2.9
Neodecanoic acid	Y	S/P	2	2G	Cont	No			Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6
Nitrating acid (mixture of sulphuric and nitric acids)	Y	S/P	1	1G	Cont	No			NF	C	T	No	Yes	15.11, 15.12, 15.16.2, 15.17, 15.18, 15.19
Nitric acid (70% and over)	Y	S/P	2	2G	Cont	No			NF	C	T	No	Yes	15.11, 15.12, 15.16.2, 15.17, 15.19
Nitric acid (less than 70%)	Y	S/P	2	2G	Cont	No			NF	C	T	No	Yes	15.11, 15.12, 15.17, 15.19
Nitilotriacetic acid, trisodium salt solution	Y	S/P	3	2G	Cont	No			Yes	C	T	AC	No	15.12, 15.17, 15.19.6
Nitrobenzene	Y	S/P	2	2G	Cont	No	-	-	Yes	C	T	ABC	No	15.12, 15.17, 15.19, 16.2.9
Nitroethane	Y	S/P	3	2G	Cont	No	T2	IIB	No	R	FT	ABC(f)	No	15.12.3, 15.12.4, 15.19.6, 16.6.1, 16.6.2, 16.6.4

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Nitroethane(80%)/ Nitropropane(20%)	Y	S/P	3	2G	Cont	No	T2	IIB	No	R	FT	ABC(f)	No	15.12.3, 15.12.4, 15.19.6, 16.6.1, 16.6.2, 16.6.3
Nitroethane, 1-Nitropropane (each 15% or more) mixture	Y	S/P	3	2G	Cont	No	T2	IIB	No	R	FT	ABC(f)	No	15.12.3, 15.12.4, 15.19.6, 16.2.6, 16.6.1, 16.6.2, 16.6.3
o-Nitrophenol (molten)	Y	S/P	2	2G	Cont	No	T4	IIB	No	R	F	ABC	No	15.19.6, 16.2.6, 16.2.9
1- or 2-Nitropropane	Y	S/P	3	2G	Cont	No	T2	IIB	No	C	FT	AC	No	15.12, 15.17, 15.19
Nitropropane (60%)/Nitroethane (40%) mixture	Y	S/P	2	2G	Cont	No	T2	IIB	No	C	FT	ABC(f)	No	15.12, 15.17, 15.19.6
o- or p-Nitrotoluenes	Y	S/P	2	2G	Cont	No		IIB	Yes	C	T	ABC	No	15.12, 15.17, 15.19.6
Nonane (all isomers)	X	S/P	2	2G	Cont	No	T3	IIA	No	R	F	ABC	No	15.19.6
Nonanoic acid (all isomers)	Y	S/P	2	2G	Cont	No			Yes	C	T	ABC	Yes	15.12, 15.17, 15.19, 16.2.9
Non-edible industrial grade palm oil	Y	S/P	2	2G	Cont	No	-	-	Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6, 16.2.7, 16.2.9
Nonene (all isomers)	Y	P	2	2G	Cont	No	T3	IIA	No	R	F	AC	No	15.19.6
Nonyl alcohol (all isomers)	Y	S/P	2	2G	Cont	No			Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6
Nonyl methacrylate monomer	Y	S/P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.9
Nonylphenol	X	S/P	1	2G	Cont	No			Yes	C	T	AC	Yes	15.12, 15.17, 15.19, 16.2.6, 16.2.9
Nonylphenol poly(4+)ethoxylate	Y	S/P	2	2G	Cont	No	-	-	Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6
Noxious liquid, NF, (1) n.o.s. (trade name ....., contains .....) ST1, Cat. X	X	P	1	2G	Open	No	-	-	Yes	O	No	AC	No	15.19, 16.2.6

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Noxious liquid, F, (2) n.o.s. (trade name ....., contains .....) ST1, Cat. X	X	P	1	2G	Cont	No	T3	IIA	No	R	F	AC	No	15.19, 16.2.6
Noxious liquid, NF, (3) n.o.s. (trade name ....., contains .....) ST2, Cat. X	X	P	2	2G	Open	No	-		Yes	O	No	AC	No	15.19, 16.2.6
Noxious liquid, F, (4) n.o.s. (trade name ....., contains .....) ST2, Cat. X	X	P	2	2G	Cont	No	T3	IIA	No	R	F	AC	No	15.19, 16.2.6
Noxious liquid, NF, (5) n.o.s. (trade name ....., contains .....) ST2, Cat. Y	Y	P	2	2G	Open	No	-		Yes	O	No	AC	No	15.19, 16.2.6, 16.2.9(l)
Noxious liquid, F, (6) n.o.s. (trade name ....., contains .....) ST2, Cat. Y	Y	P	2	2G	Cont	No	T3	IIA	No	R	F	AC	No	15.19, 16.2.6, 16.2.9(l)
Noxious liquid, NF, (7) n.o.s. (trade name ....., contains .....) ST3, Cat. Y	Y	P	3	2G	Open	No	-	-	Yes	O	No	AC	No	15.19, 16.2.6, 16.2.9(l)
Noxious liquid, F, (8) n.o.s. (trade name ....., contains .....) ST3, Cat. Y	Y	P	3	2G	Cont	No	T3	IIA	No	R	F	AC	No	15.19, 16.2.6, 16.2.9(l)
Noxious liquid, NF, (9) n.o.s. (trade name ....., contains .....) ST3, Cat. Z	Z	P	3	2G	Open	No	-		Yes	O	No	AC	No	
Noxious liquid, F, (10) n.o.s. (trade name ....., contains .....) ST3, Cat. Z	Z	P	3	2G	Cont	No	T3	IIA	No	R	F	AC	No	15.19.6
Octamethylcyclotetrasiloxane	Y	P	2	2G	Cont	No	T2	IIA	No	R	F	AC	No	15.19.6, 16.2.9

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Octane (all isomers)	X	P	2	2G	Cont	No	T3	IIA	No	R	F	AC	No	15.19.6
Octanoic acid (all isomers)	Y	S/P	2	2G	Cont	No	-	-	Yes	C	T	ABC	Yes	15.12, 15.17, 15.19
Octanol (all isomers)	Y	S/P	2	2G	Cont	No			Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6
Octene (all isomers)	Y	P	2	2G	Cont	No	T3	IIA	No	R	F	AC	No	15.19.6
n-Octyl acetate	Y	S/P	3	2G	Open	No			Yes	O	No	AC	No	15.19.6, 16.2.9
Octyl aldehydes	Y	S/P	2	2G	Cont	No	T4	IIB	No	R	F	AC	No	15.19.6, 16.2.9
Octyl decyl adipate	Y	S/P	2	2G	Open	No	-	-	Yes	O	No	AC	No	15.19.6, 16.2.9
n-Octyl mercaptan	X	S/P	1	2G	Open	No			Yes	O	No	ABC	No	15.19
Offshore contaminated bulk liquid P (o)	X	P	2	2G	Open	No	-	-	Yes	O	No	AC	No	15.19.6
Offshore contaminated bulk liquid S (o)	X	S/P	2	2G	Cont	No	T3	IIA	No	C	FT	AC	Yes	15.12, 15.15, 15.17, 15.19
Olefin-Alkyl ester copolymer (molecular weight 2000+)	Y	P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9
Olefin Mixture (C7-C9) C8 rich, stabilised	X	P	2	2G	Cont	No	T3	IIB	No	R	F	ABC	No	15.13, 15.19.6
Olefin mixtures (C5-C7)	Y	S/P	3	2G	Cont	No	T3	IIA	No	R	F	AC	No	15.19.6
Olefin mixtures (C5-C15)	X	S/P	2	2G	Cont	No	T3	IIA	No	R	FT	AC	No	15.12.3, 15.12.4, 15.19.6
Olefins (C13+, all isomers)	Y	P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.9
alpha-Olefins (C6-C18) mixtures	X	S/P	2	2G	Cont	No	T4	IIA	No	R	FT	AC	No	15.12.3, 15.12.4, 15.19.6, 16.2.9
Oleic acid	Y	S/P	2	2G	Cont	No			Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6, 16.2.9
Oleum	Y	S/P	2	2G	Cont	Dry	-	-	NF	C	T	No	Yes	15.11.2 to 15.11.8, 15.12, 15.16.2, 15.17, 15.19, 16.2.6
Oleylamine	X	S/P	2	2G	Cont	No			Yes	C	T	AC	Yes	15.12, 15.17, 15.19, 16.2.9

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Olive oil	Y	S/P	2(k)	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.7, 16.2.9
Oxygenated aliphatic hydrocarbon mixture	Z	S/P	3	2G	Open	No	-	-	Yes	O	No	ABC	No	
Palm acid oil	Y	S/P	2	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.7, 16.2.9
Palm fatty acid distillate	Y	S/P	2	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.7, 16.2.9
Palm kernel acid oil	Y	S/P	2	2G	Cont	No			Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6, 16.2.7, 16.2.9
Palm kernel fatty acid distillate	Y	S/P	2	2G	Cont	No	-	-	Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6, 16.2.7, 16.2.9
Palm kernel oil	Y	S/P	2(k)	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.7, 16.2.9
Palm kernel olein	Y	P	2(k)	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.7, 16.2.9
Palm kernel stearin	Y	P	2(k)	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.7, 16.2.9
Palm mid-fraction	Y	P	2(k)	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.7, 16.2.9
Palm oil	Y	P	2(k)	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.7, 16.2.9
Palm oil fatty acid methyl ester	Y	P	2	2G	Open	No	-	-	Yes	O	No	AC	No	15.19.6, 16.2.9
Palm olein	Y	P	2(k)	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.7, 16.2.9
Palm stearin	Y	P	2(k)	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.7, 16.2.9
Paraffin wax, highly-refined	Y	P	2	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.7, 16.2.9
Paraffin wax, semi-refined	X	S/P	2	2G	Cont	No	-	-	Yes	C	T	ABC	No	15.12, 15.17, 15.19.6, 16.2.6, 16.2.9
Paraldehyde	Z	S/P	3	2G	Cont	No	T3	IIB	No	R	F	AC	No	15.19.6, 16.2.9

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Paraldehyde-ammonia reaction product	Y	S/P	2	2G	Cont	No	T1	IIB	No	C	FT	ABC	Yes	15.12, 15.17, 15.19
Pentachloroethane	Y	S/P	2	2G	Cont	No			NF	C	T	No	No	15.12, 15.17, 15.19.6
1,3-Pentadiene	Y	P	3	2G	Cont	No	T1	IIA	No	R	F	ABC	No	15.13, 15.19.6, 16.6.1, 16.6.2, 16.6.3
1,3-Pentadiene (greater than 50%), cyclopentene and isomers, mixtures	Y	S/P	2	2G	Cont	Inert	T3	IIB	No	C	FT	ABC	Yes	15.12, 15.13, 15.17, 15.19
Pentaethylenehexamine	X	S/P	2	2G	Cont	No			Yes	C	T	ABC	Yes	15.12, 15.17, 15.19
Pentane (all isomers)	Y	P	3	2G	Cont	No	T2	IIA	No	R	F	AC	No	15.14, 15.19.6
Pentanoic acid	Y	S/P	2	2G	Cont	No			Yes	C	T	ABC	Yes	15.12, 15.17, 15.19
n-Pentanoic acid (64%)/2-Methyl butyric acid (36%) mixture	Y	S/P	2	2G	Cont	No			Yes	C	T	ABC	Yes	15.11.2, 15.11.3, 15.11.4, 15.11.6, 15.11.7, 15.11.8, 15.12, 15.17, 15.19
Pentene (all isomers)	Y	P	2	2G	Cont	No	T3	IIA	No	R	F	AC	No	15.14, 15.19.6
n-Pentyl propionate	Y	S/P	3	2G	Cont	No	T2	IIA	No	R	FT	ABC	No	15.12.3, 15.12.4, 15.19.6
Perchloroethylene	Y	S/P	2	2G	Cont	No			NF	C	T	No	No	15.12, 15.17, 15.19.6
Phenol	Y	S/P	2	2G	Cont	No	T1	IIA	Yes	C	T	AC	Yes	15.12, 15.17, 15.19, 16.2.9
1-Phenyl-1-xylyl ethane	Y	S/P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6
Phosphate esters, alkyl (C12-C14) amine	Y	S/P	2	2G	Cont	No	T4	IIB	No	R	FT	ABC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6, 16.2.9
Phosphoric acid	Z	S/P	3	2G	Cont	No			NF	C	T	No	Yes	15.11.1, 15.11.2, 15.11.3, 15.11.4, 15.11.6, 15.11.7, 15.11.8, 15.12, 15.17, 15.19, 16.2.9



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Phosphorus, yellow or white (*)	X	S/P	1	1G	Cont	Pad+(vent or inert)			No(c)	C	No	ABC	No	15.7, 15.19, 16.2.9
Phthalic anhydride (molten)	Y	S/P	2	2G	Cont	No	T1	IIA	Yes	C	T	ABC	Yes	15.12, 15.17, 15.19, 16.2.6, 16.2.9
alpha-Pinene	X	S/P	2	2G	Cont	No	T3	IIA	No	R	F	ABC	No	15.19.6
beta-Pinene	X	S/P	2	2G	Cont	No	T1	IIB	No	R	F	ABC	No	15.19.6
Pine oil	X	S/P	2	2G	Open	No			Yes	O		ABC	No	15.19.6, 16.2.6, 16.2.9
Piperazine, 68% solution	Y	S/P	2	2G	Cont	No			Yes	C	T	AC	Yes	15.12, 15.17, 15.19, 16.2.6, 16.2.9
Polyacrylic acid solution (40% or less)	Z	S/P	3	2G	Open	No	-	-	Yes	O	No	AC	No	
Polyalkyl (C18-C22) acrylate in xylene	Y	S/P	2	2G	Cont	No	T1	IIB	No	R	FT	ABC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6, 16.2.9
Polyalkylalkenaminesuccinimide, molybdenum oxysulphide	Y	P	2	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6
Poly(2-8)alkylene glycol monoalkyl(C1-C6) ether	Z	P	3	2G	Open	No	-	-	Yes	O	No	AC	No	
Poly(2-8)alkylene glycol monoalkyl (C1-C6) ether acetate	Y	P	2	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6
Polyalkyl (C10-C20) methacrylate	Y	P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9
Polyalkyl (C10-C18) methacrylate/ethylene-propylene copolymer mixture	Y	P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9
Polyaluminium chloride solution	Z	S	3	2G	Open	No			NF	O	No	No	No	
Polybutene	Y	P	2	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6
Polybutenyl succinimide	Y	P	2	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9
Poly(2+)cyclic aromatics	X	S/P	1	2G	Cont	No			Yes	C	T	ABC	No	15.12, 15.17, 15.19, 16.2.6, 16.2.9

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o
Polyether (molecular weight 1350+)	Y	P	2	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6
Polyethylene glycol	Z	P	3	2G	Open	No			Yes	O	No	AC	No	
Polyethylene glycol dimethyl ether	Z	S/P	3	2G	Open	No			Yes	O	No	AC	No	
Poly(ethylene glycol) methylbutenyl ether (MW>1000)	Z	P	3	2G	Open	No	-	-	Yes	O	No	AC	No	16.2.9
Polyethylene polyamines	Y	S/P	2	2G	Cont	No	-	-	Yes	C	T	AC	Yes	15.12, 15.17, 15.19, 16.2.6, 16.2.9
Polyethylene polyamines (more than 50% C5 -C20 paraffin oil)	Y	S/P	2	2G	Cont	No			Yes	C	T	AC	Yes	15.12, 15.17, 15.19, 16.2.9
Polyferric sulphate solution	Y	S/P	3	2G	Cont	No			NF	C	T	No	Yes	15.12, 15.17, 15.19
Poly(iminoethylene)-graft-N-poly(ethyleneoxy) solution (90% or less)	Z	S/P	3	2G	Open	No	-	-	NF	O	No	No	No	16.2.9
Polyisobutenamine in aliphatic (C10-C14) solvent	Y	S/P	2	2G	Cont	No	-	-	Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6
(Polyisobutene) amino products in aliphatic hydrocarbons	Y	S/P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.6
Polyisobutenyl anhydride adduct	Z	S/P	3	2G	Open	No			Yes	O	No	ABC	No	
Poly(4+)isobutylene (MW>224)	X	P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9
Polyisobutylene (MW≤224)	Y	P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.9

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Polyglycerin, sodium salt solution (containing less than 3% sodium hydroxide)	Z	S	2	2G	Cont	No			Yes	C	T	AC	Yes	15.12, 15.17, 15.19. 16.2.9
Polymethylene polyphenyl isocyanate	Y	S/P	3	2G	Cont	Dry			Yes(a)	C	T(a)	AD	Yes	15.12, 15.16.2, 15.17, 15.19.6, 16.2.9
Polyolefin (molecular weight 300+)	Y	P	2	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9
Polyolefin amide alkeneamine (C17+)	Y	S/P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.6
Polyolefin amide alkeneamine borate (C28-C250)	Y	P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9
Polyolefin amide alkeneamine polyol	Y	P	2	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9
Polyolefinamine (C28-C250)	Y	S/P	2	2G	Cont	No			Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6, 16.2.9
Polyolefinamine in alkyl (C2-C4) benzenes	Y	S/P	2	2G	Cont	No	T2	IIB	No	R	FT	ABC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6, 16.2.9
Polyolefinamine in aromatic solvent	Y	S/P	2	2G	Cont	No	T2	IIB	No	R	FT	ABC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6, 16.2.9
Polyolefin aminoester salts (molecular weight 2000+)	Y	S/P	2	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9
Polyolefin anhydride	Y	S/P	2	2G	Cont	No			Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6, 16.2.9
Polyolefin ester (C28-C250)	Y	P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9
Polyolefin phenolic amine (C28-C250)	Y	S/P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9
Polyolefin phosphorusulphide, barium derivative (C28-C250)	Y	P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9

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Poly(20)oxyethylene sorbitan monooleate	Y	P	3	2G	Open	No			Yes	O	No	AC	No	15.19.6, 16.2.6, 16.2.9
Poly(5+)propylene	Y	P	3	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.9
Polypropylene glycol	Z	S/P	3	2G	Open	No			Yes	O	No	AC	No	15.19.6
Polysiloxane	Y	P	2	2G	Cont	No	T2	IIB	No	R	F	ABC	No	15.19.6, 16.2.9
Potassium chloride solution	Z	P	3	2G	Open	No	-	-	NF	O	No	No	No	16.2.9
Potassium hydroxide solution (*)	Y	S/P	3	2G	Cont	No			NF	C	No	No	Yes	15.12.3.2, 15.17, 15.19
Potassium formate solutions (*)	Z	S	3	2G	Cont	No			NF	R	No	No	No	15.19.6
Potassium oleate	Y	S/P	2	2G	Open	No			Yes	O	No	AC	No	15.19.6, 16.2.6, 16.2.9
Potassium thiosulphate (50% or less)	Y	S/P	3	2G	Cont	No			NF	R	T	No	No	15.12.3, 15.12.4, 15.19.6, 16.2.9
n-Propanolamine	Y	S/P	3	2G	Cont	No			Yes	C	T	ABC	Yes	15.12, 15.17, 15.19, 16.2.9
2-Propene-1-aminium, N,N-dimethyl-N-2-propenyl-, chloride, homopolymer solution	Y	P	3	2G	Open	No	-	-	NF	O	No	No	No	15.19.6
beta-Propiolactone	Y	S/P	1	2G	Cont	No		IIA	Yes	C	T	AC	Yes	15.12, 15.17, 15.18, 15.19
Propionaldehyde	Y	S/P	3	2G	Cont	Inert	T4	IIB	No	R	F	AC	No	15.19.6
Propionic acid	Y	S/P	3	2G	Cont	No	T1	IIA	No	C	FT	AC	Yes	15.11.2, 15.11.3, 15.11.4, 15.11.6, 15.11.7, 15.11.8, 15.12, 15.17, 15.19
Propionic anhydride	Y	S/P	2	2G	Cont	No	T2	IIA	Yes	C	T	AC	Yes	15.12, 15.17, 15.19
Propionitrile	Y	S/P	1	1G	Cont	No	T1	IIB	No	C	FT	AC	Yes	15.12, 15.17, 15.18, 15.19
n-Propyl acetate	Y	P	3	2G	Cont	No	T1	IIA	No	R	F	ABC	No	15.19.6
n-Propyl alcohol	Y	S/P	3	2G	Cont	No	T2	IIA	No	C	FT	AC	No	15.12, 15.17, 15.19.6
n-Propylamine	Z	S/P	2	2G	Cont	Inert	T2	IIA	No	C	FT	AC	Yes	15.12, 15.17, 15.19

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Propylbenzene (all isomers)	Y	P	3	2G	Cont	No	T2	IIA	No	R	F	ABC	No	15.19.6
Propylene carbonate	Z	S	3	2G	Cont	No			Yes	C	T	ABC	Yes	15.12, 15.17, 15.19
Propylene glycol methyl ether acetate	Z	P	3	2G	Cont	No	T2	IIA	No	R	F	AC	No	
Propylene glycol monoalkyl ether	Z	S/P	3	2G	Cont	No	T3	IIA	No	R	F	AC	No	15.19.6
Propylene glycol phenyl ether	Z	S/P	3	2G	Open	No			Yes	O	No	ABC	No	
Propylene oxide	Y	S/P	2	2G	Cont	Inert	T2	IIB	No	C	FT	AC	No	15.8, 15.12, 15.14, 15.17, 15.19
Propylene tetramer	X	S/P	2	2G	Cont	No	T3	IIA	No	R	F	ABC	No	15.19.6
Propylene trimer	Y	S/P	2	2G	Cont	No	T3	IIA	No	R	F	ABC	No	15.19.6
Pyridine	Y	S/P	3	2G	Cont	No	T1	IIA	No	R	FT	AC	No	15.12.3, 15.12.4, 15.19.6
Pyrolysis gasoline (containing benzene)	Y	S/P	2	2G	Cont	No	T3	IIA	No	C	FT	ABC	No	15.12, 15.17, 15.19.6
Rapeseed oil	Y	P	2(k)	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.7, 16.2.9
Rapeseed oil (low erucic acid containing less than 4% free fatty acids)	Y	P	2(k)	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.7, 16.2.9
Rape seed oil fatty acid methyl esters	Y	S/P	2	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6
Resin oil, distilled	Y	S/P	2	2G	Cont	No	T1	IIA	No	C	FT	ABC	No	15.12, 15.17, 15.19.6
Rice bran oil	Y	S/P	2(k)	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.7, 16.2.9
Rosin	Y	S/P	2	2G	Cont	No			Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6, 16.2.9
Safflower oil	Y	S/P	2(k)	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.7, 16.2.9
Shea butter	Y	S/P	2(k)	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.7, 16.2.9
Sodium alkyl (C14-C17) sulphonates (60-65% solution)	Y	S/P	2	2G	Cont	No			NF	R	T	No	No	15.12.3, 15.12.4, 15.19.6, 16.2.6, 16.2.9

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Sodium aluminosilicate slurry	Z	P	3	2G	Open	No			NF	O	No	No	No	16.2.9
Sodium benzoate	Z	S/P	3	2G	Open	No			Yes	O	No	AC	No	16.2.9
Sodium borohydride (15% or less)/Sodium hydroxide solution (*)	Y	S/P	3	2G	Cont	No			NF	C	No	No	Yes	15.17, 15.19, 16.2.6, 16.2.9
Sodium bromide solution (less than 50%) (*)	Y	S/P	3	2G	Open	No	-	-	NF	R	No	No	No	15.19.6
Sodium carbonate solution (*)	Z	S/P	3	2G	Open	No			NF	R	No	No	No	15.19.6
Sodium chlorate solution (50% or less) (*)	Z	S/P	3	2G	Open	No			NF	R	No	No	No	15.9, 15.12, 15.17, 15.19, 16.2.9
Sodium dichromate solution (70% or less)	Y	S/P	1	1G	Cont	No			NF	C	T	No	Yes	15.12, 15.17, 15.18, 15.19
Sodium hydrogen sulphide (6% or less)/Sodium carbonate (3% or less) solution	Z	S/P	3	2G	Open	No			NF	O	No	No	No	15.19.6, 16.2.9
Sodium hydrogen sulphite solution (45% or less)	Z	P	3	2G	Open	No			NF	O	No	No	No	16.2.9
Sodium hydrosulphide/Ammonium sulphide solution (*)	Y	S/P	2	2G	Cont	No	T4	IIB	No	C	FT	AC	Yes	15.12, 15.15, 15.17, 15.19, 16.6.1, 16.6.2, 16.6.3
Sodium hydrosulphide solution (45% or less) (*)	Z	S/P	3	2G	Cont	Vent or pad (gas)			NF	R	T	No	Yes	15.12, 15.15, 15.19.6, 16.2.9
Sodium hydroxide solution (*)	Y	S/P	3	2G	Cont	No			NF	C	No	No	Yes	15.17, 15.19, 16.2.6, 16.2.9
Sodium hypochlorite solution (15% or less)	Y	S/P	2	2G	Cont	No	-	-	NF	R	No	No	No	15.17, 15.19.6
Sodium methylate 21-30% in methyl alcohol	Y	S/P	2	2G	Cont	No	T1	IIA	No	C	FT	AC	Yes	15.12, 15.17, 15.19, 16.2.6 (only if >28%), 16.2.9
Sodium nitrite solution	Y	S/P	3	2G	Cont	No			NF	C	T	No	No	15.12.3, 15.12.4, 15.19, 16.2.6, 16.2.9
Sodium petroleum sulphonate	Y	S/P	2	2G	Cont	No			Yes	R	T	ABC	Yes	15.12.3, 15.12.4, 15.19.6, 16.2.6

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Sodium poly(4+)acrylate solutions	Z	S/P	3	2G	Open	No	-	-	Yes	O	No	AC	No	16.2.9
Sodium silicate solution	Y	S/P	3	2G	Cont	No			NF	C	T	No	Yes	15.12, 15.17, 15.19, 16.2.9
Sodium sulphate solutions	Z	S	3	2G	Open	No			NF	O	No	No	No	16.2.9,
Sodium sulphide solution (15% or less)	Y	S/P	3	2G	Cont	No			NF	C	T	No	Yes	15.12, 15.17, 15.19, 16.2.9
Sodium sulphite solution (25% or less)	Y	S/P	3	2G	Open	No			NF	O	No	No	No	15.19.6, 16.2.9
Sodium thiocyanate solution (56% or less)	Y	S/P	3	2G	Open	No			NF	O	No	No	No	15.19.6, 16.2.9
Soyabean oil	Y	S/P	2(k)	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.7, 16.2.9
Soybean Oil Fatty Acid Methyl Ester	Y	P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.9
Styrene monomer	Y	S/P	3	2G	Cont	No	T1	IIA	No	C	FT	ABC	No	15.12, 15.13, 15.17, 15.19.6, 16.6.1, 16.6.2
Sulphohydrocarbon (C3-C88)	Y	P	2	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9
Sulpholane	Y	S/P	3	2G	Open	No			Yes	O	No	AC	No	15.19.6, 16.2.9
Sulphur (molten) (*)	Z	S/P	3	1G	Cont	Vent or pad (gas)	T3		Yes	R	F	No	No	15.10, 16.2.9
Sulphuric acid	Y	S/P	2	2G	Cont	No			NF	C	T	No	Yes	15.11, 15.12, 15.16.2, 15.17, 15.19, 16.2.9
Sulphuric acid, spent	Y	S/P	2	2G	Cont	No			NF	C	T	No	Yes	15.11, 15.12, 15.16.2, 15.17, 15.19
Sulphurized fat (C14-C20)	Z	S/P	3	2G	Open	No			Yes	O	No	ABC	No	
Sulphurized polyolefinamide alkene (C28-C250) amine	Z	P	3	2G	Open	No	-	-	Yes	O	No	AC	No	
Sunflower seed oil	Y	S/P	2(k)	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.7, 16.2.9

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Tall oil, crude	Y	S/P	2	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6
Tall oil, distilled	Y	P	2	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6
Tall oil fatty acid (resin acids less than 20%)	Y	S/P	2	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6
Tall oil pitch	Y	P	2	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9
Tall oil soap, crude	Y	S/P	2	2G	Cont	No			Yes	C	T	ABC	Yes	15.12, 15.17, 15.19, 16.2.6
Tallow	Y	P	2(k)	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.7, 16.2.9
Tallow fatty acid	Y	P	2	2G	Open	No	-	-	Yes	O	No	AC	No	15.19.6, 16.2.6, 16.2.7, 16.2.9
Tetrachloroethane	Y	S/P	2	2G	Cont	No			NF	R	T	No	No	15.12.3, 15.12.4, 15.19
Tetraethylene glycol	Z	P	3	2G	Open	No			Yes	O	No	AC	No	
Tetraethylene pentamine	Y	S/P	2	2G	Cont	No			Yes	C	T	AC	Yes	15.12, 15.17, 15.19
Tetrahydrofuran	Z	S	3	2G	Cont	No	T3	IIB	No	R	F	AC	No	15.19.6
Tetrahydronaphthalene	Y	S/P	2	2G	Cont	No			Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6
Tetramethylbenzene (all isomers)	X	S/P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.9
Titanium dioxide slurry	Z	P	3	2G	Open	No			NF	O	No	No	No	
Toluene	Y	S/P	3	2G	Cont	No	T1	IIA	No	C	FT	AC	No	15.12, 15.17, 15.19.6
Toluenediamine	Y	S/P	2	2G	Cont	No			Yes	C	T	ABC	Yes	15.12, 15.17, 15.18, 15.19, 16.2.6, 16.2.9
Toluene diisocyanate	Y	S/P	2	2G	Cont	Dry	-	-	Yes	C	T	ABC(b)D	Yes	15.12, 15.16.2, 15.17, 15.18, 15.19, 16.2.9
o-Toluidine	Y	S/P	2	2G	Cont	No			Yes	C	T	ABC	No	15.12, 15.17, 15.19
Tributyl phosphate	Y	S/P	3	2G	Cont	No			Yes	C	T	ABC	No	15.12.3, 15.12.4, 15.19.6



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1,2,3-Trichlorobenzene (molten)	X	S/P	2	2G	Cont	No			Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6, 16.2.9
1,2,4-Trichlorobenzene	X	S/P	1	2G	Cont	No			Yes	C	T	ABC	No	15.12, 15.17, 15.19, 16.2.9
1,1,1-Trichloroethane	Y	P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6
1,1,2-Trichloroethane	Y	S/P	3	2G	Open	No			NF	O	No	No	No	15.19.6
Trichloroethylene	Y	S/P	2	2G	Cont	No	-	-	NF	C	T	No	No	15.12, 15.17, 15.19.6
1,2,3-Trichloropropane	Y	S/P	3	2G	Cont	No			Yes	C	T	ABC	No	15.12, 15.17, 15.19
1,1,2-Trichloro-1,2,2-Trifluoroethane	Y	P	2	2G	Open	No			NF	O	No	No	No	15.19.6
Tricresyl phosphate (containing 1% or more ortho-isomer)	Y	S/P	2	2G	Cont	No	-	-	Yes	C	T	ABC	No	15.12, 15.17, 15.19, 16.2.6
Tricresyl phosphate (containing less than 1% ortho-isomer)	Y	S/P	2	2G	Cont	No			Yes	C	T	ABC	No	15.12, 15.17, 15.19.6, 16.2.6
Tridecane	Y	S/P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6
Tridecanoic acid	Y	S/P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9
Tridecyl acetate	Y	S/P	3	2G	Cont	No	-	-	Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6
Triethanolamine	Z	S/P	3	2G	Cont	No			Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6, 16.2.9
Triethylamine	Y	S/P	3	2G	Cont	No	T2	IIA	No	C	FT	ABC	No	15.12.3, 15.12.4, 15.19
Triethylbenzene	X	S/P	2	2G	Cont	No			Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6
Triethylenetetramine	Y	S/P	2	2G	Cont	No	-	-	Yes	C	T	AC	Yes	15.12, 15.17, 15.19, 16.2.9
Triethyl phosphate	Z	S/P	3	2G	Open	No			Yes	O	No	AC	No	15.19.6
Triethyl phosphite	Z	S/P	3	2G	Cont	No	T3	IIA	No	R	FT	ABC	No	15.12.3, 15.12.4, 15.19.6, 16.2.9
Triisopropanolamine	Z	S/P	3	2G	Open	No			Yes	O	No	AC	No	15.19.6, 16.2.9

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Triisopropylated phenyl phosphates	X	P	2	2G	Open	No			Yes	O	No	AC	No	15.19.6, 16.2.6
Trimethylacetic acid	Y	S/P	2	2G	Cont	No			Yes	R	T	AC	No	15.11, 15.12.3, 15.12.4, 15.19.6, 16.2.6, 16.2.9
Trimethylamine solution (30% or less)	Z	S/P	2	2G	Cont	No	T3	IIB	No	R	FT	AC	No	15.12.3, 15.12.4, 15.14, 15.19.6
Trimethylbenzene (all isomers)	X	S/P	2	2G	Cont	No	T1	IIA	No	R	F	ABC	No	15.19.6
Trimethylol propane propoxylated	Z	S/P	3	2G	Open	No	-	-	Yes	O	No	ABC	No	
2,2,4-Trimethyl-1,3-pentanediol diisobutyrate	Y	S/P	3	2G	Open	No			Yes	O	No	ABC	No	15.19.6
2,2,4-Trimethyl-1,3-pentanediol-1-isobutyrate	Y	S/P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6
1,3,5-Trioxane	Y	S/P	3	2G	Cont	No	T2	IIB	No	C	FT	AC	No	15.12, 15.17, 15.19.6, 16.2.9
Tripropylene glycol	Z	P	3	2G	Open	No			Yes	O	No	AC	No	
Trixylyl phosphate	X	S/P	1	2G	Cont	No			Yes	C	T	ABC	No	15.12, 15.17, 15.19.6, 16.2.6
Tung oil	Y	S/P	2(k)	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.7, 16.2.9
Turpentine	X	S/P	2	2G	Cont	No	T3	IIA	No	R	FT	AC	No	15.19.6
Undecanoic acid	Y	S/P	2	2G	Cont	No			Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6, 16.2.9
1-Undecene	X	S/P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6
Undecyl alcohol	X	S/P	2	2G	Cont	No			Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6, 16.2.9

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o
Urea/Ammonium nitrate solution	Y	S/P	3	2G	Open	No	-	-	NF	O	No	No	No	15.19.6
Urea/Ammonium phosphate solution	Y	S/P	2	2G	Cont	No			Yes	R	T	AC	No	15.12.3, 15.12.4, 15.19.6
Urea solution	Z	S/P	3	2G	Open	No			Yes	O	No	AC	No	16.2.9,
Used cooking oil (m)	X	S/P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9
Used cooking oil (Triglycerides, C16-C18 and C18 unsaturated) (m) (n)	Y	S/P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.7, 16.2.9
Valeraldehyde (all isomers)	Y	S/P	3	2G	Cont	Inert	T3	IIB	No	R	F	ABC	No	15.4.6, 15.13, 15.19.6, 16.6.1, 16.6.2
Vegetable acid oils (m)	Y	S/P	2	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.7, 16.2.9
Vegetable fatty acid distillates (m)	Y	P	2	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.7, 16.2.9
Vegetable oil mixtures, containing less than 15% free fatty acid (m)	Y	S/P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.7, 16.2.9
Vinyl acetate	Y	S/P	3	2G	Cont	No	T2	IIA	No	C	FT	ABC	No	15.12, 15.13, 15.17, 15.19.6, 16.6.1, 16.6.2
Vinyl ethyl ether	Z	S/P	2	2G	Cont	Inert	T3	IIB	No	R	F	ABC	No	15.4, 15.13, 15.14, 15.19.6, 16.6.1, 16.6.2
Vinylidene chloride	Y	S/P	2	2G	Cont	Inert	T2	IIA	No	C	FT	ABC	No	15.12, 15.13, 15.14, 15.17, 15.19, 16.6.1, 16.6.2
Vinyl neodecanoate	Y	S/P	2	2G	Cont	No			Yes	C	T	ABC	Yes	15.12, 15.13, 15.17, 15.19, 16.6.1, 16.6.2
Vinyltoluene	Y	S/P	2	2G	Cont	No	T1	IIA	No	C	FT	ABC	No	15.12, 15.13, 15.17, 15.19.6, 16.6.1, 16.6.2
White spirit, low (15-20%) aromatic	Y	S/P	2	2G	Cont	No	T3	IIA	No	R	FT	ABC	No	15.12.3, 15.12.4, 15.19.6, 16.2.9

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Wood lignin with sodium acetate/oxalate	Z	S/P	3	2G	Open	No	-	-	NF	O	No	No	No	
Xylenes	Y	P	2	2G	Cont	No	T1	IIA	No	R	F	ABC	No	15.19.6, 16.2.9 (h)
Xylenes/ethylbenzene (10% or more) mixture	Y	S/P	2	2G	Cont	No	T2	IIA	No	R	FT	ABC	No	15.12.3, 15.12.4, 15.19.6
Xylenol	Y	S/P	2	2G	Cont	No	-	IIA	Yes	C	T	ABC	Yes	15.12, 15.17, 15.19, 16.2.9
Zinc alkaryl dithiophosphate (C7-C16)	Y	P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9
Zinc alkenyl carboxamide	Y	S/P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.6
Zinc alkyl dithiophosphate (C3-C14)	Y	P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.6

### Footnotes to products in chapter 17

Some entries in chapter 17 contain footnotes, as either letters or symbols in parentheses following the name of the product, in *column a* of the tables. These provide additional information about the carriage requirements for the product. The definitions of these footnotes are included below.

- a If the product to be carried contains flammable solvents such that the flashpoint does not exceed 60°C, then special electrical systems and a flammable-vapour detector shall be provided.
- b Although water is suitable for extinguishing open-air fires involving chemicals to which this footnote applies, water shall not be allowed to contaminate closed tanks containing these chemicals because of the risk of hazardous gas generation.
- c Phosphorus, yellow or white, is carried above its autoignition temperature and therefore flashpoint is not appropriate. Electrical equipment requirements may be similar to those for substances with a flashpoint above 60°C.
- d Requirements are based on those isomers having a flashpoint of 60°C, or less; some isomers have a flashpoint greater than 60°C, and therefore the requirements based on flammability would not apply to such isomers.
- e Applies to n-decyl alcohol only.
- f Dry chemical shall not be used as fire extinguishing media.
- g Confined spaces shall be tested for both formic acid vapours and carbon monoxide gas, a decomposition product.
- h Applies to p-xylene only.
- i For mixtures containing no other components with safety hazards and where the pollution category is Y or less.
- j Only certain alcohol-resistant foams are effective.
- k Requirements for Ship Type identified in *column e* might be subject to regulation 4.1.3 of Annex II of MARPOL.
- l Applicable when the melting point is equal to or greater than 0°C.
- m From vegetable oils, animal fats and fish oils specified in the IBC Code.
- n Confirmation that the product is composed of Triglycerides, C16-C18 and C18 unsaturated shall be required in order for the entry to be used. Otherwise, the more generic entry "Used cooking oil (m)" must be used.
- o Indicates that the entries are to be used solely for backloading of contaminated bulk liquids from offshore installations used in the search and exploitation of seabed mineral resources.
- \* Indicates that with reference to chapter 21 of the IBC Code (paragraph 21.1.3), deviations from the normal assignment criteria used for some carriage requirements have been implemented.

## Chapter 18

### LIST OF PRODUCTS TO WHICH THE CODE DOES NOT APPLY

18.1 The following are products which have been reviewed for their safety and pollution hazards and determined not to present hazards to such an extent as to warrant application of the Code.

18.2 Although the products listed in this chapter fall outside the scope of the Code, the attention of Administrations is drawn to the fact that some safety precautions may be needed for their safe transportation. Accordingly, Administrations shall prescribe appropriate safety requirements.

18.3 Some liquid substances are identified as falling into Pollution Category Z and, therefore, subject to certain requirements of MARPOL Annex II.

18.4 Liquid mixtures which are assessed or provisionally assessed under regulation 6.3 of MARPOL Annex II as falling into Pollution Category Z or OS, and which do not present safety hazards, may be carried under the appropriate entry in this chapter for "Noxious or Non-Noxious Liquid Substances, not otherwise specified (n.o.s.)".

#### EXPLANATORY NOTES

Product name	The product name shall be used in the shipping document for any cargo offered for bulk shipments. Any additional name may be included in brackets after the product name. In some cases, the product names are not identical with the names given in previous issues of the Code.
Pollution Category	The letter Z means the Pollution Category assigned to each product under Annex II of MARPOL. OS means the product was evaluated and found to fall outside Categories X, Y or Z.

Product Name	Pollution Category
Acetone	Z
Alcoholic beverages, n.o.s.	Z
Apple juice	OS
n-Butyl alcohol	Z
sec-Butyl alcohol	Z
Calcium carbonate slurry	OS
Clay slurry	OS
Coal slurry	OS
Ethyl alcohol	Z
Glucose solution	OS
Glycerol ethoxylated	OS
Hydrogenated starch hydrolysate	OS
Isopropyl alcohol	Z
Kaolin slurry	OS
Lecithin	OS
Maltitol solution	OS
Microsilica slurry	OS

Molasses	OS
Noxious liquid, (11) n.o.s. (trade name ....., contains ....) Cat. Z	Z
Non noxious liquid, (12) n.o.s. (trade name ....., contains ....) Cat. OS	OS
Orange juice (concentrated)	OS
Orange juice (not concentrated)	OS
Potassium chloride solution (less than 26%)	OS
Propylene glycol	OS
Sodium acetate solutions	Z
Sodium bicarbonate solution (less than 10%)	OS
Sorbitol solution	OS
Sulphonated polyacrylate solution	Z
Tetraethyl silicate monomer/oligomer (20% in ethanol)	Z
Triethylene glycol	OS
Vegetable protein solution (hydrolyzed)	OS
Water	O

## Chapter 19

### Index of Products Carried in Bulk

19.1 The first column of the Index of Products Carried in Bulk (hereafter referred to as "the Index") provides the so-called Index Name. Where the Index Name is in capitals and in bold, the Index Name is identical to the Product Name in either chapter 17 or chapter 18. The second column listing the relevant Product Name is therefore empty. Where the Index Name is non-bold lower case it reflects a synonym for which the Product Name in either chapter 17 or chapter 18 is given in the second column. The relevant chapter of the IBC Code is reflected in the third column.

19.2 Following a review of chapter 19, a column listing UN numbers which was previously included had been removed from the Index. Since UN numbers are only available for a limited number of Index Names and there are inconsistencies between some of the names used in chapter 19 and those linked to UN numbers, it was decided to remove UN number references in order to avoid any confusion.

19.3 The Index has been developed for information purposes only. None of the Index Names indicated in non-bold lower case in the first column shall be used as the Product Name on the shipping document.

19.4 Prefixes forming an integral part of the name are shown in ordinary (roman) type and are taken into account in determining the alphabetical order of entries. These include such prefixes as:

Mono Di Tri Tetra Penta Iso Bis Neo Ortho Cyclo

19.5 Prefixes that are disregarded for purposes of alphabetical order include the following:

n-	(normal-)
sec-	(secondary-)
tert-	(tertiary-)
o-	(ortho-)
m-	(meta-)

p-	(para-)
N-	
O-	
S-	
sym-	(symmetrical)
uns-	(unsymmetrical)
dl-	
D-	
L-	
cis-	
trans-	
(E)-	
(Z)-	
alpha-	( $\alpha$ -)
beta-	( $\beta$ -)
gamma-	( $\gamma$ -)
epsilon-	( $\epsilon$ -)
omega-	( $\omega$ -)

19.6 The Index utilizes a note after the index name for some entries (shown as (a) or (b)) which indicates that the following qualifications apply:

- (a) This Index Name represents a subset of the corresponding Product Name.
- (b) The Product Name corresponding to this Index Name contains a carbon chain length qualification. Since the Index Name should always represent a subset or be an exact synonym of the corresponding Product Name, the carbon chain length characteristics should be checked for any product identified by this Index Name.



<b>Index Name</b>	<b>Product Name</b>	<b>Chapter</b>
Abietic anhydride	ROSIN	17
acedimethylamide	N,N-DIMETHYLACETAMIDE	17
Acetaldehyde cyanohydrin solution (80% or less)	LACTONITRILE SOLUTION (80% OR LESS)	17
Acetaldehyde trimer	PARALDEHYDE	17
<b>ACETIC ACID</b>		17
Acetic acid anhydride	ACETIC ANHYDRIDE	17
Acetic acid, ethenyl ester	VINYL ACETATE	17
Acetic acid, methyl ester	METHYL ACETATE	17
Acetic acid, vinyl ester	VINYL ACETATE	17
<b>ACETIC ANHYDRIDE</b>		17
Acetic ester	ETHYL ACETATE	17
Acetic ether	ETHYL ACETATE	17
Acetic oxide	ACETIC ANHYDRIDE	17
Acetoacetic acid, methyl ester	METHYL ACETOACETATE	17
Acetoacetic ester	ETHYL ACETOACETATE	17
<b>ACETOCHLOR</b>		17
<b>ACETONE</b>		18
<b>ACETONE CYANOHYDRIN</b>		17
<b>ACETONITRILE</b>		17
<b>ACETONITRILE (LOW PURITY GRADE)</b>		17
Acetyl anhydride	ACETIC ANHYDRIDE	17
Acetylene tetrachloride	TETRACHLOROETHANE	17
Acetyl ether	ACETIC ANHYDRIDE	17
Acetyl oxide	ACETIC ANHYDRIDE	17
<b>ACID OIL MIXTURE FROM SOYABEAN, CORN (MAIZE) AND SUNFLOWER OIL REFINING</b>		17
Acroleic acid	ACRYLIC ACID	17
<b>ACRYLAMIDE SOLUTION (50% OR LESS)</b>		17
<b>ACRYLIC ACID</b>		17
<b>ACRYLIC ACID/ETHENESULPHONIC ACID COPOLYMER WITH PHOSPHONATE GROUPS, SODIUM SALT SOLUTION</b>		17
Acrylic acid, 2-hydroxyethyl ester	2-HYDROXYETHYL ACRYLATE	17
Acrylic amide solution, 50% or less	ACRYLAMIDE SOLUTION (50% OR LESS)	17
Acrylic resin monomer	METHYL METHACRYLATE	17
<b>ACRYLONITRILE</b>		17
<b>ACRYLONITRILE-STYRENE COPOLYMER DISPERSION IN POLYETHER POLYOL</b>		17
Adipic acid, bis(2-ethylhexyl) ester	DI-(2-ETHYLHEXYL) ADIPATE	17
<b>ADIPONITRILE</b>		17
<b>ALACHLOR TECHNICAL (90% OR MORE)</b>		17
Alcohol	ETHYL ALCOHOL	18
Alcohol, C10	DECYL ALCOHOL (ALL ISOMERS)	17
Alcohol, C11	UNDECYL ALCOHOL	17
Alcohol, C12	DODECYL ALCOHOL	17
Alcohol, C7 (a)	HEPTANOL (ALL ISOMERS) (D)	17
Alcohol, C8	OCTANOL (ALL ISOMERS)	17

<b>Index Name</b>	<b>Product Name</b>	<b>Chapter</b>
Alcohol, C9	<b>NONYL ALCOHOL (ALL ISOMERS)</b>	17
<b>ALCOHOLIC BEVERAGES, N.O.S.</b>		18
<b>ALCOHOL (C9-C11) POLY(2.5-9)ETHOXYLATE</b>		17
<b>ALCOHOL (C10-C18) POLY (7) ETHOXYLATE</b>		17
<b>ALCOHOL (C6-C17) (SECONDARY) POLY(3-6)ETHOXYLATES</b>		17
<b>ALCOHOL (C6-C17) (SECONDARY) POLY(7-12)ETHOXYLATES</b>		17
<b>ALCOHOL (C12-C16) POLY(1-6) ETHOXYLATES</b>		17
<b>ALCOHOL (C12-C16) POLY(20+)ETHOXYLATES</b>		17
<b>ALCOHOL (C12-C16) POLY(7-19)ETHOXYLATES</b>		17
<b>ALCOHOLS (C13+)</b>		17
Alcohols, C13 - C15	<b>ALCOHOLS (C13+)</b>	17
<b>ALCOHOLS (C12+), PRIMARY, LINEAR</b>		17
<b>ALCOHOLS (C8-C11), PRIMARY, LINEAR AND ESSENTIALLY LINEAR</b>		17
<b>ALCOHOLS (C12-C13), PRIMARY, LINEAR AND ESSENTIALLY LINEAR</b>		17
<b>ALCOHOLS (C14-C18), PRIMARY, LINEAR AND ESSENTIALLY LINEAR</b>		17
Aldehyde collidine	<b>2-METHYL-5-ETHYL PYRIDINE</b>	17
Aldehydine	<b>2-METHYL-5-ETHYL PYRIDINE</b>	17
<b>ALKANES (C6-C9)</b>		17
<b>ISO- AND CYCLO-ALKANES (C10-C11)</b>		17
<b>ISO- AND CYCLO-ALKANES (C12+)</b>		17
<b>ALKANES (C5-C7), LINEAR AND BRANCHED</b>		17
<b>ALKANES (C10-C17), LINEAR AND BRANCHED</b>		17
<b>ALKANES (C10-C26), LINEAR AND BRANCHED (FLASHPOINT ≤60°C)</b>		17
<b>ALKANES (C10-C26), LINEAR AND BRANCHED, (FLASHPOINT &gt;60°C)</b>		17
<b>N-ALKANES (C9-C11)</b>		17
<b>N-ALKANES (C10-C20)</b>		17
Alkane(C10-C18)sulfonic acid, phenyl ester (a)	<b>ALKYL SULPHONIC ACID ESTER OF PHENOL</b>	17
<b>ALKARYL POLYETHERS (C9-C20)</b>		17
<b>ALKENOIC ACID, POLYHYDROXY ESTER BORATED</b>		17
<b>ALKENYL (C11+) AMIDE</b>		17
<b>ALKENYL (C16-C20) SUCCINIC ANHYDRIDE</b>		17
<b>ALKYL ACRYLATE/VINYLPYRIDINE COPOLYMER IN TOLUENE</b>		17
<b>ALKYL/CYCLO (C4-C5) ALCOHOLS</b>		17
<b>ALKYLARYL PHOSPHATE MIXTURES (MORE THAN 40% DIPHENYL TOLYL PHOSPHATE, LESS THAN 0.02% ORTHO-ISOMERS)</b>		17
<b>ALKYLATED (C4-C9) HINDERED PHENOLS</b>		17
<b>ALKYLBENZENE, ALKYLINDANE, ALKYLINDENE MIXTURE (EACH C12-C17)</b>		17
<b>ALKYLBENZENE DISTILLATION BOTTOMS</b>		17

Index Name	Product Name	Chapter
ALKYLBENZENE MIXTURES (CONTAINING AT LEAST 50% OF TOLUENE)		17
ALKYL (C3-C4) BENZENES		17
ALKYL (C5-C8) BENZENES		17
ALKYL(C9+)BENZENES		17
ALKYLBENZENES MIXTURES (CONTAINING NAPHTHALENE)		17
ALKYL (C11-C17) BENZENE SULPHONIC ACID		17
ALKYLBENZENE SULPHONIC ACID, SODIUM SALT SOLUTION		17
ALKYL (C12+) DIMETHYLAMINE		17
ALKYL DITHIOCARBAMATE (C19-C35)		17
ALKYL DITHIOTHIAZOLE (C6-C24)		17
ALKYL ESTER COPOLYMER (C4-C20)		17
ALKYL (C8-C10)/(C12-C14):(40% OR LESS/60% OR MORE) POLYGLUCOSIDE SOLUTION (55% OR LESS)		17
ALKYL (C8-C10)/(C12-C14):(60% OR MORE/40% OR LESS) POLYGLUCOSIDE SOLUTION(55% OR LESS)		17
ALKYL (C7-C9) NITRATES		17
2,2'- [3-(Alkyl(C16-C18)oxy)propylimino]diethanol (a)	ETHOXYLATED LONG CHAIN (C16+) ALKYL OXYALKYLAMINE	17
Alkylphenol, long-chain (C14-C18)	LONG-CHAIN ALKYLPHENOL (C14-C18)	17
Alkylphenol, long-chain (C18-C30)	LONG-CHAIN ALKYLPHENOL (C18-C30)	17
ALKYL(C7-C11)PHENOL POLY(4-12) ETHOXYLATE		17
ALKYL (C8-C40) PHENOL SULPHIDE		17
ALKYL (C8-C9) PHENYLAMINE IN AROMATIC SOLVENTS		17
ALKYL (C9-C15) PHENYL PROPOXYLATE		17
ALKYL (C8-C10) POLYGLUCOSIDE SOLUTION (65% OR LESS)		17
ALKYL (C8-C10)/(C12-C14):(50%/50%) POLYGLUCOSIDE SOLUTION (55% OR LESS)		17
ALKYL (C12-C14) POLYGLUCOSIDE SOLUTION (55% OR LESS)		17
ALKYL(C12-C16) PROPOXYAMINE ETHOXYLATE		17
ALKYL (C10-C15, C12 RICH) PHENOL POLY(4-12)ETHOXYLATE		17
ALKYL (C10-C20, SATURATED AND UNSATURATED) PHOSPHITE		17
ALKYL SULPHONIC ACID ESTER OF PHENOL		17
ALKYL (C18+) TOLUENES		17
Alkyltoluenesulfonic acid, calcium salts, high overbase (up to 70% in mineral oil)	ALKYL (C18-C28) TOLUENESULPHONIC ACID, CALCIUM SALTS, HIGH OVERBASE	17
Alkyl(C18-C28)toluenesulfonic acid,calcium salts, low overbase (up to 60% in mineral oil)	ALKYL (C18-C28) TOLUENESULPHONIC ACID, CALCIUM SALTS, LOW OVERBASE	17
ALKYL(C18-C28)TOLUENESULPHONIC ACID		17
ALKYL(C18-C28)TOLUENESULPHONIC ACID, CALCIUM SALTS, BORATED		17
ALKYL (C18-C28) TOLUENESULPHONIC ACID, CALCIUM SALTS, HIGH OVERBASE		17
ALKYL (C18-C28) TOLUENESULPHONIC ACID, CALCIUM SALTS, LOW OVERBASE		17

Index Name	Product Name	Chapter
3-Alky(C16-C18)oxy-N,N'-bis(2-hydroxyethyl)propan-1-amine (a)	ETHOXYLATED LONG CHAIN (C16+) ALKYLALCOXYALKYLAMINE	17
<b>ALLYL ALCOHOL</b>		17
<b>ALLYL CHLORIDE</b>		17
<b>ALUMINIUM CHLORIDE/HYDROGEN CHLORIDE SOLUTION</b>		17
<b>ALUMINIUM HYDROXIDE, SODIUM HYDROXIDE, SODIUM CARBONATE SOLUTION (40% OR LESS)</b>		17
Aluminium silicate hydroxide	KAOLIN SLURRY	18
<b>ALUMINIUM SULPHATE SOLUTION</b>		17
Aminoacetic acid, sodium salt solution	GLYCINE, SODIUM SALT SOLUTION	17
1-Amino-3-aminomethyl-3,5,5-trimethylcyclohexane	ISOPHORONEDIAMINE	17
Aminobenzene	ANILINE	17
1-Aminobutane (a)	BUTYLAMINE (ALL ISOMERS)	17
2-Aminobutane	BUTYLAMINE (ALL ISOMERS)	17
Aminocyclohexane	CYCLOHEXYLAMINE	17
Aminoethane	ETHYLAMINE	17
Aminoethane solutions, 72% or less	ETHYLAMINE SOLUTIONS (72% OR LESS)	17
2-Aminoethanol	ETHANOLAMINE	17
<b>2-(2-AMINOETHOXY) ETHANOL</b>		17
2-(2-Aminoethylamino)ethanol	AMINOETHYL ETHANOLAMINE	17
<b>AMINOETHYLDIETHANOLAMINE/AMINOETHYLETHANOLAMINE SOLUTION</b>		17
<b>AMINOETHYL ETHANOLAMINE</b>		17
N-(2-aminoethyl)ethylenediamine	DIETHYLENETRIAMINE	17
1-(2-Aminoethyl)piperazine	N-AMINOETHYLPIPERAZINE	17
<b>N-AMINOETHYLPIPERAZINE</b>		17
2-Aminoisobutane (a)	BUTYLAMINE (ALL ISOMERS)	17
Aminomethane solutions, 42% or less	METHYLAMINE SOLUTIONS (42% OR LESS)	17
1-Amino-2-methylbenzene	O-TOLUIDINE	17
2-Amino-1-methylbenzene	O-TOLUIDINE	17
<b>2-AMINO-2-METHYL-1-PROPANOL</b>		17
3-Aminomethyl-3,5,5-trimethylcyclohexylamine	ISOPHORONEDIAMINE	17
Aminophen	ANILINE	17
1-Aminopropane	N-PROPYLAMINE	17
2-Aminopropane	ISOPROPYLAMINE	17
2-Aminopropane (70% or less) solution	ISOPROPYLAMINE (70% OR LESS) SOLUTION	17
1-Amino-2-propanol	ISOPROPANOLAMINE	17
1-Aminopropan-2-ol	ISOPROPANOLAMINE	17
3-Aminopropan-1-ol	N-PROPANOLAMINE	17
2-Aminotoluene	O-TOLUIDINE	17
o-Aminotoluene	O-TOLUIDINE	17
5-Amino-1,3,3-trimethylcyclohexylmethylamine	ISOPHORONEDIAMINE	17
<b>AMMONIA AQUEOUS (28% OR LESS)</b>		17
Ammonia water, 28% or less	AMMONIA AQUEOUS (28% OR LESS)	17
<b>AMMONIUM CHLORIDE SOLUTION (LESS THAN 25%) (*)</b>		17
<b>AMMONIUM HYDROGEN PHOSPHATE SOLUTION</b>		17

Index Name	Product Name	Chapter
Ammonium hydroxide, 28% or less	AMMONIA AQUEOUS (28% OR LESS)	17
<b>AMMONIUM LIGNOSULPHONATE SOLUTIONS</b>		17
<b>AMMONIUM NITRATE SOLUTION (93% OR LESS) (*)</b>		17
<b>AMMONIUM POLYPHOSPHATE SOLUTION</b>		17
<b>AMMONIUM SULPHATE SOLUTION</b>		17
<b>AMMONIUM SULPHIDE SOLUTION (45% OR LESS) (*)</b>		17
<b>AMMONIUM THIOSULPHATE SOLUTION (60% OR LESS)</b>		17
<b>AMYL ACETATE (ALL ISOMERS)</b>		17
Amyl acetate, commercial (a)	AMYL ACETATE (ALL ISOMERS)	17
n-Amyl acetate (a)	AMYL ACETATE (ALL ISOMERS)	17
sec-Amyl acetate (a)	AMYL ACETATE (ALL ISOMERS)	17
Amylacetic ester (a)	AMYL ACETATE (ALL ISOMERS)	17
Amyl alcohol	N-AMYL ALCOHOL	17
<b>N-AMYL ALCOHOL</b>		17
<b>AMYL ALCOHOL, PRIMARY</b>		17
<b>SEC-AMYL ALCOHOL</b>		17
<b>TERT-AMYL ALCOHOL</b>		17
Amyl aldehyde	VALERALDEHYDE (ALL ISOMERS)	17
Amylcarbinol	HEXANOL	17
Amylene hydrate	TERT-AMYL ALCOHOL	17
<b>TERT-AMYL ETHYL ETHER</b>		17
Amyl ethyl ketone	ETHYL AMYL KETONE	17
<b>TERT-AMYL METHYL ETHER</b>		17
n-Amyl methyl ketone	METHYL AMYL KETONE	17
n-Amyl propionate	N-PENTYL PROPIONATE	17
Anaesthetic ether	DIETHYL ETHER (*)	17
<b>ANILINE</b>		17
Aniline oil	ANILINE	17
Anilinobenzene	DIPHENYLAMINE (MOLTEN)	17
Anthracene oil (coal tar fraction) (a)	COAL TAR	17
Ant oil, artificial	FURFURAL	17
<b>APPLE JUICE</b>		18
Aqua fortis	NITRIC ACID (70% AND OVER)	17
Argilla	KAOLIN SLURRY	18
<b>ARYL POLYOLEFINS (C11-C50)</b>		17
<b>AVIATION ALKYLATES (C8 PARAFFINS AND ISO-PARAFFINS BPT 95 - 120°C)</b>		17
Azacycloheptane	HEXAMETHYLENEIMINE	17
3-Azapentane-1,5-diamine	DIETHYLENETRIAMINE	17
Azepane	HEXAMETHYLENEIMINE	17
Azotic acid	NITRIC ACID (70% AND OVER)	17
<b>BARIUM LONG CHAIN (C11-C50) ALKARYL SULPHONATE</b>		17
Basic calcium alkyl salicylate in approximately 30% mineral oil (b)	CALCIUM LONG-CHAIN ALKYL SALICYLATE (C13+)	17
Battery acid	SULPHURIC ACID	17

Index Name	Product Name	Chapter
Behenyl alcohol (a)	ALCOHOLS (C13+)	17
Benzenamine	ANILINE	17
1,4-Benzenedicarboxylic acid, bis(2-ethylhexyl) ester	BIS(2-ETHYLHEXYL) TEREPHTHALATE	17
1,4-Benzenedicarboxylic acid, butyl ester	DIBUTYL TEREPHTHALATE	17
1,2-Benzenedicarboxylic acid, diethyl ester	DIETHYL PHTHALATE	17
1,2-Benzenedicarboxylic acid, diundecyl ester	DIUNDECYL PHTHALATE	17
<b>BENZENE AND MIXTURES HAVING 10% BENZENE OR MORE (I)</b>		17
<b>BENZENE SULPHONYL CHLORIDE</b>		17
BENZENESULPHONYL CHLORIDE	BENZENE SULPHONYL CHLORIDE	17
<b>BENZENETRICARBOXYLIC ACID, TRIOCTYL ESTER</b>		17
Benzenol	PHENOL	17
Benzol	BENZENE AND MIXTURES HAVING 10% BENZENE OR MORE (I)	17
Benzole	BENZENE AND MIXTURES HAVING 10% BENZENE OR MORE (I)	17
Benzophenol	PHENOL	17
2-Benzothiazolethiol, sodium salt solution	MERCAPTOBENZOTHIAZOL, SODIUM SALT SOLUTION	17
Benzothiazole-2-thiol, sodium salt solution	MERCAPTOBENZOTHIAZOL, SODIUM SALT SOLUTION	17
(2-Benzothiazolylthio) sodium solution	MERCAPTOBENZOTHIAZOL, SODIUM SALT SOLUTION	17
<b>BENZYL ACETATE</b>		17
<b>BENZYL ALCOHOL</b>		17
Benzyl butyl phthalate	BUTYL BENZYL PHTHALATE	17
<b>BENZYL CHLORIDE</b>		17
Betaprone	BETA-PROPIOLACTONE	17
Betula oil	METHYL SALICYLATE	17
Biformyl	GLYOXAL SOLUTION (40% OR LESS)	17
<b>BIO-FUEL BLENDS OF DIESEL/GAS OIL AND ALKANES (C10-C26), LINEAR AND BRANCHED WITH A FLASHPOINT &gt;60°C (&gt;25% BUT &lt;99% BY VOLUME)</b>		17
<b>BIO-FUEL BLENDS OF DIESEL/GAS OIL AND ALKANES (C10-C26), LINEAR AND BRANCHED WITH A FLASHPOINT ≤ 60°C (&gt;25% BUT &lt;99% BY VOLUME)</b>		17
<b>BIO-FUEL BLENDS OF DIESEL/GAS OIL AND FAME (&gt;25% BUT &lt;99% BY VOLUME)</b>		17
<b>BIO-FUEL BLENDS OF DIESEL/GAS OIL AND VEGETABLE OIL (&gt;25% BUT &lt;99% BY VOLUME)</b>		17
<b>BIO-FUEL BLENDS OF GASOLINE AND ETHYL ALCOHOL (&gt;25% BUT &lt;99% BY VOLUME)</b>		17
<b>BIO-FUEL BLENDS OF JET FUELS AND ALKANES (C10-C17), LINEAR AND BRANCHED (&gt;25% BUT &lt;99% BY VOLUME)</b>		17
Biphenyl	DIPHENYL	17
Bis(methylcyclopentadiene)	METHYLCYCLOPENTADIENE DIMER	17
2,5-Bis(alkyl(C7+)-thio)-1,3,4-thiadiazole	ALKYL DITHIOTHIAZADIAZOLE (C6-C24)	17
Bis(2-aminoethyl)amine	DIETHYLENETRIAMINE	17
N,N'-Bis(2-aminoethyl)ethane-1,2-diamine	TRIETHYLENETETRAMINE	17
N,N'-Bis(2-aminoethyl)ethylenediamine	TRIETHYLENETETRAMINE	17
N,N-Bis(2-(bis(carboxymethyl)amino)ethyl)glycine, pentasodium salt solution	DIETHYLENETRIAMINEPENTAACETIC ACID, PENTASODIUM SALT SOLUTION	17

Index Name	Product Name	Chapter
Bis(2-butoxyethyl) ether	DIETHYLENE GLYCOL DIBUTYL ETHER	17
N,N- Bis(carboxymethyl)glycine trisodium salt solution	NITRILOTRIACETIC ACID, TRISODIUM SALT SOLUTION	17
Bis(chloroethyl) ether	DICHLOROETHYL ETHER	17
Bis(2-chloroethyl) ether	DICHLOROETHYL ETHER	17
Bis (2-chloroisopropyl) ether	2,2'-DICHLOROISOPROPYL ETHER	17
Bis(2-chloro-1-methylethyl) ether	2,2'-DICHLOROISOPROPYL ETHER	17
Bis[2-(2,3-epoxypropoxy)phenyl]methane	DIGLYCIDYL ETHER OF BISPHENOL F	17
2,2-Bis[4-(2,3-epoxypropoxy)phenyl]propane	DIGLYCIDYL ETHER OF BISPHENOL A	17
Bis(2-ethoxyethyl) ether	DIETHYLENE GLYCOL DIETHYL ETHER	17
Bis(2-ethylhexyl) adipate	DI-(2-ETHYLHEXYL) ADIPATE	17
Bis (2-ethylhexyl)-1-4-benzenedicarboxylate	BIS(2-ETHYLHEXYL) TEREPHTHALATE	17
Bis(2-ethylhexyl) hydrogen phosphate	DI-(2-ETHYLHEXYL) PHOSPHORIC ACID	17
Bis(2-ethylhexyl) phthalate	DIOCTYL PHTHALATE	17
<b>BIS(2-ETHYLHEXYL) TEREPHTHALATE</b>		17
Bis(2-hydroxyethyl)amine	DIETHANOLAMINE	17
Bis(2-hydroxyethyl)ammonium 2,4-dichlorophenoxyacetate solution	2,4-DICHLOROPHENOXYACETIC ACID, DIETHANOLAMINE SALT SOLUTION	17
Bis(2-hydroxyethyl) ether	DIETHYLENE GLYCOL	17
Bis(2-hydroxypropyl)amine	DIISOPROPANOLAMINE	17
Bis(6-methylheptyl) phthalate	DIOCTYL PHTHALATE	17
Blackstrap molasses (a)	MOLASSES	18
Blend of propoxylated polyether polyols with >10% additives	GLUCITOL/GLYCEROL BLEND PROPOXYLATED (CONTAINING 10% OR MORE AMINES)	17
Bolus alba	KAOLIN SLURRY	18
<b>BRAKE FLUID BASE MIX: POLY(2-8)ALKYLENE (C2-C3) GLYCOLS/POLYALKYLENE (C2-C10) GLYCOLS MONOALKYL (C1-C4) ETHERS AND THEIR BORATE ESTERS</b>		17
Bran oil	FURFURAL	17
<b>BROMOCHLOROMETHANE</b>		17
Butaldehyde (a)	BUTYRALDEHYDE (ALL ISOMERS)	17
Butanal (a)	BUTYRALDEHYDE (ALL ISOMERS)	17
n-Butanal (a)	BUTYRALDEHYDE (ALL ISOMERS)	17
1,3-Butanediol (a)	BUTYLENE GLYCOL	17
Butane-1,3-diol (a)	BUTYLENE GLYCOL	17
1,4-Butanediol (a)	BUTYLENE GLYCOL	17
Butane -1,4-diol (a)	BUTYLENE GLYCOL	17
2,3-Butanediol (a)	BUTYLENE GLYCOL	17
Butane-2,3-diol (a)	BUTYLENE GLYCOL	17
Butane, 2-ethoxy-2-methyl-ether	TERT-AMYL ETHYL ETHER	17
Butanoic acid	BUTYRIC ACID	17
Butanol	N-BUTYL ALCOHOL	18
1-Butanol	N-BUTYL ALCOHOL	18
Butanol-1	N-BUTYL ALCOHOL	18
Butan-1-ol	N-BUTYL ALCOHOL	18
2-Butanol	SEC-BUTYL ALCOHOL	18
Butan-2-ol	SEC-BUTYL ALCOHOL	18
Butanol acetate (a)	BUTYL ACETATE (ALL ISOMERS)	17

<b>Index Name</b>	<b>Product Name</b>	<b>Chapter</b>
2-Butanol acetate (a)	BUTYL ACETATE (ALL ISOMERS)	17
1,4-Butanolide	GAMMA-BUTYROLACTONE	17
Butan-4-olide	GAMMA-BUTYROLACTONE	17
n-Butanol	N-BUTYL ALCOHOL	18
sec-Butanol	SEC-BUTYL ALCOHOL	18
tert-Butanol	TERT-BUTYL ALCOHOL	17
2-Butanone	METHYL ETHYL KETONE	17
Butan-2-one	METHYL ETHYL KETONE	17
2-Butenal	CROTONALDEHYDE	17
Butene dimer	OCTENE (ALL ISOMERS)	17
<b>BUTENE OLIGOMER</b>		17
1-Butoxybutane	N-BUTYL ETHER	17
2-Butoxyethanol (a)	ETHYLENE GLYCOL MONOALKYL ETHERS	17
2-tert-butoxyethanol (a)	ETHYLENE GLYCOL MONOALKYL ETHERS	17
<b>2-BUTOXYETHANOL (58%)/HYPERBRANCHED POLYESTERAMIDE (42%) (MIXTURE)</b>		17
2-(2-Butoxyethoxy)ethanol (a)	POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER	17
2-(2-Butoxyethoxy)ethyl acetate (a)	POLY(2-8)ALKYLENE GLYCOL MONOALKYL (C1-C6) ETHER ACETATE	17
2-Butoxyethyl acetate	ETHYLENE GLYCOL BUTYL ETHER ACETATE	17
1-Butoxypropan-2-ol (a)	PROPYLENE GLYCOL MONOALKYL ETHER	17
Butyl acetate (a)	BUTYL ACETATE (ALL ISOMERS)	17
<b>BUTYL ACETATE (ALL ISOMERS)</b>		17
n-Butyl acetate (a)	BUTYL ACETATE (ALL ISOMERS)	17
sec-Butyl acetate (a)	BUTYL ACETATE (ALL ISOMERS)	17
tert-Butyl acetate (a)	BUTYL ACETATE (ALL ISOMERS)	17
<b>BUTYL ACRYLATE (ALL ISOMERS)</b>		17
n-Butyl acrylate (a)	BUTYL ACRYLATE (ALL ISOMERS)	17
Butyl alcohol	N-BUTYL ALCOHOL	18
<b>N-BUTYL ALCOHOL</b>		18
<b>SEC-BUTYL ALCOHOL</b>		18
<b>TERT-BUTYL ALCOHOL</b>		17
n-Butyl aldehyde (a)	BUTYRALDEHYDE (ALL ISOMERS)	17
<b>BUTYLAMINE (ALL ISOMERS)</b>		17
n-Butylamine (a)	BUTYLAMINE (ALL ISOMERS)	17
sec-Butylamine (a)	BUTYLAMINE (ALL ISOMERS)	17
tert-Butylamine (a)	BUTYLAMINE (ALL ISOMERS)	17
<b>BUTYLBENZENE (ALL ISOMERS)</b>		17
tert-Butylbenzene (a)	BUTYLBENZENE (ALL ISOMERS)	17
<b>BUTYL BENZYL PHTHALATE</b>		17
Butyl butanoate (a)	BUTYL BUTYRATE (ALL ISOMERS)	17
<b>BUTYL BUTYRATE (ALL ISOMERS)</b>		17
n-Butyl butyrate (a)	BUTYL BUTYRATE (ALL ISOMERS)	17
n-Butylcarbinol	N-AMYL ALCOHOL	17
Butyl carbitol (a)	POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER	17



<b>Index Name</b>	<b>Product Name</b>	<b>Chapter</b>
Butyl carbitol acetate (a)	POLY(2-8)ALKYLENE GLYCOL MONOALKYL (C1-C6) ETHER ACETATE	17
Butyl cellosolve acetate	ETHYLENE GLYCOL BUTYL ETHER ACETATE	17
<b>BUTYL/DECYL/CETYL/EICOSYL METHACRYLATE MIXTURE</b>		17
Butyl/decyl/hexadecyl/icosyl methacrylate mixture (a)	BUTYL/DECYL/CETYL/EICOSYL METHACRYLATE MIXTURE	17
Butyl diglycol acetate (a)	POLY(2-8)ALKYLENE GLYCOL MONOALKYL (C1-C6) ETHER ACETATE	17
<b>BUTYLENE GLYCOL</b>		17
alpha-Butylene glycol (a)	BUTYLENE GLYCOL	17
beta-Butylene glycol (a)	BUTYLENE GLYCOL	17
1,3-Butylene glycol, 3-methyl ether	3-METHOXY-1-BUTANOL	17
1,3-Butylene glycol, 3-methyl ether, 1-acetate	3-METHOXYBUTYL ACETATE	17
Butylene oxide	TETRAHYDROFURAN	17
<b>1,2-BUTYLENE OXIDE</b>		17
Butyl ethanoate	BUTYL ACETATE (ALL ISOMERS)	17
Butyl ether	N-BUTYL ETHER	17
<b>N-BUTYL ETHER</b>		17
Butylethylacetic acid (a)	OCTANOIC ACID (ALL ISOMERS)	17
Butylethylene	HEXENE (ALL ISOMERS)	17
tert-Butyl ethyl ether	ETHYL TERT-BUTYL ETHER	17
iso-Butyl ketone	DIISOBUTYL KETONE	17
<b>BUTYL METHACRYLATE</b>		17
tert-Butyl methyl ether	METHYL TERT-BUTYL ETHER	17
Butyl methyl ketone	METHYL BUTYL KETONE	17
Butyl phthalate	DIBUTYL PHTHALATE	17
<b>N-BUTYL PROPIONATE</b>		17
<b>BUTYRALDEHYDE (ALL ISOMERS)</b>		17
n-Butyraldehyde	BUTYRALDEHYDE (ALL ISOMERS)	17
<b>BUTYRIC ACID</b>		17
n-Butyric acid	BUTYRIC ACID	17
Butyric alcohol	N-BUTYL ALCOHOL	18
Butyric aldehyde (a)	BUTYRALDEHYDE (ALL ISOMERS)	17
<b>GAMMA-BUTYROLACTONE</b>		17
Cajeputene	DIPENTENE	17
<b>CALCIUM ALKARYL SULPHONATE (C11-C50)</b>		17
Calcium alkyl(longchain) salicylate (overbased) in mineral oil (LOA) (b)	CALCIUM LONG-CHAIN ALKYL SALICYLATE (C13+)	17
<b>CALCIUM ALKYL (C10-C28) SALICYLATE</b>		17
Calcium bis(O-alkylsalicylate) (b)	CALCIUM LONG-CHAIN ALKYL SALICYLATE (C13+)	17
Calcium bromide / zinc bromide solution	DRILLING BRINES (CONTAINING ZINC CHLORIDE)	17
<b>CALCIUM CARBONATE SLURRY</b>		18
<b>CALCIUM HYDROXIDE SLURRY</b>		17
<b>CALCIUM HYPOCHLORITE SOLUTION (15% OR LESS)</b>		17
<b>CALCIUM HYPOCHLORITE SOLUTION (MORE THAN 15%)</b>		17

<b>Index Name</b>	<b>Product Name</b>	<b>Chapter</b>
<b>CALCIUM LIGNOSULPHONATE SOLUTIONS</b>		17
<b>CALCIUM LONG-CHAIN ALKYL (C5-C10) PHENATE</b>		17
<b>CALCIUM LONG-CHAIN ALKYL (C11-C40) PHENATE</b>		17
<b>CALCIUM LONG-CHAIN ALKYL PHENATE SULPHIDE (C8-C40)</b>		17
<b>CALCIUM LONG-CHAIN ALKYL SALICYLATE (C13+)</b>		17
<b>CALCIUM LONG-CHAIN ALKYL (C18-C28) SALICYLATE</b>		17
<b>CALCIUM NITRATE/MAGNESIUM NITRATE/POTASSIUM CHLORIDE SOLUTION</b>		17
<b>CALCIUM NITRATE SOLUTIONS (50% OR LESS)</b>		17
<b>CAMELINA OIL</b>		17
Camelina Sativa Oil	<b>CAMELINA OIL</b>	17
Camelina Sativa Seed Oil	<b>CAMELINA OIL</b>	17
Cane molasses (a)	<b>MOLASSES</b>	18
Canola oil	<b>RAPESEED OIL (LOW ERUCIC ACID CONTAINING LESS THAN 4% FREE FATTY ACIDS)</b>	17
Capric acid	<b>DECANOIC ACID</b>	17
Caproic acid	<b>HEXANOIC ACID</b>	17
Caprolactam	<b>EPSILON-CAPROLACTAM (MOLTEN OR AQUEOUS SOLUTIONS)</b>	17
<b>EPSILON-CAPROLACTAM (MOLTEN OR AQUEOUS SOLUTIONS)</b>		17
Caproyl alcohol	<b>HEXANOL</b>	17
Capryl alcohol (a)	<b>OCTANOL (ALL ISOMERS)</b>	17
Caprylic acid (a)	<b>OCTANOIC ACID (ALL ISOMERS)</b>	17
Caprylyl acetate	<b>N-OCTYL ACETATE</b>	17
Carbamide solution	<b>UREA SOLUTION</b>	17
Carbinol	<b>METHYL ALCOHOL (*)</b>	17
Carbitol acetate (a)	<b>POLY(2-8)ALKYLENE GLYCOL MONOALKYL (C1-C6) ETHER ACETATE</b>	17
Carbitol solvent (a)	<b>POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER</b>	17
Carbolic acid	<b>PHENOL</b>	17
<b>CARBOLIC OIL</b>		17
Carbon bisulphide	<b>CARBON DISULPHIDE</b>	17
<b>CARBON DISULPHIDE</b>		17
<b>CARBON TETRACHLORIDE</b>		17
Carbonyldiamide solution	<b>UREA SOLUTION</b>	17
Carbonyldiamine solution	<b>UREA SOLUTION</b>	17
Carboxyethyliminobis(ethylenenitrilo)tetraacetic acid, pentasodium salt solution	<b>DIETHYLENETRIAMINEPENTAACETIC ACID, PENTASODIUM SALT SOLUTION</b>	17
<b>CASHEW NUT SHELL OIL (UNTREATED)</b>		17
<b>CASTOR OIL</b>		17
Caustic potash solution	<b>POTASSIUM HYDROXIDE SOLUTION (*)</b>	17
Caustic soda	<b>SODIUM HYDROXIDE SOLUTION (*)</b>	17
Caustic soda solution	<b>SODIUM HYDROXIDE SOLUTION (*)</b>	17
Cellosolve acetate	<b>2-ETHOXYETHYL ACETATE</b>	17
Cesium formate solution	<b>CESIUM FORMATE SOLUTION (*)</b>	17

Index Name	Product Name	Chapter
<b>CESIUM FORMATE SOLUTION (*)</b>		17
<b>CETYL/EICOSYL METHACRYLATE MIXTURE</b>		17
Cetyl / stearyl alcohol (a)	<b>ALCOHOLS (C13+)</b>	17
China clay	<b>KAOLIN SLURRY</b>	18
<b>CHLORINATED PARAFFINS (C10-C13)</b>		17
<b>CHLORINATED PARAFFINS (C14-C17) (WITH 50% CHLORINE OR MORE, AND LESS THAN 1% C13 OR SHORTER CHAINS)</b>		17
<b>CHLOROACETIC ACID (80% OR LESS)</b>		17
alpha-Chloroallyl chloride	<b>1,3-DICHLOROPROPENE</b>	17
Chloroallylene	<b>ALLYL CHLORIDE</b>	17
<b>CHLOROBENZENE</b>		17
Chlorobenzol	<b>CHLOROBENZENE</b>	17
Chlorobromomethane	<b>BROMOCHLOROMETHANE</b>	17
1-Chloro-2-(beta-chloroethoxy)ethane	<b>DICHLOROETHYL ETHER</b>	17
1-Chloro-2,3-epoxypropane	<b>EPICHLOROHYDRIN</b>	17
2-Chloroethanol	<b>ETHYLENE CHLOROHYDRIN</b>	17
2-Chloro-N-ethoxymethyl-6'-ethylacet-o-toluidide	<b>ACETOCHLOR</b>	17
2-Chloro-N-(ethoxymethyl)-N-(2-ethyl-6-methylphenyl)acetamide	<b>ACETOCHLOR</b>	17
2-Chloroethyl alcohol	<b>ETHYLENE CHLOROHYDRIN</b>	17
beta-Chloroethyl alcohol	<b>ETHYLENE CHLOROHYDRIN</b>	17
Chloroethyl ether	<b>DICHLOROETHYL ETHER</b>	17
2-Chloro-6'-ethyl-N-(2-methoxy-1-methylethyl)acet-o-toluidide	<b>N-(2-METHOXY-1-METHYL ETHYL)-2-ETHYL-6-METHYL CHLOROACETANILIDE</b>	17
2-Chloro-N-(2-ethyl-6-methylphenyl)-N-(2-methoxy-1-methylethyl)acetamide	<b>N-(2-METHOXY-1-METHYL ETHYL)-2-ETHYL-6-METHYL CHLOROACETANILIDE</b>	17
<b>CHLOROFORM</b>		17
<b>CHLOROHYDRINS (CRUDE)</b>		17
m-Chloromethylbenzene	<b>M-CHLOROTOLUENE</b>	17
o-Chloromethylbenzene	<b>O-CHLOROTOLUENE</b>	17
p-Chloromethylbenzene	<b>P-CHLOROTOLUENE</b>	17
(Chloromethyl)ethylene oxide	<b>EPICHLOROHYDRIN</b>	17
(2-Chloro-1-methylethyl) ether	<b>2,2'-DICHLOROISOPROPYL ETHER</b>	17
2-Chloro-1-methylethyl ether	<b>2,2'-DICHLOROISOPROPYL ETHER</b>	17
Chloromethyloxirane	<b>EPICHLOROHYDRIN</b>	17
<b>4-CHLORO-2-METHYLPHENOXYACETIC ACID, DIMETHYLAMINE SALT SOLUTION</b>		17
1-Chloro-2-nitrobenzene	<b>O-CHLORONITROBENZENE</b>	17
<b>O-CHLORONITROBENZENE</b>		17
<b>1-(4-CHLOROPHENYL)-4,4- DIMETHYL-PENTAN-3-ONE</b>		17
2- or 3- Chloropropanoic acid	<b>2- OR 3-CHLOROPROPIONIC ACID</b>	17
3-Chloropropene	<b>ALLYL CHLORIDE</b>	17
<b>2- OR 3-CHLOROPROPIONIC ACID</b>		17
alpha- or beta- Chloropropionic acid	<b>2- OR 3-CHLOROPROPIONIC ACID</b>	17
3-Chloropropylene	<b>ALLYL CHLORIDE</b>	17
alpha-Chloropropylene	<b>ALLYL CHLORIDE</b>	17
Chloropropylene oxide	<b>EPICHLOROHYDRIN</b>	17

<b>Index Name</b>	<b>Product Name</b>	<b>Chapter</b>
<b>CHLOROSULPHONIC ACID</b>		17
Chlorosulphuric acid	<b>CHLOROSULPHONIC ACID</b>	17
3-Chlorotoluene	<b>M-CHLOROTOLUENE</b>	17
4-Chlorotoluene	<b>P-CHLOROTOLUENE</b>	17
alpha-Chlorotoluene	<b>BENZYL CHLORIDE</b>	17
<b>M-CHLOROTOLUENE</b>		17
<b>O-CHLOROTOLUENE</b>		17
<b>P-CHLOROTOLUENE</b>		17
<b>CHLOROTOLUENES (MIXED ISOMERS)</b>		17
<b>CHOLINE CHLORIDE SOLUTIONS</b>		17
Cinene	<b>DIPENTENE</b>	17
Cinnamene	<b>STYRENE MONOMER</b>	17
Cinnamol	<b>STYRENE MONOMER</b>	17
cis-Butenedioic anhydride	<b>MALEIC ANHYDRIDE</b>	17
cis-9-Octadecenoic acid	<b>OLEIC ACID</b>	17
<b>CITRIC ACID (70% OR LESS)</b>		17
<b>CLAY SLURRY</b>		18
<b>COAL SLURRY</b>		18
<b>COAL TAR</b>		17
Coal tar distillate	<b>COAL TAR NAPHTHA SOLVENT</b>	17
<b>COAL TAR NAPHTHA SOLVENT</b>		17
<b>COAL TAR PITCH (MOLTEN) (*)</b>		17
<b>COCOA BUTTER</b>		17
<b>COCONUT OIL</b>		17
<b>COCONUT OIL FATTY ACID</b>		17
<b>COCONUT OIL FATTY ACID METHYL ESTER</b>		17
Colamine	<b>ETHANOLAMINE</b>	17
Cold pressed grape seed oil	<b>GRAPE SEED OIL</b>	17
Cologne spirits	<b>ETHYL ALCOHOL</b>	18
Colonial spirit	<b>METHYL ALCOHOL (*)</b>	17
Colophony	<b>ROSIN</b>	17
Columbian spirit	<b>METHYL ALCOHOL (*)</b>	17
Columbian spirits	<b>METHYL ALCOHOL (*)</b>	17
<b>COPPER SALT OF LONG CHAIN (C17+) ALKANOIC ACID</b>		17
<b>CORN OIL</b>		17
<b>COTTON SEED OIL</b>		17
<b>CREOSOTE (COAL TAR)</b>		17
<b>CRESOL/PHENOL/XYLENOL MIXTURE</b>		17
<b>CRESOLS (ALL ISOMERS)</b>		17
<b>CRESYLIC ACID, DEPHENOLIZED</b>		17
Cresylic acids	<b>CRESOLS (ALL ISOMERS)</b>	17
<b>CRESYLIC ACID, SODIUM SALT SOLUTION</b>		17
Cresylols	<b>CRESOLS (ALL ISOMERS)</b>	17

<b>Index Name</b>	<b>Product Name</b>	<b>Chapter</b>
<b>CROTONALDEHYDE</b>		17
Crotonic aldehyde	<b>CROTONALDEHYDE</b>	17
Crude grape seed oil	<b>GRAPE SEED OIL</b>	17
CTMP (Chemi Thermo Mechanical Pulp) concentrate	<b>WOOD LIGNIN WITH SODIUM ACETATE/OXALATE</b>	17
Cumene (a)	<b>PROPYLBENZENE (ALL ISOMERS)</b>	17
Cumol (a)	<b>PROPYLBENZENE (ALL ISOMERS)</b>	17
Cyanoethylene	<b>ACRYLONITRILE</b>	17
2-Cyanopropan-2-ol	<b>ACETONE CYANOHYDRIN</b>	17
2-Cyano-2-propanol	<b>ACETONE CYANOHYDRIN</b>	17
2-cyanopropene-1	<b>METHACRYLONITRILE</b>	17
Cyclic propylene carbonate	<b>PROPYLENE CARBONATE</b>	17
<b>1,5,9-CYCLODODECATRIENE</b>		17
<b>CYCLOHEPTANE</b>		17
Cyclohexamethylenimine	<b>HEXAMETHYLENEIMINE</b>	17
<b>CYCLOHEXANE</b>		17
<b>CYCLOHEXANE-1,2-DICARBOXYLIC ACID, DIISONONYL ESTER</b>		17
Cyclohexane 1,2-Di-Isononyldicarboxylate	<b>CYCLOHEXANE-1,2-DICARBOXYLIC ACID, DIISONONYL ESTER</b>	17
<b>CYCLOHEXANE OXIDATION PRODUCTS, SODIUM SALTS SOLUTION</b>		17
Cyclohexane, oxidized, aqueous extraction, sodium salt	<b>CYCLOHEXANE OXIDATION PRODUCTS, SODIUM SALTS SOLUTION</b>	17
<b>CYCLOHEXANOL</b>		17
<b>CYCLOHEXANONE</b>		17
<b>CYCLOHEXANONE, CYCLOHEXANOL MIXTURE</b>		17
Cyclohexatriene	<b>BENZENE AND MIXTURES HAVING 10% BENZENE OR MORE (I)</b>	17
<b>CYCLOHEXYL ACETATE</b>		17
<b>CYCLOHEXYLAMINE</b>		17
Cyclohexyldimethylamine	<b>N,N-DIMETHYLCYCLOHEXYLAMINE</b>	17
Cyclohexyl(ethyl)amine	<b>N-ETHYLCYCLOHEXYLAMINE</b>	17
Cyclohexyl(ethyl)amine	<b>N-ETHYLCYCLOHEXYLAMINE</b>	17
Cyclohexyl ketone	<b>CYCLOHEXANONE</b>	17
Cyclohexylmethane	<b>METHYLCYCLOHEXANE</b>	17
<b>1,3-CYCLOPENTADIENE DIMER (MOLTEN)</b>		17
<b>CYCLOPENTANE</b>		17
<b>CYCLOPENTENE</b>		17
Cyclotetramethylene oxide	<b>TETRAHYDROFURAN</b>	17
<b>P-CYMENE</b>		17
Cymol	<b>P-CYMENE</b>	17
Dalapon (ISO)	<b>2,2-DICHLOROPROPIONIC ACID</b>	17
DCCP	<b>DICYCLOPENTADIENE, RESIN GRADE, 81-89%</b>	17
Deanol	<b>DIMETHYLETHANOLAMINE</b>	17
<b>DECAHYDRONAPHTHALENE</b>		17
<b>DECANOIC ACID</b>		17

<b>Index Name</b>	<b>Product Name</b>	<b>Chapter</b>
Decan-1-ol	DECYL ALCOHOL (ALL ISOMERS)	17
n-Decanol	DECYL ALCOHOL (ALL ISOMERS)	17
Decanoic acid	DECANOIC ACID	17
<b>DECENE</b>		17
Decoic acid	DECANOIC ACID	17
<b>DECYL ACRYLATE</b>		17
Decyl alcohol	DECYL ALCOHOL (ALL ISOMERS)	17
<b>DECYL ALCOHOL (ALL ISOMERS)</b>		17
Decylbenzene (a)	ALKYL(C9+)BENZENES	17
<b>DECYL/DODECYL/TETRADECYL ALCOHOL MIXTURE</b>		17
Decylic acid	DECANOIC ACID	17
Decyl octyl adipate	OCTYL DECYL ADIPATE	17
<b>DECYLOXYTETRAHYDROTHIOPHENE DIOXIDE</b>		17
Degummed grape seed oil	GRAPE SEED OIL	17
1-Deoxy-1-methylamino-D-glucitol solution (70% or less)	N-METHYLGLUCAMINE SOLUTION (70% OR LESS)	17
Detergent alkylate	ALKYL(C9+)BENZENES	17
Diacetic ester	ETHYL ACETOACETATE	17
Diacetone	DIACETONE ALCOHOL	17
<b>DIACETONE ALCOHOL</b>		17
Di[alkyl/alkenyl(C10-C20)] hydrogen phosphite (a)	ALKYL (C10-C20, SATURATED AND UNSATURATED) PHOSPHITE	17
<b>DIALKYL (C8-C9) DIPHENYLAMINES</b>		17
<b>DIALKYL (C7-C13) PHTHALATES</b>		17
<b>DIALKYL (C9 - C10) PHTHALATES</b>		17
<b>DIALKYL THIOPHOSPHATES SODIUM SALTS SOLUTION</b>		17
1,2-Diaminoethane	ETHYLENEDIAMINE	17
1,6-Diaminohexane	HEXAMETHYLENEDIAMINE (MOLTEN)	17
1,6-Diaminohexane solutions	HEXAMETHYLENEDIAMINE SOLUTION	17
2,6-Diaminohexanoic acid	L-LYSINE SOLUTION (60% OR LESS)	17
<b>2,6-DIAMINOHEXANOIC ACID PHOSPHONATE MIXED SALTS SOLUTION</b>		17
Diaminotoluene (a)	TOLUENEDIAMINE	17
2,4-Diaminotoluene (a)	TOLUENEDIAMINE	17
2,6-Diaminotoluene (a)	TOLUENEDIAMINE	17
3,6-Diazaoctane-1,8-diamine	TRIETHYLENETETRAMINE	17
1,2-Dibromoethane	ETHYLENE DIBROMIDE	17
<b>DIBROMOMETHANE</b>		17
2,2'-Dibutoxyethyl ether	DIETHYLENE GLYCOL DIBUTYL ETHER	17
<b>DIBUTYLAMINE</b>		17
Dibutylbenzene-1,2-dicarboxylate	DIBUTYL PHTHALATE	17
Dibutyl carbinol (a)	NONYL ALCOHOL (ALL ISOMERS)	17
Dibutyl ether	N-BUTYL ETHER	17
n-Dibutyl ether	N-BUTYL ETHER	17
Dibutyl hydrogen phosphite	DIBUTYL HYDROGEN PHOSPHONATE	17
<b>DIBUTYL HYDROGEN PHOSPHONATE</b>		17

Index Name	Product Name	Chapter
<b>2,6-DI-TERT-BUTYLPHENOL</b>		17
Dibutyl phosphonate	<b>DIBUTYL HYDROGEN PHOSPHONATE</b>	17
<b>DIBUTYL PHTHALATE</b>		17
Dibutyl ortho-phthalate	<b>DIBUTYL PHTHALATE</b>	17
<b>DIBUTYL TEREPHTHALATE</b>		17
<b>DICHLOROBENZENE (ALL ISOMERS)</b>		17
1,2-Dichlorobenzene (a)	<b>DICHLOROBENZENE (ALL ISOMERS)</b>	17
m-Dichlorobenzene (a)	<b>DICHLOROBENZENE (ALL ISOMERS)</b>	17
o-Dichlorobenzene (a)	<b>DICHLOROBENZENE (ALL ISOMERS)</b>	17
3,4-Dichlorobut-1-ene	<b>3,4-DICHLORO-1-BUTENE</b>	17
<b>3,4-DICHLORO-1-BUTENE</b>		17
2,2'-Dichlorodiethyl ether	<b>DICHLOROETHYL ETHER</b>	17
Dichlorodiisopropyl ether	<b>2,2'-DICHLOROISOPROPYL ETHER</b>	17
<b>1,1-DICHLOROETHANE</b>		17
1,2-Dichloroethane	<b>ETHYLENE DICHLORIDE</b>	17
1,1-Dichloroethene	<b>VINYLDENE CHLORIDE</b>	17
Dichloroether	<b>DICHLOROETHYL ETHER</b>	17
1,1-Dichloroethylene	<b>VINYLDENE CHLORIDE</b>	17
<b>DICHLOROETHYL ETHER</b>		17
2,2'-Dichloroethyl ether	<b>DICHLOROETHYL ETHER</b>	17
Dichloroethyl oxide	<b>DICHLOROETHYL ETHER</b>	17
<b>1,6-DICHLOROHEXANE</b>		17
<b>2,2'-DICHLOROISOPROPYL ETHER</b>		17
<b>DICHLOROMETHANE</b>		17
<b>2,4-DICHLOROPHENOL</b>		17
<b>2,4-DICHLOROPHENOXYACETIC ACID, DIETHANOLAMINE SALT SOLUTION</b>		17
<b>2,4-DICHLOROPHENOXYACETIC ACID, DIMETHYLAMINE SALT SOLUTION (70% OR LESS)</b>		17
<b>2,4-DICHLOROPHENOXYACETIC ACID, TRIISOPROPANOLAMINE SALT SOLUTION</b>		17
<b>1,1-DICHLOROPROPANE</b>		17
<b>1,2-DICHLOROPROPANE</b>		17
Dichloropropane / dichloropropene mixtures	<b>DICHLOROPROPENE/DICHLOROPROPANE MIXTURES</b>	17
2,2-Dichloropropanoic acid	<b>2,2-DICHLOROPROPIONIC ACID</b>	17
<b>1,3-DICHLOROPROPENE</b>		17
<b>DICHLOROPROPENE/DICHLOROPROPANE MIXTURES</b>		17
<b>2,2-DICHLOROPROPIONIC ACID</b>		17
Dichloropropylene	<b>1,3-DICHLOROPROPENE</b>	17
1,4-Dicyanobutane	<b>ADIPONITRILE</b>	17
Dicyclopentadiene	<b>1,3-CYCLOPENTADIENE DIMER (MOLTEN)</b>	17
<b>DICYCLOPENTADIENE, RESIN GRADE, 81-89%</b>		17
Didecyl phthalate (a)	<b>DIALKYL (C7-C13) PHTHALATES</b>	17
Didodecyl phthalate (a)	<b>DIALKYL (C7-C13) PHTHALATES</b>	17
<b>DIETHANOLAMINE</b>		17

<b>Index Name</b>	<b>Product Name</b>	<b>Chapter</b>
<b>DIETHYLAMINE</b>		17
<b>DIETHYLAMINOETHANOL</b>		17
2-Diethylaminoethanol	<b>DIETHYLAMINOETHANOL</b>	17
<b>2,6-DIETHYLANILINE</b>		17
<b>DIETHYLBENZENE</b>		17
Diethyl 'carbitol'	<b>DIETHYLENE GLYCOL DIETHYL ETHER</b>	17
Diethylene dioxide	<b>1,4-DIOXANE</b>	17
1,4-Diethylene dioxide	<b>1,4-DIOXANE</b>	17
Diethylene ether	<b>1,4-DIOXANE</b>	17
<b>DIETHYLENE GLYCOL</b>		17
Diethylene glycol butyl ether (a)	<b>POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER</b>	17
Diethylene glycol butyl ether acetate (a)	<b>POLY(2-8)ALKYLENE GLYCOL MONOALKYL (C1-C6) ETHER ACETATE</b>	17
<b>DIETHYLENE GLYCOL DIBUTYL ETHER</b>		17
<b>DIETHYLENE GLYCOL DIETHYL ETHER</b>		17
Diethylene glycol ethyl ether (a)	<b>POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER</b>	17
Diethylene glycol ethyl ether acetate (a)	<b>POLY(2-8)ALKYLENE GLYCOL MONOALKYL (C1-C6) ETHER ACETATE</b>	17
Diethylene glycol methyl ether (a)	<b>POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER</b>	17
Diethylene glycol methyl ether acetate (a)	<b>POLY(2-8)ALKYLENE GLYCOL MONOALKYL (C1-C6) ETHER ACETATE</b>	17
Diethylene glycol monobutyl ether (a)	<b>POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER</b>	17
Diethylene glycol monobutyl ether acetate (a)	<b>POLY(2-8)ALKYLENE GLYCOL MONOALKYL (C1-C6) ETHER ACETATE</b>	17
Diethylene glycol monoethyl ether (a)	<b>POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER</b>	17
Diethylene glycol monoethyl ether acetate (a)	<b>POLY(2-8)ALKYLENE GLYCOL MONOALKYL (C1-C6) ETHER ACETATE</b>	17
Diethylene glycol monomethyl ether (a)	<b>POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER</b>	17
Diethylene glycol monomethyl ether acetate (a)	<b>POLY(2-8)ALKYLENE GLYCOL MONOALKYL (C1-C6) ETHER ACETATE</b>	17
<b>DIETHYLENE GLYCOL PHTHALATE</b>		17
<b>DIETHYLENETRIAMINE</b>		17
<b>DIETHYLENETRIAMINEPENTAACETIC ACID, PENTASODIUM SALT SOLUTION</b>		17
N,N-Diethylethanamine	<b>TRIETHYLAMINE</b>	17
N,N-Diethylethanolamine	<b>DIETHYLAMINOETHANOL</b>	17
<b>DIETHYL ETHER (*)</b>		17
<b>DI-(2-ETHYLHEXYL) ADIPATE</b>		17
<b>DI-(2-ETHYLHEXYL) PHOSPHORIC ACID</b>		17
Di (2-ethylhexyl) Terephthalate	<b>BIS(2-ETHYLHEXYL) TEREPHTHALATE</b>	17
Diethyl oxide	<b>DIETHYL ETHER (*)</b>	17
<b>DIETHYL PHTHALATE</b>		17
<b>DIETHYL SULPHATE</b>		17
Diformyl	<b>GLYOXAL SOLUTION (40% OR LESS)</b>	17



<b>Index Name</b>	<b>Product Name</b>	<b>Chapter</b>
<b>DIGLYCIDYL ETHER OF BISPHENOL A</b>		17
<b>DIGLYCIDYL ETHER OF BISPHENOL F</b>		17
Diglycol	<b>DIETHYLENE GLYCOL</b>	17
Diglycolamine	<b>2-(2-AMINOETHOXY) ETHANOL</b>	17
Diglycol phthalate	<b>DIETHYLENE GLYCOL PHTHALATE</b>	17
<b>DIHEPTYL PHTHALATE</b>		17
<b>DI-N-HEXYL ADIPATE</b>		17
<b>DIHEXYL PHTHALATE</b>		17
1,3-Dihydroisobenzofuran-1,3-dione (molten)	<b>PHTHALIC ANHYDRIDE (MOLTEN)</b>	17
2,3-Dihydroxybutane (a)	<b>BUTYLENE GLYCOL</b>	17
2,2'-Dihydroxydiethylamine	<b>DIETHANOLAMINE</b>	17
Di-(2-hydroxyethyl)amine	<b>DIETHANOLAMINE</b>	17
Dihydroxyethyl ether	<b>DIETHYLENE GLYCOL</b>	17
1,6-Dihydroxyhexane	<b>HEXAMETHYLENE GLYCOL</b>	17
1,2-Dihydroxypropane	<b>PROPYLENE GLYCOL</b>	18
Diisobutene	<b>DIISOBUTYLENE</b>	17
<b>DIISOBUTYLAMINE</b>		17
Diisobutylcarbinol (a)	<b>NONYL ALCOHOL (ALL ISOMERS)</b>	17
<b>DIISOBUTYLENE</b>		17
alpha-Diisobutylene (a)	<b>DIISOBUTYLENE</b>	17
beta-Diisobutylene (a)	<b>DIISOBUTYLENE</b>	17
<b>DIISOBUTYL KETONE</b>		17
<b>DIISOBUTYL PHTHALATE</b>		17
2,4-diisocyanato-1-methylbenzene	<b>TOLUENE DIISOCYANATE</b>	17
2,4-Diisocyanatotoluene	<b>TOLUENE DIISOCYANATE</b>	17
Diisodecyl phthalate (a)	<b>DIALKYL (C7-C13) PHTHALATES</b>	17
<b>DIISONONYL ADIPATE</b>		17
Diisononyl phthalate (a)	<b>DIALKYL (C7-C13) PHTHALATES</b>	17
<b>DIISOCTYL PHTHALATE</b>		17
<b>DIISOPROPANOLAMINE</b>		17
<b>DIISOPROPYLAMINE</b>		17
<b>DIISOPROPYLBENZENE (ALL ISOMERS)</b>		17
Diisopropyl ether	<b>ISOPROPYL ETHER</b>	17
<b>DIISOPROPYLNAPHTHALENE</b>		17
Diisopropyl oxide	<b>ISOPROPYL ETHER</b>	17
<b>N,N-DIMETHYLACETAMIDE</b>		17
<b>N,N-DIMETHYLACETAMIDE SOLUTION (40% OR LESS)</b>		17
Dimethylacetylene carbinol	<b>2-METHYL-2-HYDROXY-3-BUTYNE</b>	17
<b>DIMETHYL ADIPATE</b>		17
<b>DIMETHYLAMINE SOLUTION (45% OR LESS)</b>		17
<b>DIMETHYLAMINE SOLUTION (GREATER THAN 45% BUT NOT GREATER THAN 55%)</b>		17
<b>DIMETHYLAMINE SOLUTION (GREATER THAN 55% BUT NOT GREATER THAN 65%)</b>		17
Dimethylaminoethanol	<b>DIMETHYLETHANOLAMINE</b>	17

<b>Index Name</b>	<b>Product Name</b>	<b>Chapter</b>
2-(Dimethylamino)ethanol	<b>DIMETHYLETHANOLAMINE</b>	17
Dimethylbenzenes	<b>XYLENES</b>	17
1,3-Dimethylbutanol	<b>METHYLAMYL ALCOHOL</b>	17
1,3-Dimethylbutan-1-ol	<b>METHYLAMYL ALCOHOL</b>	17
1,3-Dimethylbutyl acetate (a)	<b>METHYLAMYL ACETATE</b>	17
Dimethylcarbinol	<b>ISOPROPYL ALCOHOL</b>	18
<b>N,N-DIMETHYLCYCLOHEXYLAMINE</b>		17
<b>DIMETHYL DISULPHIDE</b>		17
N,N-Dimethyldodecanamine	<b>N,N-DIMETHYLDODECYLAMINE</b>	17
N,N-Dimethyldodecan-1-amine	<b>N,N-DIMETHYLDODECYLAMINE</b>	17
<b>N,N-DIMETHYLDODECYLAMINE</b>		17
1,1-Dimethylethanol	<b>TERT-BUTYL ALCOHOL</b>	17
<b>DIMETHYLETHANOLAMINE</b>		17
1,1-Dimethylethyl alcohol	<b>TERT-BUTYL ALCOHOL</b>	17
Dimethyl ethyl carbinol	<b>TERT-AMYL ALCOHOL</b>	17
1,1-dimethylethyl methyl ether	<b>METHYL TERT-BUTYL ETHER</b>	17
Dimethylformaldehyde	<b>ACETONE</b>	18
<b>DIMETHYLFORMAMIDE</b>		17
<b>DIMETHYL GLUTARATE</b>		17
2,6-Dimethyl-4-heptanone	<b>DIISOBUTYL KETONE</b>	17
2,6-Dimethylheptan-4-one	<b>DIISOBUTYL KETONE</b>	17
N,N-Dimethylhexanamine (a)	<b>ALKYL (C12+) DIMETHYLAMINE</b>	17
<b>DIMETHYL HYDROGEN PHOSPHITE</b>		17
Dimethylhydroxybenzenes (all isomers)	<b>XYLENOL</b>	17
1,1'-Dimethyl-2,2'-iminodiethanol	<b>DIISOPROPANOLAMINE</b>	17
Dimethyl ketal	<b>ACETONE</b>	18
Dimethyl ketone	<b>ACETONE</b>	18
N,N-dimethylaurylamine	<b>N,N-DIMETHYLDODECYLAMINE</b>	17
N,N-Dimethylmethanamine solution (30% or less)	<b>TRIMETHYLAMINE SOLUTION (30% OR LESS)</b>	17
6,6-Dimethyl-2-methylenebicyclo[3.1.1]heptane	<b>BETA-PINENE</b>	17
<b>DIMETHYL OCTANOIC ACID</b>		17
2,2-Dimethyloctanoic acid (a)	<b>NEODECANOIC ACID</b>	17
2,3-Dimethylphenol (a)	<b>XYLENOL</b>	17
2,4-Dimethylphenol (a)	<b>XYLENOL</b>	17
2,5-Dimethylphenol (a)	<b>XYLENOL</b>	17
2,6-Dimethylphenol (a)	<b>XYLENOL</b>	17
3,4-Dimethylphenol (a)	<b>XYLENOL</b>	17
3,5-Dimethylphenol (a)	<b>XYLENOL</b>	17
Dimethylphenols	<b>XYLENOL</b>	17
Dimethylphenyl phosphate (3:1) (all isomers)	<b>TRIXYLYL PHOSPHATE</b>	17
<b>DIMETHYL PHTHALATE</b>		17
<b>DIMETHYLPOLYSILOXANE</b>		17
2,2-Dimethylpropane (a)	<b>PENTANE (ALL ISOMERS)</b>	17
<b>2,2-DIMETHYLPROPANE-1,3-DIOL (MOLTEN OR SOLUTION)</b>		17
2,2-Dimethylpropanoic acid	<b>TRIMETHYLACETIC ACID</b>	17

Index Name	Product Name	Chapter
1,1-Dimethylpropargyl alcohol	2-METHYL-2-HYDROXY-3-BUTYNE	17
2,2-Dimethylpropionic acid	TRIMETHYLACETIC ACID	17
1,1-Dimethylpropyl ethyl ether	TERT-AMYL ETHYL ETHER	17
1,1-Dimethylpropynol	2-METHYL-2-HYDROXY-3-BUTYNE	17
<b>DIMETHYL SUCCINATE</b>		17
N,N-Dimethyltetradecanamine (a)	ALKYL (C12+) DIMETHYLAMINE	17
Dimethyl(tetradecyl)amine (a)	ALKYL (C12+) DIMETHYLAMINE	17
3,9-Dimethyltricyclo[5.2.1.0 <sup>2,6</sup> ]deca-3,9-diene	METHYLCYCLOPENTADIENE DIMER	17
Dimethyltrimethylene glycol	2,2-DIMETHYLPROPANE-1,3-DIOL (MOLTEN OR SOLUTION)	17
<b>DINITROTOLUENE (MOLTEN)</b>		17
<b>DINONYL PHTHALATE</b>		17
Dinonyl phthalate (a)	DIALKYL (C7-C13) PHTHALATES	17
3,6-Dioxaoctane-1,8-diol	TRIETHYLENE GLYCOL	18
Diocetyl adipate	DI-(2-ETHYLHEXYL) ADIPATE	17
Diocetyl hydrogen phosphate	DI-(2-ETHYLHEXYL) PHOSPHORIC ACID	17
Diocetyl phosphoric acid	DI-(2-ETHYLHEXYL) PHOSPHORIC ACID	17
<b>DIOCTYL PHTHALATE</b>		17
Diocetyl terephthalate	BIS(2-ETHYLHEXYL) TEREPHTHALATE	17
2,4-D-diolamine	2,4-DICHLOROPHOXYACETIC ACID, DIETHANOLAMINE SALT SOLUTION	17
1,4-Dioxan	1,4-DIOXANE	17
<b>1,4-DIOXANE</b>		17
1,3-Dioxolan-2-one	ETHYLENE CARBONATE	17
Dioxolone-2	ETHYLENE CARBONATE	17
1,1-Dioxothiolan	SULPHOLANE	17
Dioxyethylene ether	1,4-DIOXANE	17
<b>DIPENTENE</b>		17
<b>DIPHENYL</b>		17
<b>DIPHENYLAMINE (MOLTEN)</b>		17
<b>DIPHENYLAMINE, REACTION PRODUCT WITH 2,2,4-TRIMETHYLPENTENE</b>		17
<b>DIPHENYLAMINES, ALKYLATED</b>		17
<b>DIPHENYL/DIPHENYL ETHER MIXTURES</b>		17
Diphenyl/diphenyl oxide mixtures	DIPHENYL/DIPHENYL ETHER MIXTURES	17
Diphenyl dodecyl ether disulphonate solution	DODECYL DIPHENYL ETHER DISULPHONATE SOLUTION	17
Diphenyl dodecyl oxide disulphonate solution	DODECYL DIPHENYL ETHER DISULPHONATE SOLUTION	17
<b>DIPHENYL ETHER</b>		17
<b>DIPHENYL ETHER/DIPHENYL PHENYL ETHER MIXTURE</b>		17
<b>DIPHENYLMETHANE DIISOCYANATE</b>		17
<b>DIPHENYLOL PROPANE-EPICHLOROHYDRIN RESINS</b>		17
Diphenyl oxide	DIPHENYL ETHER	17
Diphenyl oxide / diphenyl phenyl ether mixture	DIPHENYL ETHER/DIPHENYL PHENYL ETHER MIXTURE	17
Dipropylamine	DI-N-PROPYLAMINE	17

<b>Index Name</b>	<b>Product Name</b>	<b>Chapter</b>
n-Dipropylamine	DI-N-PROPYLAMINE	17
<b>DI-N-PROPYLAMINE</b>		17
<b>DIPROPYLENE GLYCOL</b>		17
Dipropylene glycol methyl ether (a)	POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER	17
Dipropylene glycol monomethyl ether (a)	POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER	17
Disodium carbonate solution	SODIUM CARBONATE SOLUTION (*)	17
Distillates (Petroleum), Steam Cracked, C8 - C12 Fraction (a)	RESIN OIL, DISTILLED	17
<b>DITHIOCARBAMATE ESTER (C7-C35)</b>		17
<b>DITRIDECYL ADIPATE</b>		17
<b>DITRIDECYL PHTHALATE</b>		17
<b>DIUNDECYL PHTHALATE</b>		17
dl-Lactic acid	LACTIC ACID	17
dl-p-Mentha-1,8-diene	DIPENTENE	17
1-Docosanol (a)	ALCOHOLS (C13+)	17
Docosan-1-ol (a)	ALCOHOLS (C13+)	17
<b>DODECANE (ALL ISOMERS)</b>		17
1-Dodecanethiol	N-DODECYL MERCAPTAN	17
<b>TERT-DODECANETHIOL</b>		17
Dodecanoic acid	LAURIC ACID	17
1-Dodecanol	DODECYL ALCOHOL	17
Dodecan-1-ol	DODECYL ALCOHOL	17
n-Dodecanol	DODECYL ALCOHOL	17
<b>DODECENE (ALL ISOMERS)</b>		17
<b>1-DODECENE</b>		17
Dodec-1-ene	1-DODECENE	17
<b>DODECYL ALCOHOL</b>		17
n-Dodecyl alcohol	DODECYL ALCOHOL	17
<b>DODECYLAMINE/TETRADECYLAMINE MIXTURE</b>		17
<b>DODECYLBENZENE</b>		17
Dodecylbenzenesulphonic acid (contains 1.5% sulphuric acid)	ALKYL (C11-C17) BENZENE SULPHONIC ACID	17
Dodecyldimethylamine	N,N-DIMETHYLDODECYLAMINE	17
<b>DODECYL DIPHENYL ETHER DISULPHONATE SOLUTION</b>		17
Dodecyl diphenyl oxide disulphonate solution	DODECYL DIPHENYL ETHER DISULPHONATE SOLUTION	17
Dodecylene	DODECENE (ALL ISOMERS)	17
<b>DODECYL HYDROXYPROPYL SULPHIDE</b>		17
Dodecylic acid	LAURIC ACID	17
<b>N-DODECYL MERCAPTAN</b>		17
tert-Dodecyl mercaptan	TERT-DODECANETHIOL	17
<b>DODECYL METHACRYLATE</b>		17
Dodecyl 2-methylprop-2-enoate	DODECYL METHACRYLATE	17
Dodecyl-2-methyl-2-propenoate	DODECYL METHACRYLATE	17
<b>DODECYL/OCTADECYL METHACRYLATE MIXTURE</b>		17

Index Name	Product Name	Chapter
<b>DODECYL/PENTADECYL METHACRYLATE MIXTURE</b>		17
<b>DODECYL PHENOL</b>		17
Dodecyl, Tetradecyl, hexadecyl-dimethylamine mixture	<b>ALKYL (C12+) DIMETHYLAMINE</b>	17
2-Dodecylthio-1-methylethanol	<b>DODECYL HYDROXYPROPYL SULPHIDE</b>	17
1-(Dodecylthio)propan-2-ol	<b>DODECYL HYDROXYPROPYL SULPHIDE</b>	17
<b>DODECYL XYLENE</b>		17
Drilling brine: potassium chloride solution	<b>POTASSIUM CHLORIDE SOLUTION</b>	17
<b>DRILLING BRINES (CONTAINING CALCIUM BROMIDE)</b>		17
<b>DRILLING BRINES (CONTAINING ZINC CHLORIDE)</b>		17
(E)-But-2-enal	<b>CROTONALDEHYDE</b>	17
Enanthic acid	<b>N-HEPTANOIC ACID</b>	17
Enanthylic acid	<b>N-HEPTANOIC ACID</b>	17
Engravers' acid	<b>NITRIC ACID (70% AND OVER)</b>	17
<b>EPOCHLOROHYDRIN</b>		17
1,2-Epoxybutane	<b>1,2-BUTYLENE OXIDE</b>	17
1,4-epoxybutane	<b>TETRAHYDROFURAN</b>	17
1,2-Epoxypropane	<b>PROPYLENE OXIDE</b>	17
2,3-Epoxypropyl ester of mixed C10 trialkylacetic acids	<b>GLYCIDYL ESTER OF C10 TRIALKYLACETIC ACID</b>	17
2,3-Epoxypropyl neodecanoate	<b>GLYCIDYL ESTER OF C10 TRIALKYLACETIC ACID</b>	17
EPTC	<b>S-ETHYL DIPROPYLTHIOCARBAMATE</b>	17
Essence of Mirbane	<b>NITROBENZENE</b>	17
Essence of Myrbane	<b>NITROBENZENE</b>	17
Ethanamine solutions, 72% or less	<b>ETHYLAMINE SOLUTIONS (72% OR LESS)</b>	17
Ethane carbonitrile	<b>PROPIONITRILE</b>	17
Ethanedial	<b>GLYOXAL SOLUTION (40% OR LESS)</b>	17
1,2-Ethanedial	<b>ETHYLENE GLYCOL</b>	17
Ethanoic acid	<b>ACETIC ACID</b>	17
Ethanoic anhydride	<b>ACETIC ANHYDRIDE</b>	17
Ethanol	<b>ETHYL ALCOHOL</b>	18
<b>ETHANOLAMINE</b>		17
ethenyl acetate	<b>VINYL ACETATE</b>	17
ethenyl ethanoate	<b>VINYL ACETATE</b>	17
Ether	<b>DIETHYL ETHER (*)</b>	17
Ethynyl trichloride	<b>TRICHLOROETHYLENE</b>	17
2-Ethoxyethanol (a)	<b>ETHYLENE GLYCOL MONOALKYL ETHERS</b>	17
2-(2-Ethoxyethoxy)ethanol (a)	<b>POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER</b>	17
2-(2-Ethoxyethoxy)ethyl acetate (a)	<b>POLY(2-8)ALKYLENE GLYCOL MONOALKYL (C1-C6) ETHER ACETATE</b>	17
<b>2-ETHOXYETHYL ACETATE</b>		17
<b>ETHOXYLATED LONG CHAIN (C16+) ALKYL OXYALKYLAMINE</b>		17
<b>ETHOXYLATED TALLOW AMINE (&gt; 95%)</b>		17
2-Ethoxy-2-methylpropane	<b>ETHYL TERT-BUTYL ETHER</b>	17
1-Ethoxypropan-2-ol (a)	<b>PROPYLENE GLYCOL MONOALKYL ETHER</b>	17
<b>ETHYL ACETATE</b>		17

<b>Index Name</b>	<b>Product Name</b>	<b>Chapter</b>
<b>ETHYL ACETOACETATE</b>		17
Ethyl acetone	<b>METHYL PROPYL KETONE</b>	17
<b>ETHYL ACRYLATE</b>		17
<b>ETHYL ALCOHOL</b>		18
<b>ETHYLAMINE (*)</b>		17
<b>ETHYLAMINE SOLUTIONS (72% OR LESS)</b>		17
Ethylaminocyclohexane	<b>N-ETHYLCYCLOHEXYLAMINE</b>	17
<b>ETHYL AMYL KETONE</b>		17
<b>ETHYLBENZENE</b>		17
Ethyl benzol	<b>ETHYLBENZENE</b>	17
Ethyl butanoate	<b>ETHYL BUTYRATE</b>	17
<b>ETHYL TERT-BUTYL ETHER</b>		17
<b>ETHYL BUTYRATE</b>		17
2-Ethylcaproic acid	<b>2-ETHYLHEXANOIC ACID</b>	17
Ethyl carbinol	<b>N-PROPYL ALCOHOL</b>	17
Ethyl cyanide	<b>PROPIONITRILE</b>	17
<b>ETHYLCYCLOHEXANE</b>		17
<b>N-ETHYLCYCLOHEXYLAMINE</b>		17
Ethyldimethylmethane (a)	<b>PENTANE (ALL ISOMERS)</b>	17
S-Ethyl dipropylcarbamoithioate	<b>S-ETHYL DIPROPYLTHIOCARBAMATE</b>	17
<b>S-ETHYL DIPROPYLTHIOCARBAMATE</b>		17
Ethylene alcohol	<b>ETHYLENE GLYCOL</b>	17
Ethylene bis(iminodiacetic acid) tetrasodium salt solution	<b>ETHYLENEDIAMINETETRAACETIC ACID, TETRASODIUM SALT SOLUTION</b>	17
Ethylene bromide	<b>ETHYLENE DIBROMIDE</b>	17
<b>ETHYLENE CARBONATE</b>		17
Ethylenecarboxylic acid	<b>ACRYLIC ACID</b>	17
Ethylene chloride	<b>ETHYLENE DICHLORIDE</b>	17
<b>ETHYLENE CHLOROHYDRIN</b>		17
<b>ETHYLENE CYANOHYDRIN</b>		17
Ethylene diacetate	<b>ETHYLENE GLYCOL DIACETATE</b>	17
<b>ETHYLENEDIAMINE</b>		17
<b>ETHYLENEDIAMINETETRAACETIC ACID, TETRASODIUM SALT SOLUTION</b>		17
<b>ETHYLENE DIBROMIDE</b>		17
<b>ETHYLENE DICHLORIDE</b>		17
Ethylenedinitrotetraacetic acid tetrasodium salt solution	<b>ETHYLENEDIAMINETETRAACETIC ACID, TETRASODIUM SALT SOLUTION</b>	17
2,2'-Ethylenedioxydiethanol	<b>TRIETHYLENE GLYCOL</b>	18
<b>ETHYLENE GLYCOL</b>		17
<b>ETHYLENE GLYCOL ACETATE</b>		17
Ethylene glycol acrylate	<b>2-HYDROXYETHYL ACRYLATE</b>	17
Ethylene glycol butyl ether (a)	<b>ETHYLENE GLYCOL MONOALKYL ETHERS</b>	17
<b>ETHYLENE GLYCOL BUTYL ETHER ACETATE</b>		17

Index Name	Product Name	Chapter
Ethylene glycol n-butyl ether (58%)/ Hyperbranched polyesteramide (42%)	<b>2-BUTOXYETHANOL (58%)/HYPERBRANCHED POLYESTERAMIDE (42%) (MIXTURE)</b>	17
Ethylene glycol tert-butyl ether (a)	<b>ETHYLENE GLYCOL MONOALKYL ETHERS</b>	17
<b>ETHYLENE GLYCOL DIACETATE</b>		17
Ethylene glycol ethyl ether (a)	<b>ETHYLENE GLYCOL MONOALKYL ETHERS</b>	17
Ethylene glycol ethyl ether acetate	<b>2-ETHOXYETHYL ACETATE</b>	17
Ethylene glycol isopropyl ether (a)	<b>ETHYLENE GLYCOL MONOALKYL ETHERS</b>	17
Ethylene glycol methyl ether (a)	<b>ETHYLENE GLYCOL MONOALKYL ETHERS</b>	17
<b>ETHYLENE GLYCOL METHYL ETHER ACETATE</b>		17
<b>ETHYLENE GLYCOL MONOALKYL ETHERS</b>		17
Ethylene glycol monoalkyl ethers (58%)/ Hyperbranched polyesteramide (42%)	<b>2-BUTOXYETHANOL (58%)/HYPERBRANCHED POLYESTERAMIDE (42%) (MIXTURE)</b>	17
Ethylene glycol monobutyl ether (a)	<b>ETHYLENE GLYCOL MONOALKYL ETHERS</b>	17
Ethylene glycol monobutyl ether (58%)/ Hyperbranched polyesteramide (42%)	<b>2-BUTOXYETHANOL (58%)/HYPERBRANCHED POLYESTERAMIDE (42%) (MIXTURE)</b>	17
Ethylene glycol mono-tert-butyl ether (a)	<b>ETHYLENE GLYCOL MONOALKYL ETHERS</b>	17
Ethylene glycol monoethyl ether (a)	<b>ETHYLENE GLYCOL MONOALKYL ETHERS</b>	17
Ethylene glycol monoethyl ether acetate	<b>2-ETHOXYETHYL ACETATE</b>	17
Ethylene glycol monomethyl ether (a)	<b>ETHYLENE GLYCOL MONOALKYL ETHERS</b>	17
Ethylene glycol monomethyl ether acetate	<b>ETHYLENE GLYCOL METHYL ETHER ACETATE</b>	17
Ethylene glycol monophenyl ether	<b>ETHYLENE GLYCOL PHENYL ETHER</b>	17
<b>ETHYLENE GLYCOL PHENYL ETHER</b>		17
<b>ETHYLENE GLYCOL PHENYL ETHER/DIETHYLENE GLYCOL PHENYL ETHER MIXTURE</b>		17
<b>ETHYLENE GLYCOL (&gt;75%)/SODIUM ALKYL CARBOXYLATES/BORAX MIXTURE</b>		17
<b>ETHYLENE GLYCOL (&gt;85%)/SODIUM ALKYL CARBOXYLATES MIXTURE</b>		17
<b>ETHYLENE OXIDE/PROPYLENE OXIDE MIXTURE WITH AN ETHYLENE OXIDE CONTENT OF NOT MORE THAN 30% BY MASS</b>		17
Ethylene tetrachloride	<b>PERCHLOROETHYLENE</b>	17
Ethylene trichloride	<b>TRICHLOROETHYLENE</b>	17
<b>ETHYLENE-VINYL ACETATE COPOLYMER (EMULSION)</b>		17
Ethyl ethanoate	<b>ETHYL ACETATE</b>	17
Ethyl ether	<b>DIETHYL ETHER (*)</b>	17
<b>ETHYL-3-ETHOXYPROPIONATE</b>		17
Ethyl fluid (a)	<b>MOTOR FUEL ANTI-KNOCK COMPOUND (CONTAINING LEAD ALKYL)</b>	17
Ethylformic acid	<b>PROPIONIC ACID</b>	17
Ethyl glycol (a)	<b>ETHYLENE GLYCOL MONOALKYL ETHERS</b>	17
2-Ethylhexaldehyde (a)	<b>OCTYL ALDEHYDES</b>	17
2-Ethylhexanal (a)	<b>OCTYL ALDEHYDES</b>	17
<b>2-ETHYLHEXANOIC ACID</b>		17
2-Ethylhexanol (a)	<b>OCTANOL (ALL ISOMERS)</b>	17
2-Ethylhexenal	<b>2-ETHYL-3-PROPYLACROLEIN</b>	17
2-Ethylhex-2-enal	<b>2-ETHYL-3-PROPYLACROLEIN</b>	17

<b>Index Name</b>	<b>Product Name</b>	<b>Chapter</b>
2-Ethylhexoic acid (a)	OCTANOIC ACID (ALL ISOMERS)	17
<b>2-ETHYLHEXYL ACRYLATE</b>		17
2-Ethylhexyl alcohol (a)	OCTANOL (ALL ISOMERS)	17
<b>2-ETHYLHEXYLAMINE</b>		17
<b>2-ETHYL-2-(HYDROXYMETHYL) PROPANE-1,3-DIOL (C8-C10) ESTER</b>		17
Ethyllic acid	ACETIC ACID	17
5-Ethylidenebicyclo(2.2.1)hept-2-ene	ETHYLIDENE NORBORNENE	17
Ethylidene chloride	1,1-DICHLOROETHANE	17
<b>ETHYLIDENE NORBORNENE</b>		17
<b>ETHYL METHACRYLATE</b>		17
<b>N-ETHYLMETHYLALLYLAMINE</b>		17
N-Ethyl-2-methylallylamine	N-ETHYLMETHYLALLYLAMINE	17
2-Ethyl-6-methylaniline	2-METHYL-6-ETHYL ANILINE	17
2-Ethyl-6-methylbenzenamine	2-METHYL-6-ETHYL ANILINE	17
1-ethyl-4-methylbenzene	ETHYL TOLUENE	17
Ethyl methyl ketone	METHYL ETHYL KETONE	17
5-Ethyl-2-methylpyridine	2-METHYL-5-ETHYL PYRIDINE	17
Ethyl oxide	DIETHYL ETHER (*)	17
Ethyl phosphate	TRIETHYL PHOSPHATE	17
Ethyl phthalate	DIETHYL PHTHALATE	17
5-Ethyl-2-picoline	2-METHYL-5-ETHYL PYRIDINE	17
Ethyl propenoate	ETHYL ACRYLATE	17
<b>ETHYL PROPIONATE</b>		17
<b>2-ETHYL-3-PROPYLACROLEIN</b>		17
Ethyl sulphate	DIETHYL SULPHATE	17
<b>ETHYL TOLUENE</b>		17
6-Ethyl-2-toluidine	2-METHYL-6-ETHYL ANILINE	17
6-Ethyl-o-toluidine	2-METHYL-6-ETHYL ANILINE	17
Ethyl vinyl ether	VINYL ETHYL ETHER	17
Extra virgin grape seed oil	GRAPE SEED OIL	17
<b>FATTY ACID (SATURATED C13+)</b>		17
<b>FATTY ACID METHYL ESTERS (M)</b>		17
<b>FATTY ACIDS, (C8-C10)</b>		17
<b>FATTY ACIDS, (C12+)</b>		17
<b>FATTY ACIDS, (C16+)</b>		17
<b>FATTY ACIDS, ESSENTIALLY LINEAR (C6-C18) 2-ETHYLHEXYL ESTER</b>		17
Feeding corn molasses (a)	MOLASSES	18
Fermentation alcohol	ETHYL ALCOHOL	18
<b>FERRIC CHLORIDE SOLUTIONS</b>		17
<b>FERRIC NITRATE/NITRIC ACID SOLUTION</b>		17
<b>FISH OIL</b>		17
<b>FISH PROTEIN CONCENTRATE (CONTAINING 4% OR LESS FORMIC ACID)</b>		17



<b>Index Name</b>	<b>Product Name</b>	<b>Chapter</b>
<b>FISH SILAGE PROTEIN CONCENTRATE (CONTAINING 4% OR LESS FORMIC ACID)</b>		17
<b>FLUOROSILICIC ACID SOLUTION (20-30%)</b>		17
<b>FORMALDEHYDE SOLUTIONS (45% OR LESS)</b>		17
Formaldehyde trimer	1,3,5-TRIOXANE	17
Formalin	FORMALDEHYDE SOLUTIONS (45% OR LESS)	17
<b>FORMAMIDE</b>		17
Formdimethylamide	DIMETHYLFORMAMIDE	17
<b>FORMIC ACID (85% OR LESS ACID)</b>		17
<b>FORMIC ACID (OVER 85%)</b>		17
<b>FORMIC ACID MIXTURE (CONTAINING UP TO 18% PROPIONIC ACID AND UP TO 25% SODIUM FORMATE)</b>		17
Formic aldehyde	FORMALDEHYDE SOLUTIONS (45% OR LESS)	17
Formylformic acid	GLYOXYLIC ACID SOLUTION (50 % OR LESS)	17
Fural	FURFURAL	17
2-Furaldehyde	FURFURAL	17
2,5-Furandione	MALEIC ANHYDRIDE	17
Furan-2,5-dione	MALEIC ANHYDRIDE	17
<b>FURFURAL</b>		17
2-Furfuraldehyde	FURFURAL	17
<b>FURFURYL ALCOHOL</b>		17
Furylcarbinol	FURFURYL ALCOHOL	17
Fused poly(2+)cyclic aromatic hydrocarbons (b)	POLY(2+)CYCLIC AROMATICS	17
Gaultheria oil	METHYL SALICYLATE	17
Glacial acetic acid	ACETIC ACID	17
<b>GLUCITOL/GLYCEROL BLEND PROPOXYLATED (CONTAINING 10% OR MORE AMINES)</b>		17
<b>GLUCITOL/GLYCEROL BLEND PROPOXYLATED (CONTAINING LESS THAN 10% AMINES)</b>		17
Glucitol solution	SORBITOL SOLUTION	18
D-Glucitol solution	SORBITOL SOLUTION	18
<b>GLUCOSE SOLUTION</b>		18
<b>GLUTARALDEHYDE SOLUTIONS (50% OR LESS)</b>		17
Glycerin	GLYCERINE	17
<b>GLYCERINE</b>		17
Glycerin triacetate	GLYCERYL TRIACETATE	17
Glyceritol	GLYCERINE	17
Glycerol	GLYCERINE	17
<b>GLYCEROL ETHOXYLATED</b>		18
<b>GLYCEROL MONOOLEATE</b>		17
Glycerol oleate	GLYCEROL MONOOLEATE	17
Glycerol 1-oleate	GLYCEROL MONOOLEATE	17
<b>GLYCEROL PROPOXYLATED</b>		17
<b>GLYCEROL, PROPOXYLATED AND ETHOXYLATED</b>		17

<b>Index Name</b>	<b>Product Name</b>	<b>Chapter</b>
<b>GLYCEROL/SUCROSE BLEND PROPOXYLATED AND ETHOXYLATED</b>		17
Glycerol triacetate	<b>GLYCERYL TRIACETATE</b>	17
<b>GLYCERYL TRIACETATE</b>		17
<b>GLYCIDYL ESTER OF C10 TRIALKYLACETIC ACID</b>		17
Glycidyl neodecanoate	<b>GLYCIDYL ESTER OF C10 TRIALKYLACETIC ACID</b>	17
<b>GLYCINE, SODIUM SALT SOLUTION</b>		17
Glycol	<b>ETHYLENE GLYCOL</b>	17
Glycol carbonate	<b>ETHYLENE CARBONATE</b>	17
Glycol chlorohydrin	<b>ETHYLENE CHLOROHYDRIN</b>	17
Glycol dichloride	<b>ETHYLENE DICHLORIDE</b>	17
<b>GLYCOLIC ACID SOLUTION (70% OR LESS)</b>		17
Glycol monobutyl ether (a)	<b>ETHYLENE GLYCOL MONOALKYL ETHERS</b>	17
Glycols, polyethylene mono(p-nonylphenyl) ether (b)	<b>ALKARYL POLYETHERS (C9-C20)</b>	17
Glycyl alcohol	<b>GLYCERINE</b>	17
Glyoxaldehyde	<b>GLYOXAL SOLUTION (40% OR LESS)</b>	17
Glyoxalic acid	<b>GLYOXYLIC ACID SOLUTION (50 % OR LESS)</b>	17
<b>GLYOXAL SOLUTION (40% OR LESS)</b>		17
<b>GLYOXYLIC ACID SOLUTION (50 % OR LESS)</b>		17
Glyphosate	<b>GLYPHOSATE SOLUTION (NOT CONTAINING SURFACTANT)</b>	17
Glyphosate-mono(isopropylammonium)	<b>GLYPHOSATE SOLUTION (NOT CONTAINING SURFACTANT)</b>	17
<b>GLYPHOSATE SOLUTION (NOT CONTAINING SURFACTANT)</b>		17
Grain alcohol	<b>ETHYL ALCOHOL</b>	18
<b>GRAPE SEED OIL</b>		17
<b>GROUNDNUT OIL</b>		17
Hemimellitene (a)	<b>TRIMETHYLBENZENE (ALL ISOMERS)</b>	17
Hendecanoic acid	<b>UNDECANOIC ACID</b>	17
1-Hendecanol	<b>UNDECYL ALCOHOL</b>	17
cyclo-Heptamethylene	<b>CYCLOHEPTANE</b>	17
<b>HEPTANE (ALL ISOMERS)</b>		17
1-Heptanecarboxylic acid (a)	<b>OCTANOIC ACID (ALL ISOMERS)</b>	17
3-Heptanecarboxylic acid (a)	<b>OCTANOIC ACID (ALL ISOMERS)</b>	17
Heptanoic acid	<b>N-HEPTANOIC ACID</b>	17
<b>N-HEPTANOIC ACID</b>		17
<b>HEPTANOL (ALL ISOMERS) (D)</b>		17
2-Heptanone	<b>METHYL AMYL KETONE</b>	17
Heptan-2-one	<b>METHYL AMYL KETONE</b>	17
<b>HEPTENE (ALL ISOMERS)</b>		17
Heptoic acid	<b>N-HEPTANOIC ACID</b>	17
<b>HEPTYL ACETATE</b>		17
Heptyl alcohol, all isomers (a)	<b>HEPTANOL (ALL ISOMERS) (D)</b>	17
Heptylcarbinol (a)	<b>OCTANOL (ALL ISOMERS)</b>	17
Heptylene, mixed isomers	<b>HEPTENE (ALL ISOMERS)</b>	17

<b>Index Name</b>	<b>Product Name</b>	<b>Chapter</b>
Heptylic acid	N-HEPTANOIC ACID	17
n-Heptylic acid	N-HEPTANOIC ACID	17
1-Hexadecene	OLEFINS (C13+, ALL ISOMERS)	17
Hexadecyl and icosyl methacrylate mixture (a)	CETYL/EICOSYL METHACRYLATE MIXTURE	17
<b>1-HEXADECYLNAPHTHALENE / 1,4-BIS(HEXADECYL)NAPHTHALENE MIXTURE</b>		17
Hexadecylnaphthalene/dihexadecylnaphthalene mixture	1-HEXADECYLNAPHTHALENE / 1,4-BIS(HEXADECYL)NAPHTHALENE MIXTURE	17
Hexadecyl / octadecyl alcohol (a)	ALCOHOLS (C13+)	17
Hexaethylene glycol (a)	POLYETHYLENE GLYCOL	17
Hexafluorosilicate solution (20-30%)	FLUOROSILICIC ACID SOLUTION (20-30%)	17
Hexahydroaniline	CYCLOHEXYLAMINE	17
Hexahydro-1H-azepine	HEXAMETHYLENEIMINE	17
Hexahydrobenzene	CYCLOHEXANE	17
Hexahydro-l-H-azepine	HEXAMETHYLENEIMINE	17
Hexahydrophenol	CYCLOHEXANOL	17
Hexahydrotoluene	METHYLCYCLOHEXANE	17
Hexamethylene	CYCLOHEXANE	17
<b>HEXAMETHYLENEDIAMINE (MOLTEN)</b>		17
<b>HEXAMETHYLENEDIAMINE ADIPATE (50% IN WATER)</b>		17
<b>HEXAMETHYLENEDIAMINE SOLUTION</b>		17
1,6-Hexamethylenediamine solution	HEXAMETHYLENEDIAMINE SOLUTION	17
Hexamethylenediammonium adipate solution (50% solution)	HEXAMETHYLENEDIAMINE ADIPATE (50% IN WATER)	17
<b>HEXAMETHYLENE DIISOCYANATE</b>		17
Hexamethylene-1,6-diisocyanate	HEXAMETHYLENE DIISOCYANATE	17
<b>HEXAMETHYLENE GLYCOL</b>		17
<b>HEXAMETHYLENEIMINE</b>		17
<b>HEXAMETHYLENETETRAMINE SOLUTIONS</b>		17
Hexamine	HEXAMETHYLENETETRAMINE SOLUTIONS	17
Hexanaphthene	CYCLOHEXANE	17
1,6-Hexandiamine hexanedioate (1:1)	HEXAMETHYLENEDIAMINE ADIPATE (50% IN WATER)	17
<b>HEXANE (ALL ISOMERS)</b>		17
1,6-Hexanediamine	HEXAMETHYLENEDIAMINE (MOLTEN)	17
1,6-Hexanediamine solutions	HEXAMETHYLENEDIAMINE SOLUTION	17
Hexane-1,6-diamine solutions	HEXAMETHYLENEDIAMINE SOLUTION	17
Hexanedioic acid, bis(2-ethylhexyl) ester	DI-(2-ETHYLHEXYL) ADIPATE	17
1,6-Hexanediol	HEXAMETHYLENE GLYCOL	17
Hexane-1,6-diol	HEXAMETHYLENE GLYCOL	17
<b>1,6-HEXANEDIOL, DISTILLATION OVERHEADS</b>		17
n-Hexane	HEXANE (ALL ISOMERS)	17
<b>HEXANOIC ACID</b>		17
<b>HEXANOL</b>		17
Hexan-1-ol	HEXANOL	17
2-Hexanone	METHYL BUTYL KETONE	17
Hexan-2-one	METHYL BUTYL KETONE	17

Index Name	Product Name	Chapter
<b>HEXENE (ALL ISOMERS)</b>		17
1-Hexene (a)	HEXENE (ALL ISOMERS)	17
Hex-1-ene (a)	HEXENE (ALL ISOMERS)	17
2-Hexene (a)	HEXENE (ALL ISOMERS)	17
Hexone	METHYL ISOBUTYL KETONE	17
<b>HEXYL ACETATE</b>		17
sec-Hexyl acetate	METHYLAMYL ACETATE	17
Hexyl alcohol	HEXANOL	17
Hexylene (a)	HEXENE (ALL ISOMERS)	17
<b>HEXYLENE GLYCOL</b>		17
Hexyl ethanoate	HEXYL ACETATE	17
Highly-Reactive Polyisobutylene	POLY(4+)ISOBUTYLENE (MW>224)	17
Homopiperidine	HEXAMETHYLENEIMINE	17
HVO (Hydrotreated Vegetable Oil)	ALKANES (C10-C26), LINEAR AND BRANCHED, (FLASHPOINT >60°C)	17
<b>HYDROCARBON WAX</b>		17
<b>HYDROCHLORIC ACID (*)</b>		17
Hydrofluorosilic acid solution (20-30%)	FLUOROSILICIC ACID SOLUTION (20-30%)	17
Hydrofuran	TETRAHYDROFURAN	17
Hydrogenated maltose syrup	MALTITOL SOLUTION	18
Hydrogenated oligosaccharide	HYDROGENATED STARCH HYDROLYSATE	18
<b>HYDROGENATED STARCH HYDROLYSATE</b>		18
Hydrogencarboxylic acid	FORMIC ACID (85% OR LESS ACID)	17
Hydrogen chloride, aqueous	HYDROCHLORIC ACID (*)	17
<b>HYDROGEN PEROXIDE SOLUTIONS (OVER 60% BUT NOT OVER 70% BY MASS)</b>		17
<b>HYDROGEN PEROXIDE SOLUTIONS (OVER 8% BUT NOT OVER 60% BY MASS)</b>		17
Hydrogen sulphate	SULPHURIC ACID	17
alpha-Hydro-omega-hydroxypoly[oxy(methyl-1,2-ethanediyl)]	POLYPROPYLENE GLYCOL	17
Hydroxyacetic acid	GLYCOLIC ACID SOLUTION (70% OR LESS)	17
Hydroxybenzene	PHENOL	17
4-Hydroxybutanoic acid lactone	GAMMA-BUTYROLACTONE	17
4-Hydroxybutyric acid lactone	GAMMA-BUTYROLACTONE	17
gamma-Hydroxybutyric acid lactone	GAMMA-BUTYROLACTONE	17
Hydroxydimethylbenzenes	XYLENOL	17
Hydroxyethanoic acid	GLYCOLIC ACID SOLUTION (70% OR LESS)	17
2-Hydroxyethyl acetate	ETHYLENE GLYCOL ACETATE	17
<b>2-HYDROXYETHYL ACRYLATE</b>		17
beta-Hydroxyethyl acrylate	2-HYDROXYETHYL ACRYLATE	17
2-Hydroxyethylamine	ETHANOLAMINE	17
N-beta-Hydroxyethylethylenediamine	AMINOETHYL ETHANOLAMINE	17
<b>N-(HYDROXYETHYL)ETHYLENEDIAMINETRIACETIC ACID, TRISODIUM SALT SOLUTION</b>		17
beta-Hydroxyethyl phenyl ether	ETHYLENE GLYCOL PHENYL ETHER	17
2-Hydroxyethyl propenoate	2-HYDROXYETHYL ACRYLATE	17
2-Hydroxyethyl 2-propenoate	2-HYDROXYETHYL ACRYLATE	17
alpha-Hydroxyisobutyronitrile	ACETONE CYANOHYDRIN	17

<b>Index Name</b>	<b>Product Name</b>	<b>Chapter</b>
4-Hydroxy-2-keto-4-methylpentane	DIACETONE ALCOHOL	17
4-Hydroxy-4-methylpentanone-2	DIACETONE ALCOHOL	17
4-Hydroxy-4-methylpentan-2-one	DIACETONE ALCOHOL	17
2-Hydroxy-2-methylpropionitrile	ACETONE CYANOHYDRIN	17
<b>2-HYDROXY-4-(METHYLTHIO)BUTANOIC ACID</b>		17
2-Hydroxy-4-(methylthio)butyric acid	2-HYDROXY-4-(METHYLTHIO)BUTANOIC ACID	17
2-Hydroxynitrobenzene (molten)	O-NITROPHENOL (MOLTEN)	17
1-Hydroxy-2-phenoxyethane	ETHYLENE GLYCOL PHENYL ETHER	17
2-Hydroxypropanoic acid	LACTIC ACID	17
2-Hydroxypropionic acid	LACTIC ACID	17
alpha-Hydroxypropionic acid	LACTIC ACID	17
3-Hydroxypropionic acid, lactone.	BETA-PROPIOLACTONE	17
beta-Hydroxypropionitrile	ETHYLENE CYANOHYDRIN	17
2-Hydroxypropionitrile solution (80% or less)	LACTONITRILE SOLUTION (80% OR LESS)	17
alpha-Hydroxypropionitrile solution (80% or less)	LACTONITRILE SOLUTION (80% OR LESS)	17
3-Hydroxypropionitrile	ETHYLENE CYANOHYDRIN	17
2-Hydroxypropionitrile solution (80% or less)	LACTONITRILE SOLUTION (80% OR LESS)	17
2-[2-(2-hydroxypropoxy)propoxy]propan-1-ol	TRIPROPYLENE GLYCOL	17
2-Hydroxypropylamine	ISOPROPANOLAMINE	17
3-Hydroxypropylamine	N-PROPANOLAMINE	17
alpha-Hydroxytoluene	BENZYL ALCOHOL	17
3-Hydroxy-2,2,4-trimethylpentyl isobutyrate	2,2,4-TRIMETHYL-1,3-PENTANEDIOL-1-ISOBUTYRATE	17
<b>ILLIPE OIL</b>		17
2,2'-Iminodi(ethylamine)	DIETHYLENETRIAMINE	17
2,2'-Iminodiethanol	DIETHANOLAMINE	17
1,1'-Iminodipropan-2-ol	DIISOPROPANOLAMINE	17
Iron (III) chloride solutions	FERRIC CHLORIDE SOLUTIONS	17
Iron (III) nitrate / nitric acid solution	FERRIC NITRATE/NITRIC ACID SOLUTION	17
Isoacetophenone	ISOPHORONE	17
Isoamyl acetate (a)	AMYL ACETATE (ALL ISOMERS)	17
<b>ISOAMYL ALCOHOL</b>		17
Isobutaldehyde (a)	BUTYRALDEHYDE (ALL ISOMERS)	17
Isobutanal (a)	BUTYRALDEHYDE (ALL ISOMERS)	17
Isobutanol	ISOBUTYL ALCOHOL	17
Isobutanolamine	2-AMINO-2-METHYL-1-PROPANOL	17
Isobutyl acetate	BUTYL ACETATE (ALL ISOMERS)	17
Isobutyl acrylate (a)	BUTYL ACRYLATE (ALL ISOMERS)	17
<b>ISOBUTYL ALCOHOL</b>		17
Isobutyl aldehyde (a)	BUTYRALDEHYDE (ALL ISOMERS)	17
Isobutylamine (a)	BUTYLAMINE (ALL ISOMERS)	17
Isobutylcarbinol	ISOAMYL ALCOHOL	17
<b>ISOBUTYL FORMATE</b>		17
Isobutyl ketone	DIISOBUTYL KETONE	17
<b>ISOBUTYL METHACRYLATE</b>		17
Isobutylmethylcarbinol	METHYLAMYL ALCOHOL	17

<b>Index Name</b>	<b>Product Name</b>	<b>Chapter</b>
Isobutyl methyl ketone	METHYL ISOBUTYL KETONE	17
Isobutylmethylmethanol	METHYLAMYL ALCOHOL	17
Isobutyraldehyde (a)	BUTYRALDEHYDE (ALL ISOMERS)	17
Isobutyric aldehyde (a)	BUTYRALDEHYDE (ALL ISOMERS)	17
alpha-Isocyanatobenzyl-omega-isocyanatophenylpoly[(phenyl isocyanate)-alt-formaldehyde]	POLYMETHYLENE POLYPHENYL ISOCYANATE	17
3-Isocyanatomethyl-3,5,5-trimethylcyclohexyl isocyanate	ISOPHORONE DIISOCYANATE	17
Isodecanol	DECYL ALCOHOL (ALL ISOMERS)	17
Isodecyl alcohol	DECYL ALCOHOL (ALL ISOMERS)	17
Isododecane (a)	DODECANE (ALL ISOMERS)	17
Isodurene (a)	TETRAMETHYLBENZENE (ALL ISOMERS)	17
Isononanoic acid	NONANOIC ACID (ALL ISOMERS)	17
Isononanol	NONYL ALCOHOL (ALL ISOMERS)	17
Isooctane (a)	OCTANE (ALL ISOMERS)	17
Isooctanol	OCTANOL (ALL ISOMERS)	17
Isopentane (a)	PENTANE (ALL ISOMERS)	17
Isopentanol	AMYL ALCOHOL, PRIMARY	17
Isopentanol	ISOAMYL ALCOHOL	17
Isopentyl acetate (a)	AMYL ACETATE (ALL ISOMERS)	17
Isopentyl alcohol	ISOAMYL ALCOHOL	17
<b>ISOPHORONE</b>		17
<b>ISOPHORONEDIAMINE</b>		17
<b>ISOPHORONE DIISOCYANATE</b>		17
<b>ISOPRENE</b>		17
Isopropanol	ISOPROPYL ALCOHOL	18
<b>ISOPROPANOLAMINE</b>		17
Isopropenylbenzene	ALPHA-METHYLSTYRENE	17
2-Isopropoxyethanol (a)	ETHYLENE GLYCOL MONOALKYL ETHERS	17
2-Isopropoxypropane	ISOPROPYL ETHER	17
<b>ISOPROPYL ACETATE</b>		17
Isopropylacetone	METHYL ISOBUTYL KETONE	17
<b>ISOPROPYL ALCOHOL</b>		18
<b>ISOPROPYLAMINE</b>		17
<b>ISOPROPYLAMINE (70% OR LESS) SOLUTION</b>		17
Isopropylammonium N-(phosphonomethyl)glycine	GLYPHOSATE SOLUTION (NOT CONTAINING SURFACTANT)	17
Isopropylcarbinol	ISOBUTYL ALCOHOL	17
Isopropyl carbinol	ISOBUTYL ALCOHOL	17
<b>ISOPROPYLCYCLOHEXANE</b>		17
1-Isopropyl-2,2-dimethyltrimethylene diisobutyrate	2,2,4-TRIMETHYL-1,3-PENTANEDIOL DIISOBUTYRATE	17
<b>ISOPROPYL ETHER</b>		17
Isopropylideneacetone	MESITYL OXIDE	17
Isopropyl oxide	ISOPROPYL ETHER	17
4-Isopropyltoluene	P-CYMENE	17
p-Isopropyltoluene	P-CYMENE	17
4-Isopropyltoluol	P-CYMENE	17

<b>Index Name</b>	<b>Product Name</b>	<b>Chapter</b>
Isovaleral	VALERALDEHYDE (ALL ISOMERS)	17
Isovaleraldehyde	VALERALDEHYDE (ALL ISOMERS)	17
Isovaleric aldehyde	VALERALDEHYDE (ALL ISOMERS)	17
Isovalerone	DIISOBUTYL KETONE	17
<b>JATROPHA OIL</b>		17
Kaolin clay slurry	KAOLIN SLURRY	18
Kaolinite slurry	KAOLIN SLURRY	18
<b>KAOLIN SLURRY</b>		18
Ketohexamethylene	CYCLOHEXANONE	17
Ketone propane	ACETONE	18
Ketopropane	ACETONE	18
<b>LACTIC ACID</b>		17
<b>LACTONITRILE SOLUTION (80% OR LESS)</b>		17
<b>LARD</b>		17
<b>LATEX, AMMONIA (1% OR LESS)- INHIBITED</b>		17
<b>LATEX: CARBOXYLATED STYRENE-BUTADIENE COPOLYMER; STYRENE-BUTADIENE RUBBER</b>		17
<b>LAURIC ACID</b>		17
Lauryl alcohol	DODECYL ALCOHOL	17
Lead alkyls, n.o.s. (a)	MOTOR FUEL ANTI-KNOCK COMPOUND (CONTAINING LEAD ALKYLs)	17
Lead tetraethyl (a)	MOTOR FUEL ANTI-KNOCK COMPOUND (CONTAINING LEAD ALKYLs)	17
Lead tetramethyl (a)	MOTOR FUEL ANTI-KNOCK COMPOUND (CONTAINING LEAD ALKYLs)	17
<b>LECITHIN</b>		18
<b>LIGNINSULPHONIC ACID, MAGNESIUM SALT SOLUTION</b>		17
<b>LIGNINSULPHONIC ACID, SODIUM SALT SOLUTION</b>		17
Limonene	DIPENTENE	17
Linear alkylbenzene (LAB) bottoms (a)	ALKYLBENZENE DISTILLATION BOTTOMS	17
Linear alkyl(C12-C16) propoxyamine ethoxylate	ALKYL(C12-C16) PROPOXYAMINE ETHOXYLATE	17
<b>LINSEED OIL</b>		17
<b>LIQUID CHEMICAL WASTES</b>		17
Liquid paraffin	N-ALKANES (C10-C20)	17
<b>LONG-CHAIN ALKARYL POLYETHER (C11-C20)</b>		17
<b>LONG-CHAIN ALKARYL SULPHONIC ACID (C16-C60)</b>		17
<b>LONG-CHAIN ALKYLPHENATE/PHENOL SULPHIDE MIXTURE</b>		17
<b>LONG-CHAIN ALKYLPHENOL (C14-C18)</b>		17
<b>LONG-CHAIN ALKYLPHENOL (C18-C30)</b>		17
Lye, soda solution	SODIUM HYDROXIDE SOLUTION (*)	17
<b>L-LYSINE SOLUTION (60% OR LESS)</b>		17
Magnesia hydrate	MAGNESIUM HYDROXIDE SLURRY	17
<b>MAGNESIUM CHLORIDE SOLUTION</b>		17
<b>MAGNESIUM HYDROXIDE SLURRY</b>		17

<b>Index Name</b>	<b>Product Name</b>	<b>Chapter</b>
Magnesium Lignasulphonate solution	LIGNINSULPHONIC ACID, MAGNESIUM SALT SOLUTION	17
<b>MAGNESIUM LONG-CHAIN ALKARYL SULPHONATE (C11-C50)</b>		17
<b>MAGNESIUM LONG-CHAIN ALKYL SALICYLATE (C11+)</b>		17
<b>MALEIC ANHYDRIDE</b>		17
<b>MALEIC ANHYDRIDE-SODIUM ALLYLSULPHONATE COPOLYMER SOLUTION</b>		17
Maltitol	MALTITOL SOLUTION	18
<b>MALTITOL SOLUTION</b>		18
Maltitol syrup	MALTITOL SOLUTION	18
<b>MANGO KERNEL OIL</b>		17
Meglumine solution (70% or less)	N-METHYLGLUCAMINE SOLUTION (70% OR LESS)	17
<b>MERCAPTOBENZOTHAZOL, SODIUM SALT SOLUTION</b>		17
Mesitylene	TRIMETHYLBENZENE (ALL ISOMERS)	17
<b>MESITYL OXIDE</b>		17
Metaformaldehyde	1,3,5-TRIOXANE	17
Metam-sodium	METAM SODIUM SOLUTION	17
<b>METAM SODIUM SOLUTION</b>		17
<b>METHACRYLIC ACID</b>		17
<b>METHACRYLIC ACID - ALKOXPOLY (ALKYLENE OXIDE) METHACRYLATE COPOLYMER, SODIUM SALT AQUEOUS SOLUTION (45% OR LESS)</b>		17
alpha-Methacrylic acid	METHACRYLIC ACID	17
Methacrylic acid, dodecyl ester	DODECYL METHACRYLATE	17
Methacrylic acid, lauryl ester	DODECYL METHACRYLATE	17
<b>METHACRYLIC RESIN IN ETHYLENE DICHLORIDE</b>		17
<b>METHACRYLONITRILE</b>		17
Methanal	FORMALDEHYDE SOLUTIONS (45% OR LESS)	17
Methanamide	FORMAMIDE	17
Methanamine	METHYLAMINE SOLUTIONS (42% OR LESS)	17
Methanecarboxylic acid	ACETIC ACID	17
Methanoic acid	FORMIC ACID (85% OR LESS ACID)	17
Methanol	METHYL ALCOHOL (*)	17
Methenamine	HEXAMETHYLENETETRAMINE SOLUTIONS	17
<b>3-METHOXY-1-BUTANOL</b>		17
3-Methoxybutan-1-ol	3-METHOXY-1-BUTANOL	17
<b>3-METHOXYBUTYL ACETATE</b>		17
2-Methoxyethanol (a)	ETHYLENE GLYCOL MONOALKYL ETHERS	17
2-(2-Methoxyethoxy)ethanol (a)	POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER	17
2-[2-(2-Methoxyethoxy)ethoxy]ethanol (a)	POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER	17
2-(2-Methoxyethoxy)ethyl acetate (a)	POLY(2-8)ALKYLENE GLYCOL MONOALKYL (C1-C6) ETHER ACETATE	17
2-Methoxyethyl acetate	ETHYLENE GLYCOL METHYL ETHER ACETATE	17
2-Methoxy-2-methylbutane	TERT-AMYL METHYL ETHER	17



Index Name	Product Name	Chapter
3-Methoxy-3-methylbutan-1-ol	3-METHYL-3-METHOXYBUTANOL	17
2-Methoxy-1-methylethyl acetate	PROPYLENE GLYCOL METHYL ETHER ACETATE	17
<b>N-(2-METHOXY-1-METHYL ETHYL)-2-ETHYL-6-METHYL CHLOROACETANILIDE</b>		17
2-methoxy-2-methylpropane	METHYL TERT-BUTYL ETHER	17
1-Methoxypropan-2-ol (a)	PROPYLENE GLYCOL MONOALKYL ETHER	17
1-Methoxy-2-propanol acetate	PROPYLENE GLYCOL METHYL ETHER ACETATE	17
1-(2-Methoxypropoxy)propan-2-ol (a)	POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER	17
3-[3-(3-Methoxypropoxy)propoxy]propan-1-ol (a)	POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER	17
Methoxytriglycol (a)	POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER	17
Methylacetaldehyde	PROPIONALDEHYDE	17
<b>METHYL ACETATE</b>		17
Methylacetic acid	PROPIONIC ACID	17
<b>METHYL ACETOACETATE</b>		17
Methyl acetylacetate	METHYL ACETOACETATE	17
beta-Methylacrolein	CROTONALDEHYDE	17
<b>METHYL ACRYLATE</b>		17
2-Methylacrylic acid	METHACRYLIC ACID	17
2-Methylacrylic acid, dodecyl ester	DODECYL METHACRYLATE	17
2-Methylacrylic acid, lauryl ester	DODECYL METHACRYLATE	17
<b>METHYL ALCOHOL (*)</b>		17
<b>METHYLAMINE SOLUTIONS (42% OR LESS)</b>		17
1-Methyl-2-aminobenzene	O-TOLUIDINE	17
2-Methyl-1-aminobenzene	O-TOLUIDINE	17
<b>METHYLAMYL ACETATE</b>		17
<b>METHYLAMYL ALCOHOL</b>		17
<b>METHYL AMYL KETONE</b>		17
Methyl n-amyl ketone	METHYL AMYL KETONE	17
2-Methylaniline	O-TOLUIDINE	17
<b>N-METHYLANILINE</b>		17
o-Methylaniline	O-TOLUIDINE	17
2-Methylbenzenamine	O-TOLUIDINE	17
o-Methylbenzenamine	O-TOLUIDINE	17
Methylbenzene	TOLUENE	17
Methylbenzol	TOLUENE	17
<b>ALPHA-METHYLBENZYL ALCOHOL WITH ACETOPHENONE (15% OR LESS)</b>		17
2-Methyl-1,3-butadiene	ISOPRENE	17
3-Methyl-1,3-butadiene	ISOPRENE	17
2-Methylbutanal	VALERALDEHYDE (ALL ISOMERS)	17
3-Methylbutanal	VALERALDEHYDE (ALL ISOMERS)	17
2-Methylbutane (a)	PENTANE (ALL ISOMERS)	17
Methyl butanoate	METHYL BUTYRATE	17
2-Methyl-2-butanol	TERT-AMYL ALCOHOL	17

<b>Index Name</b>	<b>Product Name</b>	<b>Chapter</b>
2-Methylbutan-2-ol	TERT-AMYL ALCOHOL	17
2-Methyl-4-butanol	ISOAMYL ALCOHOL	17
3-Methyl-1-butanol	AMYL ALCOHOL, PRIMARY	17
3-Methylbutan-1-ol	AMYL ALCOHOL, PRIMARY	17
3-Methyl-1-butanol	ISOAMYL ALCOHOL	17
3-Methylbutan-1-ol	ISOAMYL ALCOHOL	17
3-Methylbutan-3-ol	TERT-AMYL ALCOHOL	17
3-Methylbut-1-ene (a)	PENTENE (ALL ISOMERS)	17
Methylbutenes (a)	PENTENE (ALL ISOMERS)	17
<b>METHYLBUTENOL</b>		17
1-Methylbutyl acetate (a)	AMYL ACETATE (ALL ISOMERS)	17
2-Methyl-2-butyl alcohol	TERT-AMYL ALCOHOL	17
3-Methyl-1-butyl alcohol	ISOAMYL ALCOHOL	17
3-Methyl-3-butyl alcohol	TERT-AMYL ALCOHOL	17
<b>METHYL TERT-BUTYL ETHER</b>		17
<b>METHYL BUTYL KETONE</b>		17
<b>METHYLBUTYNOL</b>		17
2-Methyl-3-butyn-2-ol	2-METHYL-2-HYDROXY-3-BUTYNE	17
2-Methylbut-3-yn-2-ol	2-METHYL-2-HYDROXY-3-BUTYNE	17
2-Methylbut-3-yn-2-ol	METHYLBUTYNOL	17
2-Methyl-3-butyn-2-ol	METHYLBUTYNOL	17
2-Methylbutyraldehyde	VALERALDEHYDE (ALL ISOMERS)	17
3-Methylbutyraldehyde	VALERALDEHYDE (ALL ISOMERS)	17
<b>METHYL BUTYRATE</b>		17
Methyl 'carbitol' acetate (a)	POLY(2-8)ALKYLENE GLYCOL MONOALKYL (C1-C6) ETHER ACETATE	17
Methyl 'cellosolve' acetate	ETHYLENE GLYCOL METHYL ETHER ACETATE	17
Methylchloroform	1,1,1-TRICHLOROETHANE	17
Methyl cyanide	ACETONITRILE	17
<b>METHYLCYCLOHEXANE</b>		17
1-Methyl-1,3-cyclopentadiene	METHYLCYCLOPENTADIENE DIMER	17
<b>METHYLCYCLOPENTADIENE DIMER</b>		17
<b>METHYLCYCLOPENTADIENYL MANGANESE TRICARBONYL</b>		17
<b>METHYL DIETHANOLAMINE</b>		17
4-Methyl-1,3-dioxolan-2-one	PROPYLENE CARBONATE	17
Methyl disulphide	DIMETHYL DISULPHIDE	17
Methylenebis(4-isocyanatobenzene)	DIPHENYLMETHANE DIISOCYANATE	17
Methylenebis(4-phenyl isocyanate)	DIPHENYLMETHANE DIISOCYANATE	17
Methylenebis(4-phenylene isocyanate)	DIPHENYLMETHANE DIISOCYANATE	17
Methylenebis(p-phenylene isocyanate)	DIPHENYLMETHANE DIISOCYANATE	17
4,4'-Methylenebis(4-phenyl isocyanate)	DIPHENYLMETHANE DIISOCYANATE	17
Methylene bromide	DIBROMOMETHANE	17
Methylene chloride	DICHLOROMETHANE	17
4,4'-Methylenedi(phenyl isocyanate)	DIPHENYLMETHANE DIISOCYANATE	17
Methylene dichloride	DICHLOROMETHANE	17

<b>Index Name</b>	<b>Product Name</b>	<b>Chapter</b>
4,4'-Methylenediphenyl diisocyanate	DIPHENYLMETHANE DIISOCYANATE	17
Methylenedi-p-phenylene diisocyanate	DIPHENYLMETHANE DIISOCYANATE	17
2-Methylenepropionic acid	METHACRYLIC ACID	17
Methyl ethanoate	METHYL ACETATE	17
1-Methylethyl acetate	ISOPROPYL ACETATE	17
1-Methylethylamine	ISOPROPYLAMINE	17
<b>2-METHYL-6-ETHYL ANILINE</b>		17
Methylethylcarbinol	SEC-BUTYL ALCOHOL	18
Methylethylene glycol	PROPYLENE GLYCOL	18
Methylethylene oxide	PROPYLENE OXIDE	17
<b>METHYL ETHYL KETONE</b>		17
N-(1-Methylethyl)propan-2-amine	DIISOPROPYLAMINE	17
<b>2-METHYL-5-ETHYL PYRIDINE</b>		17
<b>METHYL FORMATE</b>		17
<b>N-METHYLGLUCAMINE SOLUTION (70% OR LESS)</b>		17
N-methyl-D-glucamine solution (70% or less)	N-METHYLGLUCAMINE SOLUTION (70% OR LESS)	17
<b>2-METHYLGLUTARONITRILE WITH 2-ETHYLSUCCINONITRILE (12% OR LESS)</b>		17
Methyl glycol	PROPYLENE GLYCOL	18
5-Methylheptan-3-one	ETHYL AMYL KETONE	17
5-Methyl-3-heptanone	ETHYL AMYL KETONE	17
Methylhexylcarbinol	OCTANOL (ALL ISOMERS)	17
Methyl 2-hydroxybenzoate	METHYL SALICYLATE	17
Methyl o-hydroxybenzoate	METHYL SALICYLATE	17
<b>2-METHYL-2-HYDROXY-3-BUTYNE</b>		17
2-Methyl-2-hydroxy-3-butyne	METHYLBUTYNOL	17
2,2'-(Methylimino)diethanol	METHYL DIETHANOLAMINE	17
N-Methyl-2,2'-iminodiethanol	METHYL DIETHANOLAMINE	17
Methyl isoamyl ketone	METHYL AMYL KETONE	17
Methyl isobutenyl ketone	MESITYL OXIDE	17
Methylisobutylcarbinol	METHYLAMYL ALCOHOL	17
Methylisobutylcarbinol acetate	METHYLAMYL ACETATE	17
<b>METHYL ISOBUTYL KETONE</b>		17
p-Methylisopropyl benzene	P-CYMENE	17
2-Methylactonitrile	ACETONE CYANOHYDRIN	17
methyl mercaptopropionaldehyde	3-(METHYLTHIO)PROPIONALDEHYDE	17
<b>METHYL METHACRYLATE</b>		17
Methyl methanoate	METHYL FORMATE	17
<b>3-METHYL-3-METHOXYBUTANOL</b>		17
Methyl alpha-methylacrylate	METHYL METHACRYLATE	17
7-Methyl-3-methylene-1,6-octadiene	MYRCENE	17
Methyl 2-methylprop-2-enoate	METHYL METHACRYLATE	17
<b>METHYL NAPHTHALENE (MOLTEN)</b>		17
alpha-Methylnaphthalene (molten) (a)	METHYL NAPHTHALENE (MOLTEN)	17
beta-Methylnaphthalene (molten) (a)	METHYL NAPHTHALENE (MOLTEN)	17

Index Name	Product Name	Chapter
(o- and p-) Methylnitrobenzene	O- OR P-NITROTOLUENES	17
8-Methylnonan-1-ol	DECYL ALCOHOL (ALL ISOMERS)	17
Methylolpropane	N-BUTYL ALCOHOL	18
alpha-Methyl-omega-methoxypoly(ethylene oxide)	POLYETHYLENE GLYCOL DIMETHYL ETHER	17
alpha-Methyl-omega-methoxypoly(oxy-1,2-ethanediyl)	POLYETHYLENE GLYCOL DIMETHYL ETHER	17
alpha-Methyl-omega-methoxypoly(oxyethylene)	POLYETHYLENE GLYCOL DIMETHYL ETHER	17
Methyloxirane	PROPYLENE OXIDE	17
2-Methyl-2,4-pentanediol	HEXYLENE GLYCOL	17
2-Methylpentane-2,4-diol	HEXYLENE GLYCOL	17
4-Methylpentanol-2	METHYLAMYL ALCOHOL	17
4-Methylpentan-2-ol	METHYLAMYL ALCOHOL	17
4-Methyl-2-pentanol acetate	METHYLAMYL ACETATE	17
4-Methyl-2-pentanone	METHYL ISOBUTYL KETONE	17
4-Methylpentan-2-one	METHYL ISOBUTYL KETONE	17
2-Methylpentene (a)	HEXENE (ALL ISOMERS)	17
2-Methylpent-1-ene (a)	HEXENE (ALL ISOMERS)	17
2-Methyl-1-pentene (a)	HEXENE (ALL ISOMERS)	17
4-Methyl-1-pentene (a)	HEXENE (ALL ISOMERS)	17
4-Methyl-3-penten-2-one	MESITYL OXIDE	17
4-Methylpent-3-en-2-one	MESITYL OXIDE	17
4-Methyl-2-pentyl acetate	METHYLAMYL ACETATE	17
Methylpentyl acetates	METHYLAMYL ACETATE	17
Methyl tert-pentyl ether	TERT-AMYL METHYL ETHER	17
Methyl pentyl ketone	METHYL AMYL KETONE	17
2-Methyl-m-phenylenediamine (a)	TOLUENEDIAMINE	17
4-Methyl-m-phenylenediamine (a)	TOLUENEDIAMINE	17
Methylphenylene diisocyanate	TOLUENE DIISOCYANATE	17
4-methyl-1,3-phenylene diisocyanate	TOLUENE DIISOCYANATE	17
4-Methyl-m-phenylene diisocyanate	TOLUENE DIISOCYANATE	17
2-Methyl-2-phenylpropane (a)	BUTYLBENZENE (ALL ISOMERS)	17
2-Methylpropanal (a)	BUTYRALDEHYDE (ALL ISOMERS)	17
<b>2-METHYL-1,3-PROPANEDIOL</b>		17
2-Methylpropan-1-ol	ISOBUTYL ALCOHOL	17
2-Methyl-1-propanol	ISOBUTYL ALCOHOL	17
2-Methylpropan-2-ol	TERT-BUTYL ALCOHOL	17
2-Methyl-2-propanol	TERT-BUTYL ALCOHOL	17
2-Methylprop-2-enenitrile	METHACRYLONITRILE	17
2-Methylpropenoic acid	METHACRYLIC ACID	17
alpha-Methylpropenoic acid	METHACRYLIC ACID	17
2-Methylprop-1-enyl methyl ketone	MESITYL OXIDE	17
2-Methylpropyl acrylate (a)	BUTYL ACRYLATE (ALL ISOMERS)	17
2-Methyl-1-propyl alcohol	ISOBUTYL ALCOHOL	17
2-Methyl-2-propyl alcohol	TERT-BUTYL ALCOHOL	17
Methylpropylcarbinol	SEC-AMYL ALCOHOL	17
2-Methylpropyl formate	ISOBUTYL FORMATE	17
<b>METHYL PROPYL KETONE</b>		17
<b>2-METHYLPYRIDINE</b>		17

Index Name	Product Name	Chapter
<b>3-METHYLPYRIDINE</b>		17
<b>4-METHYLPYRIDINE</b>		17
alpha-Methylpyridine	<b>2-METHYLPYRIDINE</b>	17
1-Methylpyrrolidin-2-one	<b>N-METHYL-2-PYRROLIDONE</b>	17
1-Methyl-2-pyrrolidinone	<b>N-METHYL-2-PYRROLIDONE</b>	17
N-Methylpyrrolidinone	<b>N-METHYL-2-PYRROLIDONE</b>	17
1-Methyl-2-pyrrolidone	<b>N-METHYL-2-PYRROLIDONE</b>	17
<b>N-METHYL-2-PYRROLIDONE</b>		17
<b>METHYL SALICYLATE</b>		17
Methyl soyate	<b>SOYBEAN OIL FATTY ACID METHYL ESTER</b>	17
Methylstyrene (all isomers)	<b>VINYLTOLUENE</b>	17
<b>ALPHA-METHYLSTYRENE</b>		17
<b>3-(METHYLTHIO)PROPIONALDEHYDE</b>		17
2-Methyltrimethylene glycol	<b>2-METHYL-1,3-PROPANEDIOL</b>	17
Metolachlor	<b>N-(2-METHOXY-1-METHYL ETHYL)-2-ETHYL-6-METHYL CHLOROACETANILIDE</b>	17
<b>MICROSILICA SLURRY</b>		18
Middle oil	<b>CARBOLIC OIL</b>	17
Milk acid	<b>LACTIC ACID</b>	17
Milk of magnesia	<b>MAGNESIUM HYDROXIDE SLURRY</b>	18
Mineral wax	<b>HYDROCARBON WAX</b>	17
Mixed aliphatic oxygenated hydrocarbons, primary aliphatic alcohols and aliphatic ethers: mol wt: >200 (a)	<b>OXYGENATED ALIPHATIC HYDROCARBON MIXTURE</b>	17
<b>MOLASSES</b>		18
<b>MOLYBDENUM POLYSULPHIDE LONG CHAIN ALKYL DITHIOCARBAMIDE COMPLEX</b>		17
Monochlorobenzene	<b>CHLOROBENZENE</b>	17
Monochlorobenzol	<b>CHLOROBENZENE</b>	17
Monoethanolamine	<b>ETHANOLAMINE</b>	17
Monoethylamine	<b>ETHYLAMINE (*)</b>	17
Monoethylamine solutions, 72% or less	<b>ETHYLAMINE SOLUTIONS (72% OR LESS)</b>	17
Monoisopropanolamine	<b>ISOPROPANOLAMINE</b>	17
Monoisopropylamine	<b>ISOPROPYLAMINE</b>	17
Monomethylamine solutions, 42% or less	<b>METHYLAMINE SOLUTIONS (42% OR LESS)</b>	17
Monopropylamine	<b>N-PROPYLAMINE</b>	17
Monopropylene glycol	<b>PROPYLENE GLYCOL</b>	18
<b>MORPHOLINE</b>		17
<b>MOTOR FUEL ANTI-KNOCK COMPOUND (CONTAINING LEAD ALKYL)</b>		17
Muriatic acid	<b>HYDROCHLORIC ACID (*)</b>	17
<b>MYRCENE</b>		17
Naphtha, coal tar	<b>COAL TAR NAPHTHA SOLVENT</b>	17
<b>NAPHTHALENE (MOLTEN)</b>		17
<b>NAPHTHALENE CRUDE (MOLTEN)</b>		17
<b>NAPHTHALENESULPHONIC ACID-FORMALDEHYDE COPOLYMER, SODIUM SALT SOLUTION</b>		17
Naphtha (petroleum), Light Steam-cracked Aromatics (a)	<b>ALKYLBENZENE MIXTURES (CONTAINING AT LEAST 50% OF TOLUENE)</b>	17

<b>Index Name</b>	<b>Product Name</b>	<b>Chapter</b>
Naphtha safety solvent	WHITE SPIRIT, LOW (15-20%) AROMATIC	17
<b>NEODECANOIC ACID</b>		17
Neodecanoic acid, 2,3-epoxypropyl ester	GLYCIDYL ESTER OF C10 TRIALKYLACETIC ACID	17
Neodecanoic acid, glycidyl ester	GLYCIDYL ESTER OF C10 TRIALKYLACETIC ACID	17
Neodecanoic acid vinyl ester	VINYL NEODECANOATE	17
Neopentane (a)	PENTANE (ALL ISOMERS)	17
Neopentanoic acid	TRIMETHYLACETIC ACID	17
Neopentylene glycol	2,2-DIMETHYLPROPANE-1,3-DIOL (MOLTEN OR SOLUTION)	17
<b>NITRATING ACID (MIXTURE OF SULPHURIC AND NITRIC ACIDS)</b>		17
<b>NITRIC ACID (70% AND OVER)</b>		17
<b>NITRIC ACID (LESS THAN 70%)</b>		17
Nitric acid, fuming (a)	NITRIC ACID (70% AND OVER)	17
Nitric acid, red fuming	NITRIC ACID (70% AND OVER)	17
<b>NITRILOTRIACETIC ACID, TRISODIUM SALT SOLUTION</b>		17
2,2',2"-Nitrilotriethanol	TRIETHANOLAMINE	17
Nitrilo-2,2',2"-triethanol	TRIETHANOLAMINE	17
1,1',1"-Nitrilotripropan-2-ol	TRIISOPROPANOLAMINE	17
1,1',1"-Nitrilotri-2-propanol	TRIISOPROPANOLAMINE	17
<b>NITROBENZENE</b>		17
Nitrobenzol	NITROBENZENE	17
o-Nitrochlorobenzene	O-CHLORONITROBENZENE	17
<b>NITROETHANE</b>		17
<b>NITROETHANE(80%)/ NITROPROPANE(20%)</b>		17
<b>NITROETHANE, 1-NITROPROPANE (EACH 15% OR MORE MIXTURE</b>		17
ortho-Nitrophenol (molten)	O-NITROPHENOL (MOLTEN)	17
2-Nitrophenol (molten)	O-NITROPHENOL (MOLTEN)	17
<b>O-NITROPHENOL (MOLTEN)</b>		17
<b>1- OR 2-NITROPROPANE</b>		17
<b>NITROPROPANE (60%)/NITROETHANE (40%) MIXTURE</b>		17
2-Nitrotoluene (a)	O- OR P-NITROTOLUENES	17
4-Nitrotoluene (a)	O- OR P-NITROTOLUENES	17
o-Nitrotoluene (a)	O- OR P-NITROTOLUENES	17
p-Nitrotoluene (a)	O- OR P-NITROTOLUENES	17
<b>O- OR P-NITROTOLUENES</b>		17
<b>NONANE (ALL ISOMERS)</b>		17
1-Nonanecarboxylic acid	DECANOIC ACID	17
n-Nonane (a)	NONANE (ALL ISOMERS)	17
<b>NONANOIC ACID (ALL ISOMERS)</b>		17
Nonanols	NONYL ALCOHOL (ALL ISOMERS)	17
<b>NON-EDIBLE INDUSTRIAL GRADE PALM OIL</b>		17
<b>NONENE (ALL ISOMERS)</b>		17
<b>NONYL ALCOHOL (ALL ISOMERS)</b>		17

<b>Index Name</b>	<b>Product Name</b>	<b>Chapter</b>
Nonylcarbinol	DECYL ALCOHOL (ALL ISOMERS)	17
Nonylene (a)	NONENE (ALL ISOMERS)	17
Nonyl hydride (a)	NONANE (ALL ISOMERS)	17
<b>NONYL METHACRYLATE MONOMER</b>		17
<b>NONYLPHENOL</b>		17
<b>NONYLPHENOL POLY(4+)ETHOXYLATE</b>		17
alpha-4-Nonylphenyl-omega-hydroxypoly(oxyethylene) (b)	ALKARYL POLYETHERS (C9-C20)	17
Nopinene	BETA-PINENE	17
Nopinene	BETA-PINENE	17
<b>NOXIOUS LIQUID, NF, (1) N.O.S. (TRADE NAME ....., CONTAINS .....) ST1, CAT. X</b>		17
<b>NOXIOUS LIQUID, F, (2) N.O.S. (TRADE NAME ....., CONTAINS .....) ST1, CAT. X</b>		17
<b>NOXIOUS LIQUID, NF, (3) N.O.S. (TRADE NAME ....., CONTAINS .....) ST2, CAT. X</b>		17
<b>NOXIOUS LIQUID, F, (4) N.O.S. (TRADE NAME ....., CONTAINS .....) ST2, CAT. X</b>		17
<b>NOXIOUS LIQUID, NF, (5) N.O.S. (TRADE NAME ....., CONTAINS .....) ST2, CAT. Y</b>		17
<b>NOXIOUS LIQUID, F, (6) N.O.S. (TRADE NAME ....., CONTAINS .....) ST2, CAT. Y</b>		17
<b>NOXIOUS LIQUID, NF, (7) N.O.S. (TRADE NAME ....., CONTAINS .....) ST3, CAT. Y</b>		17
<b>NOXIOUS LIQUID, F, (8) N.O.S. (TRADE NAME ....., CONTAINS .....) ST3, CAT. Y</b>		17
<b>NOXIOUS LIQUID, NF, (9) N.O.S. (TRADE NAME ....., CONTAINS .....) ST3, CAT. Z</b>		17
<b>NOXIOUS LIQUID, F, (10) N.O.S. (TRADE NAME ....., CONTAINS .....) ST3, CAT. Z</b>		17
<b>NOXIOUS LIQUID, (11) N.O.S. (TRADE NAME ....., CONTAINS .....) CAT. Z</b>		18
<b>NON NOXIOUS LIQUID, (12) N.O.S. (TRADE NAME ....., CONTAINS .....) CAT. OS</b>		18
Octadecan-1-ol	ALCOHOLS (C14-C18), PRIMARY, LINEAR AND ESSENTIALLY LINEAR	17
1-Octadecanol	ALCOHOLS (C14-C18), PRIMARY, LINEAR AND ESSENTIALLY LINEAR	17
<b>OCTAMETHYLCYCLOTETRASILOXANE</b>		17
Octanal (a)	OCTYL ALDEHYDES	17
<b>OCTANE (ALL ISOMERS)</b>		17
1-Octanethiol	N-OCTYL MERCAPTAN	17
<b>OCTANOIC ACID (ALL ISOMERS)</b>		17
<b>OCTANOL (ALL ISOMERS)</b>		17
Octan-1-ol (a)	OCTANOL (ALL ISOMERS)	17
<b>OCTENE (ALL ISOMERS)</b>		17
Octic acid (a)	OCTANOIC ACID (ALL ISOMERS)	17
Octoic acid (a)	OCTANOIC ACID (ALL ISOMERS)	17
Octyl acetate	N-OCTYL ACETATE	17
<b>N-OCTYL ACETATE</b>		17
Octyl acrylate	2-ETHYLHEXYL ACRYLATE	17
Octyl adipate	DI-(2-ETHYLHEXYL) ADIPATE	17
Octyl alcohol (a)	OCTANOL (ALL ISOMERS)	17

<b>Index Name</b>	<b>Product Name</b>	<b>Chapter</b>
<b>OCTYL ALDEHYDES</b>		17
Octylcarbinol	<b>NONYL ALCOHOL (ALL ISOMERS)</b>	17
<b>OCTYL DECYL ADIPATE</b>		17
Octyl decyl phthalate (a)	<b>DIALKYL (C7-C13) PHTHALATES</b>	17
Octylic acid (a)	<b>OCTANOIC ACID (ALL ISOMERS)</b>	17
<b>N-OCTYL MERCAPTAN</b>		17
Octyl nitrate	<b>ALKYL (C7-C9) NITRATES</b>	17
Octyl nitrates (all isomers)	<b>ALKYL (C7-C9) NITRATES</b>	17
Octyl phthalate (a)	<b>DIALKYL (C7-C13) PHTHALATES</b>	17
Oenanthic acid	<b>N-HEPTANOIC ACID</b>	17
Oenanthylic acid	<b>N-HEPTANOIC ACID</b>	17
<b>OFFSHORE CONTAMINATED BULK LIQUID P*</b>		17
<b>OFFSHORE CONTAMINATED BULK LIQUID S*</b>		17
Oil of Mirbane	<b>NITROBENZENE</b>	17
Oil of Myrbane	<b>NITROBENZENE</b>	17
Oil of turpentine	<b>TURPENTINE</b>	17
Oil of vitriol	<b>SULPHURIC ACID</b>	17
Oil of wintergreen	<b>METHYL SALICYLATE</b>	17
Oleamine	<b>OLEYLAMINE</b>	17
<b>OLEFIN-ALKYL ESTER COPOLYMER (MOLECULAR WEIGHT 2000+)</b>		17
<b>OLEFIN MIXTURE (C7-C9) C8 RICH, STABILIZED</b>		17
<b>OLEFIN MIXTURES (C5-C7)</b>		17
<b>OLEFIN MIXTURES (C5-C15)</b>		17
<b>OLEFINS (C13+, ALL ISOMERS)</b>		17
<b>ALPHA-OLEFINS (C6-C18) MIXTURES</b>		17
<b>OLEIC ACID</b>		17
<b>OLEUM</b>		17
<b>OLEYLAMINE</b>		17
<b>OLIVE OIL</b>		17
<b>ORANGE JUICE (CONCENTRATED)</b>		18
<b>ORANGE JUICE (NOT CONCENTRATED)</b>		18
Orthophosphoric acid	<b>PHOSPHORIC ACID</b>	17
Oxal	<b>GLYOXAL SOLUTION (40% OR LESS)</b>	17
Oxalaldehyde	<b>GLYOXAL SOLUTION (40% OR LESS)</b>	17
3-Oxapentane-1,5-diol	<b>DIETHYLENE GLYCOL</b>	17
1,4-Oxazinane	<b>MORPHOLINE</b>	17
2-Oxetanone	<b>BETA-PROPIOLACTONE</b>	17
Oxoacetic acid	<b>GLYOXYLIC ACID SOLUTION (50 % OR LESS)</b>	17
Oxoethanoic acid	<b>GLYOXYLIC ACID SOLUTION (50 % OR LESS)</b>	17
2,2'-Oxybis(1-chloropropane)	<b>2,2'-DICHLOROISOPROPYL ETHER</b>	17
2,2'-Oxybis(ethyleneoxy)diethanol	<b>TETRAETHYLENE GLYCOL</b>	17
2,2'-Oxybispropane	<b>ISOPROPYL ETHER</b>	17
2,2'-Oxydiethanol	<b>DIETHYLENE GLYCOL</b>	17



Index Name	Product Name	Chapter
1,1'-Oxydipropen-2-ol	DIPROPYLENE GLYCOL	17
<b>OXYGENATED ALIPHATIC HYDROCARBON MIXTURE</b>		17
Oxymethylene	FORMALDEHYDE SOLUTIONS (45% OR LESS)	17
<b>PALM ACID OIL</b>		17
<b>PALM FATTY ACID DISTILLATE</b>		17
<b>PALM KERNEL ACID OIL</b>		17
<b>PALM KERNEL FATTY ACID DISTILLATE</b>		17
<b>PALM KERNEL OIL</b>		17
<b>PALM KERNEL OLEIN</b>		17
<b>PALM KERNEL STEARIN</b>		17
<b>PALM MID-FRACTION</b>		17
<b>PALM OIL</b>		17
<b>PALM OIL FATTY ACID METHYL ESTER</b>		17
<b>PALM OLEIN</b>		17
<b>PALM STEARIN</b>		17
Paraffin	HYDROCARBON WAX	17
C9-C11 n-Paraffin	N-ALKANES (C9-C11)	17
Paraffin, food grade	PARAFFIN WAX, HIGHLY-REFINED	17
n-Paraffin (C9-C11)	N-ALKANES (C9-C11)	17
n-Paraffins (C10-C20) (a)	N-ALKANES (C10-C20)	17
Paraffin wax	HYDROCARBON WAX	17
Paraffin wax, cosmetic	PARAFFIN WAX, HIGHLY-REFINED	17
Paraffin wax feedstock	PARAFFIN WAX, SEMI-REFINED	17
<b>PARAFFIN WAX, HIGHLY-REFINED</b>		17
<b>PARAFFIN WAX, SEMI-REFINED</b>		17
Paraffin wax, technical	PARAFFIN WAX, SEMI-REFINED	17
<b>PARALDEHYDE</b>		17
<b>PARALDEHYDE-AMMONIA REACTION PRODUCT</b>		17
Petrolatum	HYDROCARBON WAX	17
Pelargonic acid	NONANOIC ACID (ALL ISOMERS)	17
Pelargonic alcohol	NONYL ALCOHOL (ALL ISOMERS)	17
<b>PENTACHLOROETHANE</b>		17
Pentadecanol (a)	ALCOHOLS (C13+)	17
1-Pentadecene	OLEFINS (C13+, ALL ISOMERS)	17
Pentadec-1-ene (a)	OLEFINS (C13+, ALL ISOMERS)	17
<b>1,3-PENTADIENE</b>		17
Penta-1,3-diene	1,3-PENTADIENE	17
<b>1,3-PENTADIENE (GREATER THAN 50%), CYCLOPENTENE AND ISOMERS, MIXTURES</b>		17
Pentaethylene glycol (a)	POLYETHYLENE GLYCOL	17
<b>PENTAETHYLENEHEXAMINE</b>		17
Pentalin	PENTACHLOROETHANE	17
Pentamethylene	CYCLOPENTANE	17
Pentanal	VALERALDEHYDE (ALL ISOMERS)	17

<b>Index Name</b>	<b>Product Name</b>	<b>Chapter</b>
Pentane (a)	PENTANE (ALL ISOMERS)	17
<b>PENTANE (ALL ISOMERS)</b>		17
Pentanedial solutions, 50% or less	GLUTARALDEHYDE SOLUTIONS (50% OR LESS)	17
n-Pentane (a)	PENTANE (ALL ISOMERS)	17
<b>PENTANOIC ACID</b>		17
<b>N-PENTANOIC ACID (64%)/2-METHYL BUTYRIC ACID (36%) MIXTURE</b>		17
tert-Pentanoic acid	TRIMETHYLACETIC ACID	17
1-Pentanol	N-AMYL ALCOHOL	17
Pentan-1-ol	N-AMYL ALCOHOL	17
2-Pentanol	SEC-AMYL ALCOHOL	17
Pentan-2-ol	SEC-AMYL ALCOHOL	17
3-Pentanol	SEC-AMYL ALCOHOL	17
Pentan-3-ol	SEC-AMYL ALCOHOL	17
1-Pentanol acetate (a)	AMYL ACETATE (ALL ISOMERS)	17
n-Pentanol	N-AMYL ALCOHOL	17
sec-Pentanol	SEC-AMYL ALCOHOL	17
tert-Pentanol	TERT-AMYL ALCOHOL	17
2-Pentanone	METHYL PROPYL KETONE	17
Pentan-2-one	METHYL PROPYL KETONE	17
Pentasodium diethylenetriaminepentaacetate solution	DIETHYLENETRIAMINEPENTAACETIC ACID, PENTASODIUM SALT SOLUTION	17
<b>PENTENE (ALL ISOMERS)</b>		17
Pent-1-ene (a)	PENTENE (ALL ISOMERS)	17
n-Pentene (a)	PENTENE (ALL ISOMERS)	17
Pentenes	PENTENE (ALL ISOMERS)	17
Pentyl acetate (a)	AMYL ACETATE (ALL ISOMERS)	17
sec-Pentyl acetate (a)	AMYL ACETATE (ALL ISOMERS)	17
Pentyl alcohol	N-AMYL ALCOHOL	17
sec-Pentyl alcohol	SEC-AMYL ALCOHOL	17
tert-Pentyl alcohol	TERT-AMYL ALCOHOL	17
Pentyl propanoate	N-PENTYL PROPIONATE	17
<b>N-PENTYL PROPIONATE</b>		17
<b>PERCHLOROETHYLENE</b>		17
Perchloromethane	CARBON TETRACHLORIDE	17
Perhydroazepine	HEXAMETHYLENEIMINE	17
Petrolatum, highly-refined	PARAFFIN WAX, HIGHLY-REFINED	17
Petrolatum, industrial grade	PARAFFIN WAX, SEMI-REFINED	17
Petrolatum, USP-grade	PARAFFIN WAX, HIGHLY-REFINED	17
Petroleum jelly, technical	PARAFFIN WAX, SEMI-REFINED	17
Phene	BENZENE AND MIXTURES HAVING 10% BENZENE OR MORE (I)	17
Phenic acid	PHENOL	17
<b>PHENOL</b>		17
2-Phenoxyethanol	ETHYLENE GLYCOL PHENYL ETHER	17
Phenyl alkane(C10-C21)sulphonate (a)	ALKYL SULPHONIC ACID ESTER OF PHENOL	17

Index Name	Product Name	Chapter
Phenylamine	ANILINE	17
N-Phenylaniline	DIPHENYLAMINE (MOLTEN)	17
N-Phenylbenzenamine	DIPHENYLAMINE (MOLTEN)	17
1-Phenylbutane (a)	BUTYLBENZENE (ALL ISOMERS)	17
2-Phenylbutane (a)	BUTYLBENZENE (ALL ISOMERS)	17
Phenyl carbinol	BENZYL ALCOHOL	17
Phenyl 'cellosolve'	ETHYLENE GLYCOL PHENYL ETHER	17
Phenyl chloride	CHLOROBENZENE	17
1-Phenyldecane (b)	ALKYL(C9+)BENZENES	17
1-Phenyldodecane	ALKYL(C9+)BENZENES	17
Phenylethane	ETHYLBENZENE	17
Phenyl ether	DIPHENYL ETHER	17
Phenylethylene	STYRENE MONOMER	17
1-(Phenylethyl)xylene	1-PHENYL-1-XYLYL ETHANE	17
Phenyl hydride	BENZENE AND MIXTURES HAVING 10% BENZENE OR MORE (I)	17
Phenyl hydroxide	PHENOL	17
Phenylic acid	PHENOL	17
Phenylmethane	TOLUENE	17
Phenylmethanol	BENZYL ALCOHOL	17
Phenylmethyl acetate	BENZYL ACETATE	17
1-Phenylpropane (a)	PROPYLBENZENE (ALL ISOMERS)	17
2-Phenylpropane (a)	PROPYLBENZENE (ALL ISOMERS)	17
2-Phenylpropene	ALPHA-METHYLSTYRENE	17
1-Phenyltetradecane	ALKYL(C9+)BENZENES	17
1-Phenyltridecane	ALKYL(C9+)BENZENES	17
1-Phenylundecane	ALKYL(C9+)BENZENES	17
Phenylxylylethane	1-PHENYL-1-XYLYL ETHANE	17
<b>1-PHENYL-1-XYLYL ETHANE</b>		17
1-Phenyl-1-(2,5-xylyl)ethane (a)	1-PHENYL-1-XYLYL ETHANE	17
1-Phenyl-1-(3,4-xylyl)ethane (a)	1-PHENYL-1-XYLYL ETHANE	17
<b>PHOSPHATE ESTERS, ALKYL (C12-C14) AMINE</b>		17
L-alpha-Phosphatidyl choline	LECITHIN	18
N-(phosphonomethyl)glycine	GLYPHOSATE SOLUTION (NOT CONTAINING SURFACTANT)	17
<b>PHOSPHORIC ACID</b>		17
<b>PHOSPHORUS, YELLOW OR WHITE (*)</b>		17
Phthalandione (molten)	PHTHALIC ANHYDRIDE (MOLTEN)	17
Phthalic acid anhydride (molten)	PHTHALIC ANHYDRIDE (MOLTEN)	17
Phthalic acid, diundecyl ester	DIUNDECYL PHTHALATE	17
<b>PHTHALIC ANHYDRIDE (MOLTEN)</b>		17
2-Picoline	2-METHYLPYRIDINE	17
3-Picoline	3-METHYLPYRIDINE	17
4-Picoline	4-METHYLPYRIDINE	17
alpha-Picoline	2-METHYLPYRIDINE	17
beta-Picoline	3-METHYLPYRIDINE	17
gamma-Picoline	4-METHYLPYRIDINE	17

<b>Index Name</b>	<b>Product Name</b>	<b>Chapter</b>
Pimelic ketone	CYCLOHEXANONE	17
2-Pinene	ALPHA-PINENE	17
2(10)-Pinene	BETA-PINENE	17
<b>ALPHA-PINENE</b>		17
<b>BETA-PINENE</b>		17
<b>PINE OIL</b>		17
<b>PIPERAZINE, 68% SOLUTION</b>		17
2-Piperazin-1-ylethylamine	N-AMINOETHYLPIPERAZINE	17
Piperylene	1,3-PENTADIENE	17
Piperylene concentrates (Mixed)	1,3-PENTADIENE (GREATER THAN 50%), CYCLOPENTENE AND ISOMERS, MIXTURES	17
Pivalic acid	TRIMETHYLACETIC ACID	17
Poly(oxyethylene)	POLYETHER (MOLECULAR WEIGHT 1350+)	17
Poly(oxyethyleneoxyethyleneoxyphthaloyl)	DIETHYLENE GLYCOL PHTHALATE	17
Poly(sodium carboxylatoethylene)	SODIUM POLY(4+)ACRYLATE SOLUTIONS	17
<b>POLYACRYLIC ACID SOLUTION (40% OR LESS)</b>		17
<b>POLYALKYL (C18-C22) ACRYLATE IN XYLENE</b>		17
<b>POLYALKYLALKENAMINESUCCINIMIDE, MOLYBDENUM OXYSULPHIDE</b>		17
<b>POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER</b>		17
<b>POLY(2-8)ALKYLENE GLYCOL MONOALKYL (C1-C6) ETHER ACETATE</b>		17
Poly (2-8) alkylene (C2-C3) glycols / Polyalkylene (C2-C10) glycol monoalkyl (C1-C4) ethers and their borate esters (a)	<b>BRAKE FLUID BASE MIX: POLY(2-8)ALKYLENE (C2-C3) GLYCOLS/POLYALKYLENE (C2-C10) GLYCOLS MONOALKYL (C1-C4) ETHERS AND THEIR BORATE ESTERS</b>	17
<b>POLYALKYL (C10-C20) METHACRYLATE</b>		17
<b>POLYALKYL (C10-C18) METHACRYLATE/ETHYLENE-PROPYLENE COPOLYMER MIXTURE</b>		17
<b>POLYALUMINIUM CHLORIDE SOLUTION</b>		17
<b>POLYBUTENE</b>		17
<b>POLYBUTENYL SUCCINIMIDE</b>		17
<b>POLY(2+)CYCLIC AROMATICS</b>		17
<b>POLYETHER (MOLECULAR WEIGHT 1350+)</b>		17
<b>POLYETHYLENE GLYCOL</b>		17
Poly(4-12)ethylene glycol alkyl(C7-C11)phenyl ether	<b>NONYLPHENOL POLY(4+)ETHOXYLATE</b>	17
<b>POLYETHYLENE GLYCOL DIMETHYL ETHER</b>		17
<b>POLY(ETHYLENE GLYCOL) METHYLBUTENYL ETHER (MW&gt;1000)</b>		17
Polyethylene glycols, mono(p-nonylphenyl) ether (b)	<b>ALKARYL POLYETHERS (C9-C20)</b>	17
Poly(ethylene oxide) (molecular weight 1350+) (a)	<b>POLYETHER (MOLECULAR WEIGHT 1350+)</b>	17
<b>POLYETHYLENE POLYAMINES</b>		17
<b>POLYETHYLENE POLYAMINES (MORE THAN 50% C5 -C20 PARAFFIN OIL)</b>		17
<b>POLYFERRIC SULPHATE SOLUTION</b>		17
Polyglucitol	<b>HYDROGENATED STARCH HYDROLYSATE</b>	18
<b>POLYGLYCERIN, SODIUM SALT SOLUTION (CONTAINING LESS THAN 3% SODIUM HYDROXIDE)</b>		17

<b>Index Name</b>	<b>Product Name</b>	<b>Chapter</b>
Polyglycitol syrup	HYDROGENATED STARCH HYDROLYSATE	18
<b>POLY(IMINOETHYLENE)-GRAFT-N-POLY(ETHYLENEOXY) SOLUTION (90% OR LESS)</b>		17
<b>POLYISOBUTENAMINE IN ALIPHATIC (C10-C14) SOLVENT</b>		17
<b>(POLYISOBUTENE) AMINO PRODUCTS IN ALIPHATIC HYDROCARBONS</b>		17
<b>POLYISOBUTENYL ANHYDRIDE ADDUCT</b>		17
<b>POLY(4+)ISOBUTYLENE (MW&gt;224)</b>		17
<b>POLYISOBUTYLENE (MW≤224)</b>		17
<b>POLYMETHYLENE POLYPHENYL ISOCYANATE</b>		17
<b>POLYOLEFIN (MOLECULAR WEIGHT 300+)</b>		17
<b>POLYOLEFIN AMIDE ALKENEAMINE (C17+)</b>		17
<b>POLYOLEFIN AMIDE ALKENEAMINE BORATE (C28-C250)</b>		17
<b>POLYOLEFIN AMIDE ALKENEAMINE POLYOL</b>		17
<b>POLYOLEFINAMINE (C28-C250)</b>		17
<b>POLYOLEFINAMINE IN ALKYL (C2-C4) BENZENES</b>		17
<b>POLYOLEFINAMINE IN AROMATIC SOLVENT</b>		17
<b>POLYOLEFIN AMINOESTER SALTS (MOLECULAR WEIGHT 2000+)</b>		17
<b>POLYOLEFIN ANHYDRIDE</b>		17
<b>POLYOLEFIN ESTER (C28-C250)</b>		17
<b>POLYOLEFIN PHENOLIC AMINE (C28-C250)</b>		17
<b>POLYOLEFIN PHOSPHOROSULPHIDE, BARIUM DERIVATIVE (C28-C250)</b>		17
Poly(oxyalkylene)alkenyl ether (MW>1000)	<b>POLY(ETHYLENE GLYCOL) METHYL BUTENYL ETHER (MW&gt;1000)</b>	17
Poly(oxy-1,2-ethanediy), alpha-(3-methyl-3-butenyl)-, omega-hydroxy-	<b>POLY(ETHYLENE GLYCOL) METHYL BUTENYL ETHER (MW&gt;1000)</b>	17
<b>POLY(20)OXYETHYLENE SORBITAN MONOOLEATE</b>		17
Poly(oxypropylene) (molecular weight 1350+) (a)	<b>POLYETHER (MOLECULAR WEIGHT 1350+)</b>	17
poly[(phenyl isocyanate)-alt-formaldehyde] (a)	<b>POLYMETHYLENE POLYPHENYL ISOCYANATE</b>	17
Poly[(phenyl isocyanate)-co-formaldehyde] (a)	<b>POLYMETHYLENE POLYPHENYL ISOCYANATE</b>	17
Poly[propene oxide]	<b>POLYETHER (MOLECULAR WEIGHT 1350+)</b>	17
Polypropylene	<b>POLY(5+)PROPYLENE</b>	17
<b>POLY(5+)PROPYLENE</b>		17
<b>POLYPROPYLENE GLYCOL</b>		17
<b>POLYSILOXANE</b>		17
Potash lye solution	<b>POTASSIUM HYDROXIDE SOLUTION (*)</b>	17
Potassium chloride brine (<26%)	<b>POTASSIUM CHLORIDE SOLUTION (LESS THAN 26%)</b>	18
Potassium chloride drilling brine	<b>POTASSIUM CHLORIDE SOLUTION</b>	17
<b>POTASSIUM CHLORIDE SOLUTION</b>		17
<b>POTASSIUM CHLORIDE SOLUTION (LESS THAN 26%)</b>		18
<b>POTASSIUM FORMATE SOLUTIONS (*)</b>		17
<b>POTASSIUM HYDROXIDE SOLUTION (*)</b>		17

<b>Index Name</b>	<b>Product Name</b>	<b>Chapter</b>
<b>POTASSIUM OLEATE</b>		17
<b>POTASSIUM THIOSULPHATE (50% OR LESS)</b>		17
Propanal	<b>PROPIONALDEHYDE</b>	17
Propan-1-amine	<b>N-PROPYLAMINE</b>	17
2-Propanamine	<b>ISOPROPYLAMINE</b>	17
1,2-Propanediol	<b>PROPYLENE GLYCOL</b>	18
Propane-1,2-diol	<b>PROPYLENE GLYCOL</b>	18
1,2-Propanediol cyclic carbonate	<b>PROPYLENE CARBONATE</b>	17
Propanenitrile	<b>PROPIONITRILE</b>	17
1,2,3-Propanetriol	<b>GLYCERINE</b>	17
Propane-1,2,3-triol	<b>GLYCERINE</b>	17
1,2,3-Propanetriol triacetate	<b>GLYCERYL TRIACETATE</b>	17
Propanoic acid	<b>PROPIONIC ACID</b>	17
Propanoic anhydride	<b>PROPIONIC ANHYDRIDE</b>	17
Propanol	<b>N-PROPYL ALCOHOL</b>	17
1-Propanol	<b>N-PROPYL ALCOHOL</b>	17
Propan-1-ol	<b>N-PROPYL ALCOHOL</b>	17
2-Propanol	<b>ISOPROPYL ALCOHOL</b>	18
Propan-2-ol	<b>ISOPROPYL ALCOHOL</b>	18
<b>N-PROPANOLAMINE</b>		17
3-Propanolide	<b>BETA-PROPIOLACTONE</b>	17
n-Propanol	<b>N-PROPYL ALCOHOL</b>	17
Propanone	<b>ACETONE</b>	18
2-Propanone	<b>ACETONE</b>	18
Propan-2-one	<b>ACETONE</b>	18
Propenamide solution, 50% or less	<b>ACRYLAMIDE SOLUTION (50% OR LESS)</b>	17
<b>2-PROPENE-1-AMINIUM, N,N-DIMETHYL-N-2-PROPENYL-, CHLORIDE, HOMOPOLYMER SOLUTION</b>		17
Propenenitrile	<b>ACRYLONITRILE</b>	17
Propene oxide	<b>PROPYLENE OXIDE</b>	17
Propenoic acid	<b>ACRYLIC ACID</b>	17
2-Propenoic acid, homopolymer solution (40% or less)	<b>POLYACRYLIC ACID SOLUTION (40% OR LESS)</b>	17
1-Propenol-3	<b>ALLYL ALCOHOL</b>	17
2-Propen-1-ol	<b>ALLYL ALCOHOL</b>	17
Prop-2-en-1-ol	<b>ALLYL ALCOHOL</b>	17
Propenyl alcohol	<b>ALLYL ALCOHOL</b>	17
Propiolactone	<b>BETA-PROPIOLACTONE</b>	17
<b>BETA-PROPIOLACTONE</b>		17
<b>PROPIONALDEHYDE</b>		17
<b>PROPIONIC ACID</b>		17
Propionic aldehyde	<b>PROPIONALDEHYDE</b>	17
<b>PROPIONIC ANHYDRIDE</b>		17
<b>PROPIONITRILE</b>		17
beta-Propionolactone	<b>BETA-PROPIOLACTONE</b>	17
Propionitrile	<b>PROPIONITRILE</b>	17
Propionyl oxide	<b>PROPIONIC ANHYDRIDE</b>	17

<b>Index Name</b>	<b>Product Name</b>	<b>Chapter</b>
1-Propoxypropan-2-ol (a)	PROPYLENE GLYCOL MONOALKYL ETHER	17
Propyl acetate	N-PROPYL ACETATE	17
<b>N-PROPYL ACETATE</b>		17
Propyl acetone	METHYL BUTYL KETONE	17
Propyl alcohol	N-PROPYL ALCOHOL	17
2-Propyl alcohol	ISOPROPYL ALCOHOL	18
<b>N-PROPYL ALCOHOL</b>		17
sec-Propyl alcohol	ISOPROPYL ALCOHOL	18
Propyl aldehyde	PROPIONALDEHYDE	17
Propylamine	N-PROPYLAMINE	17
<b>N-PROPYLAMINE</b>		17
<b>PROPYLBENZENE (ALL ISOMERS)</b>		17
n-Propylbenzene (a)	PROPYLBENZENE (ALL ISOMERS)	17
Propylcarbinol	N-BUTYL ALCOHOL	18
Propylene aldehyde	CROTONALDEHYDE	17
2,2'-[Propylenebis(nitrilomethylene)]diphenol in aromatic solvent	ALKYL (C8-C9) PHENYLAMINE IN AROMATIC SOLVENTS	17
<b>PROPYLENE CARBONATE</b>		17
Propylene chloride	1,2-DICHLOROPROPANE	17
Propylene dichloride	1,2-DICHLOROPROPANE	17
alpha,alpha'- (Propylenedinitrilo)di-o-cresol in aromatic solvent	ALKYL (C8-C9) PHENYLAMINE IN AROMATIC SOLVENTS	17
Propylene epoxide	PROPYLENE OXIDE	17
<b>PROPYLENE GLYCOL</b>		18
1,2-Propylene glycol	PROPYLENE GLYCOL	18
Propylene glycol n-butyl ether (a)	PROPYLENE GLYCOL MONOALKYL ETHER	17
Propylene glycol ethyl ether (a)	PROPYLENE GLYCOL MONOALKYL ETHER	17
Propylene glycol methyl ether (a)	PROPYLENE GLYCOL MONOALKYL ETHER	17
<b>PROPYLENE GLYCOL METHYL ETHER ACETATE</b>		17
<b>PROPYLENE GLYCOL MONOALKYL ETHER</b>		17
Propylene glycol monobutyl ether (a)	PROPYLENE GLYCOL MONOALKYL ETHER	17
Propylene glycol beta-monoethyl ether	PROPYLENE GLYCOL MONOALKYL ETHER	17
Propylene glycol monomethyl ether (a)	PROPYLENE GLYCOL MONOALKYL ETHER	17
<b>PROPYLENE GLYCOL PHENYL ETHER</b>		17
Propylene glycol propyl ether (a)	PROPYLENE GLYCOL MONOALKYL ETHER	17
Propylene glycol trimer	TRIPROPYLENE GLYCOL	17
1,2-Propylene glycol trimer	TRIPROPYLENE GLYCOL	17
<b>PROPYLENE OXIDE</b>		17
<b>PROPYLENE TETRAMER</b>		17
<b>PROPYLENE TRIMER</b>		17
Propylethylene (a)	PENTENE (ALL ISOMERS)	17
Propyl methyl ketone	METHYL PROPYL KETONE	17
N-Propyl-1-propanamine	DI-N-PROPYLAMINE	17
Pseudobutylene glycol	BUTYLENE GLYCOL	17
Pseudocumene	TRIMETHYLBENZENE (ALL ISOMERS)	17
Pseudopinen	BETA-PINENE	17

<b>Index Name</b>	<b>Product Name</b>	<b>Chapter</b>
Pseudopinene	BETA-PINENE	17
Pygas	PYROLYSIS GASOLINE (CONTAINING BENZENE)	17
<b>PYRIDINE</b>		17
Pyroacetic acid	ACETONE	18
Pyroacetic ether	ACETONE	18
<b>PYROLYSIS GASOLINE (CONTAINING BENZENE)</b>		17
Pyrolysis gasoline (steam-cracked naphtha)	BENZENE AND MIXTURES HAVING 10% BENZENE OR MORE (I)	17
Pyrolysis gasoline, containing 10% or more benzene	BENZENE AND MIXTURES HAVING 10% BENZENE OR MORE (I)	17
Pyromucic aldehyde	FURFURAL	17
<b>RAPESEED OIL</b>		17
<b>RAPESEED OIL (LOW ERUCIC ACID CONTAINING LESS THAN 4% FREE FATTY ACIDS)</b>		17
<b>RAPE SEED OIL FATTY ACID METHYL ESTERS</b>		17
Refined, bleached, deodorised grape seed oil (RBD)	GRAPE SEED OIL	17
<b>RESIN OIL, DISTILLED</b>		17
<b>RICE BRAN OIL</b>		17
<b>ROSIN</b>		17
<b>SAFFLOWER OIL</b>		17
Saturated fatty acid (C13 and above) (a)	FATTY ACID (SATURATED C13+)	17
<b>SHEA BUTTER</b>		17
Silicofluoric acid solution (20-30%)	FLUOROSILICIC ACID SOLUTION (20-30%)	17
Slack wax	HYDROCARBON WAX	17
Sludge acid	SULPHURIC ACID, SPENT	17
SME	SOYBEAN OIL FATTY ACID METHYL ESTER	17
Soda ash solution	SODIUM CARBONATE SOLUTION (*)	17
Soda lye solution	SODIUM HYDROXIDE SOLUTION (*)	17
<b>SODIUM ACETATE SOLUTIONS</b>		18
Sodium acid sulphite solution (45% or less)	SODIUM HYDROGEN SULPHITE SOLUTION (45% OR LESS)	17
Sodium alkylbenzene sulphonate solution	ALKYLBENZENE SULPHONIC ACID, SODIUM SALT SOLUTION	17
<b>SODIUM ALKYL (C14-C17) SULPHONATES (60-65% SOLUTION)</b>		17
<b>SODIUM ALUMINOSILICATE SLURRY</b>		17
Sodium aminoacetate solution	GLYCINE, SODIUM SALT SOLUTION	17
<b>SODIUM BENZOATE</b>		17
Sodium 1,3-benzothiazole-2-thiolate solution	MERCAPTOBENZOTHIAZOL, SODIUM SALT SOLUTION	17
Sodium 1,3-benzothiazol-2-yl sulphide solution	MERCAPTOBENZOTHIAZOL, SODIUM SALT SOLUTION	17
<b>SODIUM BICARBONATE SOLUTION (LESS THAN 10%)</b>		18
Sodium bichromate solution (70% or less)	SODIUM DICHROMATE SOLUTION (70% OR LESS)	17
Sodium bisulphide solution (45% or less)	SODIUM HYDROSULPHIDE SOLUTION (45% OR LESS) (*)	17
<b>SODIUM BOROHYDRIDE (15% OR LESS)/SODIUM HYDROXIDE SOLUTION (*)</b>		17



<b>Index Name</b>	<b>Product Name</b>	<b>Chapter</b>
<b>SODIUM BROMIDE SOLUTION (LESS THAN 50%) (*)</b>		17
<b>SODIUM CARBONATE SOLUTION (*)</b>		17
Sodium carboxylate solution	<b>CYCLOHEXANE OXIDATION PRODUCTS, SODIUM SALTS SOLUTION</b>	17
<b>SODIUM CHLORATE SOLUTION (50% OR LESS) (*)</b>		17
Sodium cresylate solution	<b>CRESYLIC ACID, SODIUM SALT SOLUTION</b>	17
<b>SODIUM DICHROMATE SOLUTION (70% OR LESS)</b>		17
Sodium glycinate solution	<b>GLYCINE, SODIUM SALT SOLUTION</b>	17
Sodium hydrate solution	<b>SODIUM HYDROXIDE SOLUTION (*)</b>	17
<b>SODIUM HYDROGEN SULPHIDE (6% OR LESS)/SODIUM CARBONATE (3% OR LESS) SOLUTION</b>		17
Sodium hydrogensulphide solution (45% or less)	<b>SODIUM HYDROSULPHIDE SOLUTION (45% OR LESS) (*)</b>	17
<b>SODIUM HYDROGEN SULPHITE SOLUTION (45% OR LESS)</b>		17
<b>SODIUM HYDROSULPHIDE/AMMONIUM SULPHIDE SOLUTION (*)</b>		17
<b>SODIUM HYDROSULPHIDE SOLUTION (45% OR LESS) (*)</b>		17
<b>SODIUM HYDROXIDE SOLUTION (*)</b>		17
<b>SODIUM HYPOCHLORITE SOLUTION (15% OR LESS)</b>		17
Sodium lignosulphonate	<b>LIGNINSULPHONIC ACID, SODIUM SALT SOLUTION</b>	17
Sodium methanolate	<b>SODIUM METHYLATE 21-30% IN METHYL ALCOHOL</b>	17
Sodium methoxide	<b>SODIUM METHYLATE 21-30% IN METHYL ALCOHOL</b>	17
<b>SODIUM METHYLATE 21-30% IN METHYL ALCOHOL</b>		17
Sodium methylcarbamdithioate	<b>METAM SODIUM SOLUTION</b>	17
Sodium N-methyldithiocarbamate	<b>METAM SODIUM SOLUTION</b>	17
Sodium methyldithiocarbamate solution	<b>METAM SODIUM SOLUTION</b>	17
<b>SODIUM NITRITE SOLUTION</b>		17
<b>SODIUM PETROLEUM SULPHONATE</b>		17
<b>SODIUM POLY(4+)ACRYLATE SOLUTIONS</b>		17
Sodium rhodanate solution (56% or less)	<b>SODIUM THIOCYANATE SOLUTION (56% OR LESS)</b>	17
Sodium rhodanide solution (56% or less)	<b>SODIUM THIOCYANATE SOLUTION (56% OR LESS)</b>	17
Sodium salt of sulphonated naphthalene - formaldehyde condensate	<b>NAPHTHALENESULPHONIC ACID- FORMALDEHYDE COPOLYMER, SODIUM SALT SOLUTION</b>	17
<b>SODIUM SILICATE SOLUTION</b>		17
<b>SODIUM SULPHATE SOLUTIONS</b>		17
<b>SODIUM SULPHIDE SOLUTION (15% OR LESS)</b>		17
<b>SODIUM SULPHITE SOLUTION (25% OR LESS)</b>		17
Sodium sulphocyanate solution (56% or less)	<b>SODIUM THIOCYANATE SOLUTION (56% OR LESS)</b>	17
Sodium sulphocyanide solution (56% or less)	<b>SODIUM THIOCYANATE SOLUTION (56% OR LESS)</b>	17
Sodium tetrahydroborate (15% or less) / sodium hydroxide solution	<b>SODIUM BOROXYDRIDE (15% OR LESS)/SODIUM HYDROXIDE SOLUTION (*)</b>	17
<b>SODIUM THIOCYANATE SOLUTION (56% OR LESS)</b>		17

<b>Index Name</b>	<b>Product Name</b>	<b>Chapter</b>
Sodium tolyl oxides solution	<b>CRESYLIC ACID, SODIUM SALT SOLUTION</b>	17
'D-D Soil fumigant'	<b>DICHLOROPROPENE/DICHLOROPROPANE MIXTURES</b>	17
d-Sorbite solution	<b>SORBITOL SOLUTION</b>	18
<b>SORBITOL SOLUTION</b>		18
d-Sorbitol solution	<b>SORBITOL SOLUTION</b>	18
<b>SOYABEAN OIL</b>		17
Soya Methyl Ester (SME)	<b>SOYBEAN OIL FATTY ACID METHYL ESTER</b>	17
<b>SOYBEAN OIL FATTY ACID METHYL ESTER</b>		17
Soybean Oil Methyl Ester	<b>SOYBEAN OIL FATTY ACID METHYL ESTER</b>	17
Spirit of turpentine	<b>TURPENTINE</b>	17
Spirits of wine	<b>ETHYL ALCOHOL</b>	18
Stoddard solvent	<b>WHITE SPIRIT, LOW (15-20%) AROMATIC</b>	17
<b>STYRENE MONOMER</b>		17
Styrol	<b>STYRENE MONOMER</b>	17
Suberane	<b>CYCLOHEPTANE</b>	17
Sulfonic acid, alkane(C10-C21) phenyl ester (a)	<b>ALKYL SULPHONIC ACID ESTER OF PHENOL</b>	17
<b>SULPHOHYDROCARBON (C3-C88)</b>		17
<b>SULPHOLANE</b>		17
<b>SULPHONATED POLYACRYLATE SOLUTION</b>		18
<b>SULPHUR (MOLTEN) (*)</b>		17
<b>SULPHURIC ACID</b>		17
Sulphuric acid, fuming	<b>OLEUM</b>	17
<b>SULPHURIC ACID, SPENT</b>		17
Sulphuric chlorohydrin	<b>CHLOROSULPHONIC ACID</b>	17
Sulphuric ether	<b>DIETHYL ETHER (*)</b>	17
<b>SULPHURIZED FAT (C14-C20)</b>		17
<b>SULPHURIZED POLYOLEFINAMIDE ALKENE (C28-C250) AMINE</b>		17
<b>SUNFLOWER SEED OIL</b>		17
Sweet-birch oil	<b>METHYL SALICYLATE</b>	17
sym-Dichloroethane	<b>ETHYLENE DICHLORIDE</b>	17
sym-Dichloroethyl ether	<b>DICHLOROETHYL ETHER</b>	17
sym-Diisopropylacetone	<b>DIISOBUTYL KETONE</b>	17
sym-Dimethylethylene glycol	<b>BUTYLENE GLYCOL</b>	17
sym-Tetrachloroethane	<b>TETRACHLOROETHANE</b>	17
sym-Trioxane	<b>1,3,5-TRIOXANE</b>	17
<b>TALL OIL, CRUDE</b>		17
<b>TALL OIL, DISTILLED</b>		17
<b>TALL OIL FATTY ACID (RESIN ACIDS LESS THAN 20%)</b>		17
<b>TALL OIL PITCH</b>		17
<b>TALL OIL SOAP, CRUDE</b>		17
<b>TALLOW</b>		17
<b>TALLOW FATTY ACID</b>		17

Index Name	Product Name	Chapter
Tar acids (cresols)	CRESOLS (ALL ISOMERS)	17
Tar camphor	NAPHTHALENE (MOLTEN)	17
Terephthalic acid, dibutyl ester	DIBUTYL TEREPHTHALATE	17
3,6,9,12-Tetraazatetradecamethylenediamine	PENTAETHYLENEHEXAMINE	17
3,6,9,12-Tetraazatetradecane-1,14-diamine	PENTAETHYLENEHEXAMINE	17
1,3,5,7-Tetraazatricyclo[3.3.1.1 <sup>3,7</sup> ]decane	HEXAMETHYLENETETRAMINE SOLUTIONS	17
<b>TETRACHLOROETHANE</b>		17
1,1,2,2-Tetrachloroethane	TETRACHLOROETHANE	17
Tetrachloroethylene	PERCHLOROETHYLENE	17
1,1,2,2-tetrachloroethylene	PERCHLOROETHYLENE	17
Tetrachloromethane	CARBON TETRACHLORIDE	17
Tetradecan-1-ol	ALCOHOLS (C14-C18), PRIMARY, LINEAR AND ESSENTIALLY LINEAR	17
1-Tetradecanol	ALCOHOLS (C14-C18), PRIMARY, LINEAR AND ESSENTIALLY LINEAR	17
Tetradecene (a)	OLEFINS (C13+, ALL ISOMERS)	17
Tetradecylbenzene	ALKYL(C9+)BENZENES	17
<b>TETRAETHYLENE GLYCOL</b>		17
<b>TETRAETHYLENE PENTAMINE</b>		17
Tetraethyllead	MOTOR FUEL ANTI-KNOCK COMPOUND (CONTAINING LEAD ALKYL)	17
Tetraethylplumbane	MOTOR FUEL ANTI-KNOCK COMPOUND (CONTAINING LEAD ALKYL)	17
<b>TETRAETHYL SILICATE MONOMER/OLIGOMER (20% IN ETHANOL)</b>		18
3a,4,7,7a-Tetrahydro-3,5-dimethyl-4,7-methano-1H-indene	METHYLCYCLOPENTADIENE DIMER	17
<b>TETRAHYDROFURAN</b>		17
<b>TETRAHYDRONAPHTHALENE</b>		17
1,2,3,4-Tetrahydronaphthalene	TETRAHYDRONAPHTHALENE	17
Tetrahydro-1,4-oxazine	MORPHOLINE	17
2H-Tetrahydro-1,4-oxazine	MORPHOLINE	17
Tetrahydro-2H-1,4-oxazine	MORPHOLINE	17
Tetrahydrothiophene-1-dioxide	SULPHOLANE	17
Tetrahydrothiophene 1,1-dioxide	SULPHOLANE	17
Tetralin	TETRAHYDRONAPHTHALENE	17
<b>TETRAMETHYLBENZENE (ALL ISOMERS)</b>		17
1,2,3,4-Tetramethylbenzene (a)	TETRAMETHYLBENZENE (ALL ISOMERS)	17
1,2,3,5-Tetramethylbenzene (a)	TETRAMETHYLBENZENE (ALL ISOMERS)	17
1,2,4,5-Tetramethylbenzene (a)	TETRAMETHYLBENZENE (ALL ISOMERS)	17
Tetramethylene cyanide	ADIPONITRILE	17
Tetramethylene dicyanide	ADIPONITRILE	17
Tetramethylene glycol (a)	BUTYLENE GLYCOL	17
Tetramethylene oxide	TETRAHYDROFURAN	17
Tetramethylenesulphone	SULPHOLANE	17
Tetramethyllead	MOTOR FUEL ANTI-KNOCK COMPOUND (CONTAINING LEAD ALKYL)	17
Tetrapropylbenzene	ALKYL(C9+)BENZENES	17
Tetrapropylenebenzene	DODECYLBENZENE	17
Tetryl formate	ISOBUTYL FORMATE	17

<b>Index Name</b>	<b>Product Name</b>	<b>Chapter</b>
4-thiapentanal	<b>3-(METHYLTHIO)PROPIONALDEHYDE</b>	17
Thiophan sulphone	<b>SULPHOLANE</b>	17
Thiosulphuric acid, dipotassium salt (50% or less)	<b>POTASSIUM THIOSULPHATE (50% OR LESS)</b>	17
Titanium(IV) oxide slurry	<b>TITANIUM DIOXIDE SLURRY</b>	17
<b>TITANIUM DIOXIDE SLURRY</b>		17
<b>TOLUENE</b>		17
<b>TOLUENEDIAMINE</b>		17
2,4-Toluenediamine (a)	<b>TOLUENEDIAMINE</b>	17
2,6-Toluenediamine (a)	<b>TOLUENEDIAMINE</b>	17
<b>TOLUENE DIISOCYANATE</b>		17
2-Toluidine	<b>O-TOLUIDINE</b>	17
<b>O-TOLUIDINE</b>		17
Toluol	<b>TOLUENE</b>	17
o-Tolylamine	<b>O-TOLUIDINE</b>	17
2,4-Tolylenediamine (a)	<b>TOLUENEDIAMINE</b>	17
2,6-Tolylenediamine (a)	<b>TOLUENEDIAMINE</b>	17
Tolylenediisocyanate	<b>TOLUENE DIISOCYANATE</b>	17
2,4-Tolylene diisocyanate	<b>TOLUENE DIISOCYANATE</b>	17
m-Tolylene diisocyanate	<b>TOLUENE DIISOCYANATE</b>	17
Toxilic anhydride	<b>MALEIC ANHYDRIDE</b>	17
Treacle (a)	<b>MOLASSES</b>	18
Triacetin	<b>GLYOXAL SOLUTION (40% OR LESS)</b>	17
3,6,9-Triazaundecamethylenediamine	<b>TETRAETHYLENE PENTAMINE</b>	17
3,6,9-Triazaundecane-1,11-diamine	<b>TETRAETHYLENE PENTAMINE</b>	17
<b>TRIBUTYL PHOSPHATE</b>		17
<b>1,2,3-TRICHLOROBENZENE (MOLTEN)</b>		17
<b>1,2,4-TRICHLOROBENZENE</b>		17
<b>1,1,1-TRICHLOROETHANE</b>		17
<b>1,1,2-TRICHLOROETHANE</b>		17
beta-Trichloroethane	<b>1,1,2-TRICHLOROETHANE</b>	17
Trichloroethene	<b>TRICHLOROETHYLENE</b>	17
<b>TRICHLOROETHYLENE</b>		17
Trichloromethane	<b>CHLOROFORM</b>	17
<b>1,2,3-TRICHLOROPROPANE</b>		17
<b>1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE</b>		17
<b>TRICRESYL PHOSPHATE (CONTAINING 1% OR MORE ORTHO-ISOMER)</b>		17
<b>TRICRESYL PHOSPHATE (CONTAINING LESS THAN 1% ORTHO-ISOMER)</b>		17
<b>TRIDECANE</b>		17
<b>TRIDECANOIC ACID</b>		17
Tridecanol (a)	<b>ALCOHOLS (C13+)</b>	17
Tridecene (a)	<b>OLEFINS (C13+, ALL ISOMERS)</b>	17
Tridecoic acid	<b>TRIDECANOIC ACID</b>	17
<b>TRIDECYL ACETATE</b>		17

<b>Index Name</b>	<b>Product Name</b>	<b>Chapter</b>
Tridecyl alcohol (a)	ALCOHOLS (C13+)	17
Tridecylbenzene	ALKYL(C9+)BENZENES	17
Tridecylic acid	TRIDECANOIC ACID	17
Tridecylic acid (a)	FATTY ACID (SATURATED C13+)	17
Tri(dimethylphenyl) phosphate (all isomers)	TRIXYLYL PHOSPHATE	17
<b>TRIETHANOLAMINE</b>		17
<b>TRIETHYLAMINE</b>		17
<b>TRIETHYLBENZENE</b>		17
<b>TRIETHYLENE GLYCOL</b>		18
Triethylene glycol butyl ether (a)	POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER	17
Triethylene glycol ethyl ether (a)	POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER	17
Triethylene glycol methyl ether (a)	POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER	17
Triethylene glycol monobutyl ether (a)	POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER	17
<b>TRIETHYLENETETRAMINE</b>		17
<b>TRIETHYL PHOSPHATE</b>		17
<b>TRIETHYL PHOSPHITE</b>		17
Triformol	1,3,5-TRIOXANE	17
Triglycol	TRIETHYLENE GLYCOL	18
Trihydroxypropane	GLYCERINE	17
Trihydroxytriethylamine	TRIETHANOLAMINE	17
<b>TRIISOPROPANOLAMINE</b>		17
<b>TRIISOPROPYLATED PHENYL PHOSPHATES</b>		17
<b>TRIMETHYLACETIC ACID</b>		17
<b>TRIMETHYLAMINE SOLUTION (30% OR LESS)</b>		17
<b>TRIMETHYLBENZENE (ALL ISOMERS)</b>		17
1,2,3-Trimethylbenzene (a)	TRIMETHYLBENZENE (ALL ISOMERS)	17
1,2,4-Trimethylbenzene (a)	TRIMETHYLBENZENE (ALL ISOMERS)	17
1,3,5-Trimethylbenzene (a)	TRIMETHYLBENZENE (ALL ISOMERS)	17
2,6,6-Trimethylbicyclo[3.1.1]hept-2-ene	ALPHA-PINENE	17
Trimethylcarbinol	TERT-BUTYL ALCOHOL	17
1,1,3-Trimethyl-3-cyclohexene-5-one	ISOPHORONE	17
3,5,5-Trimethylcyclohex-2-enone	ISOPHORONE	17
3,5,5-Trimethylcyclohex-2-en-one	ISOPHORONE	17
<b>TRIMETHYLOL PROPANE PROPOXYLATED</b>		17
2,2,4-Trimethylpentane (a)	OCTANE (ALL ISOMERS)	17
<b>2,2,4-TRIMETHYL-1,3-PENTANEDIOL DIISOBUTYRATE</b>		17
2,2,4-Trimethylpentane-1,3-diol diisobutyrate	2,2,4-TRIMETHYL-1,3-PENTANEDIOL DIISOBUTYRATE	17
<b>2,2,4-TRIMETHYL-1,3-PENTANEDIOL-1-ISOBUTYRATE</b>		17
2,4,4-Trimethylpentene-1	DIISOBUTYLENE	17
2,4,4-Trimethylpent-1-ene	DIISOBUTYLENE	17
2,4,4-Trimethylpentene-2	DIISOBUTYLENE	17
2,4,4-Trimethylpent-2-ene	DIISOBUTYLENE	17

<b>Index Name</b>	<b>Product Name</b>	<b>Chapter</b>
2,4,6-Trimethyl-1,3,5-trioxane	PARALDEHYDE	17
2,4,6-Trimethyl-s-trioxane	PARALDEHYDE	17
Trioxan	1,3,5-TRIOXANE	17
<b>1,3,5-TRIOXANE</b>		17
5,8,11-Trioxapentadecane	DIETHYLENE GLYCOL DIBUTYL ETHER	17
3,6,9-Trioxaundecane	DIETHYLENE GLYCOL DIETHYL ETHER	17
Trioxymethylene	1,3,5-TRIOXANE	17
Tripropylene	PROPYLENE TRIMER	17
<b>TRIPROPYLENE GLYCOL</b>		17
Tripropylene glycol methyl ether (a)	POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER	17
Tris(dimethylphenyl) phosphate (all isomers)	TRIXYLYL PHOSPHATE	17
Tris(2-hydroxyethyl)amine	TRIETHANOLAMINE	17
2,4-D-tris(2-hydroxy-2-methylethyl)ammonium	2,4-DICHLOROPHENOXYACETIC ACID, TRIISOPROPANOLAMINE SALT SOLUTION	17
Tris(2-hydroxypropyl)amine	TRIISOPROPANOLAMINE	17
Tris(2-hydroxy-1-propyl)amine	TRIISOPROPANOLAMINE	17
Tris(2-hydroxypropyl)ammonium 2,4-dichlorophenoxyacetate solution	2,4-DICHLOROPHENOXYACETIC ACID, TRIISOPROPANOLAMINE SALT SOLUTION	17
Trisodium 2-[carboxylatomethyl(2-hydroxyethyl)amino]ethyliminodi(acetate) solution	N- (HYDROXYETHYL)ETHYLENEDIAMINETRIAC ETIC ACID, TRISODIUM SALT SOLUTION	17
Trisodium N-(carboxymethyl)-N'-(2-hydroxyethyl)-N,N'-ethylenediglycine solution	N- (HYDROXYETHYL)ETHYLENEDIAMINETRIAC ETIC ACID, TRISODIUM SALT SOLUTION	17
Trisodium N-(2-hydroxyethyl)ethylenediamine-N,N',N'-triacetate solution	N- (HYDROXYETHYL)ETHYLENEDIAMINETRIAC ETIC ACID, TRISODIUM SALT SOLUTION	17
Trisodium nitrilotriacetate solution	NITRILOTRIACETIC ACID, TRISODIUM SALT SOLUTION	17
Tritolyl phosphate, containing less than 1% ortho- isomer	TRICRESYL PHOSPHATE (CONTAINING LESS THAN 1% ORTHO-ISOMER)	17
Tritolyl phosphate, containing 1% or more ortho- isomer	TRICRESYL PHOSPHATE (CONTAINING 1% OR MORE ORTHO-ISOMER)	17
Trixylenyl phosphate	TRIXYLYL PHOSPHATE	17
<b>TRIXYLYL PHOSPHATE</b>		17
<b>TUNG OIL</b>		17
<b>TURPENTINE</b>		17
Turpentine oil	TURPENTINE	17
Turps	TURPENTINE	17
Type A Zeolite slurry (a)	SODIUM ALUMINOSILICATE SLURRY	17
1-Undecanecarboxylic acid	LAURIC ACID	17
N-Undecane (a)	N-ALKANES (C10-C20)	17
<b>UNDECANOIC ACID</b>		17
Undecan-1-ol	UNDECYL ALCOHOL	17
<b>1-UNDECENE</b>		17
Undec-1-ene	1-UNDECENE	17
<b>UNDECYL ALCOHOL</b>		17
Undecylbenzene	ALKYL(C9+)BENZENES	17
Undecylic acid	UNDECANOIC ACID	17
n-Undecylic acid	UNDECANOIC ACID	17

<b>Index Name</b>	<b>Product Name</b>	<b>Chapter</b>
uns-Trimethylbenzene (a)	TRIMETHYLBENZENE (ALL ISOMERS)	17
unsym-Trichlorobenzene	1,2,4-TRICHLOROENZENE	17
<b>UREA/AMMONIUM NITRATE SOLUTION</b>		17
<b>UREA/AMMONIUM PHOSPHATE SOLUTION</b>		17
<b>UREA SOLUTION</b>		17
<b>USED COOKING OIL (M)</b>		17
<b>USED COOKING OIL (TRIGLYCERIDES, C16-C18 AND C18 UNSATURATED)** (M)</b>		17
Valeral	VALERALDEHYDE (ALL ISOMERS)	17
<b>VALERALDEHYDE (ALL ISOMERS)</b>		17
n-Valeraldehyde	VALERALDEHYDE (ALL ISOMERS)	17
Valerianic acid	PENTANOIC ACID	17
Valeric acid	PENTANOIC ACID	17
n-Valeric acid	PENTANOIC ACID	17
Valeric aldehyde	VALERALDEHYDE (ALL ISOMERS)	17
Valerone	DIISOBUTYL KETONE	17
Vaseline (cosmetic)	PARAFFIN WAX, HIGHLY-REFINED	17
<b>VEGETABLE ACID OILS (M)</b>		17
<b>VEGETABLE FATTY ACID DISTILLATES (M)</b>		17
<b>VEGETABLE OIL MIXTURES, CONTAINING LESS THAN 15% FREE FATTY ACID (M)</b>		17
<b>VEGETABLE PROTEIN SOLUTION (HYDROLYSED)</b>		18
Vinegar acid	ACETIC ACID	17
Vinegar naphtha	ETHYL ACETATE	17
<b>VINYL ACETATE</b>		17
Vinylbenzene	STYRENE MONOMER	17
Vinylcarbinol	ALLYL ALCOHOL	17
Vinyl cyanide	ACRYLONITRILE	17
vinyl ethanoate	VINYL ACETATE	17
<b>VINYL ETHYL ETHER</b>		17
Vinylformic acid	ACRYLIC ACID	17
<b>VINYLDENE CHLORIDE</b>		17
<b>VINYL NEODECANOATE</b>		17
<b>VINYLTOLUENE</b>		17
Vinytoluene (all isomers)	VINYLTOLUENE	17
Vinyl trichloride	1,1,2-TRICHLOROETHANE	17
Vitriol brown oil	SULPHURIC ACID	17
<b>WATER</b>		18
Water glass solutions	SODIUM SILICATE SOLUTION	17
White bole	KAOLIN SLURRY	18
White caustic solution	SODIUM HYDROXIDE SOLUTION (*)	17
<b>WHITE SPIRIT, LOW (15-20%) AROMATIC</b>		17
White tar	NAPHTHALENE (MOLTEN)	17
Wine (a)	ALCOHOLIC BEVERAGES, N.O.S.	18
Wintergreen oil	METHYL SALICYLATE	17

<b>Index Name</b>	<b>Product Name</b>	<b>Chapter</b>
Wood alcohol	METHYL ALCOHOL (*)	17
<b>WOOD LIGNIN WITH SODIUM ACETATE/OXALATE</b>		17
Wood naphtha	METHYL ALCOHOL (*)	17
Wood spirit	METHYL ALCOHOL (*)	17
<b>XYLENES</b>		17
<b>XYLENES/ETHYLBENZENE (10% OR MORE) MIXTURE</b>		17
<b>XYLENOL</b>		17
Xylenol (all isomers)	XYLENOL	17
2,3-Xylenol (a)	XYLENOL	17
2,4-Xylenol (a)	XYLENOL	17
2,5-Xylenol (a)	XYLENOL	17
2,6-Xylenol (a)	XYLENOL	17
3,4-Xylenol (a)	XYLENOL	17
3,5-Xylenol (a)	XYLENOL	17
Xylols	XYLENES	17
<b>ZINC ALKARYL DITHIOPHOSPHATE (C7-C16)</b>		17
<b>ZINC ALKENYL CARBOXAMIDE</b>		17
<b>ZINC ALKYL DITHIOPHOSPHATE (C3-C14)</b>		17
Zinc bromide drilling brine	<b>DRILLING BRINES (CONTAINING ZINC CHLORIDE)</b>	17
z-Octadec-9-enamine	OLEYLAMINE	17
(Z)-Octadec-9-enoic acid	OLEIC ACID	17
Z-Octadec-9-enoic acid	OLEIC ACID	17
(Z)-Octadec-9-enylamine	OLEYLAMINE	17

"

4 The complete text of chapter 21 is replaced by the following:

## **"Chapter 21**

### **Criteria for assigning carriage requirements for products subject to the IBC Code**

#### **21.1 Introduction**

21.1.1 The following criteria are used for the determination of pollution classification and assignment of appropriate carriage requirements for bulk liquid cargoes being assessed for entry into the IBC Code or lists 1, 3 or 4 of the MEPC.2/Circular.

21.1.2 In developing such criteria, every effort has been made to follow the criteria and cut off points developed under the Globally Harmonized System (GHS).

21.1.3 Although the criteria are intended to be closely defined in order to establish a uniform approach, it must be emphasized that where human experience or other factors indicate the need for alternative arrangements, these shall always be taken into account. Where deviations from the criteria have been recognized, they shall be properly recorded with justifications.



## 21.2 Contents

21.2.1 This chapter contains the following:

- .1 minimum safety and pollution criteria for products subject to chapter 17 of the IBC Code;
- .2 criteria used to assign the minimum carriage requirements for products that meet the safety or pollution criteria to make them subject to chapter 17 of the IBC Code;
- .3 criteria used for determining special requirements in chapter 15 of the IBC Code to be included in *column o* of chapter 17 of the IBC Code;
- .4 criteria used for determining special requirements in chapter 16 of the IBC Code to be included in *column o* of chapter 17 of the IBC Code;
- .5 definitions of properties used within this chapter;
- .6 information on the use of the GESAMP Hazard Ratings; and
- .7 information on the application of the SVC/LC<sub>50</sub> ratio method.

21.2.2 The information included in parentheses following the classification criteria throughout this chapter refers to the GESAMP Hazard Profile ratings set out in appendix I of MARPOL Annex II under the "Abbreviated legend to the revised GESAMP Hazard Evaluation procedure". The full listing of GESAMP Hazard Profile ratings for evaluated substances are published annually in the GESAMP Composite List as a PPR Circular. It should be noted that ratings in parentheses (based on estimation methods applied by GESAMP) are considered as equivalent to ratings without parentheses for the purpose of assigning carriage requirements.

## 21.3 Minimum safety and pollution criteria for products subject to chapter 17 of the IBC Code

21.3.1 Products are deemed to be hazardous and subject to chapter 17 of the IBC Code if they meet one or more of the following criteria:

- .1 inhalation LC<sub>50</sub>/ATE ≤ 20 mg/L/4h (see paragraph 21.7.1.3) (C3 = 1, 2, 3 or 4);
- .2 dermal LD<sub>50</sub>/ATE ≤ 2000 mg/kg (see paragraph 21.7.1.2) (C2 = 1, 2, 3 or 4);
- .3 oral LD<sub>50</sub>/ATE ≤ 2000 mg/kg (see paragraph 21.7.1.1) (C1 = 1, 2, 3, or 4);
- .4 toxic to mammals by prolonged exposure (see paragraph 21.7.2) (D3 = C, M, R, N, T, or I);
- .5 cause skin sensitization (see paragraph 21.7.3) (D3 = Ss);
- .6 cause respiratory sensitization (see paragraph 21.7.4) (D3 = Sr);
- .7 corrosive to skin (see paragraph 21.7.5) (D1 = 3, 3A, 3B, or 3C);

- .8 with a Water Reactive Index (WRI) of  $\geq 1$  (see paragraph 21.7.6);
- .9 require inertion, inhibition, stabilization, temperature control or tank environmental control in order to prevent a hazardous reaction (see definitions in paragraph 21.7.10);
- .10 flashpoint  $< 23^{\circ}\text{C}$ ; and have an explosive/flammability range (expressed as a percentage by volume in air) of  $\geq 20\%$ ;
- .11 auto-ignition temperature of  $\leq 200^{\circ}\text{C}$ ; and
- .12 classified as pollution category X or Y or meeting the criteria for rules 11 to 13 in table 2 in paragraph 21.4.5.2.

**21.4 Criteria used to assign the minimum carriage requirements for products that meet the minimum safety or pollution criteria to make them subject to chapter 17 of the IBC Code**

**21.4.1 Column a – Product name**

21.4.1.1 A standardized chemical name, preferably assigned on the basis of the Chemical Abstracts Service (CAS) or the International Union of Pure and Applied Chemistry (IUPAC) system, shall be used as far as possible. However, where this is unnecessarily complex, then a technically correct and unambiguous alternative name may be used.

**21.4.2 Column b – Deleted**

**21.4.3 Column c – Pollution category**

21.4.3.1 *Column c* identifies the pollution category assigned to each product in accordance with MARPOL Annex II, based on table 1 below (see MARPOL Annex II, appendix I).

**Table 1 – Guidelines for the categorization of Noxious Liquid Substances**

Rule	A1 Bio- accumulation	A2 Bio- degradation	B1 Acute toxicity	B2 Chronic toxicity	D3 Long-term health effects	E2 Effects on marine wildlife and on benthic habitats	Cat
1			$\geq 5$				X
2	$\geq 4$		4				
3		NR	4				
4	$\geq 4$	NR			CMRTNI <sup>1</sup>		Y
5			4				
6			3				
7			2				
8	$\geq 4$	NR		Not 0			
9				$\geq 1$			

<sup>1</sup> Applies if the D3 rating contains any of these letters or any combination thereof.

10						Fp, F or S If not Inorganic		
11					CMRTNI <sup>1</sup>			
12	Any product not meeting the criteria of rules 1 to 11 and 13							<b>Z</b>
13	All products identified as: ≤ 2 in column A1; R in column A2; blank in column D3; not Fp, F or S (if not organic) in column E2; and 0 (zero) in all other columns of the GESAMP Hazard Profile							<b>OS</b>

#### 21.4.4 Column d – Hazards

21.4.4.1 An "S" is assigned to *column d* if any of the safety criteria described in paragraphs 21.3.1.1 to 21.3.1.11 are met.

21.4.4.2 A "P" is assigned to *column d* if the product meets the criteria for assigning ship type 1 to 3 as defined by rules 1 to 14 in the table 2.

#### 21.4.5 Column e – Ship type

21.4.5.1 Assignment of ship types is carried out from both a pollution and safety perspective. The basic criteria for assigning ship types from a pollution perspective is carried out based on the GESAMP Hazard Profile, shown in table 2. An explanation of the details in the columns is provided in appendix I of MARPOL Annex II.

21.4.5.2 The following criteria are used to assign the ship type:

##### *Ship type 1:*

Inhalation LC<sub>50</sub>/ATE ≤ 0.5 mg/L/4h (C3 = 4) and SVC/LC<sub>50</sub> ≥ 20; and/or

Dermal LD<sub>50</sub>/ATE ≤ 50 mg/kg (C2 = 4); and/or

WRI = 3; and/or

Auto-ignition temperature ≤ 65°C; and/or

Explosive range ≥ 50% v/v in air and the flashpoint < 23°C; and/or

Rules 1 or 2 of the table 2 shown in 21.4.5.2 (below).

##### *Ship type 2:*

Inhalation LC<sub>50</sub>/ATE ≤ 0.5 mg/L/4h (C3 = 4) and SVC/LC<sub>50</sub> < 20; or

Inhalation<sup>2</sup> LC<sub>50</sub>/ATE > 0.5 mg/L/4h – ≤ 2mg/L/4h (C3 = 3) and SVC/LC<sub>50</sub> ≥ 2; and/or

Dermal LD<sub>50</sub>/ATE > 50 mg/kg – ≤ 200 mg/kg (C2 = 3); and/or

WRI = 2; and/or

Auto-ignition temperature ≤ 200°C; and/or

Explosive range ≥ 40% v/v in air and the flashpoint < 23°C; and/or

Any product meeting the criteria of rules 3 to 10 in table 2.

##### *Ship type 3:*

Any of the minimum safety or pollution criteria for bulk liquid cargoes subject to chapter 17 of the IBC Code not meeting the requirements for ship types 1 or 2 and not meeting rule 15 of table 2 shown in 21.4.5.2 (below).

<sup>2</sup> Products with a density >1025 kg/m<sup>3</sup> (sinkers) or a water solubility of >50% (dissolvers) that are assigned to Ship Type 2 based on the inhalation toxicity criteria, should be re-assigned to Ship Type 3.

**Table 2 – Assignment of ship types based on the GESAMP Hazard Profile**

Rule	A1	A2	B1	B2	D3	E2	Ship Type
1			≥ 5				1
2	≥ 4	NR	4		CMRTNI <sup>3</sup>		
3	≥ 4	NR			CMRTNI <sup>3</sup>		
4			4				2
5	≥ 4		3				
6		NR	3				
7				≥ 1			
8						Fp	
9					CMRTNI <sup>3</sup>	F	
10			≥ 2			S	
11	≥ 4						3
12		NR					
13			≥ 1				
14	All other category Y Substances						
15	All other category Z Substances All "Other Substances" (OS)						NA

#### 21.4.6 Column f – Tank type

21.4.6.1 The tank type is assigned according to the following criteria:

Tank type 1G: Inhalation LC<sub>50</sub>/ATE ≤ 0.5 mg/L/4h (C3 = 4) and SVC/LC<sub>50</sub> ≥ 1000; and/or  
Dermal LD<sub>50</sub>/ATE ≤ 50 mg/kg (C2 = 4); and/or;  
WRI=3; and/or  
Auto-ignition temperature ≤ 65°C; and/or  
Explosive range ≥ 40% v/v in air and the flashpoint < 23°C.  
Based on expert judgement, tank type 1G may be required for specific products (e.g. for molten sulphur, hydrochloric acid)

Tank type 2G: Any of the minimum safety or pollution criteria for bulk liquid cargoes subject to chapter 17 or the IBC Code not meeting the requirements for tank type 1G.

#### 21.4.7 Column g – Tank vents

21.4.7.1 The tank venting arrangements are assigned according to the following criteria:

Controlled: Inhalation LC<sub>50</sub>/ATE ≤ 10 mg/L/4h (C3 = 2, 3 or 4), unless in accordance with 21.7.12; and/or  
Toxic to mammals by prolonged exposure (D3 = C, M, R, T, N, or I); and/or  
Respiratory sensitizer (D3 = Sr, see also paragraph 21.7.4); and/or  
Special carriage control needed; and/or  
Flashpoint ≤ 60°C; and  
Corrosive to skin (≤ 4h exposure). (D1 = 3A, 3B, or 3C).

<sup>3</sup> Applies if the D3 rating contains any of these letters or any combination thereof.

Open: Any of the minimum safety or pollution criteria for bulk liquid cargoes subject to chapter 17 or the IBC Code not meeting the requirements for controlled tank vents.

#### 21.4.8 Column h – Tank environmental control

21.4.8.1 The tank environmental control conditions are assigned according to the following criteria:

Inert: Auto-ignition temperature  $\leq 200^{\circ}\text{C}$ ; and/or  
 Reacts with air to cause a hazard; and/or  
 Explosive range  $\geq 40\%$  and the flashpoint  $< 23^{\circ}\text{C}$ .  
 Dry: WRI  $> 1$   
 Pad: Only applies to specific products identified on a case by case basis.  
 Vent: Only applies to specific products identified on a case by case basis.  
 No: Where the above criteria do not apply (inerting requirements may be required under SOLAS).

#### 21.4.9 Column i – Electrical equipment

21.4.9.1 If the flashpoint of the product is  $\leq 60^{\circ}\text{C}$  or the product is heated to within  $15^{\circ}\text{C}$  of its flashpoint then the electrical equipment required are assigned according to the following criteria, otherwise "-" is assigned in column *i'* and *i''*:

##### .1 Column *i'* – Temperature class:

T1 Auto-ignition temperature  $\geq 450^{\circ}\text{C}$   
 T2 Auto-ignition temperature  $\geq 300^{\circ}\text{C}$  but  $< 450^{\circ}\text{C}$   
 T3 Auto-ignition temperature  $\geq 200^{\circ}\text{C}$  but  $< 300^{\circ}\text{C}$   
 T4 Auto-ignition temperature  $\geq 135^{\circ}\text{C}$  but  $< 200^{\circ}\text{C}$   
 T5 Auto-ignition temperature  $\geq 100^{\circ}\text{C}$  but  $< 135^{\circ}\text{C}$   
 T6 Auto-ignition temperature  $\geq 85^{\circ}\text{C}$  but  $< 100^{\circ}\text{C}$

##### .2 Column *i''* – Apparatus group:

Apparatus group	MESG at $20^{\circ}\text{C}$ (mm)	MIC ratio product/methane
IIA	$> 0.90$	$> 0.80$
IIB	$> 0.50$ to $\leq 0.90$	$> 0.45$ to $\leq 0.80$
IIC	$\leq 0.50$	$\leq 0.45$

.1 The tests shall be carried out in accordance with the procedures described in IEC 60079-1-1:2002 and IEC 79-3.

.2 For gases and vapours it is sufficient to make only one determination of either the Maximum Experimental Safe Gap (MESG) or the Minimum Igniting Current (MIC) provided that:

for Group IIA: the MESG  $> 0.90$  mm or the MIC ratio  $> 0.80$   
 for Group IIB: the MESG is  $> 0.50$  mm and  $\leq 0.90$  mm; or  
 the MIC ratio is  $> 0.50$  and  $\leq 0.80$

for Group IIC: the MESH is  $\leq 0.50$  mm or the MIC ratio is  $\leq 0.45$

- .3 It is necessary to determine both the MESH and the MIC ratio when:
- .1 the MIC ratio determination only has been made, and the ratio is between 0.80 and 0.90, when an MESH determination will be required;
  - .2 the MIC ratio determination only has been made, and the ratio is between 0.45 and 0.50, when an MESH determination will be required; or
  - .3 the MESH only has been found, and is between 0.50 mm and 0.55 mm, when an MIC ratio determination will be required.

.3 **Column i''' Flashpoint:**

> 60°C	Yes
$\leq 60^\circ\text{C}$	No
Non-flammable	NF

### 21.4.10 Column j – Gauging

21.4.10.1 The gauging equipment is assigned according to the following criteria:

- Closed: Inhalation  $\text{LC}_{50}/\text{ATE} \leq 2$  mg/L/4h (C3 = 3 or 4), unless in accordance with 21.7.12; and/or  
Dermal  $\text{LD}_{50}/\text{ATE} \leq 1000$  mg/kg (C2 = 2, 3 or 4); and/or  
Toxic to mammals by prolonged exposure (D3 = C, M, R, T, N, or I); and/or  
Respiratory sensitizer (D3 = Sr, see also paragraph 21.7.4); and/or  
Severely corrosive to skin ( $\leq 3$  min exposure) (D1= 3C).
- Restricted: Inhalation  $\text{LC}_{50}/\text{ATE} > 2 - \leq 10$  mg/L/4h (C3 = 2), unless in accordance with 21.7.12; and/or  
Special carriage control indicates inerting required; and/or  
Highly corrosive to skin ( $> 3$  min -  $\leq 1$ h exposure) (D1 = 3B); and/or  
Flashpoint  $\leq 60^\circ\text{C}$ .
- Open: Any of the minimum safety or pollution criteria for bulk liquid cargoes subject to chapter 17 or the IBC Code not meeting the requirements for closed or restricted gauging.

### 21.4.11 Column k – Vapour detection

21.4.11.1 The vapour detection equipment is assigned according to the following criteria:

- Toxic (T): Inhalation  $\text{LC}_{50}/\text{ATE} \leq 10$  mg/L/4h (C3 = 2, 3, or 4), unless in accordance with 21.7.12, and/or  
Respiratory sensitizer (D3 = Sr, see also paragraph 21.7.4); and/or  
Toxic to mammals by prolonged exposure (D3 = C, M, R, T, N, or I).

Flammable (F): Flashpoint  $\leq 60^{\circ}\text{C}$   
No (No): Where the above criteria do not apply

#### 21.4.12 **Column l – Fire protection equipment**

21.4.12.1 The appropriate firefighting media are defined as being appropriate according to the following criteria related to the properties of the product:

Solubility > 10% (> 100000 mg/L)	A	Alcohol-resistant foam
Solubility $\leq 10\%$ ( $\leq 100000$ mg/L)	A	Alcohol-resistant foam; and/or
	B	Regular foam
WRI = 0	C	Water spray (generally used as a coolant and can be used with A and/or B providing that the WRI = 0)
WRI $\geq 1$	D	Dry chemical
	No	No requirements under this Code <sup>4</sup>

**Note:** all appropriate media shall be listed.

#### 21.4.13 **Column m – Deleted**

#### 21.4.14 **Column n – Emergency equipment**

21.4.14.1 The requirement to have personnel emergency equipment on board is identified by "Yes" in *column n* according to the following criteria:

Inhalation  $\text{LC}_{50}/\text{ATE} \leq 2$  mg/L/4h (C3 = 3 or 4); unless in accordance with 21.7.12 and/or  
Respiratory sensitizer (D3 = Sr, see also paragraph 21.7.4); and/or  
Severely corrosive to skin ( $\leq 3$  min exposure) (D1 = 3C); and/or  
WRI = 2.

No: indicates that the above criteria do not apply.

#### 21.5 **Column o – Criteria for special requirements in chapter 15**

21.5.1 The assignment of special requirements in *column o* shall normally follow clear criteria based on the data supplied in the reporting form. Where it is considered appropriate to deviate from such criteria, this shall be clearly documented in such a way that it can easily be retrieved on demand.

21.5.2 The criteria for making reference to the special requirements identified in chapters 15 and 16 are defined below with comments where relevant.

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<sup>4</sup> This applies where a product as identified as NF in column i" (see paragraph 21.4.9.1.3).

### **21.5.3 Paragraphs 15.2 to 15.10 and 15.20**

21.5.3.1 Paragraphs 15.2 to 15.10 and 15.20 identify specific products by name with special carriage requirements that cannot be easily accommodated in any other way.

### **21.5.4 Paragraph 15.11 – Acids**

21.5.4.1 Paragraph 15.11 applies to all acids unless they:

- .1 are organic acids – when only paragraphs 15.11.2 to 15.11.4 and paragraphs 15.11.6 to 15.11.8 apply; or
- .2 do not evolve hydrogen – when paragraph 15.11.5 need not apply.

### **21.5.5 Paragraph 15.12 – Toxic products**

21.5.5.1 All of paragraph 15.12 is added to *column o* according to the following criteria:

Inhalation  $LC_{50}/ATE \leq 2$  mg/L/4h (C3 = 3 or 4), unless in accordance with 21.7.12; and/or  
the product is a respiratory sensitizer (D3 = Sr, see also paragraph 21.7.4); and/or  
the product is toxic to mammals by prolonged exposure (D3 = C, M, R, T, N, or I).

21.5.5.2 Paragraphs 15.12.3 and 15.12.4 are added to *column o* according to the following criterion:

Inhalation  $LC_{50}/ATE > 2 - \leq 10$  mg/L/4h (C3 = 2), unless in accordance with 21.7.12.

21.5.5.3 Paragraph 15.12.3.2 is added to *column o* according to the following criteria:

Dermal  $LD_{50}/ATE \leq 1000$  mg/kg (C2 = 2, 3, or 4); and/or  
Oral  $LD_{50}/ATE \leq 300$  mg/kg (C1 = 2, 3, or 4).

### **21.5.6 Paragraph 15.13 – Cargoes protected by additives**

21.5.6.1 The requirement to assign paragraph 15.13 to *column o* is based on the information related to the product's tendency to polymerize, decompose, oxidize or undergo other chemical changes which may cause a hazard under normal carriage conditions, but which would be prevented by the addition of appropriate additives.

### **21.5.7 Paragraph 15.14 – Cargoes with a vapour pressure greater than atmospheric at 37.8°C**

21.5.7.1 The requirement to assign paragraph 15.14 to *column o* is based on the following criterion:

Boiling point  $\leq 37.8^\circ\text{C}$

### **21.5.8 Paragraph 15.16 – Cargo contamination**

21.5.8.1 Paragraph 15.16.1 is deleted.

21.5.8.2 Paragraph 15.16.2 is added to *column o* according to the following criterion:  
WRI > 1



### **21.5.9 Paragraph 15.17 – Increased ventilation requirements**

21.5.9.1 Paragraph 15.17 shall be added to *column o* according to the following criteria:

Inhalation LC<sub>50</sub>/ATE > 0.5 - ≤ 2 mg/L/4h (C3 = 3), unless in accordance with 21.7.12;  
and/or  
Respiratory sensitizer (D3 = Sr, see also paragraph 21.7.4); and/or  
Toxic to mammals by prolonged exposure (D3 = C, M, R, T, N, or I); and/or  
Highly to severely corrosive to skin (≤ 1h exposure time) (D1 = 3B or 3C).

### **21.5.10 Paragraph 15.18 – Special cargo pump-room requirements**

21.5.10.1 Paragraph 15.18 shall be added to *column o* according to the following criterion:

Inhalation LC<sub>50</sub>/ATE ≤ 0.5 mg/L/4h (C3 = 4), unless in accordance with 21.7.12

### **21.5.11 Paragraph 15.19 – Overflow control**

21.5.11.1 Paragraph 15.19 shall be added to *column o* according to the following criteria:

Inhalation LC<sub>50</sub>/ATE ≤ 2 mg/L/4h (C3 = 3 or 4), unless in accordance with 21.7.12;  
and/or  
Dermal LD<sub>50</sub>/ATE ≤ 1000 mg/kg (C2 = 2, 3, or 4); and/or  
Oral LD<sub>50</sub>/ATE ≤ 300 mg/kg (C1 = 2, 3, or 4); and/or  
Respiratory sensitizer (D3 = Sr, see also paragraph 21.7.4); and/or  
Severely corrosive to skin (≤ 3 min exposure) (D1 = 3C); and/or  
Auto-ignition temperature ≤ 200°C; and/or  
Explosive range ≥ 40% v/v in air and flashpoint < 23°C; and/or  
Classified as ship type 1 on pollution grounds.

21.5.11.2 Only paragraph 15.19.6 shall apply if the product has any of the following properties:

Inhalation LC<sub>50</sub>/ATE > 2 mg/L/4h - ≤ 10 mg/L/4h (C3 = 2), unless in accordance with 21.7.12; and/or  
Dermal LD<sub>50</sub>/ATE > 1000 mg/kg - ≤ 2000 mg/kg (C2 = 1); and/or  
Oral LD<sub>50</sub>/ATE > 300 mg/kg - ≤ 2000 mg/kg (C1 = 1); and/or  
Skin sensitizer (D3=Ss); and/or  
Highly corrosive to skin (> 3 min - ≤ 1h exposure) (D1 = 3B); and/or  
Flashpoint ≤ 60°C; and/or  
Classified as ship type 2 on pollution grounds; and/or  
Pollution category X or Y.

### **21.5.12 Paragraph 15.21 –Temperature sensors**

21.5.12.1 Paragraph 15.21 is added to *column o* according to the heat sensitivity of the product. This requirement is related to pumps in cargo pump-rooms only.

## **21.6 Column o – Criteria for special requirements in chapter 16.**

### **21.6.1 Paragraphs 16.1 to 16.2.5 and 16.3 to 16.5**

21.6.1.1 These apply to all cargoes and so are not referenced specifically in *column o*.

## 21.6.2 Paragraph 16.2.6

21.6.2.1 Paragraph 16.2.6 is added to *column o* for products, which meet the following criteria: Pollution Category X or Y and viscosity  $\geq 50$  mPa·s at 20°C.

## 21.6.3 Paragraph 16.2.9

21.6.3.1 Paragraph 16.2.9 is added to *column o* for products, which meet the following criterion: Melting point  $\geq 0^\circ\text{C}$ .

## 21.6.4 Paragraph 16.6 – Cargo not to be exposed to excessive heat

21.6.4.1 Paragraphs 16.6.2 to 16.6.4 are added to *column o* for products, which are identified as requiring temperature control during carriage.

## 21.6.5 Paragraph 16.2.7 – Persistent floaters

Paragraph 16.2.7 is added to *column o* for products which meet the following criteria: Pollution Category Y that are persistent floaters ( $E2 = Fp$ ) with a viscosity greater than or equal to 50mPa·s at 20°C and/or with a melting point greater than or equal to 0°C.

## 21.7 Definitions

### 21.7.1 Acute mammalian toxicity

LC<sub>50</sub> is the concentration in air, LD<sub>50</sub> is the amount (dose) of test substance, which causes mortality to 50% of a test species. ATE refers to a dose (concentration) range or extrapolated dose (concentration) leading to lethal effects in mammals, equivalent to an LC<sub>50</sub> or LD<sub>50</sub>.

#### 21.7.1.1 Acutely toxic if swallowed

Oral toxicity (LD <sub>50</sub> /ATE)		GESAMP Hazard Profile Rating C1
Hazard Level	mg/kg	
High	$\leq 5$	4
Moderately High	$> 5 - \leq 50$	3
Moderate	$> 50 - \leq 300$	2
Slight	$> 300 - \leq 2000$	1
Negligible	$> 2000$	0

#### 21.7.1.2 Acutely toxic in contact with skin

Dermal toxicity (LD <sub>50</sub> /ATE)		GESAMP Hazard Profile Rating C2
Hazard Level	mg/kg	
High	$\leq 50$	4
Moderately high	$> 50 - \leq 200$	3
Moderate	$> 200 - \leq 1000$	2
Slight	$> 1000 - \leq 2000$	1
Negligible	$> 2000$	0

### 21.7.1.3 Acutely toxic by inhalation<sup>5</sup>

Inhalation toxicity (LC <sub>50</sub> /ATE)		GESAMP Hazard Profile Rating C3
Hazard level	mg/L/4h	
High	≤ 0.5	4
Moderately high	> 0.5 - ≤ 2	3
Moderate	> 2 - ≤ 10	2
Slight	> 10 - ≤ 20	1
Negligible	> 20	0

### 21.7.2 Toxic to mammals by prolonged exposure

21.7.2.1 A product is classified as *toxic to mammals by prolonged exposure* if it meets any of the following criteria: it is known to be, or suspected of being carcinogenic, mutagenic, reprotoxic, neurotoxic, immunotoxic or exposure below the lethal dose is known to cause Specific Target Organ Toxicity.

21.7.2.2 Such effects may be identified from the GESAMP Hazard Profile of the product (D3 = C, M, R, T, N, or I) or other recognized sources of such information.

### 21.7.3 Skin sensitization

21.7.3.1 A product is classified as a *skin sensitizer*:

- .1 if there is evidence in humans that the substance can induce sensitization by skin contact in a substantial number of persons; or
- .2 where there are positive results from an appropriate test.

21.7.3.2 Such effects are identified in the GESAMP Hazard Profile for the product (D3 = Ss).

### 21.7.4 Respiratory sensitization

21.7.4.1 A product is classified as a *respiratory sensitizer*:

- .1 if there is evidence in humans that the substance can induce specific respiratory hypersensitivity; and/or
- .2 where there are positive results from an appropriate test; and/or
- .3 where the product does not have a GESAMP Hazard Profile and is identified as a skin sensitizer and there is no evidence to show that it is not a respiratory sensitizer.

21.7.4.2 Such effects are identified in the GESAMP Hazard Profile for the product (D3 = Sr) or other recognized sources of such information, if no profile exists.

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<sup>5</sup> All inhalation toxicity data are assumed to be for vapours and not mists or sprays, unless otherwise indicated.

### 21.7.5 Corrosive to skin

Hazard Level	Exposure time to cause full thickness necrosis of skin	GESAMP Hazard Profile rating (D1)
Severely corrosive to skin	≤ 3 min	3C
Highly corrosive to skin	> 3 min - ≤ 1h	3B (3 <sup>6</sup> )
Moderately corrosive to skin	> 1h - ≤ 4h	3A

### 21.7.6 Water reactive substances<sup>7</sup>

21.7.6.1 These are classified as follows:

Water Reactive Index (WRI)	Definition
3	Any chemical which is extremely reactive with water and produces large quantities of flammable, toxic or corrosive gas or aerosol
2	Any chemical which, in contact with water, may produce a toxic, flammable or corrosive gas or aerosol
1	Any chemical which, in contact with water, may generate heat or produce a non-toxic, non-flammable or non-corrosive gas
0	Any chemical which, in contact with water, would not undergo a reaction to justify a value of 1, 2 or 3

### 21.7.7 Air reactive substances

21.7.7.1 Air reactive substances are products that react with air to cause a potentially hazardous situation, e.g. the formation of peroxides that may cause an explosive reaction.

### 21.7.8 Electrical apparatus – Temperature class

(for products which either have a flashpoint of ≤ 60°C or are heated to within 15°C of their flashpoint)

21.7.8.1 The temperature class is defined by the International Electrotechnical Commission (IEC) as:

"The highest temperature attained under practical conditions of operation within the rating of the apparatus (and recognized overloads, if any, associated therewith) by any part of any surface, the exposure of which to an explosive atmosphere may involve a risk."

21.7.8.2 The temperature class of the electrical apparatus is assigned by selecting the Maximum Surface Temperature which is closest to, but less than, the product's auto-ignition temperature (see 21.4.9.1.1).

<sup>6</sup> Note: A rating of 3 in the D1 column of the GESAMP Hazard Profile, without any additional letter notation (A, B or C), means that the severity of corrosivity has not been established. For such cases, a rating of 3 is understood to be equivalent to a rating of 3B for the purpose of assigning carriage requirements.

<sup>7</sup> Products that are corrosive to skin are also deemed to be corrosive by inhalation.

### 21.7.9 Electrical apparatus – Apparatus group (for products with a flashpoint of $\leq 60^{\circ}\text{C}$ )

21.7.9.1 This refers to intrinsically safe and associated electrical apparatus for explosive gas atmospheres which the IEC divide into the following groups:

Group I: for mines susceptible to firedamp (not used by IMO); and

Group II: for applications in other industries – further sub-divided according to its Maximum Experimental Safe Gap (MESG) and/or the Minimum Igniting Current (MIC) of the gas/vapour into groups IIA, IIB and IIC.

21.7.9.2 This property cannot be determined from other data associated with the product; it has to be either measured or assigned by assimilation with related products in a homologous series.

### 21.7.10 Special carriage control conditions

21.7.10.1 Special carriage control conditions refer to specific measures that need to be taken in order to prevent a hazardous reaction. They include:

- .1 *Inhibition*: the addition of a compound (usually organic) that retards or stops an undesired chemical reaction such as corrosion, oxidation or polymerization.
- .2 *Stabilization*: the addition of a substance (stabilizer) that tends to keep a compound, mixture or solution from changing its form or chemical nature. Such stabilizers may retard a reaction rate, preserve a chemical equilibrium, act as antioxidants, keep pigments and other components in emulsion form or prevent the particles in colloidal suspension from precipitating.
- .3 *Inertion*: the addition of a gas (usually nitrogen) in the ullage space of a tank that prevents the formation of a flammable cargo/air mixture.
- .4 *Temperature control*: the maintenance of a specific temperature range for the cargo in order to prevent a hazardous reaction or to keep the viscosity low enough to allow the product to be pumped.
- .5 *Padding and venting*: only applies to specific products identified on a case by case basis.

### 21.7.11 Flammable cargoes

21.7.11.1 A cargo is defined as flammable according to the following criteria:

IBC Code descriptor	Flashpoint (degrees Centigrade)
Highly flammable	< 23
Flammable	$\leq 60$ but $\geq 23$

21.7.11.2 It should be noted that flashpoints of mixtures and aqueous solutions need to be measured unless all of the components are non-flammable.

21.7.11.3 It should be noted that the carriage of bulk liquid cargoes that have a flashpoint of  $\leq 60^{\circ}\text{C}$  are subject to other SOLAS regulations.

### 21.7.12 Application of the SVC/LC<sub>50</sub> ratio method

21.7.12.1 If the vapour pressure and the molecular weight of a substance are known, an estimate of the maximum vapour concentration in a closed compartment (e.g. a tank) can be calculated. This is called the saturated vapour concentration (SVC).

21.7.12.2 The hazard quotient SVC/LC<sub>50</sub><sup>8</sup> is a substance specific value for the velocity of a vapour for achieving a hazardous concentration when emerging from a liquid source (e.g. leak, spillage or tank ventilation), and can be used in the assignment of specific carriage requirements related to inhalation toxicity.

21.7.12.3 If a solid substance is transported in an aqueous solution, the vapour pressure<sup>9</sup> of this solid rather than that of water may be used in the calculation of the SVC/LC<sub>50</sub> ratio.

#### 21.7.12.4 Application of the SVC/LC<sub>50</sub> ratio for assigning Ship Type and Tank type

21.7.12.4.1 For the assignment of ship type and tank type, as set out in paragraphs 21.4.5 and 21.4.6, the application of the SVC/LC<sub>50</sub> ratio method is optional. Should this method be used, the vapour pressure at  $20^{\circ}\text{C}$  shall be used when calculating the SVC/LC<sub>50</sub> ratio.

21.7.12.4.2 The SVC mg/L of a substance should be calculated as follows:

$$SVC(mg/L) = \left( \frac{\text{Vapour pressure @ } 20^{\circ}\text{C (Pa)}}{101300 \text{ (Pa)}} \times 10^6 \right) \times \frac{M_w \left( \frac{g}{mol} \right)}{24(L/mol) \times 1000}$$

where  $M_w$  is the molecular weight of the substance.

21.7.12.4.3 The SVC/LC<sub>50</sub> ratio should be calculated as follows:

$$SVC/LC_{50} = \frac{SVC(mg/L)}{LC_{50}mg/L/4h}$$

#### 21.7.12.5 Application of the SVC/LC<sub>50</sub> ratio for assigning carriage requirements

21.7.12.5.1 For the carriage requirements listed in 21.7.12.5.5, the application of the SVC/LC<sub>50</sub> ratio method is optional. If the SVC/LC<sub>50</sub> ratio method is used in the assignment of these carriage requirements, the vapour pressure at  $40^{\circ}\text{C}$  shall be used when calculating the SVC/LC<sub>50</sub> ratio. If the carriage temperature is higher than  $40^{\circ}\text{C}$ , then the SVC/LC<sub>50</sub> ratio should be calculated at that temperature.

21.7.12.5.2 The SVC (mg/l) of a substance should be calculated as follows:

$$SVC(mg/L) = \left( \frac{\text{Vapour pressure @ } 40^{\circ}\text{C (Pa)}}{101300 \text{ (Pa)}} \times 10^6 \right) \times \frac{M_w \left( \frac{g}{mol} \right)}{[26](L/mol) \times 1000}$$

<sup>8</sup> ATE values can be considered as equivalent to LC<sub>50</sub> values. See paragraph 21.7.1.

<sup>9</sup> If this data is not available, an estimate may be used.

where  $M_w$  is the molecular weight of the substance.

21.7.12.5.3 The SVC/LC<sub>50</sub> ratio should be calculated as follows:

$$SVC / LC_{50} = \frac{SVC (mg / L)}{LC_{50} mg / L / 4h}$$

21.7.12.5.4 The SVC (mg/L) formula described in 21.7.12.5.2 is standardized for calculations at 40°C. When using the vapour pressure at higher temperatures in the calculations, the formula must be amended accordingly.

21.7.12.5.5 For the following carriage requirements, the SVC/LC<sub>50</sub> ratio method, calculated at 40°C or higher, may be used as an alternative to the acute inhalation toxicity criteria given in paragraphs 21.4 and 21.5:

.1 **Column g – Tank vents**

Assignment of controlled venting is not required based on the inhalation hazard only, if:

Inhalation LC<sub>50</sub>/ATE ≤ 10 mg/L/4h (C3 = 2, 3, or 4) and SVC/LC<sub>50</sub> < 0.2

.2 **Column j – Gauging**

Closed gauging is not required based on the inhalation hazard only, if:

Inhalation LC<sub>50</sub>/ATE ≤ 2 mg/L/4h (C3 = 3 or 4) and SVC/LC<sub>50</sub> < 0.2 but restricted gauging is required.

Restricted gauging is not required based on the inhalation hazard only, if:

Inhalation LC<sub>50</sub>/ATE > 2 - ≤ 10 mg/L/4h (C3 = 2) and SVC/LC<sub>50</sub> < 0.2

.3 **Column k – Vapour detection**

Assignment of toxic vapour detection is not required based on the inhalation hazard only, if:

Inhalation LC<sub>50</sub>/ATE ≤ 10 mg/L/4h (C3 = 2, 3, or 4) and SVC/LC<sub>50</sub> < 0.2

.4 **Column n – Emergency Equipment**

Inhalation LC<sub>50</sub>/ATE ≤ 2 mg/L/4h (C3 = 3 or 4) and SVC/LC<sub>50</sub> < 0.2

.5 **Column o – Special requirements in chapter 15**

15.12.1 and 15.12.2 are not required based on the inhalation hazard only, if:

Inhalation LC<sub>50</sub>/ATE ≤ 2 mg/L/4h (C3 = 3 or 4) and SVC/LC<sub>50</sub> < 0.2

15.12.3 and 15.12.4 are not required based on the inhalation hazard only, if:

Inhalation  $LC_{50}/ATE > 2 - \leq 10$  mg/L/4h (C3 = 2) and  $SVC/LC_{50} < 0.2$

15.17 is not required based on the inhalation hazard only, if:

Inhalation  $LC_{50}/ATE \leq 0.5$  mg/L/4h (C3 = 4) and  $SVC/LC_{50} < 0.2$

15.18 is not required based on the inhalation hazard only if:

Inhalation  $LC_{50}/ATE \leq 0.5$  mg/L/4h (C3 = 4) and  $SVC/LC_{50} < 0.2$

15.19 is not required based on the inhalation hazard only, if:

Inhalation  $LC_{50}/ATE \leq 2$  mg/L/4h (C3 = 3 or 4) and  $SVC/LC_{50} < 0.2$ , but  
15.19.6 applies

15.19.6 is not required based on the inhalation hazard only, if:

Inhalation  $LC_{50}/ATE > 2 - \leq 10$  mg/L/4h (C3 = 2) and  $SVC/LC_{50} < 0.2$ "

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## ANNEX 10

### DRAFT AMENDMENTS TO PARTS A AND A-1 OF THE IGF CODE

#### PART A

## 2 GENERAL

### 2.2 Definitions

1 The following new definition 2.2.42 is introduced after 2.2.41:

"2.2.42 *Ship constructed on or after [date of entry into force]* means:

- .1 for which the building contract is placed on or after *[date of entry into force]*;
- .2 in the absence of a building contract, the keels of which are laid or which are at a similar stage of construction on or after *[date of entry into force + six months]*; or
- .3 the delivery of which is on or after *[date of entry into force + 48 months]*."

#### PART A-1

### SPECIFIC REQUIREMENTS FOR SHIPS USING NATURAL GAS AS FUEL

## 5 SHIP DESIGN AND ARRANGEMENT

### 5.3 Regulations – General

2 The text defining  $f_v$  in paragraph 5.3.4 is amended to read as follows:

" $f_v$  is calculated by use of the formulations for factor  $v$  contained in SOLAS regulation II-1/7-2.6.1.1 and reflects the probability that the damage is ~~not~~ extending vertically above the lowermost boundary of the fuel tank. The formulations to be used are:"

## 6 FUEL CONTAINMENT SYSTEM

### 6.8 Regulations on loading limit for liquefied gas fuel tanks

3 The following regulation is added after existing 6.8.2:

"6.8.2*bis* For ships constructed on or after *[date of entry into force]*, in cases where the tank insulation and tank location make the probability very small for the tank contents to be heated up due to an external fire, special considerations may be made to allow a higher loading limit than calculated using the reference temperature, but never above 95%. ~~This also applies in cases where a second system for pressure maintenance is installed, (refer to 6.9). However, if the pressure can only be maintained / controlled by fuel consumers, the loading limit as calculated in 6.8.1 shall be used.~~"

## **9 FUEL SUPPLY TO CONSUMERS**

### **9.5 Regulations for fuel distribution outside of machinery space**

4 The following regulations are added after 9.5.2:

"9.5.3 The requirements in 9.5.4 to 9.5.7 shall apply to ships constructed on or after [date of entry into force] in lieu of the requirements in 9.5.1 and 9.5.2.

9.5.4 Where gaseous fuel pipes pass through enclosed spaces in the ship, they shall be protected by a secondary enclosure. This enclosure can be a ventilated duct or a double wall piping system. The duct or double wall piping system shall be mechanically underpressure ventilated with 30 air changes per hour, and gas detection as required in 15.8 shall be provided. Other solutions providing an equivalent safety level may also be accepted by the Administration.

9.5.5 The requirement in 9.5.4 need not be applied for fully welded fuel gas vent pipes led through mechanically ventilated spaces.

9.5.6 Liquefied fuel pipes shall be protected by a secondary enclosure able to contain leakages. If the piping system is in a fuel preparation room or a tank connection space, the Administration may waive this requirement.

The secondary enclosure shall be able to withstand the maximum pressure that may build up in the enclosure in case of leakage from the fuel piping. For this purpose, the secondary enclosure may need to be arranged with a pressure relief system that prevents the enclosure from being subjected to pressures above their design pressures."

## **10 POWER GENERATION INCLUDING PROPULSION AND OTHER GAS CONSUMERS**

### **10.3 Regulations for internal combustion engines of piston type**

5 New regulation 10.3.1.1**bis** is added after existing 10.3.1.1 as follows:

"10.3.1.1**bis** For ships constructed on or after [date of entry into force], the exhaust system shall be equipped with explosion relief ~~ventilation sufficiently dimensioned to prevent excessive explosion pressures in the event of ignition failure of one cylinder followed by ignition of the unburned gas in the system.~~ systems unless designed to accommodate the worst case overpressure due to ignited gas leaks or justified by the safety concept of the engine. A detailed evaluation of the potential for unburnt gas in the exhaust system is to be undertaken covering the complete system from the cylinders up to the open end. This detailed evaluation shall be reflected in the safety concept of the engine."

## **11 FIRE SAFETY**

### **11.3 Regulations for fire protection**

6 Regulation 11.3.3 is amended as follows:

"11.3.3 The space containing the fuel containment system shall be separated from the machinery spaces of category A or other rooms with high fire risks. The separation shall be done by a cofferdam of at least 900 mm with insulation of A-60 class. When

determining the insulation of the space containing the fuel containment system from other spaces with lower fire risks, the fuel containment system shall be considered as a machinery space of category A, in accordance with SOLAS regulation II-2/9. ~~The boundary between spaces containing fuel containment systems shall be either a cofferdam of at least 900 mm or A-60 class division.~~ For type C tanks, the fuel storage hold space may be considered as a cofferdam.

- 7 The following new regulation 11.3.3*bis* is added after regulation 11.3.3:

11.3.3*bis* Notwithstanding 11.3.3, for ships constructed on or after [*date of entry into force*], for type C tanks, the fuel storage hold space may be considered as a cofferdam provided the type C tank is not located directly above machinery spaces of category A or other rooms with high fire risk. When the fuel storage hold space is considered as a cofferdam, the minimum distance to the A-60 boundary from the outer shell of the type C tank or the boundary of the tank connection space, if any, shall be at least 900 mm."

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## ANNEX 6

### DRAFT AMENDMENTS TO THE LSA CODE

#### CHAPTER IV SURVIVAL CRAFT

##### 4.4 General requirements for lifeboats

1 Paragraph 4.4.8.1 is replaced by the following:

".1 except for a lifeboat equipped with two independent propulsion systems, where the arrangement consists of two separate engines, shaft lines, fuel tanks, piping systems and any other associated ancillaries, and for a free fall lifeboat, sufficient buoyant oars to make headway in calm seas. Thole pins, crutches or equivalent arrangements shall be provided for each oar provided. Thole pins or crutches shall be attached to the boat by lanyards or chains."

#### CHAPTER VI LAUNCHING AND EMBARKATION APPLIANCES

##### 6.1 Launching and embarkation appliances

2 Paragraph 6.1.1.3 is replaced by the following:

"6.1.1.3 A launching appliance shall not depend on any means other than gravity or stored mechanical power which is independent of the ship's power supplies to launch the survival craft or rescue boat it serves in the fully loaded and equipped condition and also in the light condition.

On cargo ships equipped with a rescue boat which is not one of the ship's survival craft, having a mass not more than 700 kg in fully equipped condition, with engine, but without the crew, the launching appliance of the boat does not need to be fitted with stored mechanical power. Manual hoisting from the stowed position and turning out to the embarkation position shall be possible by one person. The force on the crank handle shall not exceed 160 N at the maximum crank radius of 350 mm. Means shall be provided for bringing the rescue boat against the ship's side and holding it alongside so that persons can be safely embarked."

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## ANNEX 7

### DRAFT AMENDMENTS TO CHAPTER 15 OF THE FSS CODE

#### CHAPTER 15 INERT GAS SYSTEMS

#### 2 Engineering specifications

#### 2.2 Requirements for all systems

#### 2.2.3.2 Inert gas lines

1 Paragraph 2.2.3.2.1 is replaced by the following:

"2.2.3.2.1 The inert gas main may be divided into two or more branches downstream of the non-return devices required by paragraph 2.2.3.1."

2 Paragraph 2.2.3.2.6 is replaced by the following:

"2.2.3.2.6 Arrangements shall be provided to enable the inert gas main to be connected to an external supply of inert gas. The arrangements shall consist of a 250 mm nominal pipe size bolted flange, isolated from the inert gas main by a valve and located downstream of the non-return valve. The design of the flange should conform to the appropriate class in the standards adopted for the design of other external connections in the ship's cargo piping system."

#### 2.2.4 Indicators and alarms

3 Paragraph 2.2.4.2 is replaced by the following:

"2.2.4.2 Instrumentation shall be fitted for continuously indicating and permanently recording, when inert gas is being supplied:

- .1 the pressure of the inert gas mains downstream of the non-return devices; and
- .2 the oxygen content of the inert gas."

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**ANNEX 8**

**DRAFT AMENDMENTS TO THE APPENDIX (CERTIFICATES)  
TO THE SOLAS CONVENTION**

**APPENDIX  
CERTIFICATES**

**RECORD OF EQUIPMENT FOR CARGO SHIP SAFETY  
(FORM E)**

**3 Details of navigational systems and equipment**

1 Item 8.1. is replaced as follows with the corresponding footnote:

"

	<b>Item</b>	<b>Actual provision</b>
8.1	Rudder, propeller, thrust, pitch and operational mode indicator <sup>2 3</sup>	.....

3 Delete as appropriate."

**RECORD OF EQUIPMENT FOR CARGO SHIP SAFETY  
(FORM C)**

**5 Details of navigational systems and equipment**

2 Item 8.1. is replaced as follows with the corresponding footnote:

"

	<b>Item</b>	<b>Actual provision</b>
8.1	Rudder, propeller, thrust, pitch and operational mode indicator <sup>2 3</sup>	.....

3 Delete as appropriate."

**RECORD OF EQUIPMENT FOR PASSENGER SHIP SAFETY  
(FORM P)**

**5 Details of navigational systems and equipment**

3 Item 8.1. is replaced as follows:

"

	<b>Item</b>	<b>Actual provision</b>
8.1	Rudder, propeller, thrust, pitch and operational mode indicator <sup>3 4</sup>	.....

4 Delete as appropriate."

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MSC.1/Circ.1430/Rev.1  
7 December 2018

**REVISED GUIDELINES FOR THE DESIGN  
AND APPROVAL OF FIXED WATER-BASED FIRE-FIGHTING SYSTEMS FOR RO-RO  
SPACES AND SPECIAL CATEGORY SPACES**

1 The Maritime Safety Committee, at its eighty-fourth session (7 to 16 May 2008), approved the *Guidelines for the approval of fixed water-based fire-fighting systems for ro-ro spaces and special category spaces equivalent to that referred to in resolution A.123(V)* (MSC.1/Circ.1272).

2 The Maritime Safety Committee, at its ninetieth session (16 to 25 May 2012), having considered a proposal by the Sub-Committee on Fire Protection, at its fifty-fifth session, with a view to updating and integrating the prescriptive requirements of the *Recommendation on fixed fire-extinguishing systems for special category spaces* (resolution A.123(V)) and the performance-based requirements of the *Guidelines for the approval of fixed water-based fire-fighting systems for ro-ro spaces and special category spaces equivalent to that referred to in resolution A.123(V)* (MSC.1/Circ.1272), approved the *Revised guidelines for the design and approval of fixed water-based fire-fighting systems for ro-ro spaces and special category spaces* (MSC.1/Circ.1430).

3 The Committee noted that MSC.1/Circ.1430 superseded MSC.1/Circ.1272, except that fire and component tests previously conducted in accordance with MSC.1/Circ.1272, remain valid for the approval of new systems. However, existing fixed fire-extinguishing systems for special category spaces approved and installed based on resolution A.123(V), MSC.1/Circ.1272 and MSC.1/Circ.1430 installed before 1 January 2021 should be permitted to remain in service as long as they are serviceable.

4 The Maritime Safety Committee, at its 100th session (3 to 7 December 2018), approved amendments to the *Revised guidelines for the design and approval of fixed water-based fire-fighting systems for ro-ro spaces and special category spaces* (MSC.1/Circ.1430), as prepared by the Sub-Committee on Ship Systems and Equipment, at its fifth session, and the revised guidelines are set out in the annex.

5 Member Governments are invited to apply the revised annexed Guidelines when approving fixed water-based fire-fighting systems for ro-ro spaces and special category spaces installed on or after 1 January 2021 and bring them to the attention of ship designers, shipowners, equipment manufacturers, test laboratories and other parties concerned.

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## ANNEX

### REVISED GUIDELINES FOR THE DESIGN AND APPROVAL OF FIXED WATER-BASED FIRE-FIGHTING SYSTEMS FOR RO-RO SPACES AND SPECIAL CATEGORY SPACES

#### 1 General

1.1 These Guidelines and fire tests are intended for the design and approval of fixed water-based fire-fighting systems for open and closed ro-ro spaces and special category spaces defined in SOLAS regulations II-2/3.12, II-2/3.13, II-2/3.35, II-2/3.36, II-2/3.46 and II-2/3.49. Deluge systems can be applied on open ro-ro spaces when the actual wind condition is taken into consideration, for example through the use of high velocity nozzles. Systems using automatic sprinklers or nozzles are only permitted for closed ro-ro and special category spaces or other spaces where wind conditions are not likely to affect system performance.

1.2 These Guidelines are intended to replace both the prescriptive requirements of resolution A.123(V) for conventional water spray systems and the performance-based requirements of the guidelines (MSC.1/Circ.1272) for automatic sprinkler and deluge systems. All systems should comply with sections 1, 2 and 3. In addition, prescriptive-based systems should comply with section 4, and performance-based systems should comply with section 5.

#### 2 Definitions

2.1 *Area of operation* is a design area for wet-pipe, automatic sprinkler system (to be determined for performance-based systems by the test procedure described in the appendix to these Guidelines).

2.2 *Automatic sprinkler or nozzle* is a single or multiple orifice water discharge device that activates automatically when its heat-activated element is heated to its thermal rating or above, allowing water under pressure to discharge in a specific, directional discharge pattern.

2.3 *Automatic system* is a system utilizing either automatic sprinklers or nozzles or a system that is automatically activated by a fire detection system.

2.4 *Deluge system, automatic and manual release* is a system employing open nozzles attached to a piping system connected to a water supply through a valve that can be opened by signals from a fire detection system and by manual operation. When this valve is opened, water flows into the piping system and discharges from all nozzles attached thereto.

2.5 *Deluge system, manual release* is a system employing open nozzles attached to a piping system connected to a water supply through a valve that is opened by manual operation. When this valve is opened, water flows into the piping system and discharges from all nozzles attached thereto.

2.6 *Dry pipe system* is a system employing automatic sprinklers or nozzles attached to a piping system containing air or nitrogen under pressure, the release of which (as from the activation of a sprinkler or nozzle by heat from a fire) permits the water pressure to open a valve known as a dry pipe valve. The water then flows into the piping and discharges from the open nozzles or sprinklers.

2.7 *Fire control* limits the size of a fire by distribution of water so as to decrease the heat release rate, while controlling ceiling gas temperatures and pre-wetting adjacent combustibles and/or reducing heat radiation to avoid structural damage.



2.8 *Fire suppression* is the sharp reduction of the heat release rate of a fire and the prevention of regrowth.

2.9 *K-factor* is a sprinkler nozzle discharge coefficient determined by testing, that is used to calculate flow rate at any given pressure through the relationship  $Q = k P^{1/2}$ , where  $Q$  is the flow rate in litres per minute, and  $P$  is the pressure in bars.

2.10 *Open sprinkler or nozzle* is an open single or multiple orifice water discharge device that, when discharging water under pressure, will distribute the water in a specific, directional discharge pattern.

2.11 *Performance-based requirements* are based on the results of fire tests conducted on specific nozzle design and arrangements. The required engineering parameters for such systems are determined by the results of the fire tests.

2.12 *Prescriptive based requirements* are specific requirements, such as minimum water discharge density or maximum nozzle spacing, and are applied equally to all systems designed to this approach.

2.13 *Pump* means a single water pump, with its associated driver and control or an individual pump within a pump unit.

2.14 *Pump unit* means a single water pump, or two or more pumps connected together to form a unit, with their associated driver(s) and controls.

2.15 *Pre-action system* is a system employing automatic sprinklers or nozzles attached to a piping system containing air that may or may not be under pressure, with a supplemental fire detection system installed in the same area as the sprinklers or nozzles. Activation of the fire detection system opens a valve that permits water to flow into the system piping and to be discharged from any sprinkler or nozzle that has operated.

2.16 *Water-based extinguishing medium* is fresh water or seawater, with or without an antifreeze solution and/or additives to enhance fire-extinguishing capability.

2.17 *Water discharge density* is the unit rate of water application to an area or surface expressed in mm/min (equal to  $(l/min)/m^2$ ).

2.18 *Wet pipe system* is a system employing automatic sprinklers or nozzles attached to a piping system containing water and connected to a water supply so that water discharges immediately from sprinklers or nozzles opened by heat from a fire.

### **3 Principal requirements for all systems**

3.1 The system may be automatically activated, automatically activated with provisions for manual activation or manually activated.

3.2 All systems should be divided into sections. Each section should be capable of being isolated by one section control valve. The section control valves should be located outside the protected space, be readily accessible without entering the protected spaces and their locations should be clearly and permanently indicated.

3.2.1 It should be possible to manually open and close the section control valves either directly on the valve or via a control system routed outside of the protected spaces. Means should be provided to prevent the operation of the section control valves by an unauthorized person. Control valve locations should be adequately ventilated to minimize the build-up of smoke.

3.2.2 A continuously manned control station and release station(s) for deluge systems should have remote indication of pump running and pressure in valve manifold. For deluge systems, release stations with controls for start and stop of pump(s) and operation (opening and closing) of section control valves should be provided in the valve room and in a continuously manned control station or the safety centre, if fitted. Remote indication of position of valves (open/closed) should be provided in the continuously manned control station or the safety centre, if fitted.

3.3 The piping system should be sized in accordance with a hydraulic calculation technique<sup>1</sup> such as the Hazen-Williams hydraulic calculation technique or the Darcy-Weisbach hydraulic calculation technique, to ensure the availability of the flows and pressures required for correct performance of the system. The design of the system should ensure that full system pressure is available at the most remote sprinkler or nozzle in each section within 60 s of activation.

3.4 The system supply equipment should be located outside the protected spaces and all power supply components (including cables) should be installed outside of the protected space. The electrical components of the pressure source for the system should have a minimum rating of IP 54.

3.5 Activation of an automatic system should give a visual and audible alarm at a continuously manned station. The alarm in the continuously manned station should indicate the specific section of the system that is activated. The system alarm requirements described within this paragraph are in addition to, and not a substitute for, the detection and fire alarm system required by SOLAS regulation II-2/20.4.

3.6 Wet pipe systems on board vessels that can operate in areas where temperatures below 0°C can be expected, should be protected from freezing either by having temperature control of the space, heating coils on pipes, antifreeze agents or other equivalent measures.

3.7 The capacity of the system water supply should be sufficient for the total simultaneous coverage of the minimum coverage area of tables 4-1 to 4-3 and 5-1 and the vertically applicable area as defined in paragraph 3.22.

3.8 The system should be provided with a redundant means of pumping or otherwise supplying a water-based extinguishing medium to the system. The capacity of the redundant means should be sufficient to compensate for the loss of any single supply pump or alternative source. Failure of any one component in the power and control system should not result in a reduction of required pump capacity of deluge systems. In the case of wet pipe, dry pipe and pre-action systems, failure of any one component in the power and control system should not result in a reduction of the automatic release capability or reduction of required pump capacity by more than 50%. However, systems requiring an external power source need only be supplied by the main power source. Hydraulic calculations should be conducted to assure that sufficient flow and pressure are delivered to the hydraulically most demanding section both in normal operation and in the event of the failure of any one component.

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<sup>1</sup> Where the Hazen-Williams Method is used, the following values of the friction factor *C* for different pipe types which may be considered should apply:

<i>Pipe type</i>	<i>C</i>
Black or galvanized mild steel	100
Copper and copper alloys	150
Stainless steel	150

3.9 The system should be fitted with a permanent sea inlet and be capable of continuous operation during a fire using sea water.

3.10 The system and its components should be designed to withstand ambient temperatures, vibration, humidity, shock, impact, clogging and corrosion normally encountered. Piping, pipe fittings and related components except gaskets inside the protected spaces should be designed to withstand 925°C. Distribution piping should be constructed of galvanized steel, stainless steel, or equivalent. Sprinklers and nozzles should comply with paragraph 3.11.

3.11 The system and its components should be designed and installed based on international standards acceptable to the Organization.<sup>2</sup> The nozzles should be manufactured and tested based on the relevant sections of appendix A to circular MSC/Circ.1165 (Revised Guidelines for the approval of equivalent water-based fire-extinguishing systems for machinery spaces and cargo pump-rooms).

3.12 A means for testing the automatic operation of the system and, in addition, assuring the required pressure and flow should be provided.

3.13 If the system is pre-primed with water containing a fire suppression enhancing additive and/or an antifreeze agent, periodic inspection and testing, as specified by the manufacturer, should be undertaken to ensure that their effectiveness is being maintained. Fire suppression enhancing additives should be approved for fire protection service by an independent authority. The approval should consider possible adverse health effects to exposed personnel, including inhalation toxicity.

3.14 Operating instructions for the system should be displayed at each operating position.

3.15 Installation plans and operating manuals should be supplied to the ship and be readily available on board. A list or plan should be displayed showing spaces covered and the location of the zone in respect of each section. Instructions for testing and maintenance should be available on board.

3.16 Spare parts should be provided as recommended by the manufacturer. In the case of automatic sprinkler systems, the total number of spare sprinkler heads for each type of sprinklers shall be six for the first 300, 12 for the first 1,000.

3.17 Where automatic systems are installed, a warning notice should be displayed outside each entry point stating the type of medium used (i.e. water) and the possibility of automatic release.

3.18 All installation, operation and maintenance instruction/plans for the system should be in the working language of the ship. If the working language of the ship is not English, French or Spanish, a translation into one of these languages should be included.

3.19 Any foam concentrates used as system additives should comply with the *Revised guidelines for the performance and testing criteria and surveys of foam concentrates for fixed fire-extinguishing systems* (MSC.1/Circ.1312).

3.20 Means for flushing of systems with fresh water should be provided.

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<sup>2</sup> Pending the development of international standards acceptable to the Organization, national standards as prescribed by the Administration should be applied.

3.21 The presence of obstructions and the potential for shielding of the water spray should be evaluated to ensure that the system performance is not affected. Supplementary sprinklers or nozzles should be installed beneath obstructions. In addition, nozzles should be located to protect spaces above and below intermediate decks, hoistable decks and ramps. Nozzles below hoistable decks should be capable of protecting all applicable heights.

3.22 Vertically the applicable area of all decks, including hoistable decks or other intermediate decks, between reasonably gas-tight steel decks (or equivalent materials), should be included for simultaneous coverage (example: with one hoistable deck, both the layer above and below this deck with a dimensioning area complying with tables 4-1 to 4-3 or 5-1 should be included in the water supply calculations). Decks with ramps are accepted as reasonably gas-tight decks assuming that the ramps are always in their closed position at sea and the ramps and the decks which these ramps are part of are reasonably gas-tight.

3.23 The length of a deluge section (along the lanes) should not be less than 20 m and the width of the section should not be less than 14 m. Further, the sections need not be longer or wider than the distance between reasonably gas-tight steel bulkheads (or equivalent materials). The maximum size of a section on any single deck should be 48 m multiplied by the width of cargo space (measured as distance between tight steel divisions). Vertically one section can cover up to three decks.

#### 4 Additional prescriptive-based system design requirements

In addition to the requirements in section 3, systems designed with this approach should comply with paragraphs 4.1 to 4.10.

4.1 Wet pipe, dry pipe and pre-action systems should be designed for simultaneous coverage of the hydraulically most demanding area at the minimum water discharge density given in tables 4-1 to 4-3. The minimum operating pressure of any sprinkler should be 0.05 MPa.

4.2 Deluge systems should be designed for the simultaneous activation of the two adjacent deluge sections with the greatest hydraulic demand at the minimum water discharge density given in tables 4-1 to 4-3. The minimum operating pressure of any sprinkler should be 0.12 MPa.

**Table 4-1 Minimum required water discharge density and area of coverage for decks having a free height equal to or less than 2.5 m**

Type of system	Minimum water discharge density (mm/min)	Minimum coverage area
Wet pipe system	6.5	280 m <sup>2</sup>
Dry pipe or pre-action system	6.5	280 m <sup>2</sup>
Deluge system	5	2 x 20m x B <sup>1</sup>

**Table 4-2 Minimum required water discharge density and area of coverage for decks having a free height in excess of 2.5 m but less than 6.5 m**

Type of system	Minimum water discharge density (mm/min)	Minimum coverage area
Wet pipe system	15	280 m <sup>2</sup>
Dry pipe or pre-action system	15	365 m <sup>2</sup>
Deluge system	10	2 x 20 m x B <sup>1</sup>

**Table 4-3 Minimum required water discharge density and area of coverage for decks having a free height in excess of 6.5 m but less than 9.0 m**

Type of system	Minimum water discharge density (mm/min)	Minimum coverage area
Wet pipe system	20	280 m <sup>2</sup>
Dry pipe or pre-action system	20	365 m <sup>2</sup>
Deluge system	15	2 x 20 m x B <sup>1</sup>

<sup>1</sup> B = full breadth of the protected space.

4.3 Automatic sprinklers or nozzles intended for decks with a free height equal to or less than 2.5 m should have a nominal operating temperature range between 57°C and 79°C and standard response characteristics. If required by ambient conditions, higher temperature ratings may be acceptable.

4.4 Automatic sprinklers or nozzles intended for decks with a free height in excess of 2.5 m and hoistable decks that can be raised above 2.5 m should have a nominal operating temperature range between 121°C and 149°C and standard response characteristics.

4.5 Sprinklers or nozzles should be positioned in such a way that:

- .1 they are not exposed to damage by cargo;
- .2 undisturbed spray is ensured; and
- .3 water is distributed over and between all vehicles or cargo in the area being protected.

Automatic sprinklers or nozzles should be positioned and located so as to provide satisfactory performance with respect to both activation time and water distribution.

4.6 Only upright sprinklers or nozzles are allowed for dry pipe or pre-action systems.

4.7 For wet pipe and dry pipe sprinkler systems, fire detection systems should be installed in accordance with the requirements of SOLAS regulation II-2/20.4.

4.8 For manual deluge systems, automatic deluge systems and pre-action systems, fire detection systems should be provided complying with the International Code for Fire Safety Systems (FSS Code) and the following additional requirements:

- .1 the detection system should consist of flame, smoke or heat detectors of approved types, arranged as described below. The flame detectors should be installed under fixed continuous decks according to the limitation and application defined by the maker and the approval certificate. The smoke and heat detector arrangement shall comply with the FSS Code. Smoke detectors with a spacing not exceeding 11 m or heat detectors with a spacing not exceeding 9 m should be installed under hoistable ramps;
- .2 the detection system should ensure rapid operation while consideration should also be given to preventing accidental release. The area of coverage of the detection system sections should correspond to the area of coverage of the extinguishing system sections. The following arrangements are acceptable:
  - .1 set-up of approved flame detectors and approved smoke detectors or heat detectors; or
  - .2 set-up of approved smoke detectors and approved heat detectors; other arrangements can be accepted by the Administration;
- .3 for automatic deluge systems and pre-action systems, the discharge of water should be controlled by the detection system. The detection system should provide an alarm upon activation of any single detector and discharge if two or more detectors activate. The Administration may accept other arrangements; and
- .4 automatically released systems should also be capable of manual operation (both opening and closing) of the section valves. Means should be provided to prevent the simultaneous release of multiple sections that result in water-flow demand in excess of the pumping system design capacity. The automatic release may be disconnected during on- and off-loading operations, provided that this function is automatically reconnected after a pre-set time being appropriate for the operations in question.

4.9 Where beams project more than 100 mm below the deck, the spacing of spot-type heat detectors at right angles to the direction of the beam travel should not be more than two thirds of the spacing permitted under chapter 9 of the FSS Code.

4.10 Where beams project more than 460 mm below the deck and are more than 2.4 m on centre, detectors should be installed in each bay formed by the beams.

## **5 Additional performance-based system design requirements**

In addition to the requirements in section 3, systems designed with this approach should comply with paragraphs 5.1 to 5.6.

5.1 The system should be capable of fire suppression and control and be tested to the satisfaction of the Administration in accordance with the appendix to these Guidelines.

5.2 The nozzle location, type of nozzle and nozzle characteristics should be within the limits tested to provide fire suppression and control as referred to in paragraph 5.1.

5.3 System designs should be limited to the use of the maximum and minimum temperature ratings of the thermally sensitive fire detection devices tested to provide fire suppression and control as referred to in paragraph 5.1.

5.4 The capacity of the system water supply should be sufficient for the total simultaneous coverage of the minimum coverage area of table 5-1 and the vertically applicable area as defined in paragraph 3.22, and the requirements of paragraph 5.5.

**Table 5-1 Minimum coverage area per type of system**

Type of system (Definition number)	Minimum coverage area
A. Wet pipe, automatic sprinkler heads (2.18)	280 m <sup>2</sup> or area of operation as defined in the fire tests - whichever is larger
B. Deluge system, automatic <sup>1</sup> and manual release (2.4)	280 m <sup>2</sup> and the overlapping or adjacent section as defined by paragraph 5.5 <sup>2</sup>
C. Deluge system, manual release (2.5)	2 sections each of min 20 m x B <sup>2,3</sup>
D. Other systems (2.6, 2.15)	Equivalent to the above systems and to the satisfaction of the Administration

<sup>1</sup> The automatic release should comply with the requirements of paragraph 5.6.

<sup>2</sup> The pump should be sized to cover the largest section for type B systems and the two largest horizontally adjacent sections for type C systems.

<sup>3</sup> B = full breadth of the protected space.

5.5 The section arrangement for a deluge system with automatic and manual release (system B) should be such that a fire in any location of the border zone between two or more sections would be completely surrounded by activated spray heads, either by activating more than one section or by overlapping sections (whereby two or more sections cover the same area in the vicinity of the border between sections). In case of overlapping sections, such overlap should be a minimum of two times the required spray head spacing of the section in question or five metres, whichever is larger. These overlapping sections need not comply with the minimum width and length requirements of paragraph 3.23.

5.6 For systems of type B (see table 5-1) an efficient fire detection and fire confirmation system covering all parts of the ro-ro or special category spaces should be provided as follows:

- .1 the fire detection system shall consist of flame detectors and smoke detectors of approved types. The flame detectors shall be installed under fixed continuous decks according to the limitation and application defined by the maker and the approval certificate. The smoke detector arrangement shall comply with the FSS Code. Additional smoke detectors with a spacing not exceeding 11 m shall be installed under hoistable ramps;
- .2 a colour TV monitoring system should cover all parts of the ro-ro or special category spaces. Cameras need not be installed below hoistable decks if the camera arrangement can identify smoke (confirm fire) based on positions under a fixed continuous deck. The monitors for the colour TV monitoring system should be located in the continuously manned control station having the controls for section control valves and start/stop control of pumps addressed under 3.2.2; and

- .3 the relevant section of the deluge system should be automatically released when two detectors covering this area activate. Systems being released when only one detector activates may also be accepted. Automatically released systems should also be capable of manual operation (both opening and closing) of the section valves. The automatic release may be disconnected during on- and off-loading operations, provided that this function is automatically reconnected after a preset time being appropriate for the operations in question.



## APPENDIX

### TEST METHOD FOR FIXED WATER-BASED FIRE-FIGHTING SYSTEMS FOR RO-RO SPACES AND SPECIAL CATEGORY SPACES

#### 1 SCOPE

1.1 This test method is intended for evaluating the effectiveness of fixed water-based fire-fighting systems installed in ro-ro spaces and special category spaces with deck heights up to and including 5 m and/or up to and including 2.5 m.

1.2 The test programme has two objectives:

- .1 establishing nozzle location, nozzle characteristics, minimum water delivery rate and minimum water pressure for systems which will provide the required level of system response time, suppression and control; and
- .2 establishing the minimum area of operation of the system for the purpose of determining hydraulic design requirements for wet pipe, dry pipe and preaction systems.

#### 2 GENERAL REQUIREMENTS

##### 2.1 Sampling

The nozzles and other components to be tested should be supplied by the manufacturer together with design and installation criteria, operational instructions, drawings and technical data sufficient for the identification of the components.

##### 2.2 Tolerances

Unless otherwise stated, the following tolerances should apply:

- .1 length:  $\pm 2\%$  of value;
- .2 volume:  $\pm 5\%$  of value;
- .3 pressure:  $\pm 3\%$  of value; and
- .4 temperature:  $\pm 2\%$  of value.

##### 2.3 Observations

The following observations should be made during and after each test:

- .1 time of ignition;
- .2 activation time of first nozzle;
- .3 time when water flows out through first nozzle;
- .4 time when water flow is shut off;
- .5 time when the test is terminated; and
- .6 total number of activated nozzles.

## **2.4 Test hall and environmental conditions**

The test hall where the tests are conducted should have a minimum floor area of 300 m<sup>2</sup> and a ceiling height in excess of 8 m. The test hall may be equipped with a forced ventilation system, or be natural ventilated, in order to ensure that there is no restriction in air supply to the test fires. The test hall should have an ambient temperature of between 10 and 25°C at the start of each test.

## **2.5 Measurement equipment**

2.5.1 Temperatures should be measured using plain K-type thermocouple wires not exceeding 0.5 mm in diameter. The thermocouple head should be protected against direct water impingement, e.g. by tin cans.

2.5.2 System water pressure should be measured by using suitable equipment. Total water flow rate should be determined by a direct measurement or indirectly by using the pressure data and "k" factor of the nozzles.

2.5.3 The measurements should be made continuously throughout the tests.

## **2.6 System operational conditions**

The tests should simulate the conditions of an actual installed system regarding objectives such as time delays between the activation of the system and minimum system water pressure or water delivery. In addition, the use of a pre-primed fire suppression enhancing additive, if applicable, should be taken into account.

# **3 DETERMINATION OF FIRE SUPPRESSION AND CONTROL CAPABILITIES**

## **3.1 Principle**

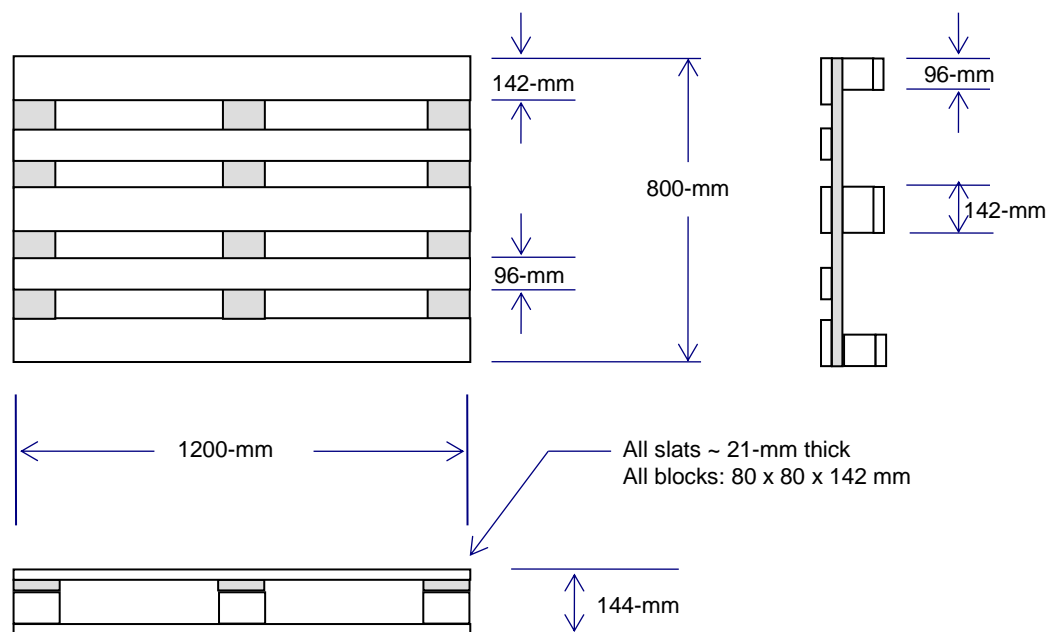
These test procedures test the effectiveness of a water-based fire-fighting system against two different scenarios: a cargo fire in a simulated freight truck, and a passenger vehicle fire.

## **3.2 Fire source**

3.2.1 The primary fire source for both scenarios consists of EUR standard wood pallets (ISO 6780:2003), stored inside with the moisture content of  $14 \pm 2\%$ . Figure 3.2.1 shows details of a EUR pallet.

3.2.2 Plywood panels made of pine or spruce are used as targets. The panels should be approximately 12 mm thick. The ignition time of the panel should not be more than 35 s and the flame spread time at 350 mm position should not be more than 100 s as measured in accordance with resolution A.653(16).

3.2.3 For ignition, commercial heptane should be applied.



**Figure 3.2.1 – Typical dimensions of the standard EUR pallet**

### 3.3 Apparatus

#### 3.3.1 Test area

The tests should be conducted in a test hall as specified in paragraph 2.4 above, under a flat, smooth, non-combustible ceiling of at least 100 m<sup>2</sup>. There should be at least a 1 m space between the perimeters of the ceiling and any wall of the test hall.

#### 3.3.2 *Fire scenario 1: cargo fire in a simulated freight truck* (see figures 3.3.2.1 to 3.3.2.3)

3.3.2.1 The primary fuel package consists of 112 wood pallets arranged in an array of 2 (wide) x 7 (high) x 8 (long) and raised up on a level of 2.8 m so that the top level of the fuel package is at 3.8 to 3.9 m above the floor.

3.3.2.2 The support frame for the wood pallet array of paragraph 3.3.2.1 should be constructed using open steel racks. The wood pallet piles should be standing freely on horizontal steel beams without any solid bottoms.

3.3.2.3 The fuel pallet array should be half-shielded by a 4.5 m long, 2.6 m wide steel plate (thickness at least 2 mm) at 4 m height. The plate should be properly fixed so that during a test it does not bend to provide an unobstructed passage of water onto the fuel package.

3.3.2.4 Plywood panel targets (acting also as obstructions) of dimensions 3.6 m (wide) x 2.4 m (high) should be arranged symmetrically on both sides of the fuel package at 1 m distance so that the top edge is at the same level as the top level of the wood pallet array.

3.3.2.5 The fire should be ignited by two steel trays centrally located under the fuel package as shown in figures 3.3.2.1 to 3.3.2.3. The square trays are 25 cm high and 0.1 m<sup>2</sup> of free surface area. The trays should be filled with water and 1 l of heptane so that the free rim height above the liquid surface is 4 cm. The distance between the bottom of the wood pallet piles and liquid surface is 29 cm.

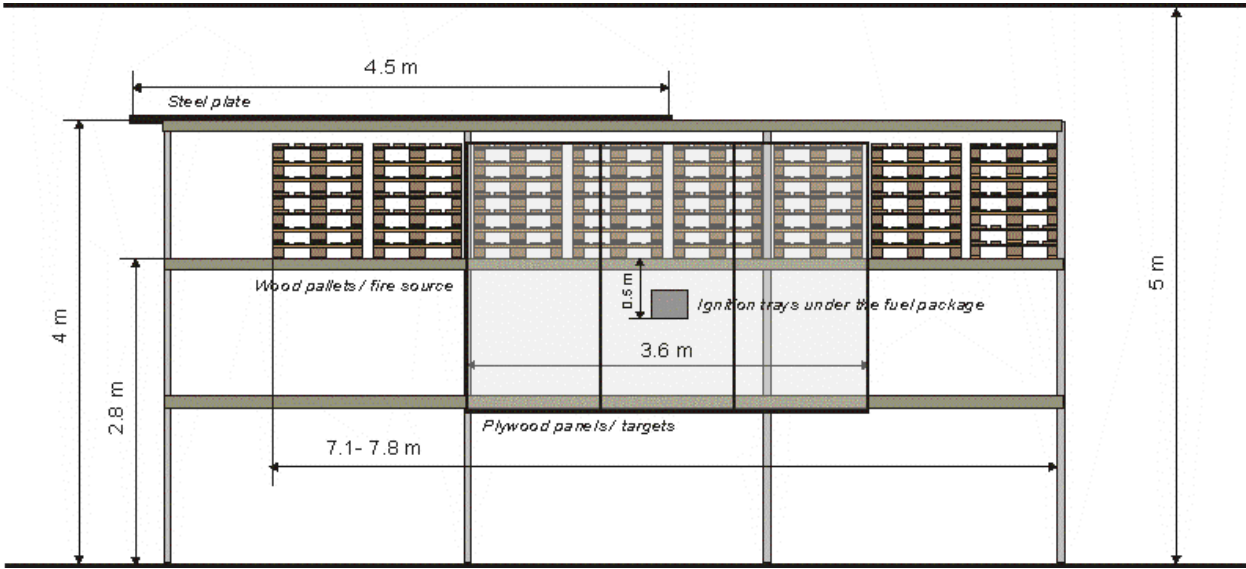


Figure 3.3.2.1 – Side view of the cargo fuel package in a simulated truck

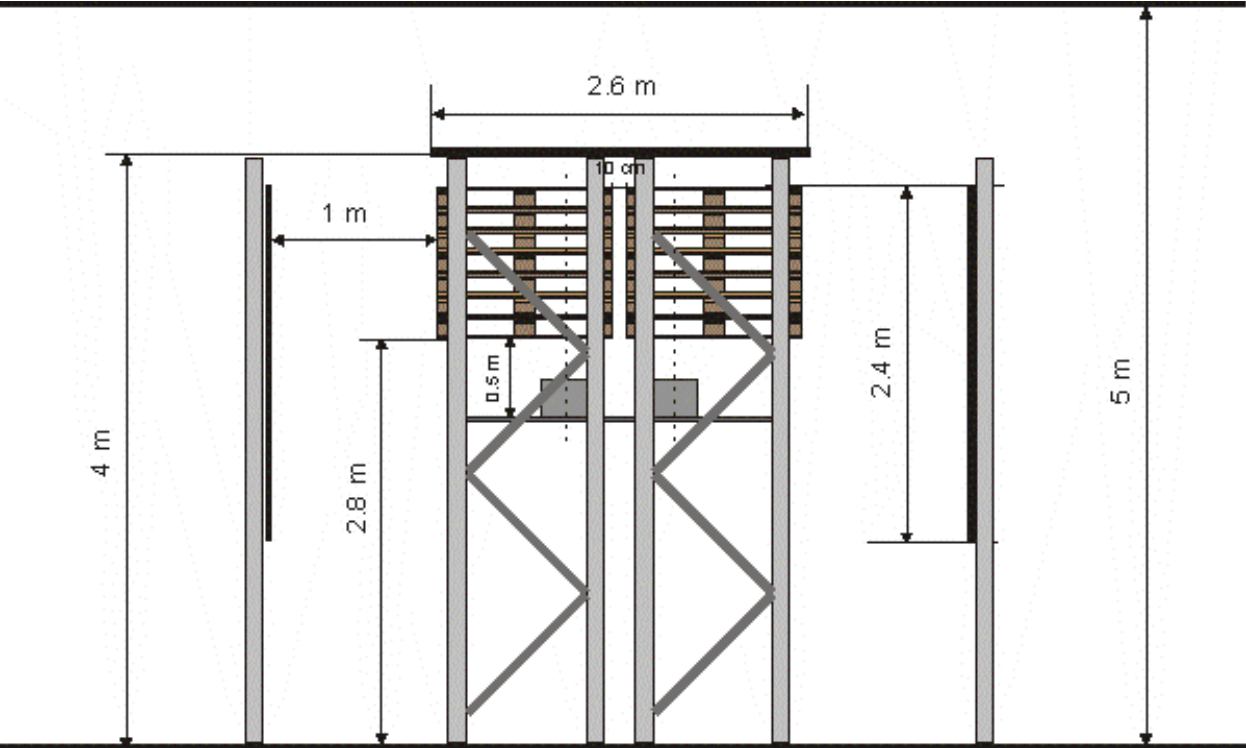
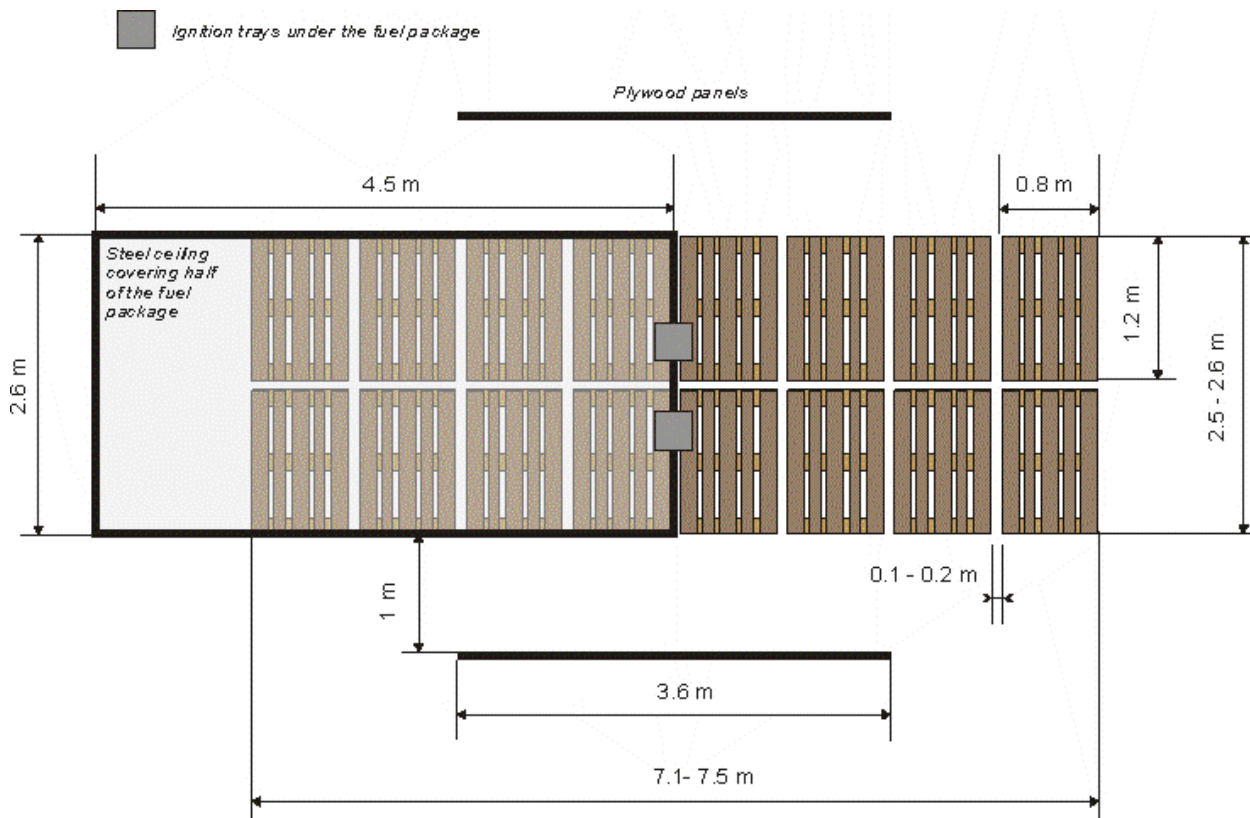


Figure 3.3.2.2 – End view of the cargo fuel package in a simulated truck



**Figure 3.3.2.3 – Top view of the cargo fuel package in a simulated truck**

### 3.3.3 *Fire scenario 2: passenger vehicle fire* (see figures 3.3.3.1 and 3.3.3.2)

3.3.3.1 The primary fuel package consists of 12 wood pallets arranged in an array of 1 pallet (wide) x 6 pallets (high) x 2 pallets (long) constructed inside a passenger vehicle mock-up.

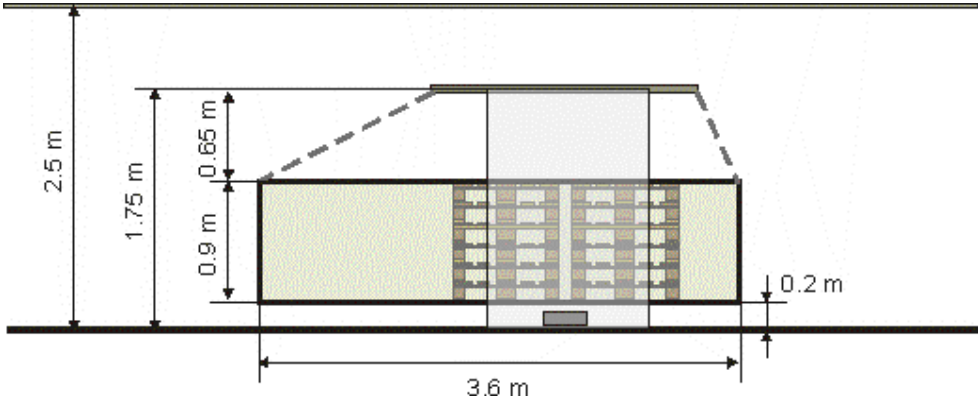
3.3.3.2 The passenger vehicle mock-up is constructed of nominally 2 mm steel.

3.3.3.3 Plywood panel targets (acting also as obstructions) of dimensions 1.2 m (wide) x 1.75 m (high) should be arranged symmetrically on both sides of the mock-up at 0.6 m distance so that the top edge is at the same level as the top level of the mock-up car.

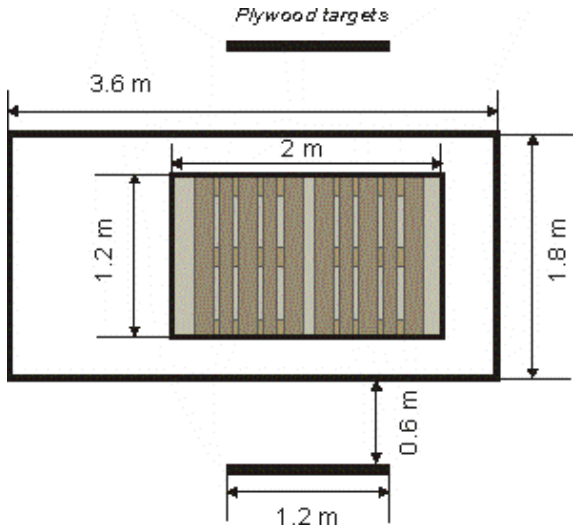
3.3.3.4 The fire should be ignited by a steel tray centrally located under the fuel package as shown in figures 3.3.3.1 and 3.3.3.2. The square tray is 10 cm high and 0.1 m<sup>2</sup> of free surface area. The tray should be filled with water and 1 l of heptane so that the free rim height above the liquid surface is 4 cm.

## 3.4 Nozzle positioning

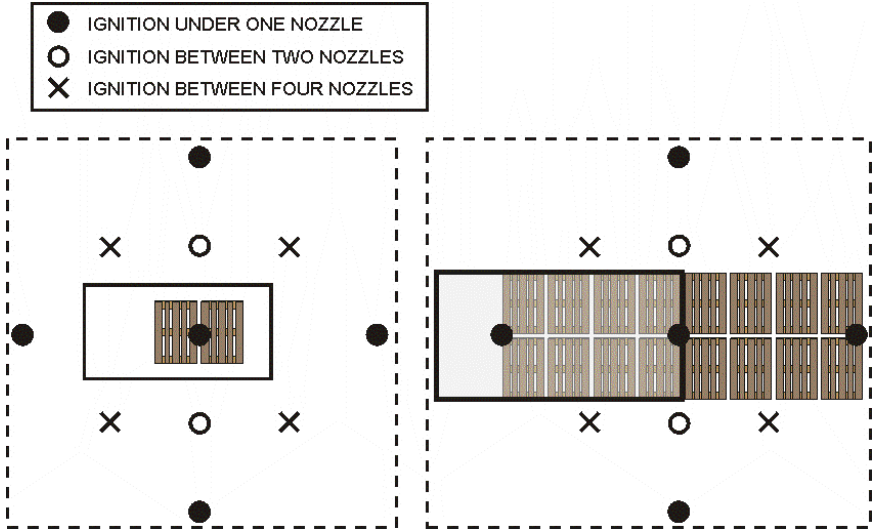
Nozzles should be installed in an array at the ceiling level in accordance with the manufacturer's design and installation criteria. Tests should be repeated with three different relative locations between the nozzle array and the fuel package, i.e. centre of ignition under one nozzle, between two nozzles and between four nozzles, as shown in figure 3.4.



**Figure 3.3.3.1 – Side view of the passenger vehicle fuel package**  
(The dashed lines visualize the shape of a car; the ceiling plate is to be fixed in its location as found most practical)



**Figure 3.3.3.2 – Top view of the passenger vehicle fuel package**



**Figure 3.4 – Nozzle positioning in the two scenarios**

### 3.5 Instrumentation

3.5.1 Instrumentation for the continuous measuring and recording of test conditions should be employed. At least the following measurements should be made:

- .1 gas temperature at 7.5 cm below the ceiling at locations shown in figure 3.5.1;
- .2 gas temperature at the targets to indicate ignition of targets as shown in figure 3.5.2; and
- .3 system water pressure near the centre of the piping array.

3.5.2 System water flow rate should be defined with suitable means for the system.

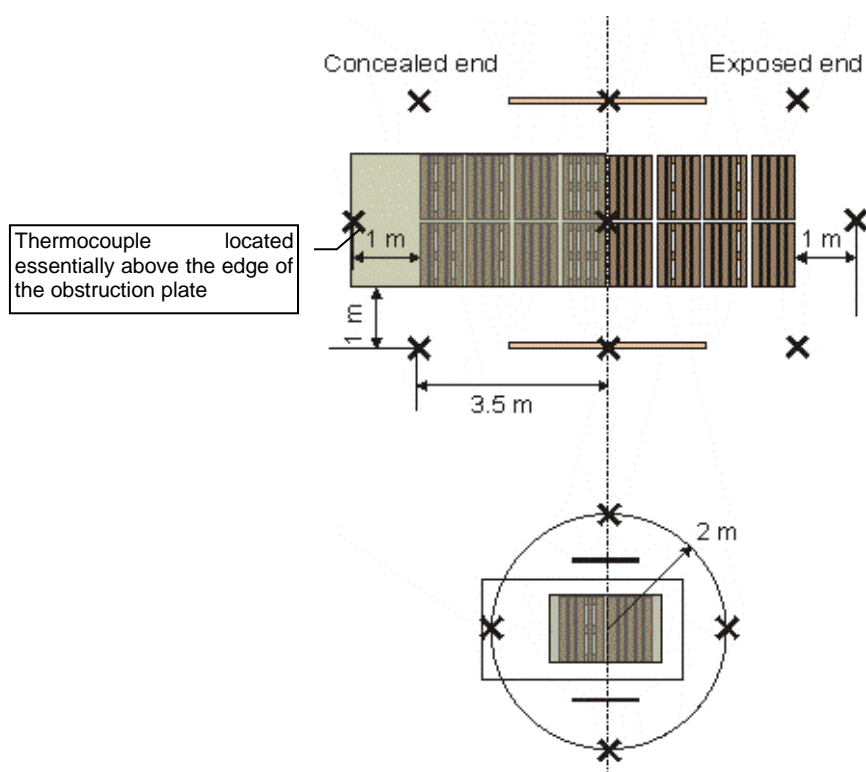
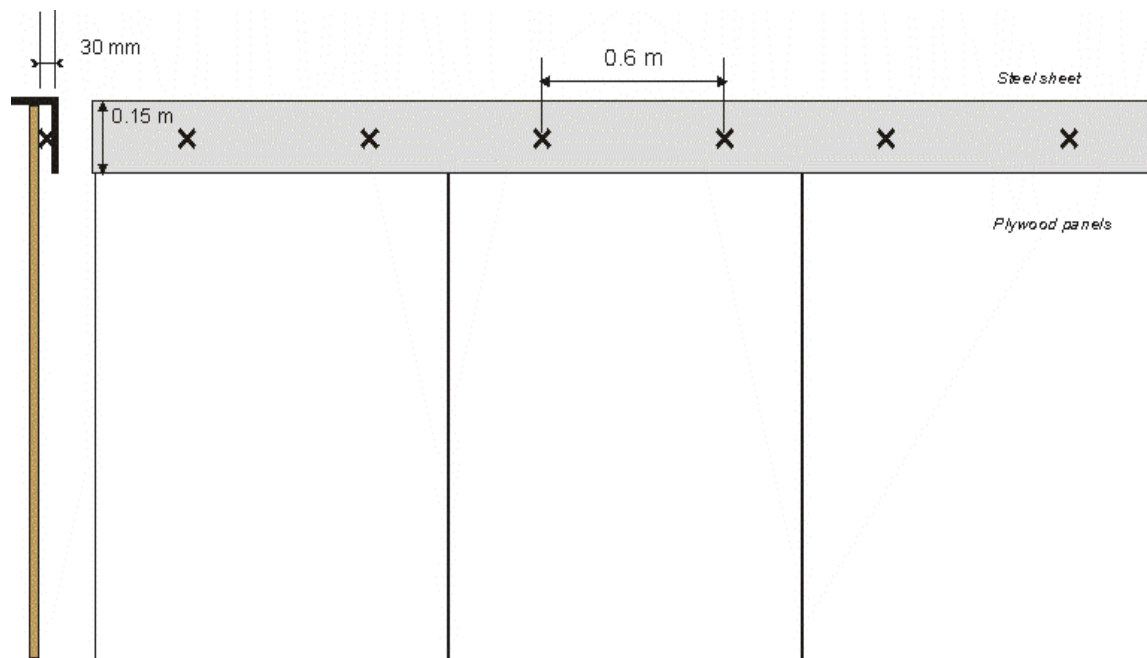


Figure 3.5.1 – Thermocouple locations in the two scenarios<sup>3</sup>

<sup>3</sup> For the truck fuel package the three locations at both ends are used for acceptance evaluation, the three locations at and around the centre of ignition are for safety purposes to define during the test whether the ceiling is at danger. For the passenger car fuel package all four locations are used for acceptance evaluation.



**Figure 3.5.2 – Thermocouple locations at the plywood targets for determining ignition of targets<sup>4</sup>**

### **3.6 Test programme and test procedure**

#### **3.6.1 Test programme**

3.6.1.1 Tests should be conducted at the minimum system water pressure at the minimum distance between the lowest part of the nozzles and the ceiling, as specified by the manufacturer.

3.6.1.2 Three tests should be conducted at ceiling heights 5 m and/or 2.5 m, with different nozzle grid locations relative to the fuel package as specified in figure 3.4.1.

#### **3.6.2 Test procedure**

3.6.2.1 Prior to starting the test the moisture content of the fuel package should be measured at several locations along the full package with a probe-type moisture meter and the results should be reported.

3.6.2.2 The actual test procedure for all tests is as follows:

- .1 the water pressure used at the start of the test should be set at the minimum value for the system specified by the manufacturer, flowing six open nozzles. If more than six nozzles operate during the test, the water supply pressure should be adjusted accordingly, to keep the required minimum system water pressure;

<sup>4</sup> A thin (about 1 mm) steel sheet is bent on top of the plywood panels as shown in the figure. Plain charring of panels is seen as a sharp edge between the black charring on the exposed surface and intact surface under the metal sheet. When ignited in flames charring is seen also under the sheet and verified by significant increase in the gas temperature under the metal sheet.



- .2 the tray should be filled with 1 litre of heptane on the water base as described in paragraph 3.3.2.5 or 3.3.3.4;
- .3 the measurements are started;
- .4 the flammable liquid pool fire(s) should be lit by means of a torch or a match;
- .5 the fire should be allowed to burn freely for a period of 2.5 min;<sup>5</sup>
- .6 the test is continued for 30 min after system activation;
- .7 any remaining fire should be manually extinguished; and
- .8 the test is terminated.

### 3.7 Acceptance criteria

The principal acceptance criteria are based on the following factors:

- .1 gas temperatures measured at locations not directly affected by impinging flames;
- .2 damage to the fuel package; and/or
- .3 ignition of targets.

**Note 1:** Damage to the fuel package is defined by the fraction of charring of the full package. The damage to each individual wood pallet should be evaluated separately and the total fraction calculated based on the detailed results. Totally black, i.e. totally charred pallet is denoted as 100% damage of the pallet (even though the pallet may have maintained its shape) and totally intact pallet is denoted as 0% damage. Partially charred pallets should be visually evaluated. Proper and adequate photographs of the damaged fuel package should be included in the test report.

**Note 2:** Ignition of targets is defined by the method described in figure 3.5.2, if the visibility during the test is such that it cannot be visually observed.

#### 3.7.1 *Fire scenario 1: cargo fire in a simulated freight truck (ceiling height 5 m)*

The following four criteria should be met:

- .1 after system activation the maximum five minute average at any of the three measurement locations at the exposed end of the fuel package should not exceed 300°C;
- .2 after system activation the maximum five minute average at any of the three measurement locations at the concealed end of the fuel package should not exceed 350°C;

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<sup>5</sup> If automatic sprinklers activate already during the 2.5 min pre-burn period, feeding water to the system should be delayed till after the 2.5 min.

- .3 total damage to the wood pallet array should not exceed 45% as defined after the test; and
- .4 the plywood targets should not ignite during the test.

### 3.7.2 **Fire scenario 2: passenger vehicle fire**

The following two criteria should be met:

- .1 after system activation the maximum five minute average at any of the four measurement locations should not exceed 350°C; and
- .2 the plywood targets should not ignite during the test.

## **4 DETERMINATION OF AREA OF OPERATION**

4.1 Both fire scenarios include hidden fires that burn intensely throughout the tests. The suppression tests as defined in paragraph 3.6.1 can be applied in establishing the area of operation of wet pipe, dry pipe and pre-action systems. The evaluation is based on the test with the largest number of nozzles activating.

4.2 The ceiling area of 100 m<sup>2</sup> as defined in paragraph 3.3.1 most likely is not sufficient for defining the area of operation. The ceiling should be large enough to allow installation of a sufficient number of nozzles so that it is unambiguous that the nozzles activating truly represent the maximum number of active nozzles.

4.3 The area of operation is determined by multiplying the largest number of nozzles activating in the tests by two and defining the corresponding coverage area.

## **5 TEST REPORT**

The test report should, as a minimum, include the following information:

- .1 name and address of the test laboratory;
- .2 date of issue and identification number of the test report;
- .3 name and address of applicant;
- .4 name and address of manufacturer or supplier of the nozzles;
- .5 test method and purpose;
- .6 nozzle identification;
- .7 description of the tested nozzles and system performance;
- .8 detailed description of the test set-up including drawings and photos of the fuel package and targets before and after the tests;
- .9 date of tests;
- .10 measured nozzle pressure and flow characteristics;

- .11 identification of the test equipment and used instruments;
  - .12 test results including observations and measurements made during and after the test;
  - .13 deviations from the test method;
  - .14 conclusions; and
  - .15 date of the report and signature.
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MSC.1/Circ.1582/Rev.1  
7 December 2018

### **REVISED UNIFIED INTERPRETATIONS OF CHAPTER 15 OF THE FSS CODE**

1 The Maritime Safety Committee, at its ninety-eighth session (7 to 16 June 2017), with a view to providing more specific guidance on requirements related to inert gas systems on tankers, approved *Unified interpretations of chapter 15 of the FSS Code* (MSC.1/Circ.1582), which was prepared by the Sub-Committee on Ship Systems and Equipment, at its fourth session (20 to 24 March 2017).

2 The Maritime Safety Committee, at its 100th session (3 to 7 December 2018), with a view to disseminating information on pending amendments to paragraph 15.2 of the FSS Code, approved a revision of the *Unified interpretations of chapter 15 of the FSS Code* (MSC.1/Circ.1582), as an interim solution, until the entry into force of the associated amendments, as prepared by the Sub-Committee on Ship Systems and Equipment, at its fifth session (12 to 16 March 2018) and set out in the annex.

3 Member States are invited to use the annexed Unified Interpretations as guidance when applying paragraphs 15.2.2.2.2, 15.2.2.3.2.1, 15.2.2.3.2.2, 15.2.2.3.2.6, 15.2.2.4.1, 15.2.2.4.2.1, and 15.2.2.4.5 of chapter 15 of the FSS Code, and to bring the Unified Interpretations to the attention of all parties concerned.

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## ANNEX

### UNIFIED INTERPRETATIONS OF CHAPTER 15 OF THE FSS CODE

#### Chapter 15 – Inert gas systems

##### **Paragraph 15.2.2.2.2**

The automatic shutdown of the inert gas system and its components should involve the following:

- .1 shutdown of fans and closing of regulating valve for the following:
  - .1 high water level in scrubber (not applicable for N<sub>2</sub>);
  - .2 low pressure/flow to scrubber (not applicable for N<sub>2</sub>); or
  - .3 high-high temperature of inert gas supply.
- .2 closing of regulating valve in the event of:
  - .1 high oxygen content (in excess of 5% by volume); or
  - .2 failure of blowers/fans or N<sub>2</sub> compressors.
- .3 activation of double-block and bleed arrangement upon:
  - .1 loss of inert gas supply (for ships with double block and bleed replacing water seal); or
  - .2 loss of power.

##### **Paragraph 15.2.2.3.2.1**

Where the words "forward of" are used, these words should be interpreted to mean "downstream of".

##### **Paragraph 15.2.2.3.2.2**

"Unambiguous information" regarding the operational status of stop valves in branch piping leading from the inert gas main to cargo tanks, means position indicators providing open/intermediate/closed status information displayed in the control panel, as required in paragraph 15.2.2.4. Limit switches should be used to positively indicate both open and closed positions. Intermediate position status should be indicated when the valve is in neither the open nor closed position.

##### **Paragraph 15.2.2.3.2.6**

Where the words "forward of" are used, these words should be interpreted to mean "downstream of".

**Paragraph 15.2.2.4.1**

The operational status of the inert gas system should be based on the indication that inert gas is being supplied downstream of the gas regulating valve and on the pressure or flow of the inert gas mains downstream of the non-return devices. However, the operational status of the inert gas system as required in paragraph 15.2.2.4.1 should not be considered to require additional indicators and alarms other than those specified in paragraphs 15.2.2.4 and 15.2.3.2 or 15.2.4.2, as appropriate.

**Paragraph 15.2.2.4.2.1**

Where the words "forward of" are used, these words should be interpreted to mean "downstream of".

**Paragraph 15.2.2.4.5.3**

The term "alarm system independent" means that a second pressure sensor, independent of the sensor serving the alarms for low pressure, high pressure and pressure indicator/recorder should be provided. Notwithstanding the above, a common programmable logic controller (PLC) should, however, be accepted for the alarms in the control system. The independent sensor should not be required if the system is arranged for the shutdown of cargo pumps. If a system for shutdown of cargo pumps is arranged, an automatic system shutting down all cargo pumps should be provided. The shutdown should be alarmed at the control station. The shutdown should not prevent the operation of ballast pumps or pumps used for bilge drainage of a cargo pump room.

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MSC.1/Circ.1597  
7 December 2018

### **UNIFIED INTERPRETATION OF PARAGRAPH 4.4.8.1 OF THE LSA CODE**

1 The Maritime Safety Committee, at its 100th session (3 to 7 December 2018), with a view to providing more specific guidance on the provision of buoyant oars and related equipment for lifeboats, approved the following Unified Interpretation of paragraph 4.4.8.1 of the LSA Code, prepared by the Sub-Committee on Ship Systems and Equipment at its fifth session (12 to 16 March 2018):

For a lifeboat equipped with two independent propulsion systems, where the arrangement consists of two separate engines, shaft lines, fuel tanks, piping systems and any other associated ancillaries, paragraph 4.4.8.1 of the LSA Code need not be applied. For all other aspects, the lifeboat should be in full compliance with paragraph 4.4.8 of the LSA Code.

2 Member States are invited to use the above Unified Interpretation as guidance when applying the provisions of paragraph 4.4.8.1 of the LSA Code and to bring it to the attention of all parties concerned.

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MSC.1/Circ.1599  
10 January 2019

**INTERIM GUIDELINES ON THE APPLICATION OF  
HIGH MANGANESE AUSTENITIC STEEL FOR CRYOGENIC SERVICE**

1 Owing to the growing global demand for Liquefied Natural Gas (LNG) as an environment-friendly energy source and the increased construction and operation of LNG-fuelled ships, the Maritime Safety Committee, at its ninety-sixth session (11 to 20 May 2016), agreed to the need to ensure that cargo and fuel tanks of LNG carriers and LNG-fuelled ships are safe and hence tasked the Sub-Committee on Carriage of Cargoes and Containers to address the matter by developing amendments to the IGC and IGF Codes, in order to include high manganese austenitic steel for cryogenic service.

2 The Maritime Safety Committee, at its 100th session (3 to 7 December 2018), acknowledging the increasing use of high manganese austenitic steel by the industry for cryogenic service and the need for guidance in this respect, approved the *Interim guidelines on the application of high manganese austenitic steel for cryogenic service*, as set out in the annex.

3 The Committee agreed to keep the Interim guidelines under review, taking into account operational experience gained with their application.

4 Member States are invited to bring the Interim guidelines to the attention of all parties concerned.

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## ANNEX

### INTERIM GUIDELINES ON THE APPLICATION OF HIGH MANGANESE AUSTENITIC STEEL FOR CRYOGENIC SERVICE

#### PART I GENERAL

#### 1 Scope

These Interim guidelines on the application of high manganese austenitic steel for cryogenic service provide the designer and manufacturer with practical information on the design and construction of cargo and fuel tanks using high manganese austenitic steel for cryogenic service, to comply with the Design Conditions defined in section 4.18 of the IGC Code and section 6.4.12 of the IGF Code.

#### 2 Application

2.1 The Interim guidelines are not intended to replace any requirements of the IGC and IGF Codes. They are intended as complementary guidelines on how to utilize high manganese austenitic steel in the design and fabrication of cargo and fuel tanks complying with the IGC and IGF Codes.

2.2 The application of high manganese austenitic steel is intended for cargo tanks and fuel tanks for the carriage of liquefied natural gas (LNG). The high manganese austenitic steel is limited to the specifications defined below.

#### 3 Definitions

*High manganese austenitic steel:* Steel with a high amount of manganese in order to retain austenite as its primary phase at atmospheric and service temperature.

*Under-matched welds:* For welded connections where the weld metal has lower yield- or tensile-strength than the parent metal.

#### PART II MATERIAL SPECIFICATIONS AND TESTING REQUIREMENTS

#### 4 Material specification

4.1 The material specification should be submitted to the Administration for approval. Documentation requirements for the material are described in detail in the appendix.

4.2 The steel should be fully killed and fine-grained. The condition of supply for all material should be hot rolled and subsequent controlled cooling as necessary. The reduction ratio of slab to finished product thickness should not be less than 3:1. Other conditions of supply should be in accordance with those prescribed by the Administration.

4.3 The document is limited to steel plates with a thickness between 6 mm and 30 mm. For greater thickness, special consideration should be given by the Administration. Other dimensions may be subject to acceptance by the Administration.

## 5 Chemical composition

The chemical composition for high manganese austenitic steel should meet the requirements of recognized standards, such as ASTM standard A1106/A1106M-17 as shown in table 1, or ISO 21635:2018.

**Table 1: Chemical composition for high manganese austenitic steel**  
(Ref. ASTM standard A1106/A1106M-17)

	Chemical Composition (wt.%, product)								
	C	Si	Mn	P	S	Cr	Cu	B	N
Requirements	0.35 - 0.55	0.10 - 0.50	22.50 - 25.50	Max. 0.030	Max. 0.010	3.00 - 4.00	0.30 - 0.70	Max. 0.005	Max. 0.050

**Note:** Silicon (Si) may be less than 0.10 %, provided total aluminum is 0.03 % or higher, or provided acid soluble aluminum is 0.025 % or higher.

## 6 Mechanical properties

Mechanical properties for the base metal of high manganese austenitic steel should meet the requirements of the IGC and IGF Codes, as relevant, and also recognized standards applied to chemical composition, such as ISO 21635:2018 (ref table 2 below) or ASTM A1106/A1106M-17. Compliance should also be documented in accordance with material testing requirements and acceptance criteria outlined in the appendix.

### .1 Base metal

**Table 2: Mechanical properties for base metal of high manganese austenitic steel**  
(Reference ISO 21635:2018)

Minimum yield strength (0.2 % offset) N/mm <sup>2</sup>	Tensile strength N/mm <sup>2</sup>	Minimum elongation % at 5.65√S <sub>0</sub>
400	800 to 970	22.0

(Note the impact test requirements as specified in table 6.3 of the IGC Code or table 7.3 of the IGF Code, as relevant)

### .2 As welded condition

**Table 3: Typical mechanical properties for "As welded condition"**

Tensile properties		
Minimum yield strength (0.2 % offset) N/mm <sup>2</sup>	Minimum tensile strength N/mm <sup>2</sup>	Minimum elongation % at 5.65√S <sub>0</sub>
400	660	22.0

(Note the impact test requirements as specified in table 6.3 of the IGC Code or table 7.3 of the IGF Code, as relevant)

## **7 Welding of metallic materials and non-destructive testing**

Welding of metallic materials and non-destructive testing should be in accordance with chapter 6 of the IGC Code or chapter 16 of the IGF Code. See also "Material testing requirements and test acceptance criteria" as set out in the appendix. Typical minimum values of yield and tensile strength for welded conditions are shown in table 3.

## **8 Material testing and acceptance criteria**

The material testing and applied acceptance criteria should be in accordance with chapter 6 of the IGC Code or chapter 16 of the IGF Code. Compliance should also be documented in accordance with the material testing requirements and acceptance criteria outlined in the appendix.

## **9 Manufacturer approval scheme**

Approval of the manufacturer should be carried out in accordance with section 6.2.2 of the IGC Code or section 16.1.1 of the IGF Code and to the satisfaction of the Administration.

### **PART III APPLICATION**

## **10 Design application**

### **10.1 General**

10.1.1 The relevant load conditions and design conditions should be established in accordance with section 4.18 of the IGC Code or section 6.4.12 of the IGF Code. Guidance on special considerations for high manganese austenitic steel is described below.

10.1.2 For the selection of relevant safety factors for high manganese austenitic steels (see paragraphs 4.21 to 4.23 of the IGC Code or section 6.4.15 of the IGF Code), the safety factors specified for "Austenitic Steels" should be applied both for the base material and for as welded condition.

### **10.2 Ultimate design condition (Reference: section 4.18.1 IGC Code or section 16.3.3 IGF Code)**

It should be noted that high manganese austenitic steels normally have under-matched welds and, therefore, it is of great importance that the design values of the yield strength and tensile strength are based on the "minimum mechanical properties" for the base material and as welded condition (see section 6 on Mechanical Properties). Note the limitation for under-matched welds defined in section 4.18.1.3.1.2 of the IGC Code or section 16.3.3.5.1 of the IGF Code.

### **10.3 Buckling strength**

10.3.1 Buckling strength analysis should be carried out based on recognized standards. Functional loads as defined in section 4.3.4 of the IGC Code or section 6.4.1.6 of the IGF Code should be considered. Note that design tolerances should be considered where relevant and be included in the strength assessment as required in section 6.6.2.1 of the IGC Code or section 16.4.2 of the IGF Code.

10.3.2 It should be noted that the acceptance criteria for the flooding load cases are different from other buckling load cases. Furthermore, the acceptance criteria for flooding load cases, as defined in the IGC Code and the IGF Code, are also different, as the IGF Code requires the tank to "keep its integrity after flooding to ensure safe evacuation of the ship" (section 6.4.1.6.3.3 of the IGF Code), while the IGC Code only refers to endangering the integrity of the ship's hull (section 4.3.4.3.3 of the IGC Code).

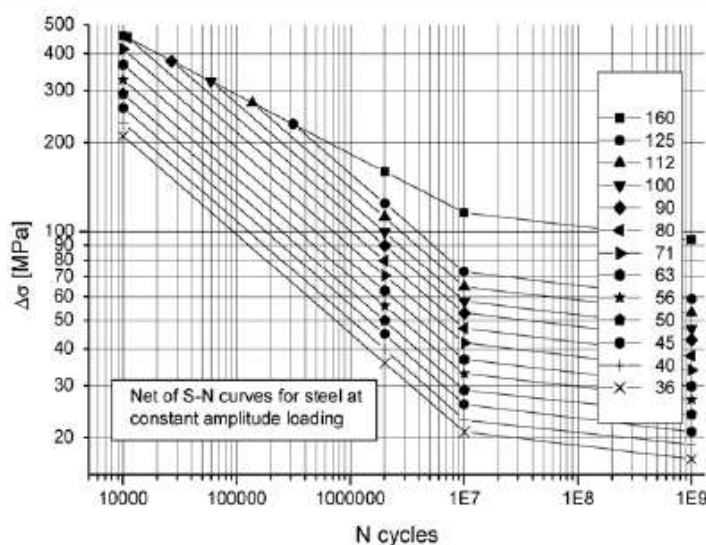
**10.4 Fatigue design condition (Reference: 4.18.2 IGC Code and 6.4.12.2 IGF Code)**

The fatigue design curves for base material and for welded conditions have been documented as a comparison with recognized S-N curves, as provided by the D-curve in reference 11.4 (table 4) and FAT 90 provided by reference 11.5 (figure 1). Fatigue tests have been carried out for butt welded joints only. However, for other details, the application of other S-N curves should be to the satisfaction of the Administration. Section 4.18.2.4.2 of the IGC Code and section 6.4.12.2.4 of the IGF Code specify the design S-N curves to be based on a 97.6% probability of survival corresponding to the mean-minus-two-standard-deviation curves of relevant experimental data up to final failure.

**Table 4 (S-N curves in air): High manganese austenitic steel has been documented to be equal or better than the D-curve (reference 11.4) for as welded condition without stress concentration from any structural details**

S-N curve	$N \leq 10^7$ cycles		$N > 10^7$ cycles $\log \bar{N}_i$ $m_2 = 5.0$	Fatigue limit at $10^7$ cycles (MPa) *)	Thickness exponent $k$	Structural stress concentration embedded in the detail (S-N class), see also equation (2.3.2)
	$m_1$	$\log \bar{N}_i$				
B1	4.0	15.117	17.146	106.97	0	
B2	4.0	14.885	16.856	93.59	0	
C	3.0	12.592	16.320	73.10	0.05	
C1	3.0	12.449	16.081	65.50	0.10	
C2	3.0	12.301	15.835	58.40	0.15	
D	3.0	12.164	15.606	52.63	0.20	1.00
E	3.0	12.010	15.350	46.78	0.20	1.13
F	3.0	11.855	15.091	41.52	0.25	1.27
F1	3.0	11.699	14.832	36.84	0.25	1.43
F3	3.0	11.546	14.576	32.75	0.25	1.61
G	3.0	11.398	14.330	29.24	0.25	1.80
W1	3.0	11.261	14.101	26.32	0.25	2.00
W2	3.0	11.107	13.845	23.39	0.25	2.25
W3	3.0	10.970	13.617	21.05	0.25	2.50

\*) see also [2.11]



**Figure 1: Reference S-N curve to high manganese austenitic steel is the FAT 90 curve. The FAT 90 curve is as welded condition without stress concentration from any structural details**

## **10.5 Fracture mechanics analyses**

10.5.1 For a cargo tank or fuel tank where a reduced secondary barrier is applied, fracture mechanics analysis should be carried out in accordance with the IGC or IGF Code.

10.5.2 Fracture toughness properties should be expressed using recognized standards. Depending on the material, fracture toughness properties determined for loading rates similar to those expected in the tank system should be required. The fatigue crack propagation rate properties should be documented for the tank material and its welded joints for the relevant service conditions. These properties should be expressed using a recognized fracture mechanics practice relating the fatigue crack propagation rate to the variation in stress intensity,  $\Delta K$ , at the crack tip. The effect of stresses produced by static loads should be taken into account when establishing the choice of fatigue crack propagation rate parameters.

10.5.3 Note that for the application where very high static load utilization is relevant, alternative methods such as ductile fracture mechanic analyses should be considered (see appendix).

10.5.4 An example of a typical Crack Tip Opening Displacement (CTOD) value at cryogenic condition can be found in figure 2.

10.5.5 A fracture mechanics analysis is required for type B tanks (section 4.22.4 of the IGC Code and section 6.4.15.2.3.3 of the IGF Code) where a reduced secondary barrier is applied. Fracture mechanics analysis may also be required for other tank types as found relevant to show compliance with fatigue and crack propagation properties. Note that CTOD values used in fracture mechanics analysis may in any case be an important property to analyse to ensure that materials are considered suitable for the application.

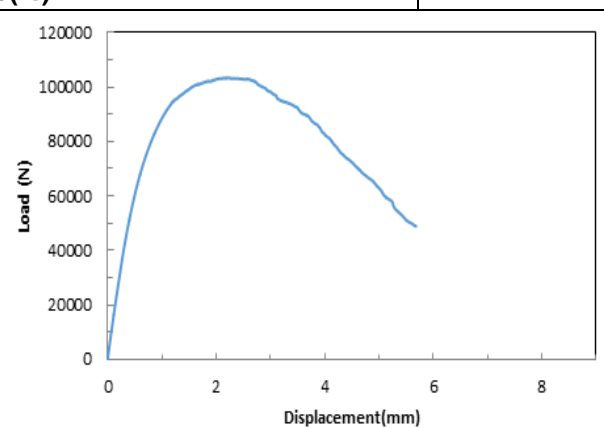
CTOD TEST REPORT					
			REPORT NO.:		
Test Method Standard	ISO 12135/15653 Specimen No.	FCAW-2		Test Date	
Specimen configuration	Square Cross-Section 3 Point Bend(W=B)			Crack plane orientation	L-T
Specimen Dimensions		1	2	3	Average
	Thickness, B (mm)	30	30	30	30
	Width, W (mm)	60	60	60	60
	Span, S (mm)	240	Knife edge thickness, z (mm)		0
Test Material	Young's Modulus of Elasticity, E (MPa)			182,000	
	YS(0.2% proof), $\sigma_{YSP}$ (MPa)			421	
	TS, $\sigma_{TSP}$ (MPa)			677	
	YS(0.2% proof), $\sigma_{YS}$ (MPa)			421	
	Machined Notch (mm)	Width, N	Length, Lmc		Root Radius
3.8		26.6		0.1	
Test Condition	Temperature(°C)			-165	
Test Result					
	Crack Length to Tip of Fatigue Pre crack (mm)				
	a <sub>1</sub>	a <sub>2</sub>	a <sub>3</sub>	a <sub>4</sub>	a <sub>5</sub>
	31.17	32.69	32.67	31.84	30.66
	a <sub>6</sub>	a <sub>7</sub>	a <sub>8</sub>	a <sub>9</sub>	a <sub>0</sub>
	30.24	30.52	31.17	29.84	31.29
	a <sub>0</sub> /W		0.52		Plastic Component of V, V <sub>p</sub> (mm)
					1.509
	Critical CTOD (mm)				
	Type of CTOD			Total CTOD	
δ m			0.54		

Figure 2: Example of typical values for CTOD test at -165°C

## 10.6 Welding

10.6.1 Welding should be carried out in accordance with section 6.5 of the IGC Code or section 16.3 of the IGF Code, and to the satisfaction of the Administration.

10.6.2 For welding, the following points can be considered:

- .1 for reducing the heat input during production:
  - .1 special attention should be given to the first root pass when applying flux-cored arc welding (FCAW); reduced amperage should be considered; and
  - .2 welding heat input of maximum 30 kJ/cm should be used as guidance for 3G position, as that has less heat input for 1G position;
- .2 distance between the weld and nozzle should be kept to a minimum to reduce the oxygen content at the vicinity of the weld pool;
- .3 weld gas composition of FCAW should normally be an 80/20 mix of argon and carbon dioxide; and
- .4 appropriate ventilation should be provided to reduce exposure to hazardous welding fumes.

### **10.7 Non-destructive testing (NDT)**

The scope of non-destructive testing (NDT) should be as required by section 6.5.6 of the IGC Code or section 16.3.6 of the IGF Code. NDT procedures should be in accordance with recognized standards to the satisfaction of the Administration. For high manganese austenitic steel suitable NDT procedures normally applicable for austenitic steels should be used.

### **10.8 Corrosion resistance**

High manganese austenitic steel is not considered a very strong corrosion resistant material in line with several similar materials such as 304 stainless steel and 9% Ni Steels. Appropriate measures with respect to corrosion protection and avoidance of a corrosive environment should be taken. Particularly for LNG fuel tanks that may not be in operation, appropriate precautions should be taken at all times to ensure that empty tanks are filled with inert gas or dry air when not in use.

## **11 References**

- 1 ASTM A1106 / A1106M-17: Standard Specification for Pressure Vessel Plate, Alloy Steel, Austenitic High Manganese for Cryogenic Application
- 2 ISO 21635:2018 Ships and marine technology – Specification of high manganese austenitic steel used for LNG tanks on board ships
- 3 Material testing requirements and acceptance criteria (appendix)
- 4 DNVGL-RP-C203 Fatigue design of offshore steel structures
- 5 IIW 1823-07 Recommendations for fatigue design of welded joints and components
- 6 BS 7910:2013 + A1:2015 Guide to methods for assessing the acceptability of flaws in metallic structures

## APPENDIX

### MATERIAL TESTING REQUIREMENTS AND ACCEPTANCE CRITERIA FOR HIGH MANGANESE AUSTENITIC STEEL

#### General assumptions and limitations

It should be noted that the investigated material is limited to:

- .□ plate thickness between 6 mm to 30 mm;
- .□ plates only (hot rolled condition); and
- .□ for methane (LNG) only.

#### SCOPE AND ACCEPTANCE CRITERIA

##### 1 Cargo constraints

High manganese austenitic steel is only considered for methane (LNG), reference: chapter 19 of the IGC Code. No additional requirements with respect to specific cargoes (chapter 17 of the IGC Code) have been evaluated. In case of use with other cargoes, the application should be to the satisfaction of the Administration.
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##### 2 Test of base material

###### 2.1 Chemical composition

Recognized standards, such as ASTM A1106/A1106M-17 or ISO 21635:2018.
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###### Test acceptance criteria

In accordance with recognized standards.
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###### 2.2 Micrographic examination

This test should be carried out in accordance with 6.3.4 of the IGC Code and 16.2.4 of the IGF Code, i.e. recognized standards, such as ASTM E112.
--

###### Test acceptance criteria

Microstructure to be reported for reference (i.e. grain size/precipitations)
--

###### 2.3 Tensile test

This test should be carried out in accordance with 6.3.1 of the IGC Code and 16.2.1 of the IGF Code.
--

Samples should be taken from three heats of different compositions, both at room and cryogenic temperatures.
--

###### Test acceptance criteria

The yield, tensile strength and elongation should be in accordance with the recognized standard applied for Chemical composition (2.1) such as ASTM A1106/A1106M-17 or ISO 21635:2018.
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**2.4 Charpy impact test**

This test should be carried out in accordance with 6.3.2 of the IGC Code and 16.2.2 of the IGF Code.

**Test acceptance criteria**

In accordance with table 6.3, as for austenitic steels, of the IGC Code and table 7.3 of the IGF Code.

*Guidance Note 9 of Tables 6.3 and 7.3: Impact tests may not be omitted for high manganese austenitic steel due to lack of experience.*

**2.5 Charpy impact test on strain aged specimens**

Recognized standards, such as ASTM E23.

**Test acceptance criteria**

In accordance with table 6.3, as for austenitic steels, of the IGC Code and 16.2.2 of the IGF Code.

*Guidance Note 9 of Tables 6.3 and 7.3 may be not applicable for high manganese steel due to lack of experience.*

**2.6 Drop weight test**

Recognized standards should be applied, such as ASTM E208. Tests should be carried out at -196°C.

**Test acceptance criteria**

No break at test temperature as defined by the applied standard.

**2.7 Fatigue test (S-N curve)**

The basis for establishing S-N Curves should be in accordance with 4.18.2.4.2 of the IGC Code and 6.4.12.2.4 of the IGF Code.

**Test acceptance criteria**

S-N curves should be minimum the fatigue strength as established curves for steel as defined in IIW or DNVGL-RP-C203.

**2.8 CTOD (Crack Tip Opening Displacement) test**

Recognized standards, such as ASTM E1820, BS 7448 or ISO 12135, should be used for these purposes.

**Test acceptance criteria**

CTOD minimum value should be in accordance with design specification for testing at room and cryogenic temperatures as per design conditions. As a guidance a minimum CTOD value of 0.2 mm is often required.

**2.9 Corrosion test**

These tests should be carried out in accordance with recognized standards.

**Test acceptance criteria**

*In accordance with recognized standard or approved by the Administration.*

**2.9.1 Intergranular corrosion test**

This test should be carried out in accordance with recognized standard, such as ASTM A262.

**Test acceptance criteria**

*In accordance with recognized standard or approved by the Administration.*

**2.9.2 General corrosion test**

This test should be carried out in accordance with recognized standards, such as ASTM NACE/ASTM G31-12a.

**Test acceptance criteria**

*In accordance with recognized standard or approved by the Administration.*

**2.9.3 Stress corrosion cracking test**

This test should be carried out to the satisfaction of the Administration, in accordance with recognized standards, such as ASTM G36 and ASTM G123.

**Test acceptance criteria**

*In accordance with recognized standard or approved by the Administration.*

**3 Tests of welded condition (including HAZ)****3.1 Micrographic examination**

This test should be carried out in accordance with 6.3.4 of the IGC Code and 16.2.4 of the IGF Code, i.e. recognized standards, such as ASTM E112 (or equivalent).

**Test acceptance criteria**

Microstructure should be reported for reference (i.e. grain size/precipitations).

**3.2 Hardness test**

This test should be carried out in accordance with 6.3.4 and 6.5.3.4.5 of the IGC Code and 16.2.4 and 16.3.3.4.5 of the IGF Code, i.e. recognized standards, such as ISO 6507-1.

**Test acceptance criteria**

The hardness value should be reported for reference.

**3.3 Cross-weld tensile test**

This test should be carried out in accordance with 6.5.3.5.1 of the IGC Code and 16.3.3.5.1 of the IGF Code as relevant application for under-matched welds. Recognized standards, such as ASTM E8/E8M, may be applied.

**Test acceptance criteria**

In accordance with 4.18.1.3.1.2 of the IGC Code and 6.4.12.1.1.3 of the IGF Code.

**3.4 Charpy impact test**

This test should be carried out in accordance with 6.3.2 and 6.5.3.4.4 of the IGC Code and 16.2.2 and 16.3.3.4.4 of the IGF Code.

**Test acceptance criteria**

In accordance with 6.5.3.5.3 of the IGC Code and 16.3.3.5.3 of the IGF Code

**3.5 CTOD (Crack Tip Opening Displacement) test**

Recognized standards, such as ASTM E1820, BS 7448 or ISO 15653, should be used for these purposes.

**Test acceptance criteria**

CTOD minimum value should be in accordance with design specification for testing at room and cryogenic temperatures as per design conditions. As a guidance a minimum CTOD value of 0.2 mm is often required.

**3.6 Ductile fracture toughness test,  $J_{Ic}$**

Recognized standards, such as ASTM E1820 or ISO 15653. The ductile fracture toughness test may be omitted at the discretion of the Administration.

**Test acceptance criteria**

In accordance with recognized standard.

**3.7 Bending test**

This test should be carried out in accordance with 6.3.3 of the IGC Code and 16.2.3 of the IGF Code.

**Test acceptance criteria**

No fracture should be acceptable after a 180° bend as required for welded material as per 6.5.3.5.2 of the IGC Code and 16.3.3.5.2 of the IGF Code.

**3.8 Fatigue test (S-N curve)**

The basis for establishing S-N Curves should be in accordance with 4.18.2.4.2 of the IGC Code and 6.4.12.2.4 of the IGF Code.

**Test acceptance criteria**

S-N curves should be minimum the fatigue strength as established curves for steel as defined in IIW or DNVGL-RP-C203.

**3.9 Corrosion test**

These tests should be carried out in accordance with recognized standards.

**Test acceptance criteria**

*In accordance with recognized standard or approved by the Administration.*

**3.9.1 Intergranular corrosion test**

This test should be carried out in accordance with recognized standard, such as ASTM A262.

**Test acceptance criteria**

*In accordance with recognized standard or approved by the Administration.*

**3.9.2 General corrosion test**

This test should be carried out in accordance with recognized standards, such as ASTM NACE/ASTM G31-12a.

**Test acceptance criteria**

*In accordance with recognized standard or approved by the Administration.*

**3.9.3 Stress corrosion cracking test**

This test should be carried out to the satisfaction of the Administration, in accordance with recognized standard, such as ASTM G36, ASTM G58 and ASTM G123.

**Test acceptance criteria**

*In accordance with recognized standard or approved by Administration.*

**References:**

ASTM E466-15 *Standard Practice for Conducting Force Controlled Constant Amplitude Axial Fatigue Tests of Metallic Materials*

ASTM E1290-08e1 *Standard Test Method for Crack-Tip Opening Displacement (CTOD) Fracture Toughness Measurement (Withdrawn 2013)*

ASTM NACE/ASTM G31-12a *Standard Guide for Laboratory Immersion Corrosion Testing of Metals.*

ISO 12737:1999 *Metallic materials - Determination of plane-strain fracture toughness<sup>1</sup>*

ISO 15653:2018 *Metallic materials - Method of test for the determination of quasi-static fracture toughness of welds<sup>2</sup>*

IIW 1823-07 *Recommendations for fatigue design of welded joints and components*

ISO 12135:2016 *Metallic materials - Unified method of test for the determination of quasistatic fracture toughness*

ISO 15653:2018 *Metallic materials - Method of test for the determination of quasistatic fracture toughness of welds*

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<sup>1</sup> Replace ASTM E1820-18 Standard Test Method for Measurement of Fracture Toughness, BS 7448 1:1991 – Fracture mechanics toughness tests. Method for determination of K<sub>Ic</sub>, critical CTOD and critical J values of metallic materials

<sup>2</sup> Supersede BS 7448-2 – Fracture Mechanics Toughness Tests: Method for Determination of K<sub>Ic</sub>, Critical CTOD and Critical J Values of Welds in Metallic Materials

## ANNEX 2

### FRAMEWORK FOR THE REGULATORY SCOPING EXERCISE FOR THE USE OF MARITIME AUTONOMOUS SURFACE SHIPS (MASS)

#### Aim

1 The aim of the regulatory scoping exercise is to determine how safe, secure and environmentally sound Maritime Autonomous Surface Ships (MASS) operations might be addressed in IMO instruments.

#### Objective

2 The objective of the regulatory scoping exercise on MASS conducted by the Maritime Safety Committee is to assess the degree to which the existing regulatory framework under its purview may be affected in order to address MASS operations.

#### Glossary

3 For the purpose of the regulatory scoping exercise, "Maritime Autonomous Surface Ship (MASS)" is defined as a ship which, to a varying degree, can operate independent of human interaction.

4 To facilitate the process of the regulatory scoping exercise, the degrees of autonomy are organized as follows:

**Degree one: *Ship with automated processes and decision support:*** Seafarers are on board to operate and control shipboard systems and functions. Some operations may be automated and at times be unsupervised but with seafarers on board ready to take control.

**Degree two: *Remotely controlled ship with seafarers on board:*** The ship is controlled and operated from another location. Seafarers are available on board to take control and to operate the shipboard systems and functions.

**Degree three: *Remotely controlled ship without seafarers on board:*** The ship is controlled and operated from another location. There are no seafarers on board.

**Degree four: *Fully autonomous ship:*** The operating system of the ship is able to make decisions and determine actions by itself.

5 The above list does not represent a hierarchic order. It should be noted that MASS could be operating at one or more degrees of autonomy for the duration of a single voyage.

#### Instruments

6 The list of mandatory instruments related to maritime safety and security to be considered as part of the regulatory scoping exercise is set out in appendix 1. These instruments should be reviewed on a regulation or rule level. Subsidiary mandatory instruments established under each parent instrument should also be considered to the level necessary to establish how they will be affected.

7 The review of mandatory instruments should be prioritized. In instruments containing both mandatory and non-mandatory parts, non-mandatory parts may be considered as part of the regulatory scoping exercise, when deemed necessary, to obtain a complete understanding of how the mandatory provisions are affected in order to address MASS operations (e.g. STCW Convention and Code).

### **Type and size of ships**

8 The application of the regulatory scoping exercise should be restricted to the applicability of the instruments under consideration.

### **Methodology**

9 As a first step, the regulatory scoping exercise will identify provisions in IMO instruments which, as currently drafted:

- .1 apply to MASS and prevent MASS operations; or
- .2 apply to MASS and do not prevent MASS operations and require no actions; or
- .3 apply to MASS and do not prevent MASS operations but may need to be amended or clarified, and/or may contain gaps; or
- .4 have no application to MASS operations.

10 Once the first step is completed, a second step will be conducted to analyse and determine the most appropriate way of addressing MASS operations, taking into account, inter alia, human element,<sup>\*</sup> technology and operational factors by:

- .1 equivalences as provided for by the instruments or developing interpretations; and/or
- .2 amending existing instruments; and/or
- .3 developing new instruments; or
- .4 none of the above as a result of the analysis.

11 Appendix 2 provides the template to be used to guide the documentation of results and, if necessary, present the results of the first step of the regulatory scoping exercise.

### **Plan of work and procedures**

12 A plan of work and procedures for the regulatory scoping exercise is provided in appendix 3.

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\* Refer to resolution A.947(23), *Human element vision, principles and goals for the Organization*.

APPENDIX 1

**LIST OF INSTRUMENTS RELATED TO MARITIME SAFETY AND SECURITY**

COLREG 1972 – International Regulations for Preventing Collisions at Sea, 1972

CSC 1972 – International Convention for Safe Containers (CSC), 1972, as amended

LL 1966 – International Convention on Load Lines, 1966

LL PROT 1988 – Protocol of 1988 relating to the International Convention on Load Lines, 1966

SAR 1979 – International Convention on Maritime Search and Rescue, 1979

SOLAS 1974 – International Convention for the Safety of Life at Sea, 1974, as amended

SOLAS AGR 1996 – Agreement concerning specific stability requirements for ro-ro passenger ships

SOLAS PROT 1978 – Protocol of 1978 relating to the International Convention for the Safety of Life at Sea, 1974

SOLAS PROT 1988 – Protocol of 1988 relating to the International Convention for the Safety of Life at Sea, 1974

SPACE STP 1973 – Protocol on Space Requirements for Special Trade Passenger Ships, 1973

STCW 1978 – International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978, as amended

STCW-F 1995 – International Convention on Standards of Training, Certification and Watchkeeping for Fishing Vessel Personnel, 1995

STP 1971 – Special Trade Passenger Ships Agreement, 1971

TONNAGE 1969 – International Convention on Tonnage Measurement of Ships, 1969

APPENDIX 2

TEMPLATE FOR THE REGULATORY SCOPING EXERCISE

Instrument: [Name of instrument]

Rule/Regulation	First step		
	Degree of autonomy	MASS application	Comments/Remarks (explain analysis conducted in determining "MASS application and potential gaps)
	Degree one		
	Degree two		
	Degree three		
	Degree four		
	Degree one		
	Degree two		
	Degree three		
	Degree four		

References:

Degrees of autonomy:

- Degree one: Ship with automated processes and decision support
- Degree two: Remotely controlled ship with seafarers on board
- Degree three: Remotely controlled ship without seafarers on board
- Degree four: Fully autonomous ship

MASS application:

- .A apply to MASS and prevent MASS operations; or
- .B apply to MASS and do not prevent MASS operations and require no actions; or
- .C apply to MASS and do not prevent MASS operations but may need to be amended or clarified, and/or may contain gaps; or
- .D have no application to MASS operations.



## APPENDIX 3

### PLAN OF WORK AND PROCEDURES FOR THE REGULATORY SCOPING EXERCISE

#### 1 General

1.1 This note provides draft procedures for the regulatory scoping exercise on Maritime Autonomous Surface Ships (MASS).

1.2 The regulatory scoping exercise should be conducted taking into account the agreed framework and methodology and any relevant decisions of the Committee.

#### 2 Web platform for the conduct of the regulatory scoping exercise

2.1 A web platform will be developed by the Secretariat as part of GISIS to facilitate the regulatory scoping exercise.

2.2 The platform will be developed in two stages, as follows:

- .1 a form for uploading the initial review of IMO instruments (to be completed by 15 February 2019); and
- .2 additional forms to allow submission of comments and other functionalities (e.g. printing, exporting, filtering, etc. (to be completed by the end of March 2019)).

2.3 The web platform will be connected to the IMO Web accounts, providing access only to registered IMO Members.<sup>1</sup> All IMO Members will have read-only access to the web platform.

2.4 The web platform should make a clear distinction between the first and the second step of the agreed methodology.

2.5 The information contained in the web platform should be retained for future references until the Committee decides otherwise.

#### 3 First step

##### 3.1 Initial review of IMO instruments

3.1.1 The initial review should be conducted by volunteering Member States, either individually or as a group. In case of a group, only one Member State will be provided with access to upload and edit the information.

3.1.2 The initial review involves only the first step of the agreed methodology.

3.1.3 Member States can volunteer to conduct the initial review of either a whole or part of an instrument (e.g. specific chapters) for all degrees of autonomy or for specific ones. Priority should be given to the consideration of degrees two and three.

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<sup>1</sup> Whenever the term "IMO Member" is used in this document, it includes Member Governments, associated Member Governments, intergovernmental organizations with observer status and non-governmental organizations in consultative status.

3.1.4 Only users authorized by the Member State conducting the initial review of a specific instrument will be allowed to upload and edit the information.

3.1.5 If necessary, the Secretariat will assist with the pre-population of the number and titles of rules and regulations on the web platform.

3.1.6 Upon completion of the initial review, the web platform will be locked for editing.

### **3.2 Commenting stage**

3.2.1 Once the initial review is completed, IMO Members will be authorized to submit comments through the web platform.

3.2.2 Comments could be submitted either on specific rules/regulations or as general comments on the instrument under review (e.g. in case of gaps in regulations).

3.2.3 As part of the commenting stage, the web platform should provide an option to indicate whether the IMO Member agrees or disagrees with the initial review. If the option "disagree" is chosen, then an explanatory comment should be provided specifying the alternative MASS application.

3.2.4 Each IMO Member will only be able to submit one comment per rule/regulation and degree of autonomy under consideration and one general comment on the instrument under consideration. In order to facilitate the subsequent consideration, comments on specific rules/regulations and general comments on the instrument under consideration will be limited to specific number of characters (to be determined according to IT functionalities).

3.2.5 After an agreed period, the web platform will be locked for comments.

### **3.3 Consideration of comments and presentation of results**

3.3.1 The volunteering Member State(s) that conducted the initial review should consider all comments received and modify the initial review, as appropriate.

3.3.2 In order to facilitate the consideration of comments, the web platform should provide statistics of the number of IMO Members that had agreed or disagreed with the initial review.

3.3.3 The volunteering Member State(s) should also prepare a summary of results addressing in particular the main issues identified during step one in respect to specific degrees of autonomy and the specific gaps identified, if any.

3.3.4 The above summary of results should be submitted by the volunteering Member State(s) for consideration by the Committee or by a group authorized to that effect.

### **3.4 Consideration of the results of the first step**

3.4.1 The Committee or a group authorized by the Committee should consider the results of the first step submitted by the volunteering Member State(s), taking into account the information in the web platform, and making any necessary final modifications, as appropriate.

3.4.2 When the consideration is completed, the Committee or a group authorized by the Committee should authorize the commencement of the second step.

3.4.3 Upon completion of the first step, the information related to step one will be closed for editing or modification.

#### **4 Second step**

##### **4.1 Analysis of the most appropriate way of addressing MASS operations**

4.1.1 The initial analysis should be conducted, preferably, by the volunteering Member State(s) that conducted the initial review.

4.1.2 The initial analysis involves the second step of the agreed methodology.

4.1.3 Only users authorized by the Member State conducting the initial analysis of a specific instrument will be allowed to upload and edit the information related to the second step.

4.1.4 Upon completion of the initial analysis, the web platform will be locked for editing.

4.1.5 The initial analysis should be high level and should not be conducted regulation by regulation.

##### **4.2 Commenting stage**

4.2.1 Once the initial analysis is completed, IMO Members will be authorized to submit comments through the web platform.

4.2.2 As part of the commenting stage, the web platform should provide an option to indicate whether the IMO Member agrees or disagrees with the initial analysis. If the option "disagree" is chosen, then an explanatory comment should be provided, specifying the most appropriate way of addressing MASS operations.

4.2.3 Each IMO Member will only be able to submit one comment per analysis.

4.2.4 After an agreed period, the web platform will be locked for comments.

##### **4.3 Consideration of comments and presentation of results**

4.3.1 The volunteering Member State(s) that conducted the initial analysis should consider all comments received and modify the initial analysis, as appropriate.

4.3.2 In order to facilitate the consideration of comments, the web platform should provide statistics of the number of IMO Members that had agreed or disagreed with the initial analysis.

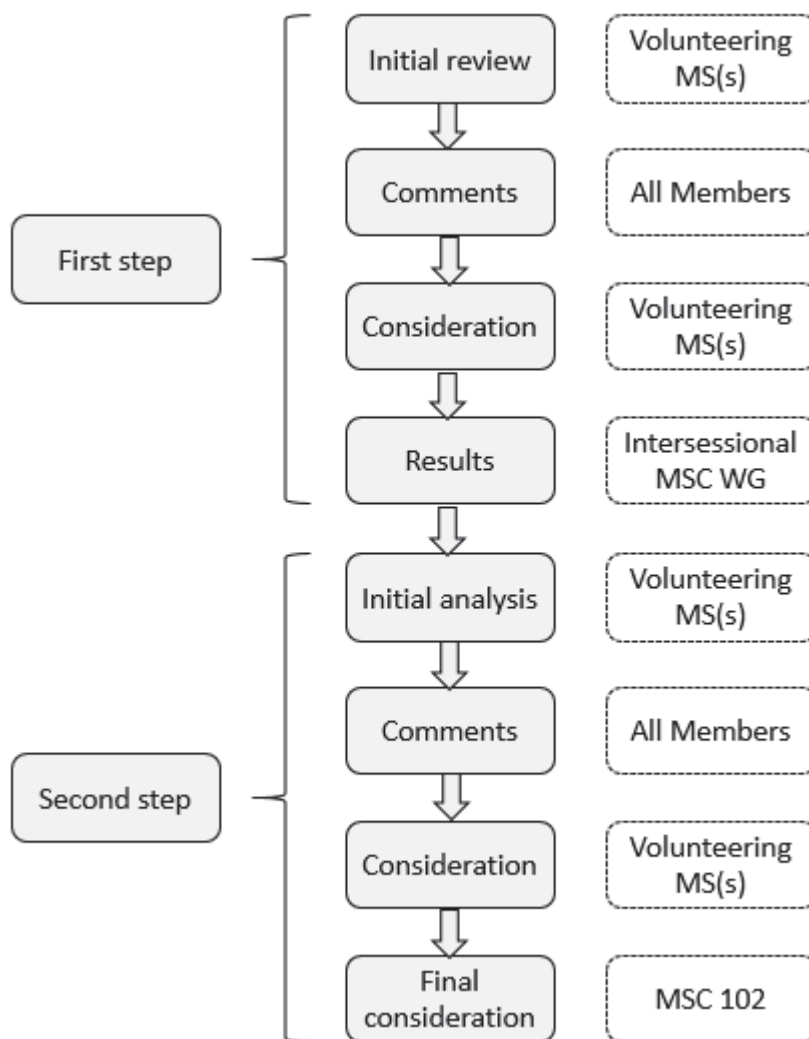
4.3.3 The volunteering Member State(s) should also prepare a summary determining the most appropriate way of addressing MASS operations specific to degrees of autonomy.

4.3.4 The above summary should be submitted by the volunteering Member State(s) for the Committee's consideration.

##### **4.4 Final consideration**

4.4.1 The Committee should consider the results of the first and second steps taking into account any relevant information, as appropriate.

### Process for the regulatory scoping exercise



### Timeline for the regulatory scoping exercise

Action	Deadline	Who?
Upload of the initial review of IMO instruments	April 2019	Volunteering Member State(s)
Commenting stage related to the initial review	May/June 2019 (two months)	All IMO Members
Consideration of comments and presentation of results	July 2019 (one month)	Volunteering Member State(s)
Consideration of the results of the first step	[2 to 6 September 2019]	[Intersessional MSC Working Group]
Analysis of the most appropriate way of addressing MASS operations (second step)	September/October 2019 (two months)	Volunteering Member State(s)
Commenting stage related to the initial analysis	November 2019 (one month)	All IMO Members

Action	Deadline	Who?
Consideration of comments and presentation of results	December 2019/January 2020 (two months) – deadline for submissions to MSC 102	Volunteering Member State(s)
Final consideration	May 2020	MSC 102

**List of instruments and volunteering Members undertaking or supporting the review of instruments**

Instrument	Chapter/Section	Degree of autonomy	Member State preparing the initial review	Supporting/assisting
SOLAS 1974				
	Chapter II-1	All	France	Sweden, Iran (Islamic Republic of)
	Chapter II-2	All	Japan	
	Chapter III	All	Netherlands	Belgium
	Chapter IV	All	Turkey	China, Japan
	Chapter V	All	China	Denmark, Japan, Singapore
	Chapter VI	All	Japan	
	Chapter VII	All	Japan	
	Chapter IX	All	Norway	China, Republic of Korea, Russian Federation
	Chapter XI-1	All	Finland	
	Chapter XI-2	All	Finland	
SOLAS AGR 1996				
SOLAS PROT 1978				
SOLAS PROT 1988				
STCW 1978 and STCW Code		All	United States	Japan, New Zealand, Republic of Korea, Russian Federation
STCW-F 1995		All	Japan	New Zealand
COLREG 1972		All	Marshall Islands	China, Japan, Singapore, United States
CSC 1972		All	Japan	Finland
LL 1966		All	India	
LL PROT 1988		All	India	
SAR 1979		All	Spain, France	Turkey

<b>Instrument</b>	<b>Chapter/ Section</b>	<b>Degree of autonomy</b>	<b>Member preparing initial review</b>	<b>State the</b>	<b>Supporting/assisting</b>
SPACE STP 1973					
STP 1971					
TONNAGE 1969					

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