



OFFSHORE STANDARD
DNV-OS-D301

FIRE PROTECTION

JANUARY 2001

DET NORSKE VERITAS

FOREWORD

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DNV Offshore Codes consist of a three level hierarchy of documents:

- *Offshore Service Specifications*. Provide principles and procedures of DNV classification, certification, verification and consultancy services.
- *Offshore Standards*. Provide technical provisions and acceptance criteria for general use by the offshore industry as well as the technical basis for DNV offshore services.
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DNV Offshore Codes are offered within the following areas:

- A) Qualification, Quality and Safety Methodology
- B) Materials Technology
- C) Structures
- D) Systems
- E) Special Facilities
- F) Pipelines and Risers
- G) Asset Operation

Amendments April 2002

This Code has been amended, but not reprinted in April 2002. The changes are incorporated in the Web, CD and printable (pdf) versions. The amendments are shown in red colour in the Web and CD versions.

All changes affecting DNV Offshore Codes that have not been reprinted, are published separately in the current *Amendments and Corrections*, issued as a printable (pdf) file.

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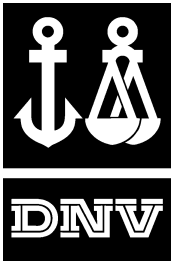
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CHAPTER 1

GENERAL

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SECTION 1 INTRODUCTION

A. General

A 100 Introduction

101 This offshore standard provides principles for design, construction and installation of fire protection of offshore units and installations.

102 This standard is applicable to drilling, storage, production, accommodation and other types of offshore units and installations.

103 The standard has been written for general worldwide application. Governmental legislation may include requirements in excess of the provisions in this standard depending on type, location and intended service of the unit or installation.

A 200 Objectives

201 The objectives of this standard are to:

- provide an internationally acceptable standard of safety for fire protection by defining minimum requirements for the design, construction and commissioning of such systems
- serve as a reference document in contractual matters between purchaser and contractor
- serve as a guideline for designers, purchasers and contractors
- specify procedures and requirements for fire protection systems subject to DNV certification and classification.

A 300 Organisation of the standard

301 This standard is divided into three main parts:

- Ch.1: General introduction, scope, definitions and references
- Ch.2: Technical provisions for fire protection systems for general “neutral” application
- Appendix A: Requirements for fixed fire fighting systems.

A 400 Adopted international maritime standards

401 The requirements of this standard are considered to meet the regulations of the International Maritime Organisation Code for Construction and Equipment of Mobile Offshore Drilling Units, 1989 (MODU Code) with regard to fire protection, detection and fire fighting systems and equipment.

402 Requirements quoted from the MODU Code and SOLAS are printed in *Arial italics* with the appropriate reference.

403 For the application of this standard, wherever the term *Administration* is quoted, this means:

- client or purchaser or other designated party, when used as a “neutral” technical standard, or
- DNV, when used for certification or classification purposes.

404 When used in text quoted from the MODU Code, the term shall be taken as a requirement to be followed in order to conform to this standard.

B. Normative References

B 100 General

101 The standards in 200 and 300 include provisions, which, through reference in the text, constitute provisions of this offshore standard. Latest issue of the references shall be used unless otherwise agreed. Other recognised standards may be used provided it can be demonstrated that these meet or exceed the requirements of the standards referenced in 200 to 300.

102 Any deviations, exceptions and modifications to the design codes and standards shall be documented and agreed between the contractor, purchaser and verifier, as applicable.

B 200 Offshore Standards

201 The latest revision of the DNV Offshore Standards listed in Table B1 applies.

Table B1 DNV Offshore Standards	
Reference	Title
DNV-OS-A101	Safety Principles and Arrangement
DNV-OS-D101	Marine and Machinery Systems and Equipment
DNV-OS-D202	Instrumentation and Telecommunication Systems

B 300 Other references

301 The latest revision of the documents listed in Table B2 applies.

Table B2 DNV Normative references	
Reference	Title
EN 54-5	Components of Automatic Fire Detection Systems Part 5 Heat Sensitive Detectors - Point Detectors Containing a Static Element
EN 54-7	Components of Automatic Fire Detection Systems - Part 7: Point-Type Smoke Detectors; Detectors Using Scattered Light, Transmitted Light or Ionization
FTP Code	International Code for Application of Fire Test Procedures
NFPA Codes	National Fire Protection Association
ISO 13702	Petroleum and natural gas industries - Control and mitigation of fires and explosions on offshore production installations - Requirements and guidelines
1989 MODU Code	Code for the Construction and Equipment of Mobile Offshore Drilling Units, 1989
SOLAS	International Convention for the Safety of Life at Sea, 1974, as amended (Including the 1996 Amendments of Ch. II-2, effective 1 July 1998)

C. Definitions

C 100 Verbal forms

101 *Shall*: Indicates requirements strictly to be followed in order to conform to this standard and from which no deviation is permitted.

102 *Should*: Indicates that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others, or that a certain course of action is preferred but not necessarily required. Other possibilities may be applied subject to agreement.

103 *May*: Verbal form used to indicate a course of action permissible within the limits of the standard.

104 *Agreement or by agreement*: Unless otherwise indicated, means agreed in writing between manufacturer or yard and purchaser.

C 200 Definitions

201 "H" class divisions

Divisions formed by bulkheads and decks which comply with the following:

- 1) they shall be constructed of steel or other equivalent material
- 2) they shall be suitably stiffened
- 3) they shall be constructed as to be capable of preventing the passage of gas, smoke and flames up to the end of the two-hour standard fire test
- 4) they shall be insulated with approved non-combustible materials or equivalent passive fire protection such that the average and maximum temperature of the unexposed side will not rise to more than 140 °C and 180 °C respectively above the original temperature, within the time listed below:

— class H-120	120 minutes
— class H-60	60 minutes
— class H-0	0 minutes

(Additionally, a class H-0₄₀₀ is often used, where 400 means the temperature limitation on the unexposed side. The class H-240 is also used for some equipment).

A test of a prototype division is required to ensure that it meets the requirements for integrity and temperature rise.

202 "A" class divisions

Divisions formed by bulkheads and decks which comply with the following:

1. they shall be constructed of steel or other equivalent material;
2. they shall be suitably stiffened;
3. they shall be so constructed as to be capable of preventing the passage of smoke and flame to the end of the one-hour standard fire test;
4. they shall be insulated with approved non-combustible materials such that the average temperature of the unexposed side will not rise more than 140 °C above the original temperature, nor will the temperature, at any one point, including any joint, rise more than 180 °C above the original temperature, within the time listed below:

— class "A-60"	60 minutes
— class "A-30"	30 minutes
— class "A-15"	15 minutes
— class "A-0"	0 minutes.

5. The Administration shall require a test of prototype bulkhead or deck in accordance with the Fire Test Procedures Code to ensure that it meets the above requirements for integrity and temperature rise.

(SOLAS reg. II-2/3.3)

203 "B" class divisions

Divisions formed by bulkheads, decks, ceilings or linings which comply with the following:

1. they shall be so constructed to be capable of preventing the passage of flame to the end of the first half hour of the standard fire test;
2. they shall have an insulation value such that the average temperature of the unexposed side will not rise more than 140 °C above the original temperature, nor will the temperature at any one point, including any joint, rise more than 225 °C above the original temperature, within the time listed below:

— class "B-15"	15 minutes
— class "B-0"	0 minutes.

3. they shall be constructed of recognised non-combustible materials and all materials entering into the construction and erection of "B" class divisions shall be non-combustible, with the exception that combustible veneers may be permitted provided they meet other requirements of this Chapter.

4. The Administration shall require a test of prototype bulkhead or deck in accordance with the Fire Test Procedures Code to ensure that it meets the above requirements for integrity and temperature rise.

(SOLAS reg. II-2/3.4)

204 "C" class divisions

Divisions constructed of approved non-combustible materials. They need meet neither requirements relative to the passage of smoke and flame nor limitations relative to the temperature rise. Combustible veneers are permitted provided they meet other requirements of this Chapter.

(SOLAS reg. II-2/3.5)

205 Accommodation spaces

Accommodation spaces are those used for public spaces, corridors, lavatories, cabins, offices, hospitals, cinemas, games and hobby rooms, pantries containing no cooking appliances and similar spaces. Public spaces are those portions of the accommodation which are used for halls, dining rooms, lounges and similar permanently enclosed spaces.

(MODU Code 1.3.45)

The accommodation area is normally used as the safe haven or temporary refuge.

206 Control stations

Control stations are those spaces in which the unit's radio or main navigation equipment or the emergency source of power is located or where the fire recording or fire control equipment or dynamical positioning control system is centralised or where the fire-extinguishing system serving various locations is situated. In case of column stabilised units a centralised ballast control station is a "control station". However, for purposes of the application of Ch.2 Sec.1, the space where the emergency source of power is located is not considered as being a control station.

(MODU Code 1.3.31)

Typical examples are central control room, radio room, process control room, gas compressor control room, bridge, emergency response room, UPS rooms and fire pump rooms and areas for control of ballast and positioning systems etc.

207 Corridor

Includes corridors and lobbies.

208 Deluge system

A system to apply firewater through an array of open spray nozzles by operation of a valve on the inlet to the system. The system will discharge through all nozzles served by the deluge valve.

209 Draught stop

A close fitting hindering any smoke from passing.

210 Drilling areas

Includes the derrick, drill floor, BOP area and the area containing shale shakers and degassers. See utility area for drilling utilities such as mud mixing, pumping, bulk storage and cementing.

211 Embarkation area

The area where personnel collect and enter each lifeboat or liferaft.

212 Enclosed spaces

Considered to be any space bounded by floors, bulkhead and/or decks which may have doors, windows or other similar openings.

213 Fire and gas detection system

A fire and gas system is a combined fire detection system and gas detection system.

214 Fire area

An area divided from other areas by horizontal and vertical fire divisions fulfilling at least requirements for A-60 partitions.

215 Fire detection system

The system includes:

- a) fire detectors and manual call points (MACs)
- b) a fire central receiving and evaluating signals from the fire detectors and MACs, and creating output signals to the alarm system and the shutdown system. The fire central shall include a device providing visual indication of activated detectors and a local audible alarm
- c) signal transfer lines between detectors, MACs and fire central
- d) power supply.

216 Fire load

The total released heat quantity in case of a complete combustion of all combustible materials in an area, including materials in walls, decks and ceilings.

217 Fire pump system

The total system including power source, pump unit transmission, fuel and cooling systems.

218 Flame retardant

Property of a substance or treatment applied to a material to substantially suppress, reduce or delay the propagation of a flame.

219 Gas detection system

The system includes:

- a) gas detectors and manual call points (MACs)
- b) a gas central receiving and evaluating signals from the gas detectors and MACs, and creating output signals to the alarm system and the shutdown system. The gas central shall include a device providing visual indication of activated detectors and a local audible alarm
- c) signal transfer lines between detectors, MACs and gas central
- d) power supply.

220 Hazardous areas

Hazardous areas are all areas in which a flammable or explosive gas and air mixtures is, or may normally be expected to be, present in quantities such as to require special precautions for the construction and use of electrical equipment and machinery.

221 Jet fire

An ignited release of pressurised and flammable fluid.

222 Low flame spread

Means that the surface thus described will adequately restrict the spread of flame, this being determined in accordance with the Fire Test Procedures Code (FTP Code).

(SOLAS reg. II-2/3.8)

223 Machinery spaces

Machinery spaces are all machinery spaces of category A and all other spaces containing propelling machinery and other fired processes, oil fuel units, steam and internal combustion engines, generators and major electrical machinery, oil filling stations, refrigerating, stabilising, ventilation and air conditioning machinery, and similar spaces, and trunks to such spaces.

(MODU Code 1.3.30)

224 Machinery spaces of category A

Machinery spaces of category A are all spaces which contain internal combustion machinery used for either:

1. *main propulsion; or*
2. *for other purposes where such machinery has in the aggregate a total power output of not less than 375 kW; or which contain any oil-fired boiler or oil fuel unit; and trunks to such spaces.*

(MODU Code 1.3.29)

225 Non-combustible material

Is material that neither burns nor gives off flammable vapours in sufficient quantity for self-ignition when heated to approximately 750 °C, this being determined in accordance with the Fire Test Procedures Code (FTP Code). Any other material is a combustible material.

(SOLAS reg. II-2/3.1)

226 Oil fuel unit

The equipment used for the preparation of oil fuel for delivery to an oil-fired boiler, or equipment used for the preparation for delivery of heated oil to an internal combustion engine, and includes any oil pressure pumps, filters and heaters dealing with oil at a pressure of more than 0.18 N/mm².

(SOLAS reg. II-2/3.21).

Spaces which contain oil-fired equipment other than boilers, such as inert gas generators, incinerators, etc. should be considered as machinery spaces of category "A" in accordance with this regulation.

(IMO MSC/Circ.847 Annex)

227 Open decks

Open deck spaces, excluding hazardous areas.

228 Passive fire protection

A coating, cladding, or free standing system that provides thermal protection in the event of a fire and that requires no manual, mechanical or other means of initiation, replenishment or sustenance.

229 Pool fire

Combustion of flammable or combustible liquid spilled and retained at a surface.

230 Primary deck covering

A deck covering which will not readily ignite or give rise to toxic or explosive hazards at elevated temperatures. Testing shall be based on IMO res. A.687(17) or an equivalent test procedure.

231 Processing area

Any area designated for separation, compression, treatment and disposal of reservoir fluids.

232 Production area

The area accommodating the entire production process from the wellhead, incoming flowlines or pipelines to the most downstream discharge valve, as relevant to the unit in question. This includes the riser or turret area.

233 Public spaces

Those portions of the accommodation which are used for halls, dining rooms, lounges and similar permanently enclosed spaces.

(SOLAS reg. II-2/3.11)

234 Sanitary and similar spaces

Communal sanitary facilities such as showers, baths, lavatories, etc., and isolated pantries containing no cooking appliances. Sanitary facilities which serve a space and with access only from that space shall be considered a portion of the space in which they are located.

(MODU Code 9.1.4.2.11)

235 Service spaces

Service spaces are those spaces used for galleys, pantries containing cooking appliances, lockers and store rooms, workshops other than those forming part of the machinery spaces, and trunks to such spaces.

(MODU Code 1.3.46)

236 Service spaces (high risk)

Lockers, store-rooms and working spaces in which flammable materials are stored, galleys, pantries containing cooking appliances, paint rooms and workshops other than those forming part of the machinery space.

(MODU Code 9.1.4.2.9)

237 Service spaces (low risk)

Lockers, storerooms and working spaces in which flammable materials are not stored, drying rooms and laundries.

(MODU Code 9.1.4.2.5)

238 Sprinkler system

A system to apply firewater through nozzles by heat exposure of frangible bulb. The system is charged with pressurised firewater up to the nozzle (may also be pressurised air). Only fire exposed nozzles will discharge firewater. The system normally also include a control valve and a device for actuating alarm when system operates.

239 Stairways

Interior stairways, lifts and escalators (other than those wholly contained within the machinery spaces) and enclosures thereto. In this connection a stairway which is enclosed only at one level shall be regarded as part of the space from which it is not separated by a fire door.

(MODU Code 9.1.4.2.4)

240 Turret

A turnable support for riser and mooring lines to enable heading control of the vessel without twisting mooring lines and flexible risers.

241 Wellhead area

The deck area surrounding the wellheads including test, production, and injection manifolds and associated flowlines.

242 Working spaces

Open or enclosed spaces containing equipment and processes, associated with drilling operations, which are not included in machinery spaces or hazardous areas.

C 300 Abbreviations

301 The abbreviations in Table C1 are used.

Table C1 Abbreviations	
Abbreviation	In full
BOP	Blow out preventer
DNV	Det Norske Veritas
ESD	Emergency shutdown
FTP	Fire Test Procedures (Code)
HVAC	Heating, ventilation and air conditioning
IEC	International Electrotechnical Commission
IMO	International Maritime Organization
ISO	International Organisation of Standardisation
LEL	Lower explosion limit
MAC	Manually activated call point
MODU	Mobile Offshore Drilling Unit
NFPA	National Fire Protection Association
OS	Offshore standard
OSS	Offshore service specification
PFP	Passive fire protection
RP	Recommended practice
STL	Submerged turret loading
STP	Submerged turret production
UPS	Uninterruptible power supply

D. Documentation

D 100 General

101 Design documentation covering the following aspects is normally produced to document fire technical systems provided under this standard:

- fire pumps
- fire main
- hydrants and hoses
- fixed fire extinguishing arrangement in engine and boiler room
- fire control plan
- automatic sprinkler system
- fixed fire detection and alarm systems in accommodation spaces, machinery spaces, and cargo spaces
- specification and location of detectors, equipment alarms and call points
- wiring diagrams
- ventilation system layout including dimensions and penetrations of ducts through fire divisions
- details of fire dampers
- penetrations of cables and pipes through fire divisions
- arrangement of means of control for closure of openings, stop of ventilation fans and stop of fuel oil pumps in machinery spaces
- fire integrity of bulkheads and decks
- general arrangement of all rooms showing fire insulation and draught stops
- details of insulation and specification of materials
- fire doors in different types of bulkheads and specification of doors
- deck coverings and surface materials specification and positions.



CHAPTER 2

TECHNICAL PROVISIONS

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SECTION 1 PASSIVE FIRE PROTECTION

A. General

A 100 Objective

101 The objectives of passive fire protection (PFP) are to prevent or mitigate the serious consequences from a fire, such as to:

- prevent escalation of fire from one area to an adjacent area
- ensure the temporary refuge is intact for the time necessary
- protect personnel from the fire (heat and smoke) and make escape or evacuation possible
- protect systems and equipment of essential importance for safety
- maintain structural integrity for the required period of time.

102 *These requirements have been formulated principally for units having their hull, superstructure, structural bulkheads, decks and deckhouses constructed of steel.*

(MODU Code 9.1.1)

103 *Units constructed of other materials may be accepted, provided that, in the opinion of the Administration, they provide an equivalent standard of safety.*

(MODU Code 9.1.2)

104 For supplementary requirements applicable to units for special types of service, see Sec.6 to Sec.8.

B. Fire Technical Requirements

B 100 Fire resistance tests

101 The qualifying properties for fire resistance shall be established through recognised codes and standards.

Guidance note:

The following references are applicable:

Reference	Title and test method
API Std 607	Fire Test for Soft-Seated Quarter-Turn Valves
BS 6755-2	Testing of valves. Specification for fire type-testing requirements
DIN 53436	Producing thermal decomposition products from materials in an air stream and their toxicological testing; decomposition apparatus and determination of test-temperature
HSE (UK) Offshore safety reports OTO 93:028 OTI 95:634	Interim jet fire test for determining the effectiveness of passive fire protection materials
IEC 60331	Tests for electric cables under fire conditions - Circuit integrity Fire resisting cables
IEC 60332-3	Tests on electric cables under fire conditions - Part 3 Flame retardant cables
IMO res. A.653(16)	Recommendation on Improved Fire Test Procedures for Surface Flammability of Bulkhead, Ceiling and Deck Finish Materials.
IMO res. A.754(18)	Recommendation on fire resistance tests for "A", "B" and "F" class divisions (FTP Code Annex 1 Part 3)

ISO 834	Fire resistance tests – Elements of building construction
ISO 1182	Fire tests - Building materials - Non-combustibility test
ISO 1716	Building materials - Determination of calorific potential Limited combustibility
ISO 5657	Reaction to fire tests - Ignitability of building products using a radiant heat source Ignition properties
ISO 5660-1	Fire tests - Reaction to fire - Part 1: Rate of heat release from building products - (Cone calorimeter method) Heat of combustion, smoke development

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B 200 Structural elements

201 Special attention shall be given to the insulation of aluminium alloy components of columns, stanchions and other structural members required to support lifeboat and liferaft stowage, launching and embarkation areas, and "A" and "B" class divisions, so as to ensure that for such members:

- supporting lifeboat and liferaft areas and "A" class divisions, the temperature rise limitation (see guidance note) shall apply at the end of one hour
- required to support "B" class divisions, the temperature rise limitation (see guidance note) shall apply at the end of half an hour.

Guidance note:

Normally the critical temperatures for aluminium with respect to structural integrity (dependent on type of alloy) is 200 °C. Other critical temperatures may be used provided that corresponding changes are taken into account concerning the thermal and mechanical properties.

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202 Heat transmissions at intersections and terminal points of required thermal barriers in fire rated divisions shall be specially considered.

Guidance note:

Any such heat bridge should be insulated to the same rating as the thermal barrier for a distance of not less than 450 mm.

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B 300 Ventilation ducts for accommodation spaces, service spaces and control stations

301 *Ventilation ducts should be of non-combustible material. Short ducts, however, not generally exceeding 2 m in length and with a cross-sectional area not exceeding 0.02 m² need not be non-combustible, subject to the following conditions:*

1. *these ducts should be of a material which, in the opinion of the Administration, has a low fire risk;*
2. *they may only be used at the end of the ventilation device;*
3. *they should not be situated less than 600 mm, measured along the duct, from where it penetrates any "A" or "B" class division including continuous "B" class ceilings.*

(MODU Code 9.2.11)

302 *Where ventilation ducts with a cross-sectional area ex-*

ceeding 0.02 m² pass through class "A" bulkheads or decks, the opening should be lined with a steel sheet sleeve unless the ducts passing through the bulkheads or decks are of steel in the vicinity of penetrations through the deck or bulkhead; the ducts and sleeves at such places should comply with the following:

1. The ducts or sleeves should have a thickness of at least 3 mm and a length of at least 900 mm. When passing through bulkheads, this length should be divided preferably into 450 mm on each side of the bulkhead. These ducts, or sleeves lining such ducts, should be provided with fire insulation. The insulation should have at least the same fire integrity as the bulkhead or deck through which the duct passes. Equivalent penetration protection may be provided to the satisfaction of the Administration.
2. Ducts with a cross-sectional area exceeding 0.075 m², except those serving hazardous areas, should be fitted with fire dampers in addition to meeting the requirements of 2.1 (300). The fire damper should operate automatically but should also be capable of being closed manually from both sides of the bulkhead or deck. The damper should be provided with an indicator which shows whether the damper is open or closed. Fire dampers are not required, however, where ducts pass through spaces surrounded by "A" class divisions, without serving those spaces, provided those ducts have the same fire integrity as the divisions which they pierce. The Administration may, given special considerations, permit operation from one side of a division only.

(MODU Code 9.2.12)

303 Ducts provided for the ventilation of machinery spaces of category A, galleys and hazardous areas should not pass through accommodation spaces, service spaces or control stations. However, the Administration may permit a relaxation from this requirement, except for the ducts serving hazardous areas passing through accommodation spaces, control stations and galleys, provided that the ducts are:

1. constructed of steel having a thickness of at least 3 mm for ducts of 300 mm in width or less and of at least 5 mm for ducts of 760 mm in width and over; in the case of ducts the width or diameter of which is between 300 mm and 760 mm, the thickness should be obtained by interpolation;
 2. fitted with automatic fire dampers close to the boundaries penetrated; and
 3. insulated to "A-60" standard from the machinery spaces or galleys to a point at least 5 m beyond each fire damper;
- or
4. constructed in steel in accordance with 1; and
 5. insulated to "A-60" standard throughout the accommodation spaces, service spaces or control stations.

(MODU Code 9.2.13)

304 Ducts provided for the ventilation of accommodation spaces, service spaces or control stations should not pass through machinery spaces of category A, galleys or hazardous areas. However, the Administration may permit a relaxation from this requirement, except for the ducts passing through hazardous areas, provided that:

1. the ducts where they pass through a machinery space of category A or a galley are constructed of steel in accordance with 2.13.1 (303.1);
2. automatic fire dampers are fitted close to the boundaries penetrated; and
3. the integrity of the machinery space or galley boundaries is maintained at the penetrations;

or

4. the ducts where they pass through a machinery space of category A or a galley are constructed of steel in accordance with 2.13.1 (303.1); and
5. are insulated to "A-60" standard within the machinery space or galley.

(MODU Code 9.2.14)

305 Ventilation ducts with a cross-sectional area exceeding 0.02 m² passing through "B" class bulkheads should be lined with steel sheet sleeves of 900 mm in length divided preferably into 450 mm on each side of the bulkhead unless the duct is of steel for this length.

(MODU Code 9.2.15)

306 Where they pass through accommodation spaces or spaces containing combustible materials, the exhaust ducts from galley ranges should be of equivalent fire integrity to "A" class divisions. Each such external exhaust duct should be fitted with:

1. a grease trap readily removable for cleaning;
2. a fire damper located in the lower end of the duct;
3. arrangements, operable from within the galley, for shutting off the exhaust fans; and
4. fixed means for extinguishing a fire within the duct.

(MODU Code 9.2.16)

307 The main inlets and outlets of all ventilation systems should be capable of being closed from outside the spaces being ventilated.

(MODU Code 9.2.17)

308 Power ventilation of accommodation spaces, service spaces, control stations, machinery spaces and hazardous areas should be capable of being stopped from an easily accessible position outside the space being served. The accessibility of this position in the event of a fire in the spaces served should be specially considered. The means provided for stopping the power ventilation serving machinery spaces or hazardous areas should be entirely separate from the means provided for stopping ventilation of other spaces.

(MODU Code 9.2.18)

309 Windows and sidescuttles in boundaries which are required to meet an "A-60" standard which face the drill floor area should be:

1. constructed to an "A-60" standard; or
2. protected by a water curtain; or
3. fitted with shutters of steel or equivalent material.

(MODU Code 9.2.19)

310 The ventilation of the accommodation spaces and control stations should be arranged in such a way as to prevent the ingress of flammable, toxic or noxious gases, or smoke from surrounding areas.

(MODU Code 9.2.20)

B 400 Penetrations

401 Openings and penetrations in fire rated divisions shall be arranged so as to maintain the fire rating of the divisions. Penetrations shall be approved for the actual divisions where they are to be installed.

402 Openings in bulkheads of "H" class are in general to be avoided.

C. Protection of Spaces or Areas

C 100 General

101 The general requirements for arrangement and the separation of spaces or areas of different category and/or operation

are given in DNV-OS-A101.

C 200 Fire integrity of bulkheads and decks

201 Fire integrity of bulkheads separating adjacent spaces shall be as given in Table C1 and Table C2.

202 In addition to complying with the specific provisions for fire integrity of bulkheads and decks in this section and in 300, the minimum fire integrity of bulkheads and decks should be as prescribed in Table C1 and Table C2. Exterior boundaries of

superstructures and deckhouses enclosing accommodation, including any overhanging decks which support such accommodation, should be constructed to "A-60" standard for the whole of the portion which faces and is within 30 m of the centre of the rotary table. For units that have a movable substructure the 30 m should be measured with the substructure at its closest drilling position to the accommodation. The Administration may accept equivalent arrangements.

(MODU Code 9.1.3)

Table C1 Fire integrity of bulkheads separating adjacent spaces											
Spaces	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Control stations (1)	A-0 _(d)	A-0	A-60	A-0	A-15	A-60	A-15	A-60	A-60	*)	A-0
Corridors (2)		C	B-0	B-0 A-0 _(b)	B-0	A-60	A-0	A-0	A-0	*)	B-0
Accommodation spaces (3)			C	B-0 A-0 _(b)	B-0	A-60	A-0	A-0	A-0	*)	C
Stairways (4)				B-0 A-0 _(b)	B-0 A-0 _(b)	A-60	A-0	A-0	A-0	*)	B-0 A-0 _(b)
Service spaces (low risk) (5)					C	A-60	A-0	A-0	A-0	*)	B-0
Machinery spaces of category A (6)						*) _(a)	A-0 _(a)	A-60	A-60	*)	A-0
Other machinery spaces (7)							A-0 _(a) (c)	A-0	A-0	*)	A-0
Hazardous areas (8)								-	A-0	-	A-0
Service spaces (high risk) (9)									A-0 _(c)	*)	A-0
Open decks (10)										-	*)
Sanitary and similar spaces (11)											C

See notes under Table C2.

Table C2 Fire integrity of decks separating adjacent spaces

Space - above below	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Control stations (1)	A-0	A-0	A-0	A-0	A-0	A-60	A-0	A-0	A-0	*)	A-0
Corridors (2)	A-0	*)	*)	A-0	*)	A-60	A-0	A-0	A-0	*)	*)
Accommodation spaces (3)	A-60	A-0	*)	A-0	*)	A-60	A-0	A-0	A-0	*)	*)
Stairways (4)	A-0	A-0	A-0	*)	A-0	A-60	A-0	A-0	A-0	*)	A-0
Service spaces (low risk) (5)	A-15	A-0	A-0	A-0	*)	A-60	A-0	A-0	A-0	*)	A-0
Machinery spaces of category A (6)	A-60	A-60	A-60	A-60	A-60	*) _(a)	A-60	A-60	A-60	*)	A-0
Other machinery spaces (7)	A15	A-0	A-0	A-0	A-0	A-0 _(a)	*) _(a)	A-0	A-0	*)	A-0
Hazardous areas (8)	A-60	A-0	A-0	A-0	A-0	A-60	A-0	-	A-0	-	A-0
Service spaces (high risk) (9)	A-60	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0 _(c)	*)	A-0
Open decks (10)	*)	*)	*)	*)	*)	*)	*)	-	*)	-	*)
Sanitary and similar spaces (11)	A-0	A-0	*)	A-0	*)	A-0	A-0	A-0	A-0	*)	*)

Notes: To be applied to Table C1 and Table C2, as appropriate.

The required fire integrity should be qualified through the conditions for the dimensioning accidental loads that applies. Areas where the dimensioning fire load exceeds 100 kW/m², H-rated divisions should be applied. See DNV-OS-A101 Sec.2.

- (a) Where the space contains an emergency power source or components of an emergency power source adjoining a space containing a ship's service generator or the components of a ship's service generator, the boundary bulkhead or deck between those spaces should be an "A-60" class division.
- (b) For clarification as to which note applies see 9.2.1 (301) and 9.2.3 (303).
- (c) Where spaces are of the same numerical category and superscript "c" appears, a bulkhead or deck of the rating shown in the tables is only required when the adjacent spaces are for a different purpose, e.g. in category (9). A galley next to a galley does not require a bulkhead but a galley next to a paint room requires an "A-0" bulkhead.
- (d) Bulkheads separating the navigating bridge, chartroom and radio room from each other may be "B-0" rating.
- *) Where an asterisk appears in the tables, the division should be of steel or equivalent material, but need not be of "A" class standard. However, where a deck is penetrated for the passage of electric cables, pipes and vent ducts, such penetrations should be made tight to prevent the passage of flame and smoke.

(MODU Code Table 9-1 and Table 9-2)

203 The following requirements should govern application of the tables:

- a) Table C1 and Table C2 should apply respectively to the bulkheads and decks separating adjacent spaces.
- b) For determining the appropriate fire integrity standards to be applied to divisions between adjacent spaces, such spaces are classified according to their fire risk, as shown in categories (1) to (11) below. The title of each category is intended to be typical rather than restrictive. The number in parenthesis preceding each category refers to the applicable column or row in the tables:

- (1) "Control stations" are spaces as defined in Ch.1 Sec.1.
- (2) "Corridors" means corridors and lobbies.
- (3) "Accommodation spaces" are spaces as defined in Ch.1 Sec.1, excluding corridors, lavatories and pantries containing no cooking appliances.
- (4) "Stairways" are interior stairways, lifts and escalators (other than those wholly contained within the machinery spaces) and enclosures thereto. In this connection a stairway which is enclosed only at one level should be regarded as part of the space from which it is not separated by a fire door.
- (5) "Service spaces (low risk)" are lockers, store-rooms and working spaces in which flammable materials are not stored, drying rooms and laundries.
- (6) "Machinery spaces of category A" are spaces as defined in Ch.1 Sec.1
- (7) "Other machinery spaces" are spaces as defined in Ch.1 Sec.1 other than machinery spaces of category A.
- (8) "Hazardous areas" are areas as defined in Ch.1 Sec.1.
- (9) "Service spaces (high risk)" are lockers, store-rooms and working spaces in which flammable materials are stored, galleys, pantries containing cooking appliances, paint rooms and workshops other than those forming part of the machinery space.
- (10) "Open decks" are open deck spaces, excluding hazardous areas.
- (11) "Sanitary and similar spaces" are communal sanitary facilities such as showers, baths, lavatories,

etc., and isolated pantries containing no cooking appliances. Sanitary facilities which serve a space and with access only from that space shall be considered a portion of the space in which they are located.

(MODU Code 9.1.4)

204 Continuous "B" class ceilings or linings in association with the relevant decks or bulkheads may be accepted as contributing wholly or in part to the required insulation and integrity of a division.

(MODU Code 9.1.5)

205 In approving structural fire protection details, the Administration should have regard to the risk of heat transmission at intersections and terminal points of required thermal barriers.

(MODU Code 9.1.6)

206 Windows and sidescuttles, with the exception of navigating bridge windows, should be of the non-opening type. Navigating bridge windows may be of the opening type provided the design of such windows permits rapid closure. The Administration may permit windows and sidescuttles outside hazardous areas to be of the opening type.

(MODU Code 9.1.7)

207 The fire resistance of doors should, as far as practicable, be equivalent to that of the division in which they are fitted. External doors in superstructures and deckhouses should be constructed to at least "A-0" class standard and be self-closing, where practicable.

(MODU Code 9.1.8)

C 300 Protection of accommodation spaces, service spaces and control stations

301 All bulkheads required to be "B" class divisions should extend from deck to deck and to the deckhouse side or other boundaries, unless continuous "B" class ceilings or linings are fitted on both sides of the bulkhead, in which case the bulkhead may terminate at the continuous ceiling or lining. In corridor bulkheads, ventilation openings may be permitted only in and under the doors of cabins, public spaces, offices and sanitary spaces. The openings should be provided only in the lower half

of the door. Where such an opening is in or under a door, the total net area of any such opening or openings should not exceed 0.05 m². When such an opening is cut in a door, it should be fitted with a grille made of non-combustible material. Such openings should not be provided in a door in a division forming a stairway enclosure.

(MODU Code 9.2.1)

302 Stairs should be constructed of steel or equivalent material.

(MODU Code 9.2.2)

303 Stairways which penetrate only a single deck should be protected at least at one level by "A" or "B" class divisions and self-closing doors so as to limit the rapid spread of fire from one deck to another. Personnel lift trunks should be protected by "A" class divisions. Stairways and lift trunks which penetrate more than a single deck should be surrounded by "A" class divisions and protected by self-closing doors at all levels. Self-closing doors should not be fitted with hold-back hooks. However, hold-back arrangements incorporating remote release fittings of the fail-safe type may be utilised.

(MODU Code 9.2.3)

304 Air spaces enclosed behind ceilings, panelling or linings should be divided by close fitting draught stops spaced not more than 14 m apart.

(MODU Code 9.2.4)

305 Except for insulation in refrigerated compartments, insulation material, pipe and vent duct lagging, ceilings, linings and bulkheads should be of non-combustible material. Insulation of pipe fittings for cold service systems and vapour barriers and adhesives used in conjunction with insulation need not be non-combustible but they should be kept to a minimum and their exposed surfaces should have low flame spread characteristics¹⁾. In spaces where penetration of oil products is possible, the surfaces of the insulation should be impervious to oil or oil vapours.

(MODU Code 9.2.5)

306 The framing, including grounds and the joint pieces of

bulkheads, linings, ceilings and draught stops, should be of non-combustible material.

(MODU Code 9.2.6)

307 All exposed surfaces in corridors and stairway enclosures and surfaces in concealed or inaccessible spaces in accommodation and service spaces and control stations should have low flame spread characteristics. Exposed surfaces of ceilings in accommodation and service spaces and control stations should have low flame spread characteristics ¹⁾.

(MODU Code 9.2.7)

1) Reference is made to IMO resolutions A.166(ES.IV) Guidelines on the evaluation of fire hazard properties of materials; A.472(XII) Improved recommendation on test method for qualifying construction materials as non-combustible; and A.564(14) Revised recommendation on fire test procedures for surface flammability of bulkhead and deck finish materials.

308 Bulkheads, linings and ceilings may have combustible veneers provided that the thickness of such veneers should not exceed 2 mm within any space other than corridors, stairway enclosures and control stations where the thickness should not exceed 1.5 mm. Alternatively, veneers which have a calorific value not exceeding 45 MJ/m² of the area for the thickness used may be accepted by the Administration, irrespective of the thickness of those veneers.

(MODU Code 9.2.8)

309 Primary deck coverings, if applied, should be of approved material which will not readily ignite, or give rise to toxic or explosive hazards at elevated temperatures. ²⁾

(MODU Code 9.2.9)

2) Reference is made to the improved provisional guidelines on test procedures for primary deck coverings, adopted by the Organisation by resolution A.214(VII).

310 Paints, varnishes and other finishes used on exposed interior surfaces should not offer an undue fire hazard in the judgement of the Administration and should not be capable of producing excessive quantities of smoke.

(MODU Code 9.2.10)

SECTION 2

ACTIVE FIRE PROTECTION OF SPECIFIC AREAS

A. General

A 100 General

101 This section gives requirements for active fire protection common to all types of offshore units and installations.

102 For supplementary requirements applicable to units and installations for special types of service, see Sec.6 to Sec.8.

B. Fire Extinguishing Systems in Specific Areas

B 100 General

101 Fixed water protection systems shall be installed to cover the following areas and equipment as applicable:

- wellhead or turret areas
- processing areas
- well test area
- crude oil and gas manifolds or piping on deck
- glycol regeneration plant
- areas containing equipment or piping through which hydrocarbon fluids is flowed for the purpose of production, export or offloading and storage
- areas of storage of cylinders with compressed gas (oxygen, acetylene, etc.).

102 The quantity of water supplied to areas requiring protection shall be sufficient to provide exposure protection to equipment within that area. See Table B1 for recommended capacity.

103 The horizontal extent of the area requiring protection may be limited by adjacent vertical class A or H divisions and/or the external boundaries of the installation.

Fixed water protection systems may consist of automatic deluge or sprinkler systems or water monitors or a combination of both. Water monitors are only considered suitable for protection of equipment in open areas. The layout is to ensure that all protected surfaces are wetted in all weather conditions. The minimum capacity given in Table B1 shall be applied for area coverage of automatic operated deluge or sprinkler systems.

Table B1 Minimum extinguishing capacities	
Area	Capacity
Wellhead area	10 l/minute m ²
Turret area	10 l/minute m ²
Processing area	10 l/minute m ²
Well test area	10 l/minute m ²
Drill floor	10 l/minute m ²

In addition to the capacity given in Table B1, dedicated deluge on exposed surfaces of pressure vessels and tanks containing combustibles to be covered with 10 l/minute/m².

B 200 Production or processing areas

201 Fixed water protection systems shall be installed to cover the following areas and equipment:

- wellhead or turret area
- area for production plant and associated pressurised piping
- offloading areas
- utility systems containing flammable gas or liquids in significant volumes or under pressure, e.g. glycol regeneration plant, methanol storage area, etc.

202 The minimum water application rate and type of protection are shown in Table B1.

Guidance note:

The minimum water application rate is specified for typical pool fires. If protection is required against jet (or torch) fires, significantly higher application rates should be specified.

---e-n-d---of---G-u-i-d-a-n-c-e---n-o-t-e---

203 In areas where liquid pool fires can be predicted, manual or fixed facilities shall be provided for application of foam of suitable type. The foam system is to have capacity for application of foam over the protected area for not less than 15 minutes.

204 Exposed pipework, pressure vessels and tanks containing inflammable gas or liquids shall have dedicated protection of minimum 10 litre per minute per m² of the exposed surface unless safety measures (see guidance note) justifies lower rates. See also Table B1.

Guidance note:

The rate may be adjusted in line with the design criteria, any passive fire protection and the capacity of the depressurising system.

---e-n-d---of---G-u-i-d-a-n-c-e---n-o-t-e---

B 300 Drilling areas

301 Fixed water protection systems shall be installed to cover the following areas and equipment:

- drill floor, and
- well test area.

302 The minimum water application rate and type of protection are shown in 103 and Table B1.

303 At least two water monitors shall be installed to cover the drilling and well test areas. These monitors shall each have a minimum capacity of 100 m³/hr at a discharge pressure of 3.5 bar. They shall have a fixed arrangement making it possible, by a simple hand grip, to disperse the water jet. The location of the water monitors shall be in easily accessible places and not on the same side of the area they shall cover. The monitors shall be made for easy and quick operation.

B 400 Accommodation, service and working spaces, and control stations

401 The accommodation, service and working spaces should be provided with approved portable fire extinguishers to the satisfaction of the Administration. Approved extinguishers should comply with regulation II-2/6 of the 1974 SOLAS Convention.

(MODU Code 9.6).

See Sec.3 C100 for SOLAS II-2/6.

Guidance note:

Portable fire extinguishers shall be located so that they can be reached within a distance of 15 m.

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B 500 Machinery spaces and in spaces containing fired processes

501 In spaces where main or auxiliary oil-fired boilers and other fired processes of equivalent thermal rating are situated, or in spaces containing oil fuel units or settling tanks, the unit should be provided with the following:

- One of the following fixed fire-extinguishing systems:

- .1 *a system complying with the provisions of regulation II-2/5 of the 1974 SOLAS Convention (See Appendix A, C200) or equivalent type of approved systems, subject to the following:*
 - the alarms shall be safe for use in a flammable cargo vapour and air mixture
 - a notice shall be posted at the control station, stating that due to the electrostatic ignition hazard, the system shall be used only for fire extinguishing, and not for inerting purposes.
- .2 *a high expansion foam system complying with the provisions of reg. II-2/9 of the 1974 SOLAS Convention (See Appendix A, B200), provided that the foam concentrate supply is suitable for extinguishing fires involving the cargoes carried.*
- .3 *a fixed pressure water-spraying system complying with the provisions of reg. II-2/10 of the 1974 SOLAS Convention (See Appendix A, A100) or equivalent type of approved systems.*

Where the machinery space and spaces containing fired processes are not entirely separate, or if fuel oil can drain from the latter spaces into the machinery space, the combined machinery space and fired process space should be considered as one compartment.

- *At least two approved portable foam extinguishers or equivalent in each space containing a fired process and each space in which a part of the oil fuel installation is situated. In addition, at least one extinguisher of the same description with a capacity of 9 l for each burner, provided that the total capacity of the additional extinguisher or extinguishers need not exceed 45 l for any one space.*

(MODU Code 9.5.1)

502 *Spaces containing internal combustion machinery used either for main propulsion or for other purposes, when such machinery has a total power output of not less than 750 kW, should be provided with the following arrangements:*

- *One of the fixed arrangements required by 501.1 to .3; and*
- *One approved foam-type extinguisher of not less than 45 °C capacity or equivalent in every engine space and one approved portable foam extinguisher for each 750 kW of engine power output or part thereof. The total number of portable extinguishers so supplied should be not less than two and need not exceed six.*

(MODU Code 9.5.2)

503 *The Administration should give special consideration to the fire-extinguishing arrangements to be provided in spaces not fitted with fixed fire-extinguishing installations containing steam turbines which are separated from boiler rooms by watertight bulkheads.*

(MODU Code 9.5.3)

504 *Where, in the opinion of the Administration, a fire hazard exists in any machinery space for which no specific provisions for fire-extinguishing appliances are prescribed in 501 to 503 there should be provided in, or adjacent to, that space a number of approved portable fire extinguishers or other means of fire extinction to the satisfaction of the Administration.*

(MODU Code 9.5.4)

C. Storage of Gas Cylinders

C 100 General

101 Designated areas shall be provided for the storage of acetylene and oxygen cylinders. These areas shall be protected by a fixed water spray system, which shall be activated upon confirmed fire detection in relevant areas. The capacity of this system to be at least 10 l/minute/m² of space to be protected.

SECTION 3 FIRE FIGHTING SYSTEMS

A. General

A 100 Introduction

101 The objectives of this section are to outline technical standards or requirements for fire fighting systems and equipment. Such equipment shall be installed with the aim to extinguish fires, reduce the effects to enable emergency actions, provide efficient control of fires and limit damage to structures and equipment.

102 This section gives requirements for fire fighting systems common to all types of offshore units and installations.

103 For supplementary requirements applicable to units and installations for special types of service, see Sec.6 to Sec.8.

B. Fire Fighting Systems

B 100 General

101 Manual local release of fire fighting systems and equipment shall be possible from a location outside the area to be protected. The location shall be such that personnel operating the release will not be exposed to excessive heat loads.

102 Active fire protection systems and equipment shall be designed for testing without interruption of normal operation.

103 All fire fighting equipment must be protected against freezing to the extent necessary.

B 200 Fire water pump system

201 *At least two independently driven power pumps should be provided, each arranged to draw directly from the sea and discharge into a fixed fire main. However, in units with high suction lifts, booster pumps and storage tanks may be installed, provided such arrangements will satisfy all the requirements of B201 to B209.*

(MODU Code 9.4.1)

202 *At least one of the required pumps should be dedicated for fire-fighting duties and be available for such duties at all times.*

(MODU Code 9.4.2)

203 *The arrangements of the pumps, sea suction and sources of power should be such as to ensure that a fire in any one space would not put both the required pumps out of action.*

(MODU Code 9.4.3)

204 *The capacity of the required pumps should be appropriate to the fire-fighting services supplied from the fire main. Where more pumps than required are installed, their capacity should be to the satisfaction of the Administration.*

(MODU Code 9.4.4)

205 *Each pump should be capable of delivering at least one jet simultaneously from each of any two fire hydrants, hoses and 19 mm nozzles while maintaining a minimum pressure of 0.35 N/mm² at any hydrant. In addition, where a foam system is provided for protection of the helicopter deck, the pump should be capable of maintaining a pressure of 0.7 N/mm² at the foam installation. If the water consumption for any other fire protection or fire-fighting purpose should exceed the rate of the helicopter deck foam installation, this consumption should be the determining factor in calculating the required capacity of the fire pumps.*

(MODU Code 9.4.5)

206 *Where either of the required pumps is located in a space*

not normally manned and, in the opinion of the Administration, is relatively far removed from working areas, suitable provision should be made for remote start-up of that pump and remote operation of associated suction and discharge valves.

(MODU Code 9.4.6)

207 *Except as provided in 202, sanitary, ballast, bilge or general service pumps may be accepted as fire pumps, provided that they are not normally used for pumping oil.*

(MODU Code 9.4.7)

208 *Every centrifugal pump which is connected to the fire main should be fitted with a non-return valve.*

(MODU Code 9.4.8)

209 *Relief valves should be provided in conjunction with all pumps connected to the fire main if the pumps are capable of developing a pressure exceeding the design pressure of the fire main, hydrants and hoses. Such valves should be so placed and adjusted as to prevent excessive pressure in the fire main system.*

(MODU Code 9.4.9)

210 Water treatment may be necessary to prevent marine growth from impairing fire water system performance. Inlet strainers shall be installed to prevent damage of the pump.

211 Fire pumps shall only be capable of being manually stopped at the driver. The only automatic trip accepted is for overspeed protection.

212 The protective shut down systems shall be simple, and in principle the fire pump systems may operate until destruction in an emergency situation. Since over-speed protection is provided, the protective device shall be automatic reset to cater for situations where new start up is called for.

213 Fire detection at the fire water pump and/or its driver area shall not stop the pump or inhibit the start of the fire pump driver.

214 The pumps shall be capable of 18 hours automatic operation. However, this period can be considered in relation to availability of external assistance.

Guidance note:

The power source for the fire water pump or the room in which it is located, should be arranged for cooling as required to assure continued operation in case of ventilation drop out.

---e-n-d---of---G-u-i-d-a-n-c-e---n-o-t-e---

B 300 Fire main

301 *A fixed fire main should be provided and be so equipped and arranged as to meet the requirements of 301 to 309.*

(MODU Code 9.4.10)

302 *The diameter of the fire main and water service pipes should be sufficient for the effective distribution of the maximum required discharge from the required fire pumps operating simultaneously.*

(MODU Code 9.4.11)

303 *With the required fire pumps operating simultaneously, the pressure maintained in the fire mains should be to the satisfaction of the Administration and be adequate for the safe and efficient operation of all equipment supplied therefrom.*

(MODU Code 9.4.12)

304 *The fire main should, where practicable, be routed clear of hazardous areas and be arranged in such a manner as to*

make maximum use of any thermal shielding or physical protection afforded by the structure of the unit.

(MODU Code 9.4.13)

305 *The fire main should be provided with isolating valves located so as to permit optimum utilisation in the event of physical damage to any part of the main.*

(MODU Code 9.4.14)

306 *The fire main should not have connections other than those necessary for fire fighting purposes.*

(MODU Code 9.4.15)

307 *All practical precautions consistent with having water readily available should be taken to protect the fire main against freezing.*

(MODU Code 9.4.16)

308 *Materials readily rendered ineffective by heat should not be used for fire mains and hydrants unless adequately protected. The pipes and hydrants should be so placed that the fire hoses may be easily coupled to them.*

(MODU Code 9.4.17)

309 *A cock or valve should be fitted to serve each fire hose so that any fire hose may be removed while the fire pumps are operating.*

(MODU Code 9.4.18)

310 *The isolating valves shall be provided for easy access of operation.*

B 400 Deluge systems

401 *Deluge systems shall be provided for protection of areas for production, off-loading, drilling, and well test equipment. The use of foam shall be specially considered where liquid fires are dominant. See Sec.2 Table B1 for required capacities.*

402 *The water pressure available at the inlet to the system or an individual section shall be sufficient for the efficient operation of all nozzles in that system or section under design flow conditions.*

403 *Release of the deluge systems shall be possible both locally and remotely at the control station where the operating status of the systems is monitored.*

404 *The piping for a deluge system, shall be designed to be robust and adequately secured and supported.*

405 *The nozzle type, location and orientation shall be suitable for the possible fire events and the environmental conditions. It should be ensured that the required quantity of water or foam will impinge on the surfaces to be protected. Due account is to be taken to the effects of obstructions.*

406 *Provisions for flushing of the distribution pipework shall be provided.*

407 *Water main supply to deluge systems or water monitors shall be so arranged that damage to any single section of the main due to fire within a protected area is not to disrupt water supply to deluge system or fire fighting equipment in an adjacent area.*

408 *Two separate supplies to the deluge firewater distribution pipework shall be provided, the main supply being from the deluge valve. The secondary supply shall preferably be from another section of the fire main, i.e. there shall preferably be an isolation valve in the fire main between the two supply locations. The secondary supply can be manually activated.*

409 *Deluge valves shall be located to provide safe access from the emergency control station on the installation, and shall be located outside the fire zone they protect.*

410 *The deluge valve system shall be designed to allow isolation and maintenance without isolation of the ring main.*

B 500 Sprinkler systems

501 *Sprinkler systems should be used in areas where slow fire growth is expected.*

502 *Pressure drop in the sprinkler system shall be alarmed and automatically activate start up of fire water pumps.*

503 *Sprinkler systems shall be equipped to provide draining and venting of air.*

B 600 Fire hydrants and hoses.

601 *The number and position of the hydrants should be such that at least two jets of water, not emanating from the same hydrant, one of which should be from a single length of fire hose, may reach any part of the unit normally accessible to those on board while the unit is being navigated or is engaged in drilling operations. A hose should be provided for every hydrant.*

(MODU Code 9.4.19)

602 *Fire hoses should be of material approved by the Administration and be sufficient in length to project a jet of water to any of the spaces in which they may be required to be used. Their maximum length should be to the satisfaction of the Administration. Every fire hose should be provided with a dual purpose nozzle and the necessary couplings. Fire hoses, together with any necessary fittings and tools, should be ready for use at any time and should be kept in conspicuous positions near the water service hydrants or connections*

(MODU Code 9.4.20)

Guidance note:

Their maximum length is not to exceed 15 m for hoses up to 63.5 mm in diameter, while 38.1 mm is suitable for hoses up to 23 m.

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603 *Nozzles should comply with the following requirements:*

- Standard nozzle sizes should be 12 mm, 16 mm and 19 mm or as near thereto as possible. Larger diameter nozzles may be permitted at the discretion of the Administration.*
- For accommodation and service spaces, a nozzle size greater than 12 mm need not be used.*
- For machinery spaces and exterior locations, the nozzle size should be such as to obtain the maximum discharge possible from two jets at the pressure specified in B205 from the smallest pump, provided that a nozzle size greater than 19 mm need not be used.*

(MODU Code 9.4.21)

604 *It shall be possible to operate the fire hose in a safe manner. Considerations in this respect shall be given to hose size and pressure.*

Guidance note:

Maximum pressure at hose is recommended not to exceed 7 bar. For recommended hose size, see NFPA 14, 2-7.2.

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605 *The surface unit should be provided with at least one international shore connection complying with regulation II-2/19.3 and 19.4 of the 1974 SOLAS Convention.*

(MODU Code 9.4.22)

Standard dimensions of flanges for the international shore connection shall be in accordance with Table B1.

Table B1 International shore connection	
<i>Description</i>	<i>Dimension</i>
<i>Outside diameter</i>	<i>178 mm</i>
<i>Inside diameter</i>	<i>64 mm</i>

Bolt circle diameter	132 mm
Slots in flange	4 holes 19 mm in diameter spaced equidistantly on a bolt circle of the above diameter, slotted to the flange periphery
Flange thickness	14.5 mm minimum
Bolts and nuts	4, each of 16 mm diameter, 50 mm in length

(SOLAS reg. II-2/19.3)

606 The connection shall be of steel or other suitable material and shall be designed for 1.0 N/mm² services. The flange shall have a flat face on one side and on the other shall be permanently attached to a coupling that will fit the ship's hydrant and hose. The connection shall be kept aboard the ship together with a gasket of any material suitable for 1.0 N/mm² services, together with four 16 mm bolts, 50 mm in length and eight washers.

(SOLAS reg. II-2/19.4)

607 Facilities should be available enabling such a connection to be used on any side of the unit.

(MODU Code 9.4.23)

B 700 Monitors

701 A fire water monitor may be remotely or locally operated and is to have sufficient movement horizontally and vertically in order to permit the monitor to cover the complete area of protection. Any remotely operated monitor shall have local manual override control.

702 The monitor shall be provided with a locking device for operating in a selected position.

703 A monitor shall be capable of both jet and spray discharge.

704 The water monitors shall be easily accessible, including access during fire situations.

B 800 Water mist and gaseous systems

801 Water mist and gaseous systems shall be considered for protection of turbine enclosures and electrical rooms.

802 For design of gaseous systems, see SOLAS regulation II-2/5 (See Appendix A, C100) and ISO 13702.

C. Portable Equipment

C 100 Extinguishers

101 All fire extinguishers shall be of approved types and designs.

(SOLAS reg. II-2/6.1 as referred to by MODU Code 9.6)

102 The capacity of required portable fluid extinguishers shall be not more than 13.5 l and not less than 9 l. Other extinguishers shall be at least as portable as the 13.5 l fluid extinguisher and shall have a fire-extinguishing capability at least equivalent to that of a 9 l fluid extinguisher.

(SOLAS reg. II-2/6.1.1 as referred to by MODU Code 9.6)

103 The fire extinguishing medium in the extinguishers shall be suitable for the potential fire hazards in the protected spaces. The capacity of a dry powder extinguisher shall be 12 kg.

104 The Administration shall determine the equivalence of fire extinguishers.

(SOLAS reg. II-2/6.1.2 as referred to by MODU Code 9.6)

105 Spare charges shall be provided in accordance with requirements to be specified by the Administration.

(SOLAS reg. II-2/6.2 as referred to by MODU Code 9.6)

106 A spare charge shall be provided for each required, portable fire extinguisher that can be readily charged on board. If this cannot be done, duplicate extinguishers shall be provided.

107 Fire extinguishers containing an extinguishing medium which, in the opinion of the Administration, either by itself or under expected conditions of use gives off toxic gases in such quantities as to endanger persons shall not be permitted.

(SOLAS reg. II-2/6.3 as referred to by MODU Code 9.6)

108 One of the portable fire extinguishers intended for use in any space shall be stowed near the entrance to that space.

(SOLAS reg. II-2/6.6 as referred to by MODU Code 9.6)

SECTION 4 FIRE AND GAS DETECTION SYSTEMS

A. General

A 100 Introduction

101 This section gives requirements for fire and gas detection systems common to all types of offshore units and installations.

102 For supplementary requirements applicable to units and installations for special types of service, see Sec.6 to Sec.8.

103 For specific requirements for the emergency shutdown (ESD) system, see DNV-OS-A101.

104 For specific requirements for alarm systems, see DNV-OS-A101 and DNV-OS-D202.

B. Basic Provisions

B 100 General

101 The fire and gas detection systems shall be designed to allow testing without interrupting other systems onboard.

102 The requirements of DNV-OS-D202 apply to the fire and gas detection systems.

103 If shutdown actions are performed by the fire and gas detection systems, the requirements for the emergency shutdown (ESD) system apply.

C. Fire Detection System, Common Provisions

C 100 General

101 Any required fixed fire detection and fire alarm system with manually operated call points shall be capable of immediate operation at all times.

(SOLAS reg. II-2/13.1.1 as referred to by MODU Code 9.7.1)

The fire detection system shall have continuous availability R0 as defined in DNV-OS-D202 Sec.2 B.

102 Power supplies and electric circuits necessary for the operation of the system shall be monitored for loss of power or fault conditions as appropriate. Occurrence of a fault condition shall initiate a visual and audible fault signal at the control panel which shall be distinct from a fire signal.

(SOLAS reg. II-2/13.1.2 as referred to by MODU Code 9.7.1)

103 There shall be not less than two sources of power supply for the electrical equipment used in the operation of the fire detection and fire alarm system, one of which shall be an emergency source. The supply shall be provided by separate feeders reserved solely for that purpose. Such feeders shall run to an automatic change-over switch situated in or adjacent to the control panel for the fire detection system.

(SOLAS reg. II-2/13.1.3 as referred to by MODU Code 9.7.1)

Guidance note:

The requirement in 103 is considered complied with by use of automatic changeover to a stand-by uninterruptible power supply as required by DNV-OS-D202 Sec.3 B200.

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104 Detectors and manually operated call points shall be grouped into sections. The activation of any detector or manually operated call point shall initiate a visual and audible fire sig-

nal at the control panel and indicating units. If the signals have not received attention within two minutes an audible alarm shall be automatically sounded throughout the crew accommodation and service spaces, control stations and machinery spaces of category A. This alarm sounder system need not be an integral part of the detection system.

(SOLAS reg. II-2/13.1.4 as referred to by MODU Code 9.7.1)

105 The control panel shall be located on the navigating bridge or in the main fire control station.

(SOLAS reg. II-2/13.1.5 as referred to by MODU Code 9.7.1)

The SOLAS term "navigating bridge" can be interpreted as continuously manned space for units without a clearly defined bridge.

The fire detection central shall be located outside the main area of fire hazard and in a location permanently attended by authorised personnel.

106 Indicating units shall, as a minimum, denote the section in which a detector or manually operated call point has operated. At least one unit shall be so located that it is easily accessible to responsible members of the crew at all times, when at sea or in port, except when the ship is out of service. One indicating unit shall be located on the navigating bridge if the control panel is located in the main fire control station.

(SOLAS reg. II-2/13.1.6 as referred to by MODU Code 9.7.1)

107 Clear information shall be displayed on or adjacent to each indicating unit about the spaces covered and the location of the sections.

(SOLAS reg. II-2/13.1.7 as referred to by MODU Code 9.7.1)

108 Where the fire detection system does not include means of remotely identifying each detector individually, no section covering more than one deck within accommodation, service and control stations shall normally be permitted except a section which covers an enclosed stairway. In order to avoid delay in identifying the source of fire, the number of enclosed spaces included in each section shall be limited as determined by the Administration. In no case shall more than fifty enclosed spaces be permitted in any section. If the detection system is fitted with remotely and individually identifiable fire detectors, the sections may cover several decks and serve any number of enclosed spaces.

(SOLAS reg. II-2/13.1.8 as referred to by MODU Code 9.7.1)

109 A section of fire detectors which covers a control station, a service space or an accommodation space shall not include a machinery space of category A.

(SOLAS reg. II-2/13.1.10 as referred to by MODU Code 9.7.1)

110 Detectors shall be operated by heat, smoke or other products of combustion, flame, or any combination of these factors. Detectors operated by other factors indicative of incipient fires may be considered by the Administration provided that they are no less sensitive than such detectors. Flame detectors shall only be used in addition to smoke or heat detectors.

(SOLAS reg. II-2/13.1.11 as referred to by MODU Code 9.7.1)

111 The requirement for use of smoke detectors in addition to flame detectors applies to accommodation and service spaces only.

112 Suitable instructions and component's spares for testing and maintenance shall be provided.

(SOLAS reg. II-2/13.1.12 as referred to by MODU Code 9.7.1)

Guidance note:

The table below provides a guideline for the choice of detectors for some typical areas.

Area	Detection principle
<i>Major hazard areas</i>	
Wellhead	Flame or heat
Drill floor	Manual
Process areas, degasser room, shale shaker room, active mud tank room, turret	Flame
<i>Other areas</i>	
Mechanically ventilated utility areas, control rooms, switchgear rooms, battery rooms, mud lab, instrument rooms, local equipment rooms, telecommunication or public address rooms, HVAC rooms, electrically driven crane engine rooms	Smoke
Turbine or generator areas, diesel engine or generator rooms	Flame or smoke
Air compressor rooms	Smoke or heat
Sack or bulk storage area, crane engine rooms, workshops	Heat
Paint store	Heat or flame
Mud processing, fuel oil storage, turbine hood, water injection treatment area, cementing unit room, diesel engine room	Flame
<i>Accommodation areas</i>	
Cabins, corridors, staircases, public rooms, radio room, laundry	Smoke
Galley, galley hood or duct, wash-rooms, WCs	Heat

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113 The function of the detection system shall be periodically tested to the satisfaction of the Administration by means of equipment producing hot air at the appropriate temperature, or smoke or aerosol particles having the appropriate range of density or particle size, or other phenomena associated with incipient fires to which the detector is designed to respond. All detectors shall be of a type such that they can be tested for correct operation and restored to normal surveillance without the renewal of any component.

(SOLAS reg. II-2/13.1.13 as referred to by MODU Code 9.7.1)

114 The fire detection system shall not be used for any other purpose, except that closing of fire doors and similar functions may be permitted at the control panel.

(SOLAS reg. II-2/13.1.14 as referred to by MODU Code 9.7.1)

Guidance note:

Shutdown of the ventilation system is considered as a 'similar function'. See also B103.

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115 When fire detectors are provided with the means to adjust their sensitivity, necessary arrangements shall be ensured to fix and identify the set point.

116 When it is intended that a particular section or detector shall be temporarily switched off, this state shall be clearly indicated. Reactivation of the section or detector shall be performed automatically after a pre-set time.

117 Fire detection systems with a zone address identification capability fitted on or after 1 October 1994 shall be so arranged that:

- a loop cannot be damaged at more than one point by a fire;

- means are provided to ensure that any fault (e.g. power break, short circuit; earth) occurring in the loop will not render the whole loop ineffective;
- all arrangements are made to enable the initial configuration of the system to be restored in the event of failure (electrical, electronic, informatic);
- the first initiated fire alarm will not prevent any other detector to initiate further fire alarms.

(SOLAS reg. II-2/13.1.15 as referred to by MODU Code 9.7.1)

118 Failure in the fire detection central or in the detector circuits shall activate failure alarm.

C 200 Installation

201 An automatic fire detection and alarm system should be provided in all accommodation and service spaces. Sleeping quarters should be fitted with smoke detectors. All systems or equipment installed to conform with this paragraph should comply with regulation II-2/13 of the 1974 SOLAS Convention.

(MODU Code 9.7.1)

202 Sufficient manual fire alarm stations should be installed at suitable locations throughout the unit.

(MODU Code 9.7.2)

Guidance note:

The paragraphs that are considered applicable from regulation II-2/13 of the 1974 SOLAS Convention are included in this offshore standard and are made applicable to all relevant spaces.

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203 Manually operated call points shall be installed throughout the accommodation spaces, service spaces and control stations. One manually operated call point shall be located at each exit. Manually operated call points shall be readily accessible in the corridors of each deck such that no part of the corridor is more than 20 m from a manually operated call point.

(SOLAS reg. II-2/13.2.1 as referred to by MODU Code 9.7.1)

204 Smoke detectors shall be installed in all stairways, corridors and escape routes within accommodation spaces. Consideration shall be given to the installation of special purpose smoke detectors within ventilation ducting.

(SOLAS reg. II-2/13.2.2 as referred to by MODU Code 9.7.1)

205 Where a fixed fire detection and fire alarm system is required for the protection of spaces other than those specified in paragraph 2.2 (203), at least one detector complying with paragraph 1.11 (110) shall be installed in each such space.

(SOLAS reg. II-2/13.2.3 as referred to by MODU Code 9.7.1)

206 Detectors shall be located for optimum performance. Positions near beams and ventilation ducts or other positions where patterns of air flow could adversely affect performance and positions where impact or physical damage is likely shall be avoided. In general, detectors which are located on the overhead shall be a minimum distance of 0.5 m away from bulkheads.

(SOLAS reg. II-2/13.2.4 as referred to by MODU Code 9.7.1)

207 The maximum spacing of detectors shall be in accordance with the table (Table C1) below:

Table C1 Maximum spacing of detectors			
Type of detector	Maximum floor area per detector	Maximum distance between centres	Maximum distance away from bulkheads
Heat	37 m ²	9 m	4.5 m
Smoke	74 m ²	11 m	5.5 m

The Administration may require or permit other spacings based upon test data which demonstrate the characteristics of the detectors.

(SOLAS reg. II-2/13.2.5 as referred to by MODU Code 9.7.1)

208 Performance of heat and smoke detectors shall be in accordance with a recognised standard, e.g. EN 54-5 and 54-7 respectively.

209 *Electrical wiring which forms part of the system shall be so arranged as to avoid galleys, machinery spaces of category A, and other enclosed spaces of high fire risk except where it is necessary to provide for fire detection or fire alarm in such spaces or to connect to the appropriate power supply.*

(SOLAS reg. II-2/13.2.6 as referred to by MODU Code 9.7.1)

210 Fire detection systems will normally not be required for spaces protected by an automatic sprinkler system provided that an alarm is given upon release of the sprinkler system.

211 Manual activation of fire alarm shall be possible from all passageways and from the control stations.

212 Fire detectors shall be fitted such that all potential fire outbreak points are effectively guarded. For recommended location of detectors, see 206.

C 300 Design

301 *The system and equipment shall be suitably designed to withstand supply voltage variation and transients, ambient temperature changes, vibration, humidity, shock, impact and corrosion normally encountered in ships.*

(SOLAS reg. II-2/13.3.1 as referred to by MODU Code 9.7.1)

302 *Smoke detectors required by paragraph 2.2 (203) shall be certified to operate before the smoke density exceeds 12.5% obscuration per metre, but not until the smoke density exceeds 2% obscuration per metre. Smoke detectors to be installed in other spaces shall operate within sensitivity limits to the satisfaction of the Administration having regard to the avoidance of detector insensitivity or over sensitivity.*

(SOLAS reg. II-2/13.3.2 as referred to by MODU Code 9.7.1)

303 *Heat detectors shall be certified to operate before the temperature exceeds 78 °C but not until the temperature exceeds 54 °C, when the temperature is raised to those limits at a rate less than 1 °C per minute. At higher rates of temperature rise, the heat detector shall operate within temperature limits to the satisfaction of the Administration having regard to the avoidance of detector insensitivity or over sensitivity.*

(SOLAS reg. II-2/13.3.3 as referred to by MODU Code 9.7.1)

304 *At the discretion of the Administration, the permissible temperature of operation of heat detectors may be increased to 30 °C above the maximum deckhead temperature in drying rooms and similar spaces of a normal high ambient temperature.*

(SOLAS reg. II-2/13.3.4 as referred to by MODU Code 9.7.1)

C 400 Additional requirements for periodically unattended machinery spaces

401 *An approved fire detection system based on the self-monitoring principle and including facilities for periodical testing should be installed in periodically unattended machinery spaces.*

(MODU Code 8.3.4)

402 *The fire detection system, required by 8.3.4 (401), should comply with the following general requirements:*

1. *This fire detection system should be so designed and the detectors so positioned as to detect rapidly the onset of fire in any part of those spaces and under any normal conditions of operation of the machinery and variations of ventilation as required by the possible range of ambient temperatures. Except in spaces of restricted height and where their use is specially appropriate, detection systems using only thermal detectors should not be permitted. The*

detection system should initiate audible and visual alarms distinct in both respects from the alarms of any other system not indicating fire, in sufficient places to ensure that the alarms are heard and observed at the locations required by 8.7.1. (See DNV-OS-A101 Sec.6 J).

2. *After installation the system should be tested under varying conditions of engine operation and ventilation.*
3. *The fire detection system, where electrically supplied, should be fed automatically from an emergency source of power by a separate feeder if the main source of power fails.*

(MODU Code 8.3.5)

403 *Means should be provided in case of fire:*

1. *in boiler air supply casings and exhausts (uptakes); and*
2. *in scavenging air belts of propulsion machinery*

to detect fires and give alarms at an early stage, unless the Administration considers this to be unnecessary in a particular case.

(MODU Code 8.3.6)

404 *Internal combustion engines of 2250 kW and above or having cylinders of more than 300 mm bore should be provided with crankcase oil mist detectors or engine bearing temperature monitors or equivalent devices.*

(MODU Code 8.3.7)

D. Gas Detection, Common Provisions

D 100 General

101 *A fixed automatic gas detection and alarm system should be provided to the satisfaction of the Administration so arranged as to monitor continuously all enclosed areas of the unit in which an accumulation of flammable gas may be expected to occur and capable of indicating at the main control point by aural and visual means the presence and location of an accumulation.*

(MODU Code 9.8.1)

The gas detection system shall have continuous availability R0 as defined in DNV-OS-D202 Sec.2 B.

102 *At least two portable gas monitoring devices should be provided, each capable of accurately measuring a concentration of flammable gas.*

(MODU Code 9.8.2)

103 *A permanently installed automatic system shall be provided for continuous detection of hydrocarbon gas in the following areas:*

- hazardous areas, except in zone 0 and areas mechanically ventilated
- ventilation outlets from hazardous areas having mechanical ventilation
- intakes for ventilation air.

On units and installations where the sources of leakage of inflammable and toxic gases are concentrated in a small area, gas detectors in the air inlets of mechanically ventilated areas may be omitted provided that the ventilation systems are shut down automatically in the event of gas detection anywhere, and that gas detectors are located in all zone 1 and 2 areas. External air inlets for accommodation spaces shall always be fitted with gas detectors.

104 *The gas detection system is to indicate both by audible and visible alarm in the control centre the presence of an accumulation of gas corresponding to 25% and 60% of lower explosion limit.*

105 *If hazardous concentration of H₂S may occur, equip-*

ment to measure H₂S shall be installed. The system shall indicate both an audible and visible alarm in the control centre at 10 ppm H₂S.

SECTION 5 MISCELLANEOUS ITEMS

A. General

A 100 Introduction

101 This section gives requirements for miscellaneous fire technical items common to all types of offshore units and installations.

102 For supplementary requirements applicable to units and installations for special types of service, see Sec.6 to Sec.8.

A 200 Maintenance

201 *Fire-extinguishing appliances should be kept in good order and be available for immediate use at all times.*

(MODU Code 9.13.2)

B. Firemen's Outfit and Breathing Apparatus

B 100 General

101 *At least two firemen's outfits complying with the requirements of regulation II-2/17.1 and 17.2 and two sets of personal equipment, each set comprising the items stipulated in regulation II-2/17.1.1.1, 17.1.1.2 and 17.1.1.3 of the 1974 SOLAS Convention should be provided.*

(MODU Code 9.9.1)

102 *Spare charges should be provided for each breathing apparatus to the satisfaction of the Administration.*

(MODU Code 9.9.2)

103 *The firemen's outfits should in general be stored so as to be easily accessible and ready for use and, where applicable, one of the outfits should be located at a position readily accessible from any helicopter deck.*

(MODU Code 9.9.3)

C. Arrangements in Machinery and Working Spaces

C 100 General

101 *Means should be provided for stopping ventilating fans serving machinery and working spaces and for closing all doorways, ventilators, annular spaces around funnels and other openings to such spaces. These means should be capable of being operated from outside such spaces in case of fire.*

(MODU Code 9.10.1)

102 *Machinery driving forced and induced draught fans, electric motor pressurisation fans, oil fuel transfer pumps, oil fuel unit pumps and other similar fuel pumps should be fitted with remote controls situated outside the space concerned so that they may be stopped in the event of a fire arising in the space in which they are located.*

(MODU Code 9.10.2)

103 *Every oil fuel suction pipe from a storage, settling or daily service tank situated above the double bottom should be fitted with a cock or valve capable of being closed from outside the space concerned in the event of a fire arising in the space in which such tanks are situated. In the special case of deep tanks situated in any shaft or pipe tunnel, valves on the tanks should be fitted but control in the event of fire may be effected by means of an additional valve on the pipeline or lines outside the*

tunnel or tunnels.

(MODU Code 9.10.3)

D. Provisions for Helicopter Facilities

D 100 General

101 *Helicopter decks of steel, aluminium or other non-combustible materials are to be constructed to the satisfaction of the Administration and should be of at least "A-0" class, as identified in Ch.1 Sec.1. Means should be provided to prevent the collection of liquids on the helicopter deck and to prevent liquids from spreading to or failing on other parts of the unit. The Administration may accept an air gap of at least 1 m between the deckhouse top and the underside of the helicopter deck as an alternative to the "A-0" requirement. Deckhouse tops directly below helicopter decks should have no openings.*

(MODU Code 9.11.1)

102 *On any helicopter deck there should be provided and stored near to the means of access to that deck:*

1. *at least two dry powder extinguishers having a total capacity of not less than 45 kg;*
2. *a suitable foam application system consisting of monitors or foam-making branch pipes capable of delivering foam solution to all parts of the helicopter deck at a rate of not less than 6 l/minute for at least 5 minute for each square metre of the area contained within a circle of diameter "D", where "D" is the distance in metres across the main rotor and tail rotor in the fore and aft line of a helicopter with a single main rotor and across both rotors for a tandem rotor helicopter. The Administration may accept other fire-fighting systems which provide a fire extinguishing capability at least as effective as the required foam application system;*
3. *carbon dioxide extinguishers of a total capacity of not less than 18 kg or equivalent, one of these extinguishers being so equipped as to enable it to reach the engine area of any helicopter using the deck; and*
4. *at least two dual purpose nozzles and hoses sufficient to reach any part of the helicopter deck.*

(MODU Code 9.11.2)

103 *A designated area should be provided for the storage of fuel tanks which should be:*

1. *as remote as is practicable from accommodation spaces, escape routes and embarkation stations; and*
2. *suitably isolated from areas containing a source of vapour ignition.*

(MODU Code 9.11.3)

104 *The fuel storage area should be provided with arrangements whereby fuel spillage may be collected and drained to a safe location.*

(MODU Code 9.11.4)

105 *Tanks and associated equipment should be protected against physical damage and from a fire in an adjacent space or area.*

(MODU Code 9.11.5)

106 *Where portable fuel storage tanks are used, special attention should be given to:*

1. *design of the tank for its intended purpose;*
2. *mounting and securing arrangements;*

3. *electrical bonding; and*
4. *inspection procedures.*

(MODU Code 9.11.6)

107 *Storage tank fuel pumps should be provided with means which permit shutdown from a safe remote location in the event of a fire. Where a gravity fed fuelling system is installed, equivalent closing arrangements should be provided.*

(MODU Code 9.11.7)

108 *The fuel pumping unit should be connected to one tank at a time and the piping between the tank and the pumping unit should be of steel or equivalent material, as short as possible and protected against damage.*

(MODU Code 9.11.8)

109 *Fire-extinguishing arrangements for protection of the designated area should be to the satisfaction of the Administration.*

(MODU Code 9.11.9)

110 *Electrical fuel pumping units and associated control equipment should be of a type suitable for the location and potential hazard.*

(MODU Code 9.11.10)

111 *Fuel pumping units should incorporate a device which will prevent over-pressurisation of the delivery or filling hose.*

(MODU Code 9.11.11)

112 *The procedures and precautions during refuelling operations should be in accordance with good recognised practice.*

(MODU Code 9.11.12)

113 *Attention should be paid to the electrical bonding of all equipment used in refuelling operations.*

(MODU Code 9.11.13)

114 *"NO SMOKING"- signs should be displayed at appropriate locations.*

(MODU Code 9.11.14)

E. Storage of Gas Cylinders

E 100 General

101 *Where more than one cylinder of oxygen and more than one cylinder of acetylene are carried simultaneously, such cylinders should be arranged in accordance with the following:*

1. *Permanent piping systems for oxyacetylene systems are acceptable provided that they are designed having due regard to standards and codes of practice to the satisfaction of the Administration.*

2. *Where two or more cylinders of each gas are intended to be carried in enclosed spaces, separate dedicated storage rooms should be provided for each gas.*
3. *Storage rooms should be constructed of steel, and be well ventilated and accessible from the open deck.*
4. *Provision should be made for the expeditious removal of cylinders in the event of fire.*
5. *"NO SMOKING" signs should be displayed at the gas cylinder storage rooms.*
6. *Where cylinders are stowed in open locations means should be provided to:*
 - *protect cylinders and associated piping from physical damage;*
 - *minimise exposure to hydrocarbons; and*
 - *ensure suitable drainage.*

(MODU Code 9.12.1)

102 *Areas or spaces where such cylinders are stored shall be protected by a fixed water spray system. The capacity of this system shall be minimum 10 l/minute/m² of space to be protected.*

F. Fire Control Plan

F 100 General

101 *A fire control plan complying with regulation II-2/20 of the 1974 SOLAS Convention should be permanently exhibited.*

(MODU Code 9.13.1)

102 *In all ships general arrangement plans shall be permanently exhibited for the guidance of the ship's officers, showing clearly for each deck the control stations, the various fire sections enclosed by "A" class divisions, the sections enclosed by "B" class divisions together with particulars of the fire detection and fire alarm systems, the sprinkler installation, the fire-extinguishing appliances, means of access to different compartments, decks, etc. and the ventilating system including particulars of the fan control positions, the position of dampers and identification numbers of the ventilating fans serving each section. Alternatively, at the discretion of the Administration, the aforementioned details may be set out in a booklet a copy of which shall be supplied to each officer, and one copy shall at all times be available on board in an accessible position. Plans and booklets shall be kept up to date, any alterations being recorded thereon as soon as practicable. Description in such plans and booklets shall be in the official language of the flag state. If the language is neither English nor French, a translation into one of those languages shall be included. In addition, instructions concerning the maintenance and operation of all the equipment and installations on board for the fighting and containment of fire shall be kept under one cover, readily available in an accessible position.*

(SOLAS reg. II-2/20.1)

SECTION 6 SUPPLEMENTARY REQUIREMENTS FOR DRILLING UNITS

A. General

A 100 Introduction

101 This section gives fire technical requirements applicable to drilling units. The requirements are to be applied supplementary to the requirements given by Sec.1 to Sec.5.

102 For specific requirements for ESD and fire and gas detection systems, see DNV-OS-A101 and DNV-OS-D202.

B. Passive Fire Protection

B 100 Systems and equipment

101 Reference is made to DNV-OS-A101 for general requirements for protection of systems and equipment.

102 Equipment and systems which are important to safety and need to be kept intact during a fire, shall be provided with passive fire protection or located such that they will not be exposed to excessive fire loads.

Guidance note:

Such equipment and systems could be valves and their accumulators, cables and their trays, piping systems and pressure vessels with their support, position mooring system etc.

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103 All electrical cables in accommodation areas shall be flame retardant according to IEC 60332-3 with additions, or other similar test method.

Where oil absorbing insulating material is used, the insulation shall be covered by non-combustible vapour-tight sheeting.

C. Gas Detection

C 100 General

101 The following provisions apply to drilling units in addition to the common provisions in Sec.4.

102 A permanently installed automatic system shall be provided for detection of hydrogen sulphide gas in the following areas:

- shale-shaker area
- mud tank area
- drill floor
- above or in the mud flow line.

103 The detection system is to give both audible and visual alarm in the main control room and on the drill floor. The system is clearly to indicate where gas has been detected. Visual indication of the gas concentration shall be given in the main control room.

D. Firemen's Outfit and Breathing Apparatus

D 100 General

101 A drilling installation shall be equipped with at least 4 sets of apparatus for complete breathing protection. These are to be properly marked and easily accessible. One of these shall be stored on or by the drill floor, one in the mud pit area and one in the shale shaker area. The breathing apparatus for the mud pit area and the shale shaker area shall be safely located having regard to fire in these areas.

SECTION 7

SUPPLEMENTARY REQUIREMENTS FOR OIL AND GAS PRODUCTION AND STORAGE UNITS

A. General

A 100 Introduction

101 This section gives fire technical requirements applicable to oil production and storage units. The requirements are to be applied supplementary to the requirements given by Sec.1 to Sec.5.

102 For specific requirements for ESD and fire and gas detection systems, see DNV-OS-A101 and DNV-OS-D202.

B. Passive Fire Protection

B 100 Structural elements

101 Load-bearing structures shall maintain integrity for the required period of time when exposed to the defined dimensioning accidental loads as defined in DNV-OS-A101.

102 Normally the critical temperatures with respect to structural integrity are as given in Table B1.

Table B1 Critical temperatures	
Material	Temperature
Structural steel and ordinary reinforcing steel	400 to 450 °C
Pre-stressed reinforcing steel	350 °C
Aluminium dependent on type of alloy	200 °C

103 Other critical values may be used as long as corresponding changes are taken into account concerning the thermal and mechanical properties.

104 Special attention shall be given to the insulation of aluminium alloy components of columns, stanchions and other structural members required to support lifeboat and liferaft stowage, launching and embarkation areas, and "A" and "B" class divisions, to ensure that:

- for such members supporting lifeboat and liferaft areas and "A" class divisions, the temperature rise limitation specified in 102 shall apply at the end of one hour; and
- for such members required to support "B" class divisions, the temperature rise limitation specified in 102 shall apply at the end of half an hour.

B 200 Systems and equipment

201 Reference is made to DNV-OS-A101 for general requirements for protection of systems and equipment.

202 Equipment and systems that are important to safety and need to be kept intact during a fire shall be provided with passive fire protection or located such that they will not be exposed to excessive fire loads. Cables with such functions shall be fire resistant, see IEC 60332-1.

Guidance note:

Such equipment and systems could be valves and their accumulators, cables and their trays, piping systems and pressure vessels with their support, position mooring system etc.

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203 Where oil absorbing insulating material is used, the insulation shall be covered by non-combustible vapour-tight sheeting.

B 300 Protection of spaces or areas

301 Exterior boundaries of superstructures and deckhouses enclosing accommodation spaces, service spaces and control stations, including any overhanging decks which support such accommodation, are to be protected against heat, for the portions facing the tank area, including 3 m of the side boundary, by insulation to minimum class "A-60" standard. See Sec.1 Table C2.

302 Bulkheads between crude oil pump rooms, including their trunks, and machinery spaces are to be class "A", and are to have no penetrations which are less than class "A-0" or equivalent in all respects, other than the crude oil pump shaft glands and similar glanded penetrations, see also Sec.1 Table C1 and Table C2.

303 Skylights to crude oil pump rooms shall be of steel and be capable of being closed from outside the pump room.

304 Permanent approved gas tight lighting enclosures for illuminating cargo pump-rooms may be permitted in bulkheads and decks separating cargo pump-rooms and other spaces provided they are of adequate strength and the integrity and gas tightness of the bulkhead or deck is maintained.

C. Fire Water Systems

C 100 Fire water pump system

101 The fire water pump systems shall be selected to deliver the pressure and flow requirements for the operation of the water based systems, such as the deluge, sprinkler, monitors, hoses etc. The required capacity will be the single largest credible fire area, which will have fixed firewater extinguishing system installed and additionally manual fire fighting demand from two hose streams and any relevant monitors. See also Sec.2 Table B1.

102 The status of the fire pump systems shall at all times be available at the central control station.

103 Firewater pumps shall start automatically upon fire detection in any area they are serving, as well as upon low pressure in the fire water ring main.

104 Each pump system shall have a supply capacity of 100% of the anticipated fire water demand, see 101 and Sec.3 B201. Each pump system shall preferably consist of 2 x 50% pump units.

D. Fire Water Distribution

D 100 General

101 An area shall be supplied by at least two well separated branch pipes on the fire main.

102 Fixed fire fighting systems, including deluge valve and fire water distribution pipework is normally to be designed so that fire water protection is effective within 20 s of the demand.

Guidance note:

For production plant with high protection requirements e.g. jet fires or thin wall pressure vessels, shorter response times or passive fire protection may be required to ensure the effectiveness of the system.

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103 The deluge valve system shall be activated by a signal from the fire and gas detection system and is to have local energy source for the valve actuator. The overall control system shall be designed to minimise the possibility of unintended valve opening if associated utilities are damaged, while a high degree of availability is maintained.

Guidance note:

As an example, for pneumatic control systems, unintended valve opening due to failure of main instrument air supply could be prevented by installation of a local air accumulator with a check valve in the air line. Solenoid valves for activation could be 'fail fixed' on loss of signal. The fail safe function can be provided by installing fusible bulbs in the protected fire zone to depressurise the control system and activate the deluge valve directly.

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E. Active Fire Protection of Specific Areas

E 100 General

101 Attention shall be given to any statutory requirements of the national authority having jurisdiction in the waters where the vessel is located during operation.

E 200 Deck fire fighting systems

201 Oil production and/or storage vessels are to have a fixed deck foam fire extinguishing system in accordance with the following requirements.

202 The arrangement for providing foam shall be capable of delivering foam to the entire tank deck area as well as into any crude oil tank with ruptured deck.

203 The deck foam system shall be capable of simple and rapid operation. The main control station for the system shall be suitably located outside the area, adjacent to the accommodation spaces and readily accessible and operable in the event of fire in the areas protected.

204 The rate of supply of foam solution shall be not less than the greatest of the following:

- a) 0.6 litre/minute/m² of cargo tank deck area, where crude oil tank deck area means the maximum breadth of the ship multiplied by the total longitudinal extent of the cargo tank spaces;
- b) 6 litre/minute/m² of the horizontal sectional area of the single tank having the largest such area, or;
- c) 3 litre/minute/m² of the area protected by the largest monitor, such area being entirely forward of the monitor, but not less than 1250 litre/minute.

205 The foam concentrate shall be of recognised type and delivered with product certificate.

206 Sufficient foam concentrate shall be supplied to ensure at least 20 minutes of foam generation in tankers fitted with an inert gas installation, and 30 minutes of foam generation in tankers not fitted with an inert gas installation when using solution rates given in 204 a), b), or c), whichever is the greatest.

207 The foam expansion ratio (i.e. the ratio of the volume of foam produced to the volume of the mixture of water and foam-making concentrate supplied) is generally not to exceed 12 to 1. Where systems essentially produce low-expansion foam but at an expansion ratio slightly in excess of 12 to 1, the quantity of foam solution available is to be calculated as for 12 to 1 expansion ratio systems. When medium-expansion ratio foam (between 50 to 1 and 150 to 1 expansion ratio) is employed the application rate of the foam and the capacity of a monitor installation will be specially considered.

208 Foam from the fixed foam system shall be supplied by means of monitors and foam applicators. At least 50% of the foam solution supply rate required in 204 a) or b) is to be delivered from each monitor. In such a case the capacity of each applicator shall be at least 25% of the foam solution supply rate required in 204 a) and b).

209 The number and position of monitors shall be such as to comply with 202. The capacity of any monitor shall be at least 3 litre/minute of foam solution per m² of deck area protected by that monitor, such area being entirely forward of the monitor.

210 Such capacity shall not be less than 1250 litre/minute.

211 The distance from the monitor to the farthest extremity of the protected area forward of that monitor is not to be more than 75% of the monitor throw in still air conditions.

212 A monitor and hose connection for a foam applicator shall be situated both port and starboard at the front of the poop or accommodation spaces facing the cargo tank deck.

213 Applicators shall be provided to ensure flexibility of action during fire fighting operations and to cover areas screened from the monitors. The capacity of any applicator shall not be less than 400 litre/minute and the applicator throw in still air condition shall not be less than 15 m. No less than four foam applicators shall be provided. The number and disposition of foam main outlets shall be such that foam from at least two applicators can be directed to any part of the cargo tank deck area.

214 Valves shall be provided in the foam main, and in the fire main when this is an integral part of the deck foam system, immediately forward of any monitor position to isolate damaged sections of those mains.

Operation of a deck foam system at its required output shall permit the simultaneous use of the minimum required number of jets of water at the required pressure from the fire main.

E 300 Fire fighting in cargo or crude oil pump rooms

301 Each cargo pump room shall be provided with one of the following fixed fire-extinguishing systems operated from a readily accessible position outside the pump room. Cargo pump rooms shall be provided with a system suitable for machinery spaces of category A.

- a) A system complying with the provisions of regulation II-2/5 of the 1974 SOLAS Convention (See Appendix A, C100) or equivalent type of approved systems, subject to the following:
 - the alarms shall be safe for use in a flammable cargo vapour and air mixture
 - a notice shall be posted at the control station, stating that due to the electrostatic ignition hazard, the system shall be used only for fire extinguishing, and not for inerting purposes.
- b) A high expansion foam system complying with the provisions of reg. II-2/9 of the 1974 SOLAS Convention (See Appendix A, sub-section B), provided that the foam concentrate supply is suitable for extinguishing fires involving the cargoes carried.
- c) A fixed pressure water-spraying system complying with the provisions of reg. II-2/10 of the 1974 SOLAS Convention (See Appendix A, A100) or equivalent type of approved systems.

302 Where the extinguishing medium used in the cargo pump room system is also used in systems serving other spaces, the quantity of medium provided or its delivery rate need not be more than the maximum required for the largest compartment.

E 400 Fire fighting in offloading area and STL rooms

401 The offloading area, bow and stern, shall have the following fire fighting equipment:

- water jets and foam monitors covering the bow loading and mooring area. Number, location and type of monitors are to be optimised with regard to fire-fighting efficiency. The foam system is to be independent from the vessel's main foam system
- water-based sprinkler system covering the mooring chain, fairlead and the exterior of the bow control station, if fitted
- foam-based sprinkler system for the bow loading connector room.

402 Fixed fire-extinguishing system in the STL room shall be according to the requirements in cargo or crude oil pump rooms, see 300.

E 500 Fire fighting in engine and boiler rooms

501 An additional fire extinguishing plant shall be fitted in the engine and boiler rooms when auxiliary boilers and turbines are fuelled by crude oil or gas. The system shall be installed in such a way that it is possible for an approved fire extinguishing medium to be directed on to the gas turbines, boiler fronts and on to the spill tray. The emission of extinguishing medium is automatically to stop the exhaust fan of the boiler hood.

502 There shall be in each boiler room at least one set of portable foam applicator unit complying with the provisions of regulation II-2/6.4 of SOLAS (see Sec.3 C100).

503 *There shall be at least two portable foam extinguishers or equivalent in each firing space in each boiler room and in each space in which a part of the oil fuel installation is situated. There shall be not less than one approved foam type extinguisher of at least 135 l capacity or equivalent in each boiler room. These extinguishers shall be provided with hoses on reels suitable for reaching any part of the boiler room. In the case of domestic boilers of less than 175 kW it may be considered relaxing the requirements of this paragraph.*

(SOLAS reg. II-2/7.1.3)

Guidance note:

50 kg dry powder or 45 kg CO₂ is considered as equivalent to 135 l foam liquid.

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F. Special Requirements for Areas for Treatment and Storage of Liquefied Gases

F 100 General

101 The requirements for deck fire fighting system in E200 apply.

F 200 Water spray system

201 A water spray system for cooling, fire prevention and crew protection shall be installed to cover:

- a) Exposed cargo tank domes and exposed parts of cargo tanks.
- b) Exposed on-deck storage vessels for flammable or toxic products.
- c) Cargo liquid and vapour discharge and loading manifolds and the area of their control valves and any other areas where essential control valves are situated and which is to be at least equal to the area of the drip trays provided.
- d) Boundaries of superstructures, deckhouses normally manned, cargo compressor rooms, cargo pump rooms,

store rooms containing high fire risk items and cargo control rooms facing the cargo area. Boundaries of unmanned forecastle structures not containing high fire risk items or equipment, do not require water spray protection.

202 The system shall be capable of covering all areas mentioned in 201 with a uniformly distributed water spray of at least 10 l/minute/m² for horizontal projected surfaces and 4 l/minute/m² for vertical surfaces. For structures having no clearly defined horizontal or vertical surfaces, the capacity of the water spray system shall be determined by the greater of the following:

- projected horizontal surface x 10 l/minute/m² or
- actual surface x 4 l/minute/m².

203 On vertical surfaces, spacing of nozzles protecting lower areas may take account of anticipated rundown from higher areas. Stop valves shall be fitted at intervals in the spray main for the purpose of isolating damaged sections. Alternatively, the system may be divided into two or more sections, which may be operated independently provided the necessary controls are located together, aft of the cargo area. A section protecting any area included in 201 a) and b), is to cover the whole of the athwartships tank grouping, which includes that area.

204 The capacity of the water spray pump shall be sufficient to deliver the required amount of water to all areas simultaneously or, where the system is divided into sections, the arrangements and capacity shall be such as to simultaneously supply water to any one section and to the surfaces specified in 201. Alternatively, the main fire pumps may be used for this service, provided that their total capacity is increased by the amount needed for the spray system. In either case, a connection through a stop valve shall be made between the fire main and water spray main outside the cargo area.

205 Water pumps normally used for other services, may be arranged to supply the water spray main.

206 The pipes, valves, nozzles and other fittings in the water spray system are to be resistant to corrosion by seawater, e.g. by galvanised pipe, and to the effect of fire.

207 Remote starting of pumps supplying the water spray system and remote operation of any normally closed valves in the system should be arranged in suitable locations outside the cargo area, adjacent to the accommodation spaces and readily accessible and operable in the event of fire in the areas protected.

F 300 Dry chemical powder fire extinguishing system

301 Vessels storing liquefied gas shall be fitted with a fixed dry chemical powder type extinguishing system for the purpose of fighting fire on the deck in the complete cargo area and bow or stern cargo handling areas, if applicable. The system shall be of approved type and tested for its purpose.

302 The system shall be capable of delivering powder from at least two hand hose lines or a combination monitor or hand hose line(s) to any part of the above deck exposed cargo area including above deck product piping. The system shall be activated by an inert gas, such as nitrogen, used exclusively for this purpose and stored in pressure vessels adjacent to the powder containers.

303 The system is to consist of at least two independent, self-contained dry chemical powder units with associated controls, pressurising medium, fixed piping, monitors or hand hose lines. For vessels with a cargo capacity of less than 1000 m³, consideration may be given to permit only one such unit to be fitted. A monitor shall be provided and so arranged as to protect the cargo loading and discharge manifold areas and be capable of actuation and discharge locally and remotely. The monitor is not required to be remotely aimed if it can deliver the necessary powder to all required areas of coverage from a single position. All hand hose lines and monitors shall be ca-

pable of actuation at the hose storage reel or monitor. At least one hand hose line or monitor shall be situated at the after end of the cargo area.

304 A fire extinguishing unit having two or more monitors, hand hose lines, or combinations thereof, is to have independent pipes with a manifold at the powder container. Where two or more pipes are attached to a unit the arrangement shall be such that any or all of the monitors and hand hose lines shall be capable of simultaneous or sequential operation at their rated capacities.

305 The capacity of a monitor is not to be less than 10 kg/s. Hand hose lines shall be non-kinkable and be fitted with a nozzle capable of on or off operation and discharge at a rate not less than 3.5 kg/s. The maximum discharge rate shall be such as to allow operation by one person. The length of a hand hose line is not to exceed 33 m. Where fixed piping is provided between the powder container and a hand hose line or monitor, the length of piping is not to exceed that length which is capable of maintaining the powder in a fluidised state during sustained or intermittent use, and which can be purged of powder when the system is shut down. Hand hose lines and nozzles shall be of weather resistant construction or stored in weather resistant housing or covers and be readily accessible.

306 A sufficient quantity of dry chemical powder shall be stored in each container to provide a minimum of 45 s discharge time for all monitors and hand hose lines attached to each powder unit. Coverage from fixed monitors shall be in accordance with Table F1.

Table F1 Coverage from fixed monitors

<i>Monitors</i>	<i>Capacity of fixed monitors (kg/s)</i>
For coverage of up to 10 m	10
For coverage of up to 30 m	25
For coverage of up to 40 m	45

307 Hand hose lines are to be considered to have a maximum effective distance of coverage equal to the length of hose. Special consideration is to be given in cases where areas to be protected are substantially higher than the monitor or hand hose reel locations.

308 Vessels fitted with bow or stern loading and discharge arrangements, shall be provided with an additional dry chemical powder unit complete with at least one monitor and one hand hose line. This additional unit shall be located to protect the bow or stern loading and discharge arrangements. The area of the cargo line forward or aft of the cargo area shall be protected by hand hose lines.

F 400 Cargo compressor and pump rooms

401 The cargo compressor and pump rooms shall be provided with carbon-dioxide system as specified in regulation II-2/5 of the 1974 SOLAS Convention (See Appendix A, C100). A notice shall be exhibited at the controls stating that the system is only to be used for fire extinguishing and not for inerting purposes, due to the electrostatic ignition hazard. The alarms shall be safe for use in a flammable cargo vapour-air mixture. For the purpose of this requirement, an extinguishing system shall be provided which is suitable for machinery spaces. However, the amount of carbon dioxide gas carried shall be sufficient to provide a quantity of free gas equal to 45% of the gross volume of the cargo compressor and pump rooms in all cases.

G. Fire Detection and Alarm Systems

G 100 General

101 An automatic fire detection system shall be installed in machinery spaces, service spaces, accommodation spaces, production areas and in any space containing equipment in petroleum or any other flammable substance is stored, conveyed, processed or consumed.

102 Fire detection in areas containing production facilities is normally to result in automatic shut-down of hydrocarbon flow and ventilation for the area.

103 Automatic shutdown of ventilation is to take place upon:

- detection of fire in enclosed spaces, unless this is in conflict with overall smoke control strategy.
- smoke detection in ventilation air inlets.

104 Detected fire in wellhead, turret, oil production or crude oil tank areas shall initiate automatic shutdown of wellhead valves and oil production facilities.

H. Gas Detection

H 100 General

101 Automatic shutdown of all hydrocarbon flow is to take place when gas is detected.

102 Automatic shutdown of ventilation is to take place upon detected gas with a maximum concentration of 25% of LEL in the air inlets to non-hazardous areas. Shutdown of ventilation shall include shutdown of fan, any heating element and closing of fire damper. Shutdown of ventilation is to ensure that the detected gas is isolated from ignition sources in the ventilated space.

Guidance note:

The response time of detection and shutdown shall be evaluated against the transport time of gas in the ventilation duct.

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103 Gas detection in cargo pump rooms and double hull spaces shall be arranged in accordance with principles given in Rules for Classification of Ships Pt.5 Ch.3 Sec.9 F and G.

104 Upon detection of hydrocarbon gas with maximum concentration of 60% of LEL in the area of wellhead, turret, production facilities and crude oil tanks, the wellhead valves and oil production facilities are to be automatically shutdown. See also DNV-OS-A101 Sec.5 D.

I. Conversions

I 100 General

101 Alternative solutions to the requirements for fire safety as stipulated in this section may be considered, e.g. for conversion of existing vessels to oil production and storage vessels, provided the required level of safety is maintained.

SECTION 8

SUPPLEMENTARY REQUIREMENTS FOR OTHER SPECIAL SERVICE TYPE UNITS OR INSTALLATIONS

A. General

A 100 Introduction

101 This section gives additional fire protection requirements for special service units or installations that shall be applied supplementary to the requirements given by Sec.1 to Sec.5.

B. Special Requirements for Fire Fighters

B 100 Introduction

101 Fire fighters are units intended for fighting fires on offshore and onshore structures as well as rescue operations in this relation.

102 Fire fighters are categorised in 3 categories depending on their intended service:

- Category I implies units for early stage fire fighting and rescue operations close to structures on fire.
- Category II and III implies units for continuous fighting of large fires and for cooling of structures on fire.
- Category III implies units with larger pumping capacities than II.

B 200 Technical provisions

201 Technical requirements applicable for fire fighters are given in Rules for Classification of Ships Pt.5 Ch.7 Sec.5.

C. Special Requirements for Units with Diving Systems

C 100 Passive fire protection

101 Enclosed spaces for diving systems shall be separated from adjacent rooms or spaces by bulkheads and deck with fire resistance defined as "A-60" division. Such spaces shall not be adjacent to any hazardous areas.

C 200 Fire extinguishing.

201 Enclosed spaces for diving systems shall be equipped with manually actuated extinguishing system with such a layout as to cover the whole system. For rooms intended for pressurised gas storage containers, the extinguishing system shall be a fixed pressure water-spraying system.

Open deck areas where diving systems are located, shall be provided with fire extinguishing equipment, which shall be considered in each case.

D. Special Requirements for Offshore Loading Buoys

D 100 Fire control and extinguishing

101 The arrangement of fire control and extinguishing shall be adequate for the buoy during its intended operation. Compensating procedures and measures, e.g. standby vessel with fire fighting equipment during manned periods shall be credited.

102 All fire-extinguishing appliances shall be kept in good order and shall be available for immediate use.

D 200 Unmanned buoys

201 An unmanned buoy does not require permanent arrangement for fire control and extinction.

Guidance note:

Examples are simple buoys without helicopter deck, boat-landing or working platforms.

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D 300 Not permanently manned buoys

301 A buoy that may be manned for maintenance or testing purposes shall be equipped with fire control and fire extinction systems, including:

- approved portable fire extinguishers shall be provided in service and working spaces;
- emergency shelter and other enclosed areas for e.g. machinery, electrical power generation and distribution shall be arranged with a fixed fire extinguishing system as outlined in this section; and
- provision for helicopter facilities.

D 400 Provision for helicopter facilities

401 Helicopter facilities shall in principle comply with the requirements in Sec.5.

For installations where adequate arrangement of fire control and fire extinction for the buoy is achieved without the provision of a fire pump, fixed dry powder system of capacity 250 kg is at least to be installed.

APPENDIX A FIXED FIRE FIGHTING SYSTEMS

A. Pressure Water-Spraying Systems in Machinery Spaces

A 100 General

101 The requirements in this section apply to ships and spaces where fixed water-spraying systems are required or fitted.

Guidance note:

Reference is made to IMO MSC/Circ.668 "Guidelines for the approval of water-based fire-extinguishing systems as referred to in SOLAS 74 for machinery spaces and cargo pump-rooms", as amended by IMO MSC/Circ.728.

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102 Any required fixed pressure water-spraying fire-extinguishing system in machinery spaces shall be provided with spraying nozzles of an approved type.

(SOLAS reg. II-2/10.1)

103 The number and arrangement of the nozzles shall be to the satisfaction of the Administration and shall be such as to ensure an effective average distribution of water of at least 5 l/m²/minute in the spaces to be protected. Where increased application rates are considered necessary, these shall be to the satisfaction of the Administration. Nozzles shall be fitted above bilges, tank tops and other areas over which oil fuel is liable to spread and also above other specific fire hazards in the machinery spaces.

(SOLAS reg. II-2/10.2)

104 The system may be divided into sections, the distribution valves of which shall be operated from easily accessible positions outside the spaces to be protected and will not be readily cut off by a fire in the protected space.

(SOLAS reg. II-2/10.3)

105 The system shall be kept charged at the necessary pressure and the pump supplying the water for the system shall be put automatically into action by a pressure drop in the system.

(SOLAS reg. II-2/10.4)

106 The pump shall be capable of simultaneously supplying at the necessary pressure all sections of the system in any one compartment to be protected. The pump and its controls shall be installed outside the space or spaces to be protected. It shall not be possible for a fire in the space or spaces protected by the water-spraying system to put the system out of action.

(SOLAS reg. II-2/10.5)

107 The pump may be driven by independent internal combustion machinery but, if it is dependent upon power being supplied from the emergency generator fitted in compliance with the provisions of regulation II-1/44 or regulation II-1/45, as appropriate, that generator shall be so arranged as to start automatically in case of main power failure so that power for the pump required by paragraph 5 (105) is immediately available. When the pump is driven by independent internal combustion machinery it shall be so situated that a fire in the protected space will not affect the air supply to the machinery.

(SOLAS reg. II-2/10.6)

108 Precautions shall be taken to prevent the nozzles from becoming clogged by impurities in the water or corrosion of piping, nozzles, valves and pump.

(SOLAS reg. II-2/10.7)

B. Fixed High-Expansion Foam Fire Extinguishing System in Machinery Spaces

B 100 Application

101 The requirements in this section apply to ships and spaces where fixed gas fire extinguishing systems are required or fitted.

B 200 General

201 Any required fixed high-expansion foam system in machinery spaces shall be capable of rapidly discharging through fixed discharge outlets a quantity of foam sufficient to fill the greatest space to be protected at a rate of at least 1 m in depth per minute. The quantity of foam-forming liquid available shall be sufficient to produce a volume of foam equal to five times the volume of the largest space to be protected. The expansion ratio of the foam shall not exceed 1 000 to 1.

(SOLAS reg. II-2/9.1.1)

202 The Administration may permit alternative arrangements and discharge rates provided that it is satisfied that equivalent protection is achieved.

(SOLAS reg. II-2/9.1.2)

203 Supply ducts for delivering foam, air intakes to the foam generator and the number of foam-producing units shall in the opinion of the Administration be such as will provide effective foam production and distribution.

(SOLAS reg. II-2/9.2)

204 The arrangement of the foam generator delivery ducting shall be such that a fire in the protected space will not affect the foam generating equipment.

(SOLAS reg. II-2/9.3)

205 The foam generator, its sources of power supply, foam-forming liquid and means of controlling the system shall be readily accessible and simple to operate and shall be grouped in as few locations as possible at positions not likely to be cut off by a fire in the protected space.

(SOLAS reg. II-2/9.4)

C. Fixed Gas Fire Extinguishing System

C 100 Application

101 The requirements in this section apply to ships and spaces where fixed gas fire extinguishing systems are required or fitted.

Guidance note:

Reference is made to IMO MSC/Circ.776 "Guidelines for the approval of equivalent fixed gas fire-extinguishing systems, as referred to in SOLAS 74, for machinery spaces and cargo pump rooms."

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C 200 General

201 The use of a fire-extinguishing medium which, in the opinion of the Administration, either by itself or under expected conditions of use gives off toxic gases in such quantities as to endanger persons shall not be permitted.

(SOLAS reg. II-2/5.1.1)

202 The necessary pipes for conveying fire-extinguishing

medium into protected spaces shall be provided with control valves so marked as to indicate clearly the spaces to which the pipes are led. Suitable provision shall be made to prevent inadvertent admission of the medium to any space. Where a cargo space fitted with a gas fire-extinguishing system is used as a passenger space the gas connection shall be blanked during such use.

(SOLAS reg. II-2/5.1.2)

203 The piping for the distribution of fire-extinguishing medium shall be arranged and discharge nozzles so positioned that a uniform distribution of medium is obtained.

(SOLAS reg. II-2/5.1.3)

204 Means shall be provided to close all openings which may admit air to or allow gas to escape from a protected space.

(SOLAS reg. II-2/5.1.4)

205 Where the volume of free air contained in air receivers in any space is such that, if released in such space in the event of fire, such release of air within that space would seriously affect the efficiency of the fixed fire-extinguishing system, the Administration shall require the provision of an additional quantity of fire-extinguishing medium.

(SOLAS reg. II-2/5.1.5)

206 Means shall be provided for automatically giving audible warning of the release of fire-extinguishing medium into any space in which personnel normally work or to which they have access. The alarm shall operate for a suitable period before the medium is released.

(SOLAS reg. II-2/5.1.6)

207 The means of control of any fixed gas fire-extinguishing system shall be readily accessible and simple to operate and shall be grouped together in as few locations as possible at positions not likely to be cut off by a fire in a protected space. At each location there shall be clear instructions relating to the operation of the system having regard to the safety of personnel.

(SOLAS reg. II-2/5.1.7)

208 Automatic release of fire-extinguishing medium shall not be permitted, except as permitted by paragraph 3.3.5 (SOLAS reg. II-2) and in respect of local automatically operated units referred to in paragraphs 3.4 and 3.5 (SOLAS reg. II-2)

(SOLAS reg. II-2/5.1.8)

209 Where the quantity of extinguishing medium is required to protect more than one space, the quantity of medium available need not be more than the largest quantity required for any one space so protected.

(SOLAS reg. II-2/5.1.9)

210 Except as otherwise permitted by paragraphs 3.3, 3.4 or 3.5 (SOLAS reg. II-2) pressure containers required for the storage of fire-extinguishing medium, other than steam, shall be located outside protected spaces in accordance with paragraph 1.13.

(SOLAS reg. II-2/5.1.10)

211 Means shall be provided for the crew to safely check the quantity of medium in the containers.

(SOLAS reg. II-2/5.1.11)

212 Containers for the storage of fire-extinguishing medium and associated pressure components shall be designed to pressure codes of practice to the satisfaction of the Administration having regard to their locations and maximum ambient temperatures expected in service.

(SOLAS reg. II-2/5.1.12)

213 When the fire-extinguishing medium is stored outside a protected space, it shall be stored in a room which shall be situated in a safe and readily accessible position and shall be ef-

fectively ventilated to the satisfaction of the Administration. Any entrance to such a storage room shall preferably be from the open deck and in any case shall be independent of the protected space. Access doors shall open outwards, and bulkheads and decks including doors and other means of closing any opening therein, which form the boundaries between such rooms and adjoining enclosed spaces shall be gastight. For the purpose of the application of the integrity tables in regulations 26 (SOLAS reg. II-2), such storage rooms shall be treated as control stations.

(SOLAS reg. II-2/5.1.13)

214 Spare parts for the system shall be stored on board and be to the satisfaction of the Administration.

(SOLAS reg. II-2/5.1.14)

C 300 Carbon dioxide systems

301 General requirements for CO₂ fire extinguishing systems

For cargo spaces the quantity of carbon dioxide available shall, unless otherwise provided, be sufficient to give a minimum volume of free gas equal to 30% of the gross volume of the largest cargo space so protected in the ship.

(SOLAS reg. II-2/5.2.1)

302 For machinery spaces the quantity of carbon dioxide carried shall be sufficient to give a minimum volume of free gas equal to the larger of the following volumes, either:

- 40% of the gross volume of the largest machinery space so protected, the volume to exclude that part of the casing above the level at which the horizontal area of the casing is 40% or less of the horizontal area of the space concerned taken midway between the tank top and the lowest part of the casing; or
- 35% of the gross volume of the largest machinery space protected, including the casing; provided that the above-mentioned percentages may be reduced to 35% and 30% respectively for cargo ships of less than 2000 gross tonnage; provided also that if two or more machinery spaces are not entirely separate they shall be considered as forming one space.

(SOLAS reg. II-2/5.2.2)

303 For the purpose of this paragraph the volume of free carbon dioxide shall be calculated at 0.56 m³/kg.

(SOLAS reg. II-2/5.2.3)

304 For machinery spaces the fixed piping system shall be such that 85% of the gas can be discharged into the space within 2 minutes.

(SOLAS reg. II-2/5.2.4)

305 Carbon dioxide systems installed on or after 1 October 1994 shall comply with the following requirements:

- Two separate controls shall be provided for releasing carbon dioxide into a protected space and to ensure the activities of the alarm. One control shall be used to discharge the gas from its storage containers. A second control shall be used for opening the valve of the piping which conveys the gas into the protected space.
- The two controls shall be located inside a release box clearly identified for the particular space. If the box containing the controls is to be locked, a key to the box shall be in a break-glass type enclosure conspicuously located adjacent to the box.

(SOLAS reg. II-2/5.2.5)

C 400 Halogenated hydrocarbon systems, Application

401 New installation of halogenated hydrocarbon systems shall be prohibited on all new ships.

(SOLAS reg. II-2/5.3.1)

Guidance note:

Gas fire-extinguishing systems for replacing or as an alternative to Halon have been type approved by DNV, and tentative rules for such systems are available upon request.

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C 500 Steam systems

501 *In general, the Administration shall not permit the use of steam as a fire-extinguishing medium in fixed fire-extinguishing systems. Where the use of steam is permitted by the Administration it shall be used only in restricted areas as an addition to the required fire-extinguishing medium and with the proviso that the boiler or boilers available for supplying steam shall have an evaporation of at least 1.0 kg of steam per hour for each 0.75 m³ of the gross volume of the largest space so protected. In addition to complying with the foregoing requirements the systems in all respects shall be as determined by, and to the satisfaction of, the Administration.*

(SOLAS reg. II-2/5.4)

C 600 Other gas systems

601 *Where gas other than carbon dioxide or halogenated hydrocarbons, or steam as permitted by paragraph 4 is produced on the ship and is used as a fire-extinguishing medium, it shall be a gaseous product of fuel combustion in which the oxygen content, the carbon monoxide content, the corrosive elements and any solid combustible elements have been reduced to a permissible minimum.*

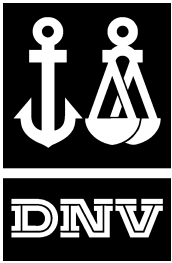
(SOLAS reg. II-2/5.5.1)

602 *Where such gas is used as the fire-extinguishing medium in a fixed fire-extinguishing system for the protection of machinery spaces it shall afford protection equivalent to that provided by a fixed system using carbon dioxide as the medium.*

(SOLAS reg. II-2/5.5.2)

603 *Where such gas is used as a fire-extinguishing medium in a fixed fire-extinguishing system for the protection of cargo spaces, a sufficient quantity of such gas shall be available to supply hourly a volume of free gas at least equal to 25% of the gross volume of the largest space protected in this way for a period of 72 hours.*

(SOLAS reg. II-2/5.5.3)



CHAPTER 3

CERTIFICATION AND CLASSIFICATION

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SECTION 1 CERTIFICATION AND CLASSIFICATION

A. General

A 100 Introduction

101 As well as representing DNV's interpretation of safe engineering practice for general use by the offshore industry, the offshore standards also provide the technical basis for DNV classification, certification and verification services.

102 A complete description of principles, procedures, applicable class notations and technical basis for offshore classification is given by the DNV Offshore Service Specifications (OSS).

103 Classification procedures and requirements specifically applicable in relation to the technical requirements given in

Ch.2 of this standard are given in this chapter.

A 200 Assumption

201 Any deviations, exceptions and modifications to the design codes and standards given as recognised reference codes shall be approved by DNV.

202 Where codes and standards call for the extent of critical inspections and tests to be agreed between contractor or manufacturer and client, the resulting extent is to be agreed with DNV.

203 DNV may accept alternative solutions found to represent an overall safety level equivalent to that stated in the requirements of this standard.

SECTION 2 CERTIFICATION OF EQUIPMENT

A. General

A 100 General

101 Equipment shall be certified consistent with its functions and importance for safety.

102 Equipment referred to in this standard will be categorised as follows:

Category I:

- equipment related to safety for which a DNV certificate is required.

Category I equipment is subdivided into IA and IB categorisation.

Category II:

- equipment related to safety for which a works certificate prepared by the manufacturer is accepted.

103 For equipment category I, the following approval procedure shall be followed:

- design approval, followed by a design verification report (DVR) or type approval certificate
- fabrication survey followed by issuance of a product certificate.

104 Depending on the required extent of survey, category I equipment is subdivided into IA and IB with the specified requirements as given below:

Category IA:

- pre-production meeting, as applicable, prior to the start of fabrication
- class survey during fabrication
- witness final functional, pressure and load tests, as applicable
- review fabrication record.

Category IB:

- pre-production meeting (optional)
- witness final functional, pressure and load tests, as applicable
- review fabrication record.

The extent of required survey by DNV is to be decided on the basis of manufacturer's QA/QC system, manufacturing survey arrangement (MSA) with DNV and type of fabrication methods.

Guidance note:

It should be noted that the scopes defined for category IA and IB are typical and adjustments may be required based on considerations such as:

- complexity and size of a delivery
- previous experience with equipment type
- maturity and effectiveness of manufacturer's quality assurance system
- degree of subcontracting.

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105 Equipment of category II is normally accepted on the basis of a works certificate prepared by the manufacturer. The certificate shall contain the following data as a minimum:

- equipment specification or data sheet
- limitations with respect to operation of equipment
- statement (affidavit) from the manufacturer to confirm that the equipment has been constructed, manufactured and tested according to the recognised methods, codes and standards.

Guidance note:

Independent test certificate or report for the equipment or approval certificate for manufacturing system may also be accepted.

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B. Equipment Categorisation

B 100 General

101 Categorisation of safety critical equipment is given in Table B1. Equipment that is considered important for safety, which is not listed, shall be categorised after special consideration.

Table B1 Categories for fire protection equipment		
Component	Category	
	IB	II
Fire dampers	X	
Fire water pumps	X	
Pressurised components in fire extinguishing system		X
Fire hose		X
Hose reels and associated equipment		X
Nozzles		X
Equipment for fixed fire fighting installations		X
Fire resisting divisions and materials		X
Doors		X
Windows		X
Fire and gas detectors		X
Wheeled and portable extinguishing system		X