Contents

RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

Part O WORK-SHIPS

Chapter 1 GENERAL

1.1 Application and Equivalency

1.1.1 Application*

1 Requirements stipulated in this Part apply to the work-ships (hereinafter referred to as "ships" in this Part) defined in 1.3.2.

2 Unless otherwise specially specified in this Part, relevant requirements of other Parts are to be applied as appropriate.

3 The hull construction, equipment and scantlings of ships to be classified for restricted service may be appropriately modified according to the conditions of service.

4 The Society may request additional requirements, depending upon designated operations

5 Ships other than passenger ships of not less than 500 *gross tonnage* engaged on international voyages (except non self-propelled ships) which have large embarking capacities that include at least one industrial personnel (*IP*) are subject to **Annex 1.1.1-5 "Ships Carrying Industrial Personnel (IP)"** in addition to this chapter.

6 Ships other than passenger ships not engaged on international voyages or of less than 500 gross tonnage but which have large embarking capacities that include at least one *IP* on board are not subject to **Annex 1.1.1-5 "Ships Carrying Industrial Personnel (IP)"**. However, special consideration is to be paid for such ships in addition to this chapter.

1.1.2 Consideration for Special Ships

As for ships of a type or purpose different from those specified in this Part, the required hull construction, equipment, arrangements and scantlings are to be specified respectively based upon the fundamental concept of the requirements in this Part and these specified requirements apply as substitutes of the requirements in this Part.

1.1.3 Equivalency

The hull construction, equipment, machinery, etc. and the respective installation arrangements of each as well as the scantlings to which the requirements of this Part are not applicable will be accepted by the Society, provided that the Society is satisfied that such construction, equipment, machinery, installation arrangements and scantlings are equivalent to those required in this Part.

1.1.4 National Regulations, Instructions, etc.

With respect to the hull construction, equipment, machinery, etc. of ships, attention is to be paid to compliance with national regulations or instructions, etc. of the flag states or the coastal states in which ships operate in addition to the requirements in this Rules. The Society may make special requirements as instructed by the flag states of ships or the governments of sovereign nations under which such ships operate.

1.2 General

1.2.1 Stability

The requirements in this Part apply to ships having appropriate stability in all conceivable conditions. The Society emphasizes that special attention is to be paid to ship stability by builders during the design and construction stages and by masters while in service.

1.2.2 Docking

Every ship is recommended to be dry docked within six months after launching.

1.2.3 Workmanship

1 Workmanship is to be of the best quality possible. During construction, the builder is to supervise and inspect in detail every

job performed in the shed and yard.

2 The connections of the structural parts of the hull are to be fair and sound.

3 The edges of steel plates are to be accurate and fair.

4 The flanging inner radius is not to be less than two times but not greater than 3 times the plate thickness.

5 Where frames or beams pass through watertight decks or bulkheads, the deck or bulkhead is to be of a watertight construction that does not use wooden materials or cement.

6 The details of welded joints and their workmanship are to be as specified in **Part M** in addition to **Chapter 12, Part 1, Part C**.

1.2.4 Class Notations*

1 For ships complying with the requirements in this Part, an appropriate notation corresponding to ship purpose will be affixed to the Classification Characters.

2 For ships provided with dynamic positioning systems which satisfy the requirements in **Chapter 10, Part P**, an appropriate notation corresponding to the type of dynamic positioning system used by the ships will be affixed to the Classification Characters.

3 The notation "*Industrial Personnel*" (abbreviated as *IP*) is to be affixed to the classification characters of ships complying with **Annex 1.1.1-5 "Ships Carrying Industrial Personnel (IP)"**.

1.2.5 Materials, Hull Equipment, Weldings and End Connections

1 Materials, hull equipment, weldings and end connections are to be according to the following **(1)** or **(2)** depending upon ship length:

(1) For ships which are 90 *m* or longer, materials, hull equipment and end connections are to be according to relevant requirements in **Part C**. In addition, weldings are to be according to **Chapter 12, Part 1, Part C**.

(2) For ships which are less than 90 *m* long, materials, hull equipment, weldings and end connections are to be according to **1.3, Part CS**.

2 Equipment is to comply with the requirement of **Part L**, in addition to the requirements in **-1** above.

1.2.6 Load Lines

1 The load lines of ships are to be in accordance with the requirements of **Part V**.

2 In cases where a large mat or similar supporting structure which contributes to buoyancy is utilized by a ship when it is in a floating state, said mat or similar supporting structure is to be ignored in the calculation of the freeboard. However, such mats or similar supporting structures are always to be taken into account in the evaluation of the stability of the ship when it is in a floating state.

3 For ships of a special construction, the load line is to be at the discretion of the Society.

1.2.7 Ice Strengthening

Ships intended for navigation in ice covered waters are to be reinforced in accordance with the requirements of **Chapter 5, Part I**.

1.2.8 Ships which are Engaged In Works with Danger of a Fire or an Explosion

For ships engaged in work where there is a danger of fire or explosion, the requirements in the following **(1)** to **(6)** are to apply in addition to relevant requirements of this Part, depending upon ship purpose.

(1) For electrical installations, the requirements in **12.2** and **12.3, Part P** are to be applied as appropriate.

(2) For ventilation systems installed in hazardous areas, the requirements in **13.2.3, Part P** are to be applied.

(3) For machinery installations installed in hazardous areas, the requirements in **13.3.4, Part P** are to be applied.

(4) For electrical installations installed in hazardous areas, the requirements in **13.4.4, Part P** are to be applied.

(5) For fire protection and means of escape, the requirements in **14.4, Part P** are to be applied.

(6) For fire extinguishing systems, the requirements in **15.4, Part P** are to be applied.

1.2.9 Operating Manual*

An appropriate operating manual corresponding to the ship's purpose is to be on board every ship.

1.3 Definitions

1.3.1 Application

The definitions of the terms and symbols which appear in this Part are as specified in this **1.3**, in addition to those specified

elsewhere.

1.3.2 Work-ship*

A "Work-ship" is a ship primary engaged in a designated operation such as dredging, lifting of heavy loads, fire fighting, offshore supply, towing, etc. at sea. Work-ships are defined according to their purpose as follows:

(1) Dredgers

A "dredger" is a ship engaged in dredging sand and rocks from the seabed.

(2) Crane ships

A "crane ship" is a ship engaged in lifting heavy loads and moving such loads vertically and horizontally.

(3) Vessels engaged in towing operations

(a) Tugs

A "tug" is a ship primary engaged in towing ships when such ships leave or come into a port and leave or come alongside the shore, or towing non self-propelled units, floating units, etc.

(b) Ocean tugs

An "ocean tug" is a ship engaged in towing non self-propelled units, floating units, etc. in the ocean.

(c) Escort tugs

An "escort tug" is a ship engaged in towing operations as steering, braking and otherwise controlling of the assisted ship during ordinary or emergency maneuvering.

(4) Pusher tugs

A "pusher tug" is a ship that pushes barges forward with its bow.

(5) Fire fighting vessel

A "fire fighting vessel" is a ship engaged in fire fighting operations.

(6) Offshore supply vessels

An "offshore supply vessel" is a ship primary engaged in the supply of stores such as water and fuel oil, materials and equipment to offshore installations; and, for the purpose of this Part, which is designed with accommodation and bridge erections in the forward part of the unit and an exposed cargo deck in the aft part for the handling of cargo at sea.

(7) Anchor handling vessels

An "anchor handling vessel" is a ship engaged in the installation, moving and taking up of the mooring anchors of mobile offshore drilling units, dredgers, etc.

(8) Vessels engaged in laying objects on the seabed

(a) Cable laying vessels

A "cable laying vessel" is a ship engaged in laying cable on the seabed.

(b) Pipe laying vessels

A "pipe laying vessel" is a ship engaged in laying pipes on the seabed.

(9) Oil recovery vessels

An "oil recovery vessel" is a ship with a system to recover oil spilled on the surface of the water and/or a storage system for recovered oils.

(10) Wind turbine installation ships

A "wind turbine installation ship" is a ship engaged in the installation, maintenance and repair of offshore wind turbines.

(11) Wind farm support vessel

A "wind farm support vessel" is a ship primary engaged in the transporting the workers defined in 1.3.6 to the offshore wind turbines or transporting and serving as accommodation facilities for such workers. This, however, does not include non self-propelled ships.

(12) Other ships

"Other ships" are ships other than those specified above.

1.3.3 Type of Ships

Ships are classified into the following four groups depending upon their type:

(1) Ship-type ship

A "ship-type ship" is a ship having a hull which has propelling machinery and is installed with work-related installations, or a

ship designed for designated operations in the floating condition or towed condition.

(2) Barge-type ship

A "barge-type ship" is a ship having a hull which has no propelling machinery and is installed with work-related installations, or a ship designed for designated operations in the floating condition or towed condition.

(3) Self-elevating ship

A "self-elevating ship" is a ship which has a sufficiently buoyant hull that is installed with equipment and deck elevating systems as well as legs which are lowered to the seabed and elevate the hull above the waves during designated operations.

(4) Column-stabilized unit

A "column-stabilized unit" is a unit which has a hull that is installed with equipment, columns, footings or lower hulls, bracing, etc. During designated operations, the unit may be positioned by anchor mooring systems or dynamic positioning systems and such operations may be carried out in a condition in which that the unit is described as being a semi-submersible or being supported by the seabed in shallow water areas.

1.3.4 Hazardous Area

Hazardous areas are all those areas where, due to the possible presence of a flammable atmosphere, the use of machinery or electrical equipment without proper consideration may lead to a fire hazard or an explosion. In addition, hazardous areas may be extended or reduced depending on the actual arrangements in each case, by the use of windshields, special ventilation arrangements, structural arrangements, etc.

1.3.5 SPS Code

"*SPS Code*" is the "*Code of Safety for Special Purpose Ships*".

1.3.6 Worker

A "worker" is defined as the industrial personnel (*IP*) or special personnel (*SP*), who are engaged in operations mainly related to offshore wind turbines.

1.3.7 Personnel Transfer

"Personnel transfer" is mainly the transferring of people between a ship, and ships other than work ships (as defined in **1.3.2)** or facilities such as offshore wind turbines at sea, using dedicated equipment. This, however, does not include the embarkation and disembarkation of pilots.

1.3.8 Ships which Have Large Embarking Capacities.

"Ships which have large embarking capacities" are ships for which the number of workers and passengers on board exceeds 12.

1.3.9 Industrial Personnel (*IP*)

"Industrial personnel (*IP*)" is all persons transported or accommodated on board for the purpose of offshore industrial activities performed on board other ships, offshore facilities or both. Industrial personnel are not to be treated as or considered to be passengers.

1.3.10 Special Personnel (*SP*)

"Special personnel (*SP*)" is all persons who are not passengers or members of the crew or children of under one year of age and who are on board in connection with the special purpose of the ship or because of special work being carried out aboard the ship. Special personnel are not to be treated as or considered to be passengers.

Chapter 2 DREDGERS

2.1 General

2.1.1 Application

Dredgers (hereinafter referred to as "ships" in this Chapter) are to apply the requirements in this Chapter in addition to the relevant requirements of other Parts.

2.2 Stability

2.2.1 General*

1 Intact and damage stability are to be according to this **2.2** in addition to **Part U** and **2.3, Part 1, Part C**.

2 Intact stability is to be in accordance with requirements given in **Part U**. In addition, special consideration is to be paid to stability during designated operations.

2.2.2 Calculation on Stability

In applying the requirements in **2.1.2**, **Part U**, the heeling lever resulting from designated operations is to be considered the one most unfavorable for stability.

2.3 Hull Construction

2.3.1 General

Hull constructions are to be according to this **2.3** in addition to relevant requirements in each chapter of **Part C**, **Part CS** or **Part Q**.

2.3.2 Surroundings of Ladder Wells

The surroundings of the ladder wells in ships are to be provided with cofferdams or be suitably reinforced.

2.4 Hull Equipment

2.4.1 General

1 Hull equipment is to be according to this **2.4** in addition to relevant requirements in each chapter of **Part C**, **Part CS** or **Part Q**.

2 In cases where equipment and devices for the ship's purpose are fitted, suitable measures are to be taken so that ship safety is not impaired.

3 Cargo gear is to be at the discretion of the Society.

2.4.2 Seat for Dredging Machinery

Seats for primary dredging machinery are to have sufficient strength.

2.5 Machinery

2.5.1 General

Main propulsion machinery, power transmission systems, shafting systems, propellers, prime movers other than the main propulsion machinery, boilers and related equipment, incinerators, pressure vessels, auxiliaries, piping systems, and all of their respective control systems (hereinafter all of the above will be referred to as "machinery installations") of the ship are to be according to this **2.5** in addition to **Part D**.

2.5.2 Tests

1 Before installation on board, equipment and components constituting the machinery installations are to be tested at the plants

provided with installations and equipment necessary for the tests (hereinafter referred to as "manufacturers, etc." in this Part) in accordance with the relevant requirements in **Part D**.

2 Notwithstanding the requirements in **-1**, for machinery installations, other than boilers, pressure vessels belonging to Group I or II and piping systems which contain inflammable or toxic liquids, used solely for the operation which is the purpose of the ship, the tests may be deemed appropriate by the Society.

3 The systems or the equipment essential for the safety of the ship or for the propulsion of the ship (only applicable to the ship which has the main propulsion machinery) are, after installed on board, to be subjected to performance tests.

2.6 Electrical Installations

2.6.1 General

Electrical equipment and wiring for ships (hereinafter referred to as "electrical installations") of the ship are to be according to this **2.6** in addition to **Part H**.

2.6.2 Tests

1 Among electrical equipment used solely for the operation which is the purpose of the ship, fuses, circuit breakers, explosion-protected electrical equipment and cables are to be subjected to be in accordance with the requirement in **1.2.1-4**, **Part H**. However, electrical installations which do not comply with this requirement may be accepted provided that the submission of documents such as specifications, sectional assembly drawings, test reports, certificates issued by public bodies for the examination by the Society.

2 Electrical equipment used solely for the operation which is the purpose of the ship and not listed in **-1** may be in accordance with the standards deemed appropriate by the Society.

3 For electrical installations used solely for the operation which is the purpose of the ship, an insulation resistance test specified in **2.18.1**, **Part H** and performance tests of safety devices for generators and transformers are to be carried out after installed on board.

2.7 Fire Protection, Means of Escape and Fire Extinguishing Systems

2.7.1 General

Fire protection, means of escape and fire extinguishing systems are to be according to relevant requirements in each chapter of **Part R**.

2.8 Computer-based Systems

2.8.1 General

Computer-based systems are to be in accordance with relevant requirements in **Part X**.

Chapter 3 CRANE SHIPS

3.1 General

3.1.1 Application

Crane ships (hereinafter referred to as "ships" in this Chapter) are to apply the requirements in this Chapter in addition to the relevant requirements of other Parts.

3.2 Stability

3.2.1 General

Intact and damage stability are to be according to this **3.2** in addition to **Part U** and **2.3, Part 1, Part C**.

3.2.2 Stability Requirements during Lifting Operations*

Intact stability during lifting operations is to be subject to stability requirements separately specified by the Society for the following ships:

(1) Ships intended to operate involving the lifting of the ship's own structures or for lifts in which the maximum heeling moment due to the lift is greater than that given in the following. The calculations are to be completed at the most unfavourable loading conditions for which the lifting equipment is to be used.

$$M_L = 0.67 \times \Delta \times G_0M \times \left(\frac{f}{B}\right)$$

M_L : Threshold value for the heeling moment, in $(t \cdot m)$, induced by the (lifting equipment and) load in the lifting equipment.

G_0M : The initial metacentric height, in (m), with free surface correction, including the effect of the (lifting equipment and) load in the lifting equipment.

f : the minimum freeboard, in (m), measured from the upper side of the weather deck to the waterline.

B : the moulded breadth of the ship, in (m), as defined in **2.1.4, Part A**.

Δ : the displacement of the ship, including the lift load, in (t).

(2) Ships which are engaged in lifting operations where no transverse heeling moment is induced and the increase of the ship's vertical centre of gravity (VCG) due to the lifted weight is greater than 1%.

3.3 Hull Construction

3.3.1 General

Hull constructions are to be according to this **3.3** in addition to relevant requirements in each chapter of **Part C**, **Part CS** or **Part Q**.

3.3.2 Longitudinal Strength

With respect to the longitudinal strength of a barge-type ship provided with cranes, in cases where the cross sectional coefficient is calculated when such cranes are in operation, the value of Z_2 is to be according to **Chapter 12, Part Q** or calculated according to the following formula:

$$Z_2 = 8.36CM_s\,(cm^3)$$

where

All symbols are to be in accordance with the requirements given in **Chapter 12, Part Q**.

3.4 Hull Equipment

3.4.1 General*

1 Hull equipment is to be according to relevant requirements in each chapter of **Part C**, **Part CS** or **Part Q**.

2 In cases where equipment and devices for the ship's purpose are fitted, suitable measures are to be taken so that ship safety is not impaired.

3 Cargo gear is to be at the discretion of the Society.

3.5 Machinery

3.5.1 General

Machinery installations of the ship are to be according to this **3.5** in addition to **Part D**.

3.5.2 Tests

1 Before installation on board, equipment and components constituting the machinery installations are to be tested at the manufacturers in accordance with the relevant requirements in **Part D**.

2 Notwithstanding the requirements in **-1**, for machinery installations, other than boilers, pressure vessels belonging to Group I or II and piping systems which contain inflammable or toxic liquids, used solely for the operation which is the purpose of the ship, the tests may be deemed appropriate by the Society.

3 The systems or the equipment essential for the safety of the ship or for the propulsion of the ship (only applicable to the ship which has the main propulsion machinery) are, after installed on board, to be subjected to performance tests.

3.6 Electrical Installations

3.6.1 General

Electrical installations of the ship are to be according to this **3.6** in addition to **Part H**.

3.6.2 Tests

1 Among electrical equipment used solely for the operation which is the purpose of the ship, fuses, circuit breakers, explosion-protected electrical equipment and cables are to be subjected to be in accordance with the requirement in **1.2.1-4**, **Part H**. However, electrical installations which do not comply with this requirement may be accepted provided that the submission of documents such as specifications, sectional assembly drawings, test reports, certificates issued by public bodies for the examination by the Society.

2 Electrical equipment used solely for the operation which is the purpose of the ship and not listed in **-1** may be in accordance with the standards deemed appropriate by the Society.

3 For electrical installations used solely for the operation which is the purpose of the ship, an insulation resistance test specified in **2.18.1**, **Part H** and performance tests of safety devices for generators and transformers are to be carried out after installed on board.

3.7 Fire Protection, Means of Escape and Fire Extinguishing Systems

3.7.1 General

Fire protection, means of escape and fire extinguishing systems are to be according to relevant requirements in each chapter of **Part R**.

3.8 Computer-based Systems

3.8.1 General

Computer-based systems are to be in accordance with relevant requirements in **Part X**.

Chapter 4 VESSELS ENGAGED IN TOWING OPERATIONS

4.1 General

4.1.1 Application

Vessels engaged in towing operations (hereinafter referred to as "ships" in this Chapter) are to apply the requirements in this Chapter in addition to the relevant requirements of other Parts.

4.2 Stability

4.2.1 General*

1 Intact and damage stability are to be according to this **4.2** in addition to **Part U** and **2.3, Part 1, Part C**.

2 Intact stability is to be in accordance with requirements given in **Part U**. In addition, special consideration is to be paid to stability during designated operations.

4.2.2 Calculation on Stability

In applying the requirements in **2.1.2**, **Part U**, the heeling lever resulting from designated operations is to be considered the one most unfavorable for stability.

4.3 Hull Construction

4.3.1 General

Hull constructions are to be according to this **4.3** in addition to relevant requirements in each chapter of **Part C**, **Part CS** or **Part Q**.

4.3.2 Stern Frames

Scantlings of various parts of propeller posts are to be suitably increased from that given by **11.5.1.2, Part 1, Part C** or the formula and figures in **Fig. CS2.1**.

4.3.3 Rudder Stocks

The diameter of rudder stocks of ships is not to be less than 1.1 times that required in **Chapter 13, Part 1, Part C** or **Chapter 3, Part CS**.

4.3.4 Strength of Contact Parts with Other Ships

The construction of parts, such as the bow parts of ships, in cases where ships come into contact with other ships for navigation or operation purposes, is to be such to ensure sufficient strength.

4.3.5 Supporting Structures of Towing Equipment*

1 In principle, towing equipment is to be located on longitudinals, beams or girders, which are parts of the deck construction.

2 In cases where towing equipment cannot be located as specified in **-1** above, towing equipment is to be arranged on reinforced members.

3 The supporting structures of towing equipment are to be such to ensure sufficient strength.

4 The design load on fittings is to take into account all acting loads.

5 The design loads for the supporting structures of towing equipment are to be not less than the breaking strength of the towline system.

4.4 Hull Equipment

4.4.1 General*

1 Hull equipment is to be according to this **4.4** in addition to relevant requirements in each chapter of **Part C**, **Part CS** or **Part Q**.

2 In cases where equipment and devices for the ship's purpose are fitted, suitable measures are to be taken so that ship safety is not impaired.

3 Cargo gear is to be at the discretion of the Society.

4.4.2 Towing Equipment*

1 The towing hooks, towing bits or towing bollards fitted onto ocean tugs is to be located as low as practicable, and close to, but abaft of, the centre of gravity of the ship in the expected towing condition.

2 Equipment, such as winches, for towing operations is to be provided with suitable safety devices so that towing wires are able to be released or cut in times of emergency except in cases where the emergency release systems required in accordance with the following **-3** are fitted.

3 In the case of tugs and escort tugs including those ships normally not intended for towing operation in transverse direction, engaged in towing operations within close quarters, ports or terminals, towing winches other than those on board ships used solely for long distance ocean towage, anchor handling or similar offshore activities are to be fitted with an emergency release system complying with the requirements of **Annex 4.4.2-3**.

4.4.3 Fenders

For contact with other vessels and sea-based facilities, ships are to be equipped with sufficient fenders.

4.5 Machinery

4.5.1 General

Machinery installations of the ship are to be according to this **4.5** in addition to **Part D**.

4.5.2 Tests

1 Before installation on board, equipment and components constituting the machinery installations are to be tested at the manufacturers in accordance with the relevant requirements in **Part D**.

2 Notwithstanding the requirements in **-1**, for machinery installations, other than boilers, pressure vessels belonging to Group I or II and piping systems which contain inflammable or toxic liquids, used solely for the operation which is the purpose of the ship, the tests may be deemed appropriate by the Society.

3 The systems or the equipment essential for the safety of the ship or for the propulsion of the ship (only applicable to the ship which has the main propulsion machinery) are, after installed on board, to be subjected to performance tests.

4.6 Electrical Installations

4.6.1 General

Electrical installations of the ship are to be according to this **4.6** in addition to **Part H**.

4.6.2 Tests

1 Among electrical equipment used solely for the operation which is the purpose of the ship, fuses, circuit breakers, explosion-protected electrical equipment and cables are to be subjected to be in accordance with the requirement in **1.2.1-4**, **Part H**. However, electrical installations which do not comply with this requirement may be accepted provided that the submission of documents such as specifications, sectional assembly drawings, test reports, certificates issued by public bodies for the examination by the Society.

2 Electrical equipment used solely for the operation which is the purpose of the ship and not listed in **-1** may be in accordance with the standards deemed appropriate by the Society.

3 For electrical installations used solely for the operation which is the purpose of the ship, an insulation resistance test specified in **2.18.1**, **Part H** and performance tests of safety devices for generators and transformers are to be carried out after installed on board.

4.7 Fire Protection, Means of Escape and Fire Extinguishing Systems

4.7.1 General

Fire protection, means of escape and fire extinguishing systems are to be according to this **4.7** in addition to relevant requirements in each chapter of **Part R**.

4.7.2 Additional Equipment for Ships Engaged In Towing Operations

Emergency exits from machinery spaces to decks are to be capable of being used at extreme heel angles. In addition, emergency exits are to be positioned as high as possible above waterlines and positioned as near as practicable to ship centrelines.

4.8 Computer-based Systems

4.8.1 General

Computer-based systems are to be in accordance with relevant requirements in **Part X**.

Chapter 5 PUSHER TUGS

5.1 General*

5.1.1 Application

Pusher tugs (hereinafter referred to as "ships" in this Chapter) are to apply the requirements in this Chapter in addition to the relevant requirements of other Parts.

5.2 Stability

5.2.1 General*

1 Intact and damage stability are to be according to this **5.2** in addition to **Part U** and **2.3, Part 1, Part C**.

2 Intact stability is to be in accordance with requirements given in **Part U**. In addition, special consideration is to be paid to stability during designated operations.

5.2.2 Calculation on Stability

In applying the requirements in **2.1.2, Part U**, the heeling lever resulting from designated operations is to be considered the one most unfavorable for stability.

5.3 Hull Construction

5.3.1 General

Hull constructions are to be according to this **5.3** in addition to relevant requirements in each chapter of **Part C**, **Part CS** or **Part Q**.

5.3.2 Strength of Contact Parts with Other Ships

The construction of parts, such as the bow parts of ships, in cases where ships come into contact with other ships for navigation or operation purposes, is to be such to ensure sufficient strength.

5.3.3 Construction in way of Coupling Devices for Connection

In cases where ships are equipped with coupling devices for connection to other vessels, etc., construction in way of such coupling devices is to be such to ensure sufficient strength.

5.4 Hull Equipment

5.4.1 General

Hull equipment is to be according to this **5.4** in addition to relevant requirements in each chapter of **Part C**, **Part CS** or **Part Q**.

5.4.2 Fenders

For contact with other vessels and sea-based facilities, the ship is to be equipped with sufficient fenders.

5.5 Machinery

5.5.1 General

Machinery installations of the ship are to be according to this **5.5** in addition to **Part D**.

5.5.2 Tests

1 Before installation on board, equipment and components constituting the machinery installations are to be tested at the manufacturers in accordance with the relevant requirements in **Part D**.

2 Notwithstanding the requirements in **-1**, for machinery installations, other than boilers, pressure vessels belonging to Group I

or II and piping systems which contain inflammable or toxic liquids, used solely for the operation which is the purpose of the ship, the tests may be deemed appropriate by the Society.

3 The systems or the equipment essential for the safety of the ship or for the propulsion of the ship (only applicable to the ship which has the main propulsion machinery) are, after installed on board, to be subjected to performance tests.

5.6 Electrical Installations

5.6.1 General

Electrical installations of the ship are to be according to this **5.6** in addition to **Part H**.

5.6.2 Tests

1 Among electrical equipment used solely for the operation which is the purpose of the ship, fuses, circuit breakers, explosion-protected electrical equipment and cables are to be subjected to be in accordance with the requirement in **1.2.1-4**, **Part H**. However, electrical installations which do not comply with this requirement may be accepted provided that the submission of documents such as specifications, sectional assembly drawings, test reports, certificates issued by public bodies for the examination by the Society.

2 Electrical equipment used solely for the operation which is the purpose of the ship and not listed in **-1** may be in accordance with the standards deemed appropriate by the Society.

3 For electrical installations used solely for the operation which is the purpose of the ship, an insulation resistance test specified in **2.18.1**, **Part H** and performance tests of safety devices for generators and transformers are to be carried out after installed on board.

5.7 Fire Protection, Means of Escape and Fire Extinguishing Systems

5.7.1 General

Fire protection, means of escape and fire extinguishing systems are to be according to relevant requirements in each chapter of **Part R**.

5.8 Computer-based Systems

5.8.1 General

Computer-based systems are to be in accordance with relevant requirements in **Part X**.

Chapter 6 FIRE FIGHTING VESSELS

6.1 General

6.1.1 Application

Fire fighting vessels (hereinafter referred to as "ships" in this Chapter) are to apply the requirements in this Chapter in addition to the relevant requirements of other Parts.

6.2 Stability

6.2.1 General*

1 Intact and damage stability are to be according to this **6.2** in addition to **Part U** and **2.3, Part 1, Part C**.

2 Intact stability is to be in accordance with requirements given in **Part U**. In addition, special consideration is to be paid to stability during designated operations.

6.2.2 Calculation on Stability

In applying the requirements in **2.1.2**, **Part U**, the heeling lever resulting from designated operations is to be considered the one most unfavorable for stability.

6.3 Hull Construction

6.3.1 General

Hull constructions are to be according to this **6.3** in addition to relevant requirements in each chapter of **Part C**, **Part CS** or **Part Q**.

6.3.2 Supporting Structures of Monitors for Fire Fighting

The supporting structures of the monitors for fire fighting are to be such to ensure sufficient strength to handle the reaction forces of water jets.

6.4 Hull Equipment

6.4.1 General

Hull equipment is to be according to this **6.4** in addition to relevant requirements in each chapter of **Part C**, **Part CS** or **Part Q**.

6.4.2 Fire Fighting Equipment for Fighting Fires on Other Vessels*

Ships are to be fitted with fire fighting equipment for fighting fires on other vessels and fitted with suitable equipment to ensure the safety of their own ship during fire fighting operations.

6.5 Machinery

6.5.1 General

Machinery installations of the ship are to be according to this **6.5** in addition to **Part D**.

6.5.2 Tests

1 Before installation on board, equipment and components constituting the machinery installations are to be tested at the manufacturers in accordance with the relevant requirements in **Part D**.

2 Notwithstanding the requirements in **-1**, for machinery installations, other than boilers, pressure vessels belonging to Group I or II and piping systems which contain inflammable or toxic liquids, used solely for the operation which is the purpose of the ship, the tests may be deemed appropriate by the Society.

3 The systems or the equipment essential for the safety of the ship or for the propulsion of the ship (only applicable to the ship which has the main propulsion machinery) are, after installed on board, to be subjected to performance tests.

6.5.3 Propulsion Machinery

1 Propulsion machinery is to have sufficient power to secure stable maneuverability during fire fighting operations.

2 Propulsion machinery is to be able to maintain ship position in still water as well as the capacity of water monitors during fire fighting operations at not more than 80% of the propulsion force in any direction.

3 Control systems

Control systems are to be provided with the following functions to prevent complete loss of power due to power overloads:

(1) Alarm devices which give alarms in cases where propulsion power exceeds 80% during fire fighting operations.

(2) Means which reduce the speed of propulsion machinery in cases where propulsion power exceeds 100% during fire fighting operations.

6.5.4 Auxiliaries and Piping Systems

Pumps and piping systems intended for serving water monitors or water spray devices which are used for protection are to comply with the following requirements:

(1) Pumps and piping systems are not to be used for services other than water monitors and water spray devices.

(2) In cases where 2 or more pumps are provided, independent sea inlets are to be provided for each pump.

(3) In cases where 2 or more pumps are provided, they are to have equal or near equal capacity.

(4) Adequate piping arrangements to prevent overheating at low pump delivery rates are to be provided to each pump.

(5) Piping systems are to be protected against overpressure.

(6) Pumps and piping systems used for water spray devices are to be independent from systems serving water monitors, except in cases where such pumps are intended for serving water monitors and water spray devices.

(7) Piping systems are to be protected against corrosion and freezing.

6.5.5 Sea Inlets for Fire Fighting Operations*

1 The sea inlets for fire fighting operations are not to be used for services other than fire fighting operations or water spray devices.

2 The sea inlets for fire fighting operations and sea chests are to be arranged as low as practical to avoid clogging due to debris or ice and oil intake from the sea surface.

3 The location of sea inlets for fire fighting operations and sea chests are to be such that water suction is not impeded by ship motions or the water flow from propellers or thrusters.

4 Each sea inlet for fire fighting operations is to be provided with a shut off valve.

5 Fire fighting pumps, the shut off valves mentioned above, and overboard discharge valves are to be operable from the same locations.

6 The starting of fire fighting pumps in cases where shut off valves are closed is to be prevented by providing either interlock systems or by audible and visual alarms.

6.6 Electrical Installations

6.6.1 General

Electrical installations of the ship are to be according to this **6.6** in addition to **Part H**.

6.6.2 Tests

1 Among electrical equipment used solely for the operation which is the purpose of the ship, fuses, circuit breakers, explosion-protected electrical equipment and cables are to be subjected to be in accordance with the requirement in **1.2.1-4**, **Part H**. However, electrical installations which do not comply with this requirement may be accepted provided that the submission of documents such as specifications, sectional assembly drawings, test reports, certificates issued by public bodies for the examination by the Society.

2 Electrical equipment used solely for the operation which is the purpose of the ship and not listed in **-1** may be in accordance with the standards deemed appropriate by the Society.

3 For electrical installations used solely for the operation which is the purpose of the ship, an insulation resistance test specified in **2.18.1**, **Part H** and performance tests of safety devices for generators and transformers are to be carried out after installed on board.

6.7 Fire Protection, Means of Escape and Fire Extinguishing Systems

6.7.1 General

Fire protection, means of escape and fire extinguishing systems are to be according to this **6.7** in addition to relevant requirements in each chapter of **Part R**.

6.7.2 Fire Protection

1 In general, exposed decks, hulls and all exterior boundaries of forecastles and deck houses above the lightest operating waterline are to be made out of steel.

2 Special consideration is to be paid to boundaries which are to be constructed of materials other than steel.

6.7.3 Windows

In cases where water-spray systems are not provided to protect ships from the heat radiated from the fire, steel deadlights or shutters are to be provided on all windows and port lights, except for those in navigation bridges.

6.7.4 Water-spray Systems*

In cases where water-spray systems are provided to protect ships from the heat radiated from the fire, such systems are to be according to the following **(1)** to **(3)**:

(1) Water-spray systems are to provide suitable protection for all exterior boundaries including the boundaries of hulls, superstructures, and deck houses. In cases where deemed appropriate by the Society, this requirement may be dispensed with.

(2) Water-spray systems are to be protected from corrosion.

(3) Deck scuppers and freeing ports are to be appropriately provided to assure efficient drainage of water from deck surfaces in cases where water-spray systems are in operation.

6.8 Computer-based Systems

6.8.1 General

Computer-based systems are to be in accordance with relevant requirements in **Part X**.

Chapter 7 OFFSHORE SUPPLY VESSELS

7.1 General

7.1.1 Application

Offshore supply vessels (hereinafter referred to as "ships" in this Chapter) are to apply the requirements in this Chapter in addition to the relevant requirements of other Parts.

7.2 Stability

7.2.1 General*

1 Intact and damage stability are to be according to this 7.2 in addition to **Part U** and **2.3, Part 1, Part C**. However, for ships specifically approved by the Society, these requirements may be waived.

2 Intact stability is to be in accordance with requirements given in **Part U**. In addition, special consideration is to be paid to stability during designated operations.

7.2.2 Calculation on Stability

In applying the requirements in **2.1.2**, **Part U**, the heeling lever resulting from designated operations is to be considered the one most unfavorable for stability.

7.3 Hull Construction

7.3.1 General

Hull constructions are to be according to this 7.3 in addition to relevant requirements in each chapter of **Part C**, **Part CS** or **Part Q**.

7.3.2 Access Openings

Access to the machinery spaces of category A of ships is to be arranged within the forecastle as far as possible. Any access to such machinery spaces from exposed cargo decks is to be provided with two weathertight closures.

7.3.3 Hull Strength

Side construction is to be such to ensure sufficient strength for impact loads arising from contact with other vessels.

7.3.4 Loading of Cargo

1 In cases where cargo rails are fitted onto cargo decks, the structures under the stanchions of cargo rails are to be appropriately reinforced.

2 In cases where heavy cargo is carried on deck, effective means such as steel cradles, steel or wooden dunnages, etc. are to be provided so that weight is uniformly distributed onto deck structures.

7.3.5 Superstructure and Deckhouses*

The superstructure end bulkheads and boundary walls of deckhouses are to be such to ensure sufficient strength for operational loads.

7.3.6 Cargo Tanks

1 Liquid cargo tanks used to carry hazardous or noxious cargoes are to be according to the following **(1)** to **(3)**:

(1) Quantities of liquid cargo are to be limited to $800m^3$ or a volume in cubic meters equal to 40% of ship deadweight calculated at a cargo density of $1.0t/m^3$. However, there are no such quantity limitations for drilling fluids (liquid mud, etc.), cargo fuels having flashpoints exceeding 60°C and non-noxious liquid substances.

(2) In cases where not bounded by bottom shell plating, fuel oil tanks, cargo pump-rooms or pump-rooms, cargo integral tanks are to be separated from other spaces by cofferdams having accessible widths of $600mm$.

(3) Independent tanks are to be segregated from machinery spaces, propeller shaft tunnels, if fitted, dry cargo spaces, accommodation and service spaces and from drinking water and stores for human consumption by cofferdams, void spaces,

cargo pump-rooms, oil fuel tanks or other similar spaces.

2 Dry cargo tanks are to be according to the following **(1)** and **(2)**:

(1) In cases where cargo tanks for dry cement or mud are fitted, these cargo tanks are to be separated from engine rooms and accommodation spaces by steel bulkheads and decks.

(2) Cargo transfer piping systems are, in principle, not to be led through machinery spaces. However, in cases where such design is impractical, piping systems may pass through machinery spaces, provided that all pipe connections located within the machinery spaces are welded and any detachable connections are arranged outside of such spaces.

7.3.7 Bulkheads

1 Machinery spaces and other working and living spaces in the hull are to be separated by watertight bulkheads.

2 An afterpeak bulkhead is to be fitted and made watertight up to the freeboard deck. The afterpeak bulkhead may, however, be stepped below the freeboard deck.

7.4 Hull Equipment

7.4.1 General*

1 Hull equipment is to be according to this 7.4 in addition to relevant requirements in each chapter of **Part C**, **Part CS** or **Part Q.**

2 In cases where equipment and devices for the ship's purpose are fitted, suitable measures are to be taken so that ship safety is not impaired.

3 Cargo gear is to be at the discretion of the Society.

7.4.2 Fenders*

Longitudinal fenders are normally to be fitted on side shells in the deck areas where upper decks or forecastles decks are at full breadth.

7.4.3 Protection of Decks*

Wooden sheathings, etc. are to be provided on cargo decks to appropriately protect steel deck plates from mechanical damage and/or scuffing.

7.4.4 Cargo Loading Equipment*

In cases where cargo rails are fitted onto cargo decks, cargo rail stanchions are to be attached.

7.4.5 Means for Emergency Disconnection of Cargo Hoses

Where cargo hoses whose specified maximum working pressure exceeds 5 *MPa* are used, a means for their emergency disconnection is to be provided. This means is to be capable of being activated from the bridge or cargo control stations. In addition, any couplings used to connect such hoses are to be of a self-sealing type (i.e., close automatically upon disconnection).

7.5 Machinery

7.5.1 General

Machinery installations of the ship are to be according to this 7.5 in addition to **Part D**.

7.5.2 Engine Exhaust Outlets

Exhaust outlets of internal combustion engines are to be fitted with suitable spark-arresting devices.

7.5.3 Tests

1 Before installation on board, equipment and components constituting the machinery installations are to be tested at the manufacturers in accordance with the relevant requirements in **Part D**.

2 Notwithstanding the requirements in **-1**, for machinery installations, other than boilers, pressure vessels belonging to Group I or II and piping systems which contain inflammable or toxic liquids, used solely for the operation which is the purpose of the ship, the tests may be deemed appropriate by the Society.

3 The systems or the equipment essential for the safety of the ship or for the propulsion of the ship (only applicable to the ship which has the main propulsion machinery) are, after installed on board, to be subjected to performance tests.

7.6 Electrical Installations

7.6.1 General

Electrical installations of the ship are to be according to this 7.6 in addition to Part H.

7.6.2 Tests

1 Among electrical equipment used solely for the operation which is the purpose of the ship, fuses, circuit breakers, explosion-protected electrical equipment and cables are to be subjected to be in accordance with the requirement in 1.2.1-4, Part H. However, electrical installations which do not comply with this requirement may be accepted provided that the submission of documents such as specifications, sectional assembly drawings, test reports, certificates issued by public bodies for the examination by the Society.

2 Electrical equipment used solely for the operation which is the purpose of the ship and not listed in -1 may be in accordance with the standards deemed appropriate by the Society.

3 For electrical installations used solely for the operation which is the purpose of the ship, an insulation resistance test specified in 2.18.1, Part H and performance tests of safety devices for generators and transformers are to be carried out after installed on board.

7.7 Fire Protection, Means of Escape and Fire Extinguishing Systems

7.7.1 General

Fire protection, means of escape and fire extinguishing systems are to be according to relevant requirements in each chapter of Part R.

7.8 Computer-based Systems

7.8.1 General

Computer-based systems are to be in accordance with relevant requirements in Part X.

Chapter 8 ANCHOR HANDLING VESSELS

8.1 General

8.1.1 Application

Anchor handling vessels (hereinafter referred to as "ships" in this Chapter) are to apply the requirements in this Chapter in addition to the relevant requirements of other Parts.

8.2 Stability

8.2.1 General*

1 Intact and damage stability are to be according to this **8.2** in addition to **Part U** and **2.3, Part 1, Part C**. However, for ships specifically approved by the Society, these requirements may be waived.

2 Intact stability is to be in accordance with requirements given in **Part U**. In addition, special consideration is to be paid to stability during designated operations.

8.2.2 Calculation on Stability

In applying the requirements in **2.1.2**, **Part U**, the heeling lever resulting from designated operations is to be considered the one most unfavorable for stability.

8.3 Hull Construction

8.3.1 General

Hull constructions are to be according to this **8.3** in addition to relevant requirements in each chapter of **Part C**, **Part CS** or **Part Q**.

8.3.2 Supporting Structures of Anchor Handling Equipment*

1 The supporting structures of anchor handling equipment and in way of parts where anchors are loaded are to be such to ensure sufficient strength.

2 The design loads for the supporting structures of anchor handling equipment are not to be less than the breaking strength of the anchor handling equipment, the maximum braking capacity of the winch, or the maximum hoisting capacity of the winch, whichever is the greatest.

8.3.3 Suitable Construction for Anchor Handling Operation

1 Ships are to have completely clear after decks in order to effectively handle anchors.

2 In cases where anchor handling operations are conducted using after deck stern rollers, the aft terminals in way of the stern areas for anchor handling are to be round in shape.

8.4 Hull Equipment

8.4.1 General*

1 Hull equipment is to be according to this **8.4** in addition to relevant requirements in each chapter of **Part C**, **Part CS** or **Part Q**.

2 In cases where equipment and devices for the ship's purpose are fitted, suitable measures are to be taken so that ship safety is not impaired.

3 Cargo gear is to be at the discretion of the Society.

8.4.2 Protection of Deck Areas*

Deck areas for the collection and handling of anchors and associated equipment are to be protected by wooden sheathing, etc. However, in cases where deemed appropriate by the Society, such protection may be omitted.

8.4.3 Safety Devices

Equipment, such as winches, for anchor handling operations is to be provided with suitable safety devices so that towing wires are able to be released or cut in times of emergency.

8.4.4 Equipment for Anchor Handling

Anchor handling equipment components such as fixtures, the stern roller, pin connections are, in principle, are to be capable of sustaining the breaking strength of the towlines, etc. However, in cases where design loads are determined in advance and are clearly indicated on board the ship, such loads may be used in lieu of the breaking strength of the towlines, etc. when deemed appropriate by the Society.

8.5 Machinery

8.5.1 General

Machinery installations of the ship are to be according to this **8.5** in addition to **Part D**.

8.5.2 Control Stations

1 Anchor handling and towing winch equipment are to be capable of being operated from a control station located on the navigation bridge and at least one additional control station located on deck with an unobstructed view of the equipment.

2 Each control station is to be equipped with suitable control elements, such as operating levers, whose functions are clearly marked. Wherever practical, control levers are to be moved in the direction of the intended towline movement. In addition, operating levers are to automatically return to the stop position upon release and are to be capable of being secured in the stop position.

3 Means are to be provided for measuring the tension of anchor handling and tow lines for display at control stations.

8.5.3 Winch Brakes

Each winch for anchor handling is to be provided with a means of power control braking. Such as means is to be regenerative, dynamic, counter torque breaking, controlled lowering or mechanically controlled braking which is capable of maintaining control at low speeds. Brakes are to be applied automatically upon loss of power or whenever winch levers are returned to the neutral position.

8.5.4 Power Supply

When the power supply for normal operation of anchor handling or towing winch equipment is the same as the power supply for propulsion equipment, such as shaft generators, shaft power take-offs (PTO), etc., an independent (redundant) power supply with sufficient capacity for winch operation is to be available to ensure that ship maneuverability during anchor handling or towing operations is not degraded.

8.5.5 Tests

1 Before installation on board, equipment and components constituting the machinery installations are to be tested at the manufacturers in accordance with the relevant requirements in **Part D**.

2 Notwithstanding the requirements in **-1**, for machinery installations, other than boilers, pressure vessels belonging to Group I or II and piping systems which contain inflammable or toxic liquids, used solely for the operation which is the purpose of the ship, the tests may be deemed appropriate by the Society.

3 The systems or the equipment essential for the safety of the ship or for the propulsion of the ship (only applicable to the ship which has the main propulsion machinery) are, after installed on board, to be subjected to performance tests.

8.6 Electrical Installations

8.6.1 General

Electrical installations of the ship are to be according to this **8.6** in addition to **Part H**.

8.6.2 Tests

1 Among electrical equipment used solely for the operation which is the purpose of the ship, fuses, circuit breakers, explosion-protected electrical equipment and cables are to be subjected to be in accordance with the requirement in **1.2.1-4**, **Part H**. However, electrical installations which do not comply with this requirement may be accepted provided that the submission of documents such as specifications, sectional assembly drawings, test reports, certificates issued by public bodies for the examination by the Society.

2 Electrical equipment used solely for the operation which is the purpose of the ship and not listed in **-1** may be in accordance

with the standards deemed appropriate by the Society.

3 For electrical installations used solely for the operation which is the purpose of the ship, an insulation resistance test specified in **2.18.1**, **Part H** and performance tests of safety devices for generators and transformers are to be carried out after installed on board.

8.7 Fire Protection, Means of Escape and Fire Extinguishing Systems

8.7.1 General

Fire protection, means of escape and fire extinguishing systems are to be according to relevant requirements in each chapter of **Part R**.

8.8 Computer-based Systems

8.8.1 General

Computer-based systems are to be in accordance with relevant requirements in **Part X**.

Chapter 9 VESSELS ENGAGED IN LAYING OBJECTS ON THE SEABED

9.1 General

9.1.1 Application

Vessels engaged in laying objects on the seabed (hereinafter referred to as "ships" in this Chapter) are to apply the requirements in this Chapter in addition to the relevant requirements of other Parts.

9.2 Stability

9.2.1 General*

1 Intact and damage stability are to be according to this **9.2** in addition to **Part U** and **2.3, Part 1, Part C**. However, for ships specifically approved by the Society, these requirements may be waived.

2 Intact stability is to be in accordance with requirements given in **Part U**. In addition, special consideration is to be paid to stability during designated operations.

9.2.2 Calculation on Stability

In applying the requirements in **2.1.2**, **Part U**, the heeling lever resulting from designated operations is to be considered the one most unfavorable for stability.

9.3 Hull Construction

9.3.1 General

Hull constructions are to be according to this **9.3** in addition to relevant requirements in each chapter of **Part C**, **Part CS** or **Part Q**.

9.3.2 Hull Strength

1 The supporting structures of equipment used for laying objects on the seabed are to be such to ensure sufficient strength.

2 The supporting structures of parts used for loading cable and pipes are to be such to ensure sufficient strength.

3 In cases where ships are equipped with mooring equipment or anchor handling equipment for positioning, the supporting structures of such equipment are to be such to ensure sufficient strength.

9.4 Hull Equipment

9.4.1 General*

1 Hull equipment is to be according to this **9.4** in addition to relevant requirements in each chapter of **Part C**, **Part CS** or **Part Q**.

2 In cases where equipment and devices for the ship's purpose are fitted, suitable measures are to be taken so that ship safety is not impaired.

3 Cargo gear is to be at the discretion of the Society.

9.4.2 Safety Devices

Equipment for laying objects on the seabed is to be provided with suitable safety devices so that towing wires are able to be released or cut in times of emergency.

9.5 Machinery

9.5.1 General

Machinery installations of the ship are to be according to this **9.5** in addition to **Part D**.

9.5.2 Tests

1 Before installation on board, equipment and components constituting the machinery installations are to be tested at the manufacturers in accordance with the relevant requirements in **Part D**.

2 Notwithstanding the requirements in **-1**, for machinery installations, other than boilers, pressure vessels belonging to Group I or II and piping systems which contain inflammable or toxic liquids, used solely for the operation which is the purpose of the ship, the tests may be deemed appropriate by the Society.

3 The systems or the equipment essential for the safety of the ship or for the propulsion of the ship (only applicable to the ship which has the main propulsion machinery) are, after installed on board, to be subjected to performance tests.

9.6 Electrical Installations

9.6.1 General

Electrical installations of the ship are to be according to this **9.6** in addition to **Part H**.

9.6.2 Tests

1 Among electrical equipment used solely for the operation which is the purpose of the ship, fuses, circuit breakers, explosion-protected electrical equipment and cables are to be subjected to be in accordance with the requirement in **1.2.1-4**, **Part H**. However, electrical installations which do not comply with this requirement may be accepted provided that the submission of documents such as specifications, sectional assembly drawings, test reports, certificates issued by public bodies for the examination by the Society.

2 Electrical equipment used solely for the operation which is the purpose of the ship and not listed in **-1** may be in accordance with the standards deemed appropriate by the Society.

3 For electrical installations used solely for the operation which is the purpose of the ship, an insulation resistance test specified in **2.18.1**, **Part H** and performance tests of safety devices for generators and transformers are to be carried out after installed on board.

9.7 Fire Protection, Means of Escape and Fire Extinguishing Systems

9.7.1 General

Fire protection, means of escape and fire extinguishing systems are to be according to relevant requirements in each chapter of **Part R**.

9.8 Computer-based Systems

9.8.1 General

Computer-based systems are to be in accordance with relevant requirements in **Part X**.

Chapter 10 OIL RECOVERY VESSELS

10.1 General

10.1.1 Application

Oil recovery vessels (hereinafter referred to as "ships" in this Chapter) are to apply the requirements in this Chapter in addition to the relevant requirements of other Parts.

10.1.2 Hazardous Areas

Hazardous areas for ship are as listed in the following **(1)** to **(13)**. However, in areas other than those listed below, the requirements in **13.1.3-3**, **Part P** correspondingly apply.

(1) Recovered oil tanks (including oily-water separating tanks, hereinafter the same)

(2) Enclosed spaces and semi-enclosed spaces adjacent to recovered oil tanks or having bulkheads above and in line with recovered oil tank bulkheads

(3) Recovered oil pump rooms and enclosed spaces in which oil recovering apparatus is located

(4) Enclosed spaces and semi-enclosed spaces in which recovered oil pipes are fitted

(5) Enclosed spaces in which portable oil recovering apparatus or recovered oil hoses are stored

(6) Areas on exposed deck within 3 *m* of any oil recovering apparatus installed on open deck excluding that is stored on exposed deck after oil recovering work

(7) Areas on exposed deck within 3 *m* of any recovered oil tank outlet

(8) Areas on exposed deck within 3 *m* of any entrance or ventilation opening of hazardous areas

(9) Areas on exposed deck over all recovered oil tanks and to the full breadth of the ship plus 3 *m* fore and aft on exposed deck, up to a height of 2.4 *m* above the exposed deck (the outer surface of the recovered oil tank in case where the surface is above the exposed deck)

(10) Enclosed spaces and semi-enclosed spaces having direct openings, such as doors or windows, into any hazardous area specified in **(1)** to **(9)**

(11) All areas on exposed deck up to a height of 3 *m* above the load line(1)

(12) Enclosed spaces having direct openings, such as doors or windows, into any hazardous area specified in **(11)**(1)

(13) Notwithstanding **(10)** and **(12)**, enclosed spaces having direct openings into any hazardous area specified in **(6)** to **(9)** and **(11)** may be considered not hazardous provided that the space is separated by a gas-tight steel bulkhead or equivalent thereto and maintained with overpressure in relation to the atmosphere by a supply-type mechanical ventilation system with an air change rate not less than 30 *times per hour*. Inlets of the ventilation system are to be located in non-hazardous areas as high and far away from any inlet of a ventilation system for hazardous areas as practicable. And the arrangement of ducts in the space is to be such that the entire space is efficiently ventilated. In case of failure of the driving motor for a fan, a visual and audible alarm is to be given.

Note:

1. Areas specified in **(11)** and **(12)** may be considered not hazardous where the ship is engaged in the work at areas far away from the oil spillage area.

10.2 Stability

10.2.1 General*

1 Intact and damage stability are to be according to this **10.2** in addition to **Part U** and **2.3, Part 1, Part C**. However, for ships specifically approved by the Society, these requirements may be waived.

2 Intact stability is to be in accordance with requirements given in **Part U**. In addition, special consideration is to be paid to stability during designated operations.

10.2.2 Calculation on Stability

In applying the requirements in **2.1.2**, **Part U**, the heeling lever resulting from designated operations is to be considered the one most unfavorable for stability.

10.3 Hull Construction

10.3.1 General

Hull constructions are to be according to relevant requirements in each chapter of **Part C**, **Part CS** or **Part Q**.

10.4 Hull Equipment

10.4.1 General

Hull equipment is to be according to relevant requirements in each chapter of **Part C**, **Part CS** or **Part Q**.

10.5 Machinery

10.5.1 General

Machinery installations of the ship are to be according to this **10.5** in addition to **Part D**.

10.5.2 Tests

1 Before installation on board, equipment and components constituting the machinery installations are to be tested at the manufacturers in accordance with the relevant requirements in **Part D**.

2 Notwithstanding the requirements in **-1**, for machinery installations, other than boilers, pressure vessels belonging to Group I or II and piping systems which contain inflammable or toxic liquids, used solely for the operation which is the purpose of the ship, the tests may be deemed appropriate by the Society.

3 The systems or the equipment essential for the safety of the ship or for the propulsion of the ship (only applicable to the ship which has the main propulsion machinery) are, after installed on board, to be subjected to performance tests.

10.6 Machinery Installations in Hazardous Area

10.6.1 General

Machinery installations in hazardous areas for ship are to comply with the requirements in the following **(1)** to **(3)**.

(1) Machinery installations in hazardous areas

The requirements in **13.3.3**, **Part P** are to apply correspondingly.

(2) Oil recovery apparatus

Oil recovery apparatus is to be constructed so as to ensure the safety to the operator and so as not to ignite the explosive gas.

(3) Gas detection

At least one piece of gas detection equipment is to be provided in order to detect gases in enclosed non-hazardous spaces and in other spaces deemed necessary by the Society in case those spaces contain source of ignition. One piece of portable gas detection equipment is to be provided where the fixed gas detection equipment is only provided on board.

10.6.2 Piping System

1 Exhaust outlets of internal combustion engines and boilers are to discharge outside of all hazardous areas.

2 Exhaust outlets of internal combustion engines are to be fitted with suitable spark-arresting devices.

3 Exhaust piping insulation is to be protected from absorbing oil when said piping is exposed to oil or oil vapors.

4 Air intakes are to be located no less than 3 *m* from hazardous areas.

10.7 Electrical Installations

10.7.1 General

Electrical installations of the ship are to be according to this 10.7 in addition to Part H.

10.7.2 Tests

1 Among electrical equipment used solely for the operation which is the purpose of the ship, fuses, circuit breakers, explosion-protected electrical equipment and cables are to be subjected to be in accordance with the requirement in 1.2.1-4, Part H. However, electrical installations which do not comply with this requirement may be accepted provided that the submission of documents such as specifications, sectional assembly drawings, test reports, certificates issued by public bodies for the examination by the Society.

2 Electrical equipment used solely for the operation which is the purpose of the ship and not listed in -1 may be in accordance with the standards deemed appropriate by the Society.

3 For electrical installations used solely for the operation which is the purpose of the ship, an insulation resistance test specified in 2.18.1, Part H and performance tests of safety devices for generators and transformers are to be carried out after installed on board.

10.8 Electrical Installations in Hazardous Areas

10.8.1 General

Electrical installations in hazardous areas for a ship are to comply with the requirements in the following **(1)** to **(7)**.

(1) Intrinsically safe type electrical equipment and associated cables may be installed in any hazardous area specified in 10.1.2.

(2) In hazardous areas specified in 10.1.2(2) to **(5)**, lighting fittings of flame-proof type and associated cables may be installed.

(3) In hazardous areas specified in 10.1.2(6), flameproof type electrical equipment and associated cables may be installed.

(4) In hazardous areas specified in 10.1.2(7) to **(9)**, flame-proof type electrical equipment, increased safety type electrical equipment and associated cables may be installed.

(5) For electrical installations installed in hazardous areas specified in 10.1.2(10), these areas are to be considered as equivalent to the adjacent hazardous area having direct openings, and the electrical installations are to be in compliance with the relevant requirements in **(1)** to **(4)**.

(6) In hazardous areas specified in 10.1.2(11) and **(12)**, flame-proof type electrical equipment and associated cables may be installed. However, where the ship is engaged in the work at areas far away from the oil spillage area, all types of electrical installations may be installed in case that the electrical installation is provided with a multipole linked switch in non-hazardous area and a precaution against the use of the installation during the oil recovery work is taken.

(7) Electrical equipment installed on non-hazardous exposed deck is to be provided with a multipole linked switch at a continuously attended location outside the hazardous areas to easily shut off the electrical power supply in case of the increase of the risk of ignition or fire due to the increase of gas concentrations, etc. during the oil recovery work.

10.9 Fire Protection, Means of Escape and Fire Extinguishing Systems

10.9.1 General

Fire protection, means of escape and fire extinguishing systems are to be according to relevant requirements in each chapter of Part R.

10.9.2 Ventilation Systems Installed in Hazardous Areas*

Ventilation systems of ships are to comply with the requirements in the following **(1)** and **(2)**.

(1) Ventilatilation for hazardous areas

(a) Recovered oil pump rooms and enclosed spaces in which oil recovering apparatus is located are to be provided with an exhaust-type mechanical ventilation system with an air change rate not less than 20 *times per hour*. Inlets of the ventilation system are to be located as high as practicable in non-hazardous areas. However, the ventilation system for small recovered oil pump rooms which contain no source of ignition may be dispensed with subject to the approval of the Society.

(b) Driving motors for fans of the ventilation systems for hazardous areas are to be installed outside ventilation ducts. Fans and casings are to be designed so as not to emit sparks due to contact of moving parts or formation of static electricity.

(2) Ventilation for non-hazardous areas (excluding areas considered not hazardous in the application of **10.1.2(13)**)

(a) The ventilation method for non-hazardous areas is not to be an exhaust mechanical type.

(b) Inlets and outlets of the ventilation system are to be located in non-hazardous areas as high and far away as practicable from any inlet of a ventilation system for hazardous areas.

10.10 Computer-based Systems

10.10.1 General

Computer-based systems are to be in accordance with relevant requirements in **Part X**.

Chapter 11 WIND TURBINE INSTALLATION SHIPS

11.1 General

11.1.1 Application

1 Wind turbine installation ships (hereinafter referred to as "ships" in this Chapter) are to apply the requirements in this Chapter in addition to the relevant requirements of other Parts.

2 Column-stabilized units are to be at the discretion of the Society.

3 Notwithstanding the requirements in this Chapter, the requirements applicable to ships engaged on international voyages are to be confirmed by the Administration.

11.2 Stability

11.2.1 General

1 Intact and damage stability of ship-type and barge-type ships are to be in accordance with the requirements given in **Part U** and **2.3, Part 1, Part C**.

2 Self-elevating ships are to be in accordance with the requirements in **4.1.2** to **4.1.5, Part P** and **4.2** to **4.5**, **Part P**.

3 For ships carrying cargo on deck such as open pipes that may accumulate water inside, free surface effects are to be considered.

4 In case of the ships considered inadequate to be fully and/or directly applied the requirements in **-1** because of some special reasons, stability will be individually determined by the Society.

11.2.2 Stability Requirements during Lifting Operations*

In cases where the ship is not to be secured by mooring at jetties, etc. or another equivalent method, and is intended to operate for lifts in the floating condition, intact stability during lifting operations is to be subject to stability requirements separately specified by the Society for the following ships:

(1) Ships intended to operate involving the lifting of the ship's own structures or for lifts in which the maximum heeling moment due to the lift is greater than that given in the following. The calculations are to be completed at the most unfavourable loading conditions for which the lifting equipment is to be used.

$$M_L = 0.67 \times \Delta \times G_0M \times \left(\frac{f}{B}\right)$$

M_L : Threshold value for the heeling moment, in $(t \cdot m)$, induced by the (lifting equipment and) load in the lifting equipment.

G_0M : The initial metacentric height, in (m), with free surface correction, including the effect of the (lifting equipment and) load in the lifting equipment.

f : the minimum freeboard, in (m), measured from the upper side of the weather deck to the waterline.

B : the moulded breadth of the ship, in (m), as defined in **2.1.4, Part A**.

Δ : the displacement of the ship, including the lift load, in (t).

(2) Ships which are engaged in lifting operations where no transverse heeling moment is induced and the increase of the ship's vertical centre of gravity (VCG) due to the lifted weight is greater than 1%.

11.3 Watertight Bulkheads and Closing Appliances

11.3.1 General

1 Watertight bulkheads and closing appliances of ship-type and barge-type ships are to be according to relevant requirements in each chapter of **Part C**, **Part CS** or **Part Q**.

2 Watertight bulkheads and closing appliances of self-elevating ships are to be according to **Chapter 5**, **Part P**.

11.4 Hull Constructions

11.4.1 General

1 Hull constructions are to be according to this **11.4** in addition to relevant requirements in each chapter of **Part C**, **Part CS** or **Part Q**.

2 Structural analysis is to be carried out in accordance with the requirements in **7.1.2** to **7.1.12, Part P** and **7.2** and **7.3, Part P**.

3 Self-elevating ships are to be according to the following **(1)** to **(5)** in addition to the requirements in **-1** and **-2**.

(1) Structural analysis for overall strength is to be carried out in accordance with the requirements in **-2**. In addition, an unbalanced supported condition by the legs, if necessary, is to be considered.

(2) The hull is to be considered as a complete structure having sufficient strength to resist all induced stresses while in the elevated position and supported by all legs.

(3) The scantlings of the respective hull structural members are to be in accordance with the requirements in **7.1.2** to **7.1.12, Part P** and **7.2** and **7.3, Part P** with reference to the loads prescribed in **Chapter 3, Part P** in addition to the requirements in **(1)**.

(4) The hull structure, including the parts of the well, etc., is to be good in the continuity of longitudinal strength and transverse strength.

(5) The ship is to be designed for a crest clearance, greater than that in the following **(a)** and **(b)**, whichever is smaller, between the underside of the ship in the elevated position and the crest of the design wave.

(a) $1.2m$

(b) 10% of the combined storm tide, astronomical tide and height of the maximum wave crest above the mean low water level. The wave height may be specified by the Owner subject to the approval by the Society.

11.4.2 Materials for Structural Members

1 Materials for the structural members of ship-type and barge-type ships are to be in accordance with **1.2.5**.

2 Materials for the structural members of self-elevating ships are to be in accordance with **6.2, Part P**.

11.4.3 Supporting Structures for Cargo Handling Appliances

Allowable stresses for the supporting structures of cargo handling appliances and the supporting equipment of cargo handling appliances are to be in accordance with the following **(1)** and **(2)**:

(1) Considering the safe working loads of cargo handling appliances, allowable stresses for the static loads and dynamic loads of cargo handling appliances are not to exceed the values specified in **7.2.2, Part P**.

(2) Allowable stresses for the static loading and combined loading specified in **7.2.1, Part P** are not to exceed the values in **7.2.2, Part P**.

11.4.4 Supporting Structures for Pile Driving Equipment

Allowable stresses for the supporting structures for pile driving equipment are to be in accordance with the following **(1)** and **(2)**:

(1) Allowable stresses for the static loads and dynamic loads of pile driving equipment are not to exceed the values specified in **7.2.2, Part P**.

(2) Allowable stresses for the static loading and combined loading specified in **7.2.1, Part P** are not to exceed the values in **7.2.2, Part P**.

11.4.5 Supporting Structures for Loaded Cargoes

1 Allowable stresses for the supporting structures for positions and the surrounding areas where cargoes are loaded, and cargo loading equipment attached to the hull such as blade racks are not to exceed the values in **7.2.2, Part P** for the static loading and combined loading specified in **7.2.1, Part P**.

2 Supporting structures are to be designed as appropriate so as to withstand additional loads due to the trim and heel of the ship in damaged conditions.

11.4.6 Deckhouses

Deckhouses are to be in accordance with the requirements in **11.3, Part 1, Part C**. In applying the requirement in **4.9.2.2, Part 1, Part C**, deckhouses which are close to the side shell of self-elevating ships are to be treated as superstructure end bulkhead and other deckhouses are to be treated as boundary walls of deckhouse.

11.4.7 Legs

Legs of self-elevating ships are to be in accordance with the requirements in the following **(1)** to **(8)** in addition to the requirements in **11.4.1-2**. However, with regard to the motions of the ship and legs, they may be determined by an analytical method or from a model experiment as deemed appropriate by the Society.

(1) Legs are to be either shell type or truss type, and, as a rule, footings or bottom mats are to be fitted. Where footings or bottom mats are not fitted, proper consideration is to be given to the leg penetration of the seabed and the end fixity of the leg. In the strength calculation of such a leg, the leg is to be assumed as pin-supported at a position at least 3 *metres* below the seabed.

(2) Legs in the transit condition are to be in accordance with the following **(a)** and **(b)**. The wording "transit condition" means a condition which does not exceed a 12-hour voyage. However, during any portion of the voyage, the ship is to be capable of arriving at its destination within 6 *hours*.

(a) The legs are to have sufficient strength for the bending moment obtained from the following formula:

$M_1 + 1.2M_2$ (*N-m*)

M_1: Dynamic bending moment caused by a 6-*degrees* single amplitude of roll or pitch at the natural period of the unit(*N-m*)

M_2: Static bending moment due to gravity caused by a 6 *degrees* legs' angle of inclination(*N-m*)

(b) The legs are to be investigated for any proposed leg arrangement with respect to vertical position, and the approved positions are to be specified in the operating manual.

(3) Legs in the ocean transit condition are to be designed in accordance with the following **(a)** to **(d)**:

(a) The legs are to be designed for acceleration and gravity moments resulting from the motions in the severest anticipated environmental transit condition, together with corresponding wind moments.

(b) The legs are to have sufficient strength for the bending moment obtained from the following formula:

$M_3 + 1.2M_4$ (*N-m*)

M_3: Dynamic bending moment caused by a 15-*degrees* single amplitude of roll or pitch at a 10-second period (*N-m*)

M_4: Static bending moment due to gravity caused by a 15-*degrees* legs' angle of inclination (*N-m*)

(c) For ocean transit condition, it may be necessary to reinforce or support the legs, or to remove sections of them.

(d) The approved condition is to be included in the operating manual.

(4) Legs are to be designed to withstand the dynamic loads which may be encountered by their unsupported length just prior to touching bottom, and also to withstand the shock of touching the seabed while the ship is afloat and subject to wave motions.

(5) The maximum design motions, bottom conditions and sea state while lowering legs and the sea state while raising the legs are to be clearly indicated in the operating manual.

(6) When computing leg stresses, while in the elevated position, the maximum overturning load on the ship, using the most adverse combination of applicable variable loadings together with the loadings specified in **Chapter 3, Part P** is to be considered. Forces and moments due to lateral frame deflections of the legs are to be taken into account.

(7) Leg scantlings are to be determined in accordance with a method of rational analysis to the satisfaction of the Society.

(8) Except for self-elevating ships utilizing a bottom mat, each leg is to have the capability of being pre-loaded to the maximum applicable combined load after initial positioning at a site. The pre-loading procedures are to be included in the operation manual.

11.4.8 Bottom Mats

In cases where bottom mats are installed to the legs of self-elevating ships, such bottom mats are to be in accordance with the requirements in the following **(1)** to **(6)**:

(1) The construction of bottom mats is to be designed so that loads transmitted from the legs may be evenly distributed to the respective parts of the mats.

(2) The thickness of the shell plating of the bottom mats without opening to the sea and the scantlings of shell stiffeners are not to be less than determined by the requirements in **7.3.2** and **7.3.3, Part P**. In this case, the top of h_s is at the water level at flood tide, and the top of h_c is 0.6 times the design wave height in the severe storm condition above the water level at the design water depth.

(3) The scantlings of the watertight bulkheads and their stiffeners provided in the bottom mats are not to be less than the value determined by the requirements in **Chapter 6, Part 1, Part C** (assessment in flooded conditions) with necessary modifications

or the requirements in Chapter 13, Part CS. In the case of applying Chapter 13, Part CS, the top of h is to be substituted for the top of h_c specified in **(2)**.

(4) Where the ship is resting on the seabed, the effects of scouring are also to be considered.

(5) The effects of skirt plates, where provided, are to be given special consideration.

(6) Mats are to be designed to withstand the shock of touching the seabed while the ship is afloat and subject to wave motions.

11.4.9 Structure of Jacking System Connections to Hulls

The structure of jacking system connections to hulls are to be in accordance with the following **(1)** and **(2)**.

(1) Scantlings of such structures are to have sufficient strength for the loads prescribed in 11.4.7 and Chapter 3, Part P.

(2) Loads transmitted from legs are to be properly diffused into hull structures.

11.5 Hull Equipment

11.5.1 General

1 Hull equipment of ship-type and barge-type ships is to be according to this 11.5 in addition to relevant requirements in each chapter of Part C, Part CS or Part Q.

2 Hull equipment of self-elevating ships is to be according to this 11.5 in addition to the requirements in 9.1 to 9.5 of Part P.

3 In cases where equipment and devices for designated operations are fitted, suitable measures are to be taken so that ship safety is not impaired.

11.5.2 Protective Coatings of Tanks

For dedicated seawater ballast tanks, including pre-load tanks on self-elevating ships, the requirements in 3.3.5.3, Part 1, Part C are to be complied with. However, spud cans on such ships need not comply with such requirements.

11.6 Positioning Systems

11.6.1 General

Positioning systems provided for ships are to be according to the requirements in Chapter 10, Part P.

11.7 Machinery

11.7.1 General*

Main propulsion machinery, power transmission systems, shafting systems, propellers, prime movers other than the main propulsion machinery, boilers and related equipment, incinerators, pressure vessels, auxiliaries, piping systems, all of their respective control systems and deck elevating systems (hereinafter all of the above will be referred to as "machinery installations" in this chapter) of the ship are to be according to this 11.7 in addition to Part D.

11.7.2 Tests

1 Before installation on board, equipment and components constituting machinery installations are to be tested at the manufacturers in accordance with the relevant requirements in Part D.

2 Notwithstanding **-1** above, for machinery installations (other than boilers, pressure vessels belonging to Group I or II and piping systems which contain inflammable or toxic liquids) used solely for operations which is the intended purpose of the ship, tests may be as deemed appropriate by the Society.

3 Systems or the equipment essential for the safety of the ship or for the propulsion of the ship (only applicable to ships which have main propulsion machinery) are to be subjected to performance tests after installation on board.

4 Mechanical components used for load carrying components, torque transmitting components, components for fixation systems and hydraulic components of the jacking systems are to be subjected to the hardness tests and non-destructive tests specified in 5.5.1, Part D.

5 Rack and pinion jacking systems are to be tested in accordance with the following. However, in cases where systems are of equivalent design, the Society may allow such tests to be omitted in consideration of established service histories.

(1) A load equivalent to 150 % of the maximum normal holding capacity rating of the unit is to be applied, and the climbing pinion is to make at least one complete revolution.

(2) The unit is to be disassembled and it is to be confirmed that all pinions and gears are free from abnormal defects by non-destructive tests deemed appropriate by the Society.

11.7.3 Jacking Systems

1 The following plans and documents are to be submitted to the Society in addition to those specified in **Chapter 15, Part B**.

(1) Plans and documents for approval

(a) A description of the jacking system and plans for its arrangement

(b) Rack and pinion jacking systems

i) Detailed plans for rack and pinions (including details of tooth geometry in cases where it is not an involute gear)

ii) Plans for power transmitting components, shafts, bearings, couplings, casings and brakes

iii) Detailed plans for gear elements

iv) Diagrams for electric and hydraulic control systems

v) Detailed plans for hydraulic power packs

iv) Detailed plans for electric motors (including specifications and operating characteristics)

vii) Detailed plans for fixation systems (if provided)

viii) Prototype test procedures (if applicable)

(c) Ram and pin jacking systems

i) Detailed plans for hydraulic cylinders and control valves

ii) Details for pins and activating mechanisms

iii) Detailed plans and arrangements for pin holes

iv) Diagrams for electric and hydraulic control systems

v) Detailed plans for hydraulic power packs

vi) Detailed plans for electric motors (including specifications and operating characteristics)

vii) Detailed plans for casings and supporting structures of the system (including fixed and movable crossheads)

(d) Detailed plans for monitoring and alarm systems

(e) Material specifications for load carrying components (racks and jackcases for rack and pinion units, jacking pins and yokes for hydraulically actuated units, etc.), torque transmitting components (climbing pinions, gears, pinions, planet carriers, pins, shafts, torque supports, couplings, coupling bolts, torque flanges, brakes, etc.), fixation system components and hydraulic components (hydraulic cylinders, actuators, etc.) of **(b)** and **(c)** above

(f) Design calculations (including strength, fatigue, buckling, rigidity, critical speed (resonance) analysis) of **(b)** and **(c) above**

(2) Plans and documents for reference

(a) Documents for Failure Modes and Effects Analysis (*FMEA*)

(b) Details and procedures for non-destructive tests for components subject to direct load (including inspection locations, inspection types and acceptance criteria)

(c) Details for operating temperature and heating arrangements for low-temperature service

(d) Limits for alignment and misalignment between rack and pinions

2 The material of load carrying components and torque transmitting components, fixation system components and hydraulic components of jacking systems are to be suitable for the temperature conditions of the operating areas of intended use and are to comply with **Part K**.

3 Jacking systems (including fixation systems in cases where separately equipped as holding mechanisms) are to be such as to maintain the safety of the ship in the event of the failure of any part of the system, control device or loss of the source of power for the driving gear. A suitable monitoring device is to be provided at a permanently attended control station to indicate such failure.

4 With respect to **-3** above, Failure Modes and Effects Analysis (*FMEA*) is to be used to confirm that the safety of the ship will not be compromised by the jacking system.

5 Where electrical motors, hydraulic or pneumatic systems are used as a source of power for a jacking system (including fixation systems in cases where separately equipped as holding mechanisms), two or more sets of sources of power are to be provided so as to be capable of operating the jacking system even when one of the sets fails. However, one set may be acceptable for ships designated

for use in restricted areas (except for ships which have large embarking capacities).

6 Jacking systems (including fixation systems in cases where separately equipped as holding mechanisms) are to be designed and constructed for the maximum lowering and lifting loads of a ship as specified in the ship's operating manual for at least the following loading conditions. In addition, friction loss from leg guiding and the effect of variation in location of the centre of gravity of the hull are to be included in the maximum lowering and lifting loads.

(1) Normal lifting, lowering, holding of hull (static loading)

(2) Pre-load lifting, lowering, holding of hull (static loading in cases where lifting and lowering as well as combined loading in cases where holding)

(3) Normal lifting, lowering, holding of legs (static loading)

(4) Severe storm holding under the elevated condition and the afloat condition (combined loading)

7 Allowable stresses of the mechanical components used in jacking systems (including fixation systems in cases where separately equipped as holding mechanisms) are to comply with the values specified in **7.2.2, Part P** under all the loading conditions specified in **-6** above. In addition, buckling strength and fatigue strength are to be in accordance with the requirements of **7.1.5** and **7.1.6, Part P** respectively. In the case of gears, tooth surface contact and tooth root bending are to be in accordance with requirements specified otherwise by the Society.

8 Jacking systems (including fixation systems in cases where separately equipped as holding mechanisms) are to be able to withstand the forces imposed upon a ship from the maximum environmental criteria for the ship.

9 All lifting and lowering operations as well as applicable repeated loads are to be considered for fatigue strength. In the case of gears, the following safety factors are to be applied for cumulative fatigue in the fatigue design life.

Tooth surface contact: 1.0

Tooth root bending: 1.5

10 In cases where hydraulic cylinders are used as power sources for ram and pin jacking systems, the requirements of **Chapter 10, Part D** are to be applied mutatis mutandis. For piping attached to such cylinders, the requirements of **Chapter 12** and **Chapter 13, Part D** are to be applied mutatis mutandis.

11 Jacking systems are to be operable from central jacking control stations.

12 Jacking control stations are to be provided for the following safety devices.

(1) Audible and visual alarms for jacking system overload and out-of-level. For rack and pinion jacking systems, visible and audible alarms for rack phase differential are to be provided in cases where required for design reasons.

(2) Indicators for the following:

(a) The inclination of the ship on two horizontal perpendicular axes

(b) Power consumption or other indicators for the lifting or lowering of the legs (as applicable)

(c) Brake release status

13 Communication systems are to be provided between the central jacking controls and locations at each leg.

11.7.4 Bilge Piping

The bilge piping of self-elevating ships is to be in accordance with the requirements in following **(1)** to **(3)**:

(1) A means to indicate whether a valve is open or closed is to be provided at each location from which said valve can be controlled. The indicator is to rely on the movement of the valve spindle.

(2) At least two independent power bilge pumps of a self-priming type or equivalent thereto are to be provided and are to be connected respectively to the main bilge suction pipes. Ballast pumps, sanitary pumps, general service pumps, etc. driven by independent power may be accepted as independent power bilge pumps provided that they are connected properly to the main bilge line. However, one bilge pump may be accepted for ships designated for use in restricted areas (except for a ship which has a large embarking capacity).

(3) Notwithstanding **13.5.3-1, Part D**, branch bilge suction pipes from each compartment are to have an internal diameter obtained from the following formula or be standard pipes which have an internal diameter nearest to the calculated diameter. In cases where the internal diameter of such standard pipes is less than the calculated value by 5*mm* or more, standard pipes of one grade higher diameter are to be used.

where

$d' = 2.15\sqrt{A} + 25$ (mm) minimum 50 (mm)

d': Internal diameter of branch bilge suction pipes (mm)

A: Wetted surface area of the compartment (excluding stiffening members) when the compartment is half filled with water (m^2)

11.7.5 Air Pipes and Overflow Pipes

For self-elevating ships, the air pipe openings and discharge openings of overflow pipes are to be located above the final calculated immersion line in the assumed damage condition specified in 11.2 and are to be positioned outside the extent of damage defined in 11.2.

11.7.6 Sounding Pipes

Sounding pipes of self-elevating ships are to be in accordance with the requirements in the following **(1)** and **(2)**:

(1) The internal diameter of sounding pipes of 20m or more in length is not to be less than 50mm.

(2) Where a remote level indicator is used for tanks which are not always accessible, an additional sounding system is to be provided.

11.8 Electrical Installations

11.8.1 General

1 Electrical installations of the ship are to be according to this 11.8 in addition to Part H.

2 Emergency sources of electrical power are to be capable, in addition to applicable loads given in **3.3.2-2, Part H**, of supplying simultaneously at least the following services for those periods specified hereinafter, if they depend upon electrical sources for operation:

(1) For a period of 18 *hours*, the emergency lighting specified in the following:

(a) at every muster and embarkation station; and

(b) on helicopter landing decks.

(2) For a period of 4 *days*, any signalling lights or sound signals which may be required for marking of offshore structures.

(3) For a period of 30 *minutes*, the services listed in the following **(a)** and **(b)**:

(a) Devices to operate the watertight doors required by **5.2.2, Part P**, but not necessarily all of them simultaneously, unless an independent temporary source of stored energy is provided; and

(b) Control devices and indicators required by **5.2.2, Part P**.

11.8.2 Tests

1 Among electrical equipment used solely for the operation which is the purpose of the ship, fuses, circuit breakers, explosion-protected electrical equipment and cables are to be subjected to be in accordance with the requirements in 1.2.1-4, Part H. However, electrical installations which do not comply with this requirement may be accepted provided that the submission of documents such as specifications, sectional assembly drawings, test reports, certificates issued by public bodies for the examination by the Society.

2 Electrical equipment used solely for the operation which is the purpose of the ship and not listed in -1 may be in accordance with the standards deemed appropriate by the Society.

3 For electrical installations used solely for the operation which is the purpose of the ship, an insulation resistance test specified in 2.18.1, Part H and performance tests of safety devices for generators and transformers are to be carried out after installed on board.

11.9 Fire Protection and Means of Escape

11.9.1 General

Fire protection and means of escape are to be according to relevant requirements in each chapter of Part R.

11.10 Fire Extinguishing Systems

11.10.1 General*

1 Fire extinguishing systems are to be according to relevant requirements in each chapter of Part R.

2 For fire pumps and water supply of self-elevating ships, the requirements in **15.2.2-11**, **Part P** are to be correspondingly applied, in addition to the requirement in **-1**.

11.11 Helicopter Facilities

11.11.1 General

1 The structure, equipment, etc. of helicopter facilities are to comply with following **(1)** to **(7)**:

(1) Helicopter loads: **3.2.7, Part P**;

(2) Guardrails: **9.3.1-2, Part P**;

(3) Isolation of fuel oil arrangements for helicopters: **11.1.4-10, Part P**;

(4) Emergency lighting of helicopter decks: **12.2.3-3, Part P**;

(5) Fire protection, means of escape and fire extinguishing systems: **Chapter 18, Part R** and **15.2.15 (10), Part P**;

(6) Helicopter facilities: **Chapter 17, Part P**; and

(7) Provisions of operation manuals: **18.8.1, Part R.**

2 Regarding details of the operation manuals related to helicopter facilities, including the operation manual described in **-1(7)**, reference is to be made to **Chapter 18, Part P**.

11.12 Safety Equipment

11.12.1 General

1 Safety equipment is to be according to relevant requirements in each chapter of the **Rules for Safety Equipment**.

2 For self-elevating ships, the requirements in **Chapter 16, Part P** are to be correspondingly applied.

3 For ships which have no propelling machinery, **1.1.1-2, Part 1 of the Rules for Safety Equipment** may be applied. In such case, all or part of the application of the requirement in each chapter of the **Rules for Safety Equipment** may be dispensed with; however, even in such cases, particular attention is to be paid to the instructions issued by the Administrations.

11.13 Radio Installations

11.13.1 General

1 Radio installations are to be according to relevant requirements in each chapter of the **Rules for Radio Installations**.

2 For ships which have no propelling machinery, **1.1.2 of the Rules for Radio Installations** may be applied. In such case, all or part of the application of the remaining requirements in the **Rules for Radio Installations** may be dispensed with.

11.14 Habitation Installations

11.14.1 General

Habitation installations are to be according to instructions issued by the Administration.

11.15 Cargo Handling Appliances

11.15.1 General

Cargo handling appliances are to be according to the **Rules for Cargo Handling Appliances**. In addition, they are to be at the discretion of the Society.

11.15.2 Supporting Equipment of Cargo Handling Appliances

Supporting equipment for cargo appliances, such as boom rests, etc., is to be appropriately designed so as to be capable of withstanding loads due to ship motions and inclination.

11.16 Computer-based Systems

11.16.1 General

Computer-based systems are to be in accordance with relevant requirements in **Part X**.

Chapter 12 Wind Farm Support Vessels

12.1 General

12.1.1 Application

1 Wind farm support vessels (hereinafter referred to as "ships" in this chapter) are to be applied to this chapter in addition to other relevant parts of the Society's Rules.

2 For ships primarily engaged in transporting workers to offshore wind turbines and serving as accommodation facilities for such workers, **12.1** to **12.8** are to be complied with.

3 For ships primarily engaged in transporting workers, **12.9** is to be complied with in addition to **12.1** to **12.7**.

12.2 Stability

12.2.1 General*

1 Intact and damage stability are to be according to this **12.2** in addition to **Part U** and **2.3, Part 1 of Part C**. However, for ships specially approved by the Society, these requirements may be waived.

2 Intact stability is to be in accordance with **Part U**. In addition, with regard to stability, special consideration is to be given to heeling levers and other related matters during designated operations.

3 For ships carrying cargoes on deck (e.g. open pipes in which water may accumulate), free surface effects are to be considered.

4 In the case of ships for which the full or direct application of **-1** above is considered to be insufficient because of some special reason, stability will be determined by the Society on a case-by-case basis.

12.2.2 Stability Calculations

In applying **2.1.2, Part U**, heeling levers resulting from designated operations to be considered are the ones most unfavorable with respect to stability.

12.3 Hull Construction

12.3.1 General

1 Hull construction is to be according to this **12.3** in addition to relevant requirements in **Part C** or **Part CS**.

2 Supporting structures of equipment and devices used for the maintenance and management of offshore wind turbines are to be such as to ensure sufficient strength.

3 In all operations for which the ship is intended, the effect of all loads due to cargoes on deck and especially heavy equipment are to be taken into account.

4 The construction of parts, such as the bow parts of ships, in cases where ships come into contact with other ships or offshore structures for personnel transfer purposes, is to be such as to ensure sufficient strength.

12.4 Hull Equipment

12.4.1 General

1 Hull equipment of ships is to be according to this **12.4** in addition to relevant requirements in **Part C** or **Part CS**.

2 In cases where equipment and devices for designated operations are fitted, suitable measures are to be taken so that ship safety is not impaired.

12.4.2 Personnel Transfer Arrangements*

1 Ships are to be provided with designated areas for personnel transfer (hereinafter referred to as "personnel transfer areas"), and such areas are to comply with the following:

(1) Such areas are to be located sufficiently away from the propellers, nozzles, etc. of propulsion systems (including side thrusters).

(2) Such areas are to be kept free of structures and arrangements that obstruct personnel transfer.

(3) Such areas are to be provided with sufficient lightning. In addition, lighting for the personnel transfer arrangements specified in **-2** below, the sea surface around such arrangements as well as associated means of passage for such arrangements are to be capable of being supplied by emergency sources of electrical power in the event of main power failure.

(4) Surfaces of such areas used as means of passage (e.g. stairways). are to be non-skid surfaces.

(5) Regardless of weather conditions, such areas and their associated arrangements are to be clearly visible from navigation bridges.

2 Ships are to be provided with designated arrangements for personnel transfer (hereinafter referred to as "personnel transfer arrangements"). Such arrangements are to comply with the following:

(1) The structures of such arrangements are to be such that they will not endanger operators or users during normal operations.

(2) The materials used for arrangements are to be as deemed appropriate by the Society.

(3) Special consideration is to be given to protect users in the event of main power failure.

(4) Support structures underneath decks are to be adequately reinforced in cases where such arrangements are installed on deck.

3 Procedures for personnel transfer and instructions for personnel transfer arrangements are to be indicated in operating manuals, and are to comply with the following:

(1) The full sequence of personnel transfer is to take place at locations sufficiently away from the propellers, nozzles, etc. of propulsion systems (including side thrusters).

(2) Such procedures and instruction are to include items and methods for checking environmental conditions during ship operations as well as for operational checks of personnel transfer arrangements.

(3) Such procedures and instructions are to include information on any limitations placed on the use of personnel transfer arrangements, taking into account environmental conditions when personnel transfers take place.

12.5 Machinery

12.5.1 General

Main propulsion machinery, power transmission systems, shafting systems, propellers, prime movers other than the main propulsion machinery, boilers and related equipment, incinerators, pressure vessels, auxiliaries, piping systems and all of their respective control systems (hereinafter collectively referred to as "machinery installations" in this chapter) of ships are to be according to this **12.5** in addition to **Part D**.

12.5.2 Tests

1 Before installation on board, equipment and components constituting machinery installations are to be tested at manufacturers in accordance with **Part D**.

2 Notwithstanding **-1** above, for machinery installations (other than boilers, pressure vessels belonging to Group I or II and piping systems which contain inflammable or toxic liquids) used solely for operations which is the intended purpose of the ship, tests may be as deemed appropriate by the Society.

3 Systems or equipment essential for ship safety or for ship propulsion are to be subjected to performance tests after installation on board.

12.6 Electrical Installations

12.6.1 General*

Electrical installations of the ship are to be according to this **12.6** in addition to **Part H**.

12.6.2 Tests

1 Among electrical equipment used for the intended purpose of the ship (such as electrical equipment for personnel transfer arrangements or lighting near personnel transfer arrangements, etc.), associated fuses, circuit breakers, explosion-protected electrical equipment and cables are to be in accordance with **1.2.1-4, Part H**. However, electrical installations which do not comply with this requirement may be accepted provided that documents (such as specifications, sectional assembly drawings, test reports, certificates) issued by recognized third-parties are submitted to the Society for review.

2 Electrical equipment used for the intended purpose of the ship and not listed in **-1** above are to be in accordance with the

standards deemed appropriate by the Society.

3 For electrical installations used for the intended purpose of the ship, the insulation resistance tests specified in **2.18.1, Part H** and performance tests for safety devices are to be carried out for generators and transformers after installation on board.

12.7 Fire Protection and Means of Escape

12.7.1 General

Fire protection and means of escape are to be according to relevant requirements in **Part R**.

12.8 Special Requirements for Ships Engaged in Transporting Workers to Offshore Wind Turbines and Serving as Accommodation Facilities for Such Workers

12.8.1 Stability*

1 For ships equipped with personnel transfer equipment which effect intact stability, the following are to be taken into account.

(1) The overturning moments due to environmental and operational conditions. In order to consider the most critical scenario, the full range of operating configurations (including both stowed and operational modes) is to be taken into account.

(2) The effects of loads due to cargoes on deck for each operating condition.

(3) The estimated weights and heights of the centre of gravity in the most critical scenario if large and heavy equipment or structures are intended to be stowed on deck and are going to be installed on grillages to add extra height.

2 In cases where ships are not to be secured by mooring at jetties, piers, etc. or some other equivalent method and are intended to operate on lifts in the floating condition, intact stability for the following ships during lifting operations is to be subject to stability requirements separately specified by the Society:

(1) Ships intended to operate involving the lifting of the ship's own structures or for lifts in which the maximum heeling moment due to the lift is greater than that given in the following. Calculations are to be completed at the most unfavourable loading conditions for which the lifting equipment is to be used.

$$M_L = 0.67 \times \Delta \times G_0M \times \left(\frac{f}{B}\right)$$

M_L: Threshold value for the heeling moment ($t \cdot m$) induced by the load due to the lifting equipment (hereinafter referred to as "lifting load").

G_0M: Initial metacentric height (m) with free surface correction, including the effects of the lifting load.

f: Minimum freeboard (m) measured from the upper side of the weather deck to the waterline.

B: Moulded breadth of the ship (m), as defined in **2.1.4, Part A**

Δ: Displacement of the ship (t), including the lifting load

(2) Ships which are engaged in lifting operations where no transverse heeling moment is induced and the increase of ship vertical centre of gravity (VCG) due to the lifted weight is greater than 1 %.

12.8.2 Hull Construction*

1 Side construction is to be such as to ensure sufficient strength for impact loads arising from contact.

2 The superstructure end bulkheads and boundary walls of deckhouses are to be such as to ensure sufficient strength for operational loads.

3 If heavy loads are to be carried on deck, the deck is to be adequately reinforced for the maximum anticipated load.

4 In cases where heavy cargoes are carried on deck, effective means such as dunnage are to be provided so that weight is uniformly distributed onto deck structures.

5 Means are to be taken to adequately secure and protect cargoes loaded on deck. In general, bulwarks, rails, containers or racks, etc. are to be arranged and properly secured to reinforced parts of the hull structure.

6 Air pipes, valves, small hatches, etc. are to be effectively protected and reinforced against damage caused by cargo and loading equipment.

7 In principle, hatch covers at flush deck openings above decks on which cargoes are to be loaded are to have the same design loads as adjacent decks.

12.8.3 Hull Equipment*

1 Sufficient fenders are to be fitted on side shells in deck areas where upper decks or forecastles decks are at full breadth.

2 Wooden sheathings and other means are to be provided on cargo decks so as to appropriately protect steel deck plates from mechanical damage or scuffing.

3 In cases where cargo rails are fitted onto cargo decks, cargo rail stanchions are to be attached

12.8.4 Helicopter Facilities*

1 The structures, equipment, etc. of helicopter facilities are to comply with following **(1)** to **(7)**:

(1) Helicopter loads: **3.2.7, Part P**;

(2) Guardrails: **9.3.1-2, Part P**;

(3) Isolation of fuel oil arrangements for helicopters: **11.1.4-10, Part P**;

(4) Emergency lighting of helicopter decks: **12.2.3-3, Part P**;

(5) Fire protection, means of escape and fire extinguishing systems: **Chapter 18, Part R** and **15.2.15 (10), Part P**;

(6) Helicopter facilities: **Chapter 17, Part P**; and

(7) Provision of operation manuals: **18.8.1, Part R**.

2 Regarding details of operation manuals related to helicopter facilities, including the operation manuals referred to in **-1(7)** above, reference is to be made to **Chapter 18, Part P**.

12.8.5 Positioning Systems

1 Positioning systems provided for ships are to be in accordance with **Chapter 10, Part P**.

2 Where dynamic positioning systems (hereinafter referred to as "DPS") are provided, such are to comply with either the requirements for Class 2 DPS or Class 3 DPS.

3 Where the DPS has interfaces with control devices for personnel transfer arrangements, the effects of the operation of such control devices on dynamic positioning performance are to be identified and addressed through Failure Mode Effect Analysis (*FMEA*).

12.8.6 Worker Accommodation

Taking into account the maximum number of workers who will be on board, a sufficient number of properly sized sleeping berths is to be provided on board at suitable locations for the purpose of worker accommodation.

12.9 Special Requirements for Ships Primarily Engaged in Transporting Workers

12.9.1 General

Where ships have personnel transfer arrangements or cargo gear which effect stability, and loads heavy cargoes on deck, **12.8** is to be complied with.

12.9.2 Stability

Notwithstanding **12.2.1-1** and **-2,** ships navigating at maximum speeds equal to or exceeding the values in **2.1.2, Part 1 of the Rules for High Speed Craft** are to comply with the **Rules for High Speed Craft**.

12.9.3 Hull Construction

Notwithstanding **12.3.1-3**, ships navigating at maximum speeds equal to or exceeding the values in **2.1.2, Part 1 of the Rules for High Speed Craft** are to comply with the **Rules for High Speed Craft**.

12.9.4 Hull Equipment

1 Notwithstanding **12.4.1-1**, ships navigating at maximum speeds equal to or exceeding the values in **2.1.2, Part 1 of the Rules for High Speed Craft** are to comply with the **Rules for High Speed Craft**, **12.4.2** and this **12.9.4**.

2 In cases where platforms are installed as personnel transfer arrangements on the bow parts of ships, such platforms are to comply with the following:

(1) Guardrails are to be provided on both sides of the platform and around the personnel transfer area.

(2) Coamings of sufficient height are to be provided for platform steps, such steps are to be provided with non-skid surfaces.

(3) The guardrails referred to in **(1)** above are to comply with **14.8, Part 1 of Part C**.

(4) According to **14.8, Part 1 of Part C**, wire ropes or chains are to be provided on the side of the platform where ship embarkation and disembarkation operations take place.

12.9.5 Machinery

Notwithstanding **12.5.1**, ships navigating at maximum speeds equal to or exceeding the values in **2.1.2, Part 1 of the Rules for High Speed Craft** are to comply with the **Rules for High Speed Craft**.

12.9.6 Electrical Installations

Notwithstanding **12.6.1**, ships navigating at maximum speeds equal to or exceeding the values in **2.1.2, Part 1 of the Rules for High Speed Craft** are to be comply with the **Rules for High Speed Craft**.

12.9.7 Fire Protection and Means of Escape

Notwithstanding **12.7.1**, ships navigating at maximum speeds equal to or exceeding the values in **2.1.2, Part 1 of the Rules for High Speed Craft** are to comply with the **Rules for High Speed Craft**.

12.9.8 Worker Waiting Areas

Taking into account the maximum number of workers who will be on board, a sufficient number of properly sized chairs are to be placed at suitable positions on board to allow workers to wait safely during ship navigation.

Annex 1.1.1-5. SHIPS CARRYING INDUSTRIAL PERSONNEL (IP)

An1 General

An1.1 GENERAL

An1.1.1 Application

1 The requirements of this annex apply to ships of not less than 500 gross tonnages engaged on international voyages (except non self-propelled ships) which have large embarking capacities of at least one industrial personnel (*IP*).

2 Ships (except for high speed craft) authorised by the Administration to carry more than 12 *IP* in accordance with *MSC.418(97)* "Interim Recommendations on the Safe Carriage of More Than 12 Industrial Personnel On Board Vessels Engaged on International Voyages" are to comply with **An3.1**, **An3.2** (except for **An3.2.1-1(7)**), **An4.7** and **An4.8** of this annex.

3 High speed craft authorised by the Administration to carry more than 12 *IP* in accordance with the *MSC.418(97)* are to comply with **An3.1**, **An3.2** (except for **An3.2.1-1(7)**), **An5.7** and **An5.8** of this annex.

4 Ships which have not been authorised by the Administration to carry more than 12 *IP* in accordance with the *MSC.418(97)* are to comply with and be certified with this annex.

5 The number of *IP* in **An1.1.1-2** to **An1.1.1-4** is the total number of passengers, *IP* and *SP*.

An1.2 Definitions

An1.2.1

The definitions of terms in this annex are in accordance with the following **(1)** to **(5)**.

(1) Carriage means transportation, accommodation or both.

(2) "*HSC* Code" means the *International Code of Safety for High-Speed Craft, 2000*, as adopted by the Maritime Safety Committee of the IMO by resolution *MSC.97(73)*, as amended.

(3) "Offshore industrial activities" mean the construction, maintenance, decommissioning, operation or servicing of offshore facilities related, but not limited, to exploration and exploitation of resources by the renewable or hydrocarbon energy sectors, aquaculture, ocean mining or similar activities.

(4) "IP area" is every area or space where IP are normally intended to stay during voyage or are allowed to access.

(5) "Personnel transfer" means the full sequence of the operation of transferring personnel and their equipment at sea to or from a ship to which this annex applies and from or to another ship or an offshore facility.

An2 GOALS AND FUNCTIONAL REQUIREMENTS

An2.1 Industrial Personnel (*IP*) (IP Code 2.1)

An2.1.1 Goal

The goal of this section is to ensure the following **(1)** and **(2)**.

(1) safe operations during the carriage of industrial personnel, and

(2) industrial personnel are medically fit and familiar with the hazards associated with their operational environments, including the risks associated with personnel transfer operations.

An2.1.2 Functional Requirements

In order to achieve **An2.1.1**, *IP* are to satisfy the following:

(1) *IP* are to be medically fit.

(2) *IP* are to be able to communicate with the ship's crew.

(3) *IP* are to have received appropriate safety training.

(4) *IP* are to have received onboard ship-specific safety training.

(5) *IP* are to have received onboard ship transfer arrangement and associated equipment training.

An2.2 Safe Transfer of Personnel (IP Code 2.2)

An2.2.1 Goal

The goal of this section is to ensure the safety of all persons involved in personnel transfers, including safe and suitable means of transfer and the capability of safely carrying out operations connected to personnel transfers.

An2.2.2 Functional Requirements

In order to achieve **An2.2.1**, the safe transfer of personnel is to satisfy the following:

(1) Means are to be provided to avoid injuries during personnel transfers.

(2) Personnel transfer arrangements are to comply with the following **(a)** to **(c)**.

  (a) Personnel transfer arrangements are to be designed, constructed and maintained to withstand the loads they are subjected to.

  (b) Personnel transfer arrangements are to be designed and engineered to fail to a safe condition in the event of a loss or reduction in their associated functionality.

  (c) Personnel transfer arrangements are to be capable of safely returning persons in transfer to a safe location after loss of power.

(3) Means for position keeping are to be provided and arranged in a manner that prevents accidents during transfer of personnel and to be suitable for the mode of operation and interactions with other ships or offshore facilities.

(4) Means are to be provided to ensure that the information on the number of *IP* on board and their identity is kept updated to assist in ensuring that the actual number of persons on board is known at all times.

An2.3 Subdivision and Stability (IP Code 2.3)

An2.3.1 Goal

The goal of this section is to ensure adequate ship stability, in both the intact and damaged conditions, taking into consideration the total number of persons on board.

An2.3.2 Functional Requirements

In order to achieve **An2.3.1**, ships are to be designed with weathertight and watertight boundaries providing for adequate stability standards, in both the intact and damaged conditions, taking into account the total number of persons on board.

An2.4 Machinery Installations (IP Code 2.4)

An2.4.1 Goal

The goal of this section is to ensure machinery installations capable of delivering the required functionality to ensure safe navigation and safe carriage of persons on board both during normal operation and in any emergency situation, taking into account the total number of persons on board.

An2.4.2 Functional Requirements

In order to achieve **An2.4.1**, machinery installations are to satisfy with following:

(1) Where the capacity needed to ensure the required functionality of any machinery system is dependent on the number of persons on board (e.g. bilge pumping systems), necessary additional capacity is to be provided.

(2) Steering gear systems are to be capable of maintaining steerage after any incident affecting machinery installations.

(3) Essential systems are to have the necessary redundancy or isolation, or combination thereof, in order to ensure the capability of safely accommodating persons on board after any incident affecting machinery installations, taking into account the number of persons on board.

An2.5 Electrical Installations (IP Code 2.5)

An2.5.1 Goal

The goal of this section is to ensure the following **(1)** and **(2)**:

(1) emergency sources of power capable of delivering the required functionality of essential systems in emergency situations, taking into account the total number of persons on board; and

(2) protection of all persons on board from electrical hazards.

An2.5.2 Functional Requirements

In order to achieve **An2.5.1**, electrical installations are to satisfy the following:

(1) Emergency power supplies to essential systems are to have the necessary redundancy or isolation, or combination thereof, to ensure the capability of safely accommodating persons on board after damage, taking into account the number of persons on board and the time needed for orderly evacuation.

(2) Precautions against shock, fire and other hazards of electrical origin are to be provided.

An2.6 Periodically Unattended Machinery Spaces (IP Code 2.6)

An2.6.1 Goal

The goal of this section is to ensure that, if and when a machinery space is periodically unattended, this does not impair the safety of the ship or the persons on board.

An2.6.2 Functional Requirements

In order to achieve **An2.6.1**, periodically unattended machinery spaces are to satisfy the following:

(1) Periodically unattended machinery spaces are to ensure safe operations, taking into account the number of persons on board.

(2) Periodically unattended machinery space are to be equipped with additional controls, monitoring and alarm systems to ensure safe operation in order to achieve a safety equivalent to that of a normally attended machinery space, taking into account the number of persons on board.

An2.7 Fire Safety (IP Code 2.7)

An2.7.1 Goal

The goal of this section is to satisfy the fire safety objectives of *SOLAS* or the basic fire safety principles of the *HSC* Code, taking into account the number of persons on board.

An2.7.2 Functional Requirements

In order to achieve **An2.7.1**, means are to be provided for satisfying the fire safety functional requirements of *SOLAS* or the basic

fire safety principles of the *HSC* Code, taking into account the number of persons on board, are to be provided.

An2.8 Life-Saving Appliances and Arrangements (IP Code 2.8)

An2.8.1 Goal

The goal of this section is to ensure appropriate and sufficient means for the safe abandonment of the ship and recovery of persons.

An2.8.2 Functional Requirements

In order to achieve **An2.8.1**, life-saving appliances and arrangements are to satisfy the following:

(1) The capacity of survival craft is to be sufficient to accommodate all persons on board.

(2) Appropriate and sufficient personal life-saving appliances are to be available for all persons on board.

(3) Sufficient space for assembling and mustering is to be ensured.

(4) Onboard communication and alarm systems are to be provided to ensure emergency communication to all persons on board.

(5) Means are to be provided to ensure the safe recovery of persons.

An2.9 Dangerous Goods (IP Code 2.9)

An2.9.1 Goal

The goal of this section is to ensure the safe carriage of *IP* while transporting and handling dangerous goods on ships certified in accordance with this annex, taking into consideration the total number of persons on board.

An2.9.2 Functional Requirements

In order to achieve **An2.9.1**, hazards caused by the transportation and handling of dangerous goods are to be taken into account and the risk to all persons on board is to be minimised in consideration of the nature of the dangerous goods.

An3 REGULATIONS

An3.1 Industrial Personnel (*IP*) (IP Code 3.1)

An3.1.1 Requirements

1 In order to meet the functional requirements set out in **An2.1.2(1)**, all *IP* are to be at least 16 years of age and documentary evidence is to be made available to the master that they are physically and medically fit to fulfil all the requirements in this **An3.1**, based on a standard acceptable to the Administration.

2 In order to meet the functional requirements set out in **An2.1.2(2)**, all *IP* are to demonstrate adequate knowledge of the working language on board in order to be able to communicate effectively and understand any instructions given by the ship's crew.

3 In order to meet the functional requirements set out in **An2.1.2(3)**, all *IP* are to receive training or instruction with respect to the following **(1)** to **(3)** prior to boarding the ship.

(1) Personal survival that includes the following **(a)** to **(d):**

(a) knowledge of emergency situations that may occur on board a ship,

(b) use of personal life-saving equipment,

(c) safely entering the water from a height and survival in the water, and

(d) boarding a survival craft from the ship and water while wearing a lifejacket.

(2) Fire safety that includes knowledge of the types of fire hazards on board ships and precautionary measures to be taken to prevent a fire.

(3) Personal safety and social responsibilities that include the following **(a)** to **(c):**

(a) understanding the authority of the master or their representative on board,

(b) complying with instructions provided by the ship's crew, and

(c) understanding the safety information symbols, signs and alarm signals found on board the ship.

4 Notwithstanding **-3** above, suitably qualified industrial personnel based on a standard acceptable to the Administration may be considered to meet the functional requirements set out in **An2.1.2(3)**.

5 No *IP* are to be allowed on board the ship unless the master has been provided with documentation confirming that such personnel have received the training or instructions required by this regulation.

6 In order to meet the functional requirement set out in **An1.2(4)**, all *IP* are to receive onboard ship-specific safety training that includes the following **(1)** to **(4)** immediately after boarding or prior to leaving ports.

(1) the layout of the ship;

(2) the location of personal life-saving appliances, muster and embarkation stations, emergency escape routes and first aid stations;

(3) the safety information, symbols, signs and alarms on board; and

(4) action to be taken in the event of an alarm sounding or the declaration of an emergency.

7 In order to meet the functional requirement set out in **An2.1.2(5)**, all *IP* are to receive training in the ship's procedures, arrangements and other additional safety measures or equipment related to the transfer of personnel to other ships, offshore facilities or both.

An3.2 Safe Transfer (IP Code 3.2)

An3.2.1 Requirements

1 In order to meet the functional requirement in **An2.2.2(1)**, personnel transfer arrangements are to comply with the following **(1)** to **(10)**.

(1) Personnel transfer appliances and arrangements are to be kept clean, properly maintained and regularly inspected to ensure that they are safe to use.

(2) The rigging and use of personnel transfer arrangements is to be supervised by a responsible officer and operated by properly trained personnel. Safety procedures are to be established and followed by personnel engaged in rigging and operating any

mechanical equipment.

(3) Means of communication are to be provided between the supervising responsible officer and the navigation bridge.

(4) All personnel transfer arrangements are to be permanently marked to enable identification of each appliance for the purposes of survey, inspection and record-keeping. A record of use and maintenance is to be kept on board the ship.

(5) Prior to commencing personnel transfer operations, personnel transfer arrangements are to be checked to ensure they are functioning properly.

(6) Means are to be provided to ensure safe and unobstructed passage for *IP* between personnel transfer arrangements and where they are being transported or accommodated on board.

(7) Lighting capable of being supplied by emergency sources of power is to be provided to illuminate personnel transfer arrangements, the water below and the passage specified in **(6)** above.

(8) Deck areas for personnel transfers are to be designated and free from obstructions.

(9) Job safety analyses are to be carried out when planning, and before executing, personnel transfers at sea. Such analyses are to take into account environmental conditions as well as operational and equipment limitations.

(10) When planning personnel transfers, the guidance on safety when transferring persons at sea in *MSC-MEPC.7/Circ.10* or another relevant guidance acceptable to the Administration is to be taken into account.

2 In order to meet the functional requirement in **An2.2(2)**, personnel transfer arrangements are to be designed, constructed, tested and installed in accordance with standards acceptable to the Administration or the requirements of a classification society which is recognised by the Administration.

3 In order to meet the functional requirement in **An2.2.2(2)**, personnel transfer arrangements are to comply with the following **(1)** to **(3)**.

(1) The design of the personnel transfer arrangements is to be suitable for the arrangement on the ship.

(2) An analysis is to be performed in order to evaluate failures in *IP* transfer arrangements and all associated systems which might impair the availability of the transfer arrangements, endanger the safety of the persons involved or both. Such analysis is to comply with following **(a)** and **(b)**.

(a) Consider the effects of failure of all equipment and systems due to single failure, fire in any space or flooding of any watertight compartment that could affect the availability of the transfer arrangements.

(b) Provide solutions to ensure the availability of *IP* transfer arrangements and the safety of all persons involved upon the failures identified in **(a)** above.

(3) Where a single failure results in the failure of more than one component in a system (i.e. a common cause failure), all resulting failures are to be considered together. Where the occurrence of a failure leads directly to further failures, all such failures are to be considered together.

4 In order to meet the functional requirement in **An2.2.2(3)**, the manoeuvrability of the ship together with the expected need for the ship to keep position over time is to be evaluated to ensure the correct use of position-keeping equipment.

5 In order to meet the functional requirement in **An2.2.2(4)**, procedures are to be in place to ensure correct information on the number and identity of all persons on board at all times.

An4 ADDITIONAL REGULATIONS FOR SHIPS CERTIFIED IN ACCORDANCE WITH SOLAS CHAPTER I

An4.1 General (IP Code 4.1)

An4.1.1 Requirements

1 Unless expressly provided otherwise in this part, ships carrying *IP* are to meet the *SOLAS* requirements for cargo ships in addition to applicable requirements in this part.

2 Ships complying with **An4.1.1-1** are considered to meet the goals and functional requirements in paragraphs **An2.3** to **An2.9** in addition to applicable regulations in this chapter.

An4.2 Subdivision and Stability (IP Code 4.2)

An4.2.1 Requirements

1 Where the ship is certified to carry more than 240 persons on board, it is to meet the requirements of *SOLAS* regulation II-1/5 as though the ship is a passenger ship and the *IP* are counted as passengers. However, *SOLAS* regulation II-1/5.5 is not applicable.

2 Subdivision and damage stability are to be in accordance with *SOLAS* Chapter II-1, where the ship is considered a passenger ship and *IP* are counted as passengers, with the value *R* as follows:

(1) Where the ship is certified to carry more than 240 persons, the value *R* is assigned as *R*;

(2) Where the ship is certified to carry not more than 60 persons, the value *R* is assigned as 0.8 *R*; or

(3) For more than 60 persons but not more than 240 persons, the value *R* is to be determined by linear interpolation between the values given in **(1)** and **(2)** above.

R: Values according to the following formula

$$1 - \frac{5000}{Ls + 2.5N + 15225}$$

where

L_s: the greatest projected moulded length in metres (m) of the ship at or below deck or decks limiting the vertical extent of flooding with the ship at the deepest subdivision draught.

N: Values according to the following formula

$$N_1 + 2N_2$$

where

N_1: number of persons for whom lifeboats are provided

N_2: number of persons (including officers and crew) the ship is permitted to carry in excess of N_1

3 Where the conditions of service are such that compliance with **An4.2.1-2** above on the basis of $N = N_1 + 2N_2$ is impracticable and where the Administration considers that a suitably reduced degree of hazard exists, a lesser value of *N* may be taken but in no case less than $N = N_1 + N_2$.

4 For ships to which **An4.2.1-2(1)** applies, *SOLAS* regulations II-1/8 and II-1/8-1 and *SOLAS* Chapter II-1, Parts B-2, B-3 and B-4 are to be applied as though the ship is a passenger ship and the *IP* are passengers. However, *SOLAS* regulations II-1/14 and II-1/18 are not applicable.

5 For ships to which **An4.2.1-2(2)** and **An4.2.1-2(3)** apply, except as provided in **An4.2.1-6**, the provisions of SOLAS Chapter II-1, Parts B-2, B-3 and B-4 are to apply as though the ship is a cargo ship and the *IP* are crew. However, the requirements of *SOLAS* regulations II-1/8 and II-1/8-1 need not be applied and *SOLAS* regulations II-1/14 and II-1/18 are not applicable.

6 All ships certified in accordance with this annex are to comply with *SOLAS* regulations II-1/9, II-1/13, II-1/19, II-1/20 and II-1/21 as though the ship is a passenger ship.

An4.3 Machinery Installations (IP Code 4.3)

An4.3.1 Requirements

1 In order to meet the functional requirement set out in **An2.4.2(1)**, the ship is to comply with *SOLAS* regulation II-1/35-1 as though the ship is a passenger ship.

2 In order to meet the functional requirement set out in **An2.4.2(2)**, where the ship is certified to carry more than 240 persons on board, it is to comply *SOLAS* regulation II-1/29 as though the ship is a passenger ship.

An4.4 Electrical Installations (IP Code 4.4)

An4.4.1 Requirements

1 In order to meet the functional requirement set out in **An2.5.2(1)**, electrical installations are to comply with the following **(1)** and **(2)**:

(1) For installations in ships of more than 50 *m* in length carrying not more than 60 persons on board, the requirements in *SOLAS* regulation II-1/42.2.6.1 applies in addition to the requirements in *SOLAS* regulation II-1/43

(2) For installations in ships carrying more than 60 persons on board, *SOLAS* regulation II-1/42 applies.

2 In order to meet the functional requirement set out in **An2.5.2(2)** for installations on ships carrying more than 60 persons on board, *SOLAS* regulation II-1/45.12 applies.

An4.5 Periodically Unattended Machinery Spaces (IP Code 4.5)

An4.5.1 Requirements

In order to meet the functional requirements set out in **An2.6.2**, ships carrying more than 240 persons on board are considered to be passenger ships in relation to *SOLAS* Chapter II-1, Part E.

An4.6 Fire Safety (IP Code 4.6)

An4.6.1 Requirements

In order to meet the functional requirements set out in **An2.4.2(3)** and **An2.7.2**, the following apply:

(1) Where the ship is certified to carry more than 240 persons on board, the requirements for passenger ships carrying more than 36 passengers of *SOLAS* Chapter II-2 apply.

(2) Where the ship is certified to carry more than 60 persons but not more than 240 persons on board, the requirements for passenger ships carrying not more than 36 passengers of *SOLAS* Chapter II-2 apply, except that *SOLAS* regulations II-2/21 and 22 need be applied.

An4.7 Life-Saving Appliances and Arrangements (IP Code 4.7)

An4.7.1 Requirements

In order to meet the functional requirements set out in paragraph **An2.8.2**, the following apply:

(1) For ships carrying more than 60 persons on board, the requirements for passenger ships engaged on international voyages, which are not short international voyages, of SOLAS Chapter III apply.

(2) Regardless of the number of the persons on board, *SOLAS* regulations III/2 and III/19.2.3 are not applicable.

(3) Where the term “passenger” is used in *SOLAS* Chapter III, it is to be read to mean *IP* as defined in **An1.2.1(3)**.

(4) Notwithstanding **(3)** above, the required number of infant or child lifejackets is to be calculated solely based on the number of passengers on board.

An4.8 Dangerous Goods (IP Code 4.8)

An4.8.1 General

IP may only bring dangerous goods on board for the purpose of their role off the ship and with the prior consent of the master of the ship. These dangerous goods are to be considered as cargo and are to be transported in accordance with *SOLAS* Chapter VII, Part A.

An4.8.2 Carriage of Dangerous Goods in Packaged Form

In order to meet the functional requirements in paragraph **An2.9.2**, the following apply:

(1) For ships certified to carry more than 240 persons on board, *SOLAS* regulation II-2/19.3.6.2 for passenger ships carrying more than 36 passengers applies.

(2) For the purpose of the requirements of the *IMDG* Code, ships certified to carry more than 240 persons on board are considered to be passenger ships and those certified to carry 240 or fewer persons on board are considered to be cargo ships.

An4.8.3 Carriage of Dangerous Goods in Solid Form in Bulk

In order to meet the functional requirements in paragraph **An2.9.2**, the following apply:

(1) For ships certified to carry more than 240 persons on board, *SOLAS* regulation II-2/19.3.6.2 for passenger ships carrying more than 36 passengers applies.

(2) For the purpose of the requirements of the *IMSBC* Code, *IP* are considered to be ship personnel in the context of personnel protection.

An4.8.4 Carriage of Dangerous Liquid Chemicals, Liquefied Gases and Oil

1 In order to meet the functional requirements in **An2.9.2**, when simultaneously carrying dangerous liquid chemicals and/or liquefied gases as cargo in bulk and *IP*, the ship is to either be certified in accordance with the requirements of *SOLAS* Chapter VII, Part B or C or meet and be certified in accordance with a standard not inferior to that developed by the Administration. In addition, the following apply:

(1) The carriage of toxic products, low-flashpoint products or acids is not to be allowed when the total number of persons on board exceeds 60.

(2) The areas and spaces on ships where *IP* are not permitted to enter are to be clearly marked.

(3) Arrangements for personnel transfer are to be located outside of cargo areas.

(4) Access to the arrangements for personnel transfer is, as far as practicable, to be located outside of cargo areas.

(5) Embarkation or personnel transfer, and the loading or unloading of cargo are not to take place simultaneously.

2 In order to meet the functional requirements in paragraph **An2.9.2**, when simultaneously carrying oil as cargo, as defined in Annex I of *MARPOL*, and *IP*, the additional requirements in **An4.8.4-1.** above are to apply.

3 "Low-flashpoint products" means any of the following:

(1) noxious liquid substances with flashpoints not exceeding 60 °C,

(2) oil with flashpoints not exceeding 60 °C, and

(3) liquefied gases which require flammable vapour detection in accordance with Chapter 19 of the *IGC* Code.

4 "Toxic products" means either of the following:

(1) dangerous chemicals to which 15.12 of the *IBC* Code applies, or

(2) liquefied gases which require toxic vapour detection in accordance with Chapter 19 of the *IGC* Code.

5 "Acids" mean dangerous chemicals to which 15.11 of the *IBC* Code applies

6 In order to meet the functional requirements in **An2.9.2** when carrying liquefied gases in bulk, , *IP* are considered to be personnel in the context of training and personnel protection for the purpose of the *IGC* Code.

An5 ADDITIONAL REGULATIONS FOR CRAFT CERTIFIED IN ACCORDANCE WITH SOLAS CHAPTER X

An5.1 General (IP Code 5.1)

An5.1.1 Requirements

1 High speed cargo craft certified in accordance with *SOLAS* Chapter X are not to carry more than 60 persons on board.

2 Unless expressly provided otherwise in this chapter, high speed craft carrying not more than 60 persons on board are to meet the requirements for cargo craft in the *HSC* Code and the applicable requirements in this chapter.

3 Craft complying with **An5.1.1-2.** above in addition to the applicable requirements in this part are considered to meet the goals and functional requirements in **An2.3** to**An2.9**.

4 Since the carriage of *IP* on high speed craft is not considered to be a transit voyage as specified in 1.9.1.1 of the *HSC* Code, a permit to operate is required.

5 Where the term "passenger" is used in applicable requirements in the *HSC* Code, it is to be read to mean "persons on board other than crew".

An5.2 Subdivision and Stability (IP Code 5.2)

An5.2.1 Requirements

In order to meet the functional requirements set out in **An2.3.2**, the following apply:

(1) Chapter 2, Part B, except 2.13.2 and 2.14, of the *HSC* Code applies in lieu of Chapter 2, Part C of the *HSC* Code.

(2) When applying the provisions of Chapter 2 of the *HSC* Code, the expression "passenger" is to be read as "persons on board other than crew". In addition, the mass of each such person is to be assumed to be 90 *kg* instead of 75 *kg*.

An5.3 Machinery Installations (IP Code 5.3-)

An5.3.1 Requirements

In order to meet the functional requirements set out in **An2.4.2,** provisions in Chapter 10, Part B of the *HSC* Code applies as applicable to Category A passenger craft in lieu of Chapter 10, Part C of the *HSC* Code.

An5.4 Electrical Installations (IP Code 5.4)

An5.4.1 Requirements

In order to meet the functional requirements set out in **An2.5.2**, 12.7.10 of the *HSC* Code applies.

An5.7 Life-Saving Appliances and Arrangements (IP Code 5.7)

An5.7.1 Requirements

In order to meet the functional requirements set out in **An2.8.2**, the following apply:

(1) 4.2.3 of the *HSC* Code applies.

(2) 8.4.3 of the *HSC* Code applies, and the expression "passenger spaces" is to be read as "*IP* area".

(3) The required number of infant or child lifejackets is to be calculated solely based on the number of passengers on board.

An5.8 Dangerous Goods (IP Code 5.8)

An5.8.1 General

IP may only bring dangerous goods on board for the purpose of their role off the craft and with the prior consent of the master of the craft. These dangerous goods are considered to be cargo and are to be transported in accordance with Chapter 7, Part D of the *HSC* Code.

An5.8.2 Requirements

In order to meet the functional requirements set out in **An2.9.2**, the following apply:

(1) For the purpose of carrying *IP*, the areas and spaces on craft where *IP* are not permitted to enter are to be clearly marked.

(2) Arrangements for personnel transfer are to be located outside of cargo areas.

(3) Access to arrangements for personnel transfer is, as far as practicable, to be located outside of cargo areas.

(4) Embarkation or personnel transfer, and the loading or unloading of cargo are not to take place simultaneously.

Annex 4.4.2-3TOWING WINCH EMERGENCY RELEASE SYSTEMS

1.1 General

1.1.1 General

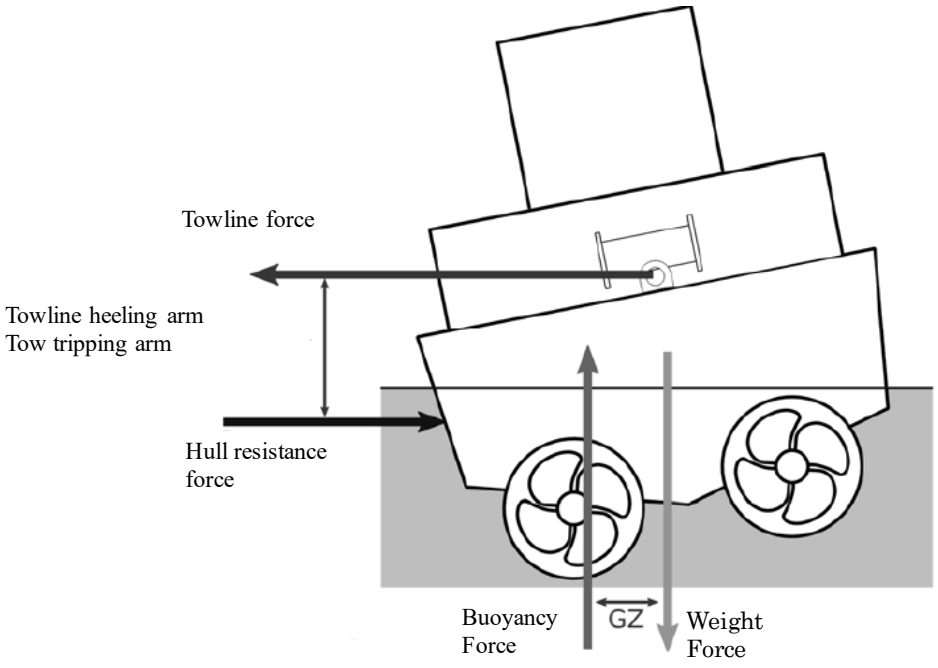
1 This annex defines minimum safety standards for winch emergency release systems provided on towing winches that are used on towing ships and escort tugs within close quarters, ports or terminals, including those ships normally not intended for towing operation in transverse direction (hereinafter referred to as "ships" in this annex).

2 The requirements of this annex apply to towing winches of the ships referred to in **-1** above but do not apply to towing winches on board ships used solely for long distance ocean towage, anchor handling or similar offshore activities.

1.1.2 Purpose

The purpose of this annex is to provide requirements to prevent the capsize of ships when in the act of towage as a result of the towline force acting transversely to ships (in beam direction) as a consequence of an unexpected event (could be loss of propulsion/steering or otherwise), whereby the resulting couple generated by offset and opposing transverse forces (towline force is opposed by thrust or hull resistance force) causes the ships to heel and, ultimately, to capsize. This capsize may be referred to as "girting", "girthing", "girding" or "tripping". See **Fig. 1.2.1-1** which shows the forces acting during towage operations.

Fig. 1.2.1-1 Forces During Towing



1.2 Terminology

1.2.1 Definitions

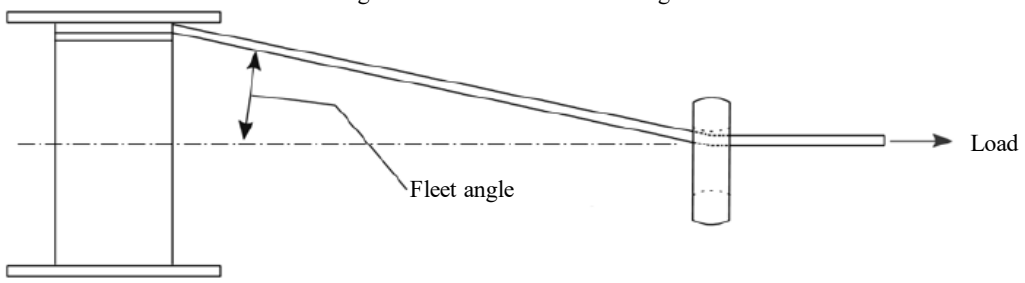
For the purpose of this annex, the following definitions are to apply.

(1) "Emergency release system" refers to the mechanism and associated control arrangements that are used to release the load on the towline in a controlled manner under both normal and blackout conditions.

(2) "Maximum design load" is the maximum load that can be held by the winch as defined by the manufacturer (the manufacturer's rating).

(3) "Fleet angle" is the angle between the applied load (towline force) and the towline as it is wound onto the winch drum. See **Fig. 1.2.1-2**.

Fig. 1.2.1-2 Towline "Fleet Angle"



1.3 General Requirements

1.3.1 Attaching of Towlines

The in-board end of the towline is to be attached to the winch drum with a weak link or similar arrangement that is designed to release the towline at low load.

1.3.2 Emergency Release Systems

All towing winches are to be fitted with an emergency release system.

1.4 Emergency Release System Requirements

1.4.1 Performance requirements

1 The emergency release system is to operate across the full range of towline load, fleet angle and ship heel angle under all normal and reasonably foreseeable abnormal conditions (these may include, but are not limited to, the following: ship electrical failure, variable towline load (for example, due to heavy weather), etc.).

2 The emergency release system is to be capable of operating with towline loads up to at least 100 % of the maximum design load.

3 The emergency release system is to function as quickly as is reasonably practicable and within a maximum of three seconds after activation.

4 The emergency release system is to allow the winch drum to rotate and the towline to pay out in a controlled manner such that, when the emergency release system is activated, there is sufficient resistance to rotation to avoid uncontrolled unwinding of the towline from the drum. Spinning (free, uncontrolled rotation) of the winch drum is to be avoided, as this could cause the towline to get stuck and disable the release function of the winch.

5 Once the emergency release is activated, the towline load required to rotate the winch drum is to be no greater than **(1)** or **(2)**:

(1) The lesser of five *tonnes* or 5% of the maximum design load when two layers of towline are on the drum, or

(2) 15% of the maximum design load where it is demonstrated that this resistance to rotation does not exceed 25% of the force that will result in listing sufficient for the immersion of the lowest unprotected opening.

6 Emergency release of the towline is to be possible in the event of a blackout. For this purpose, where additional sources of

energy are required, such sources are to comply with -7 below.

7 The sources of energy required by -6 above are to be sufficient to achieve the most onerous of the following conditions (as applicable):

(1) Sufficient for at least three attempts to release the towline (i.e. three activations of the emergency release system). Where the system provides energy for more than one winch it is to be sufficient for three activations of the most demanding winch connected to it.

(2) Where the winch design is such that the drum release mechanism requires continuous application of power (e.g. where the brake is applied by spring tension and released using hydraulic or pneumatic power) sufficient power is to be provided to operate the emergency release system (e.g. hold the brake open and allow release of the towline) in the event of a blackout for a minimum of 5 *minutes*. This may be reduced to the time required for the full length of the towline to feed off the winch drum at the load specified in -5 above if this is less than 5 *minutes*.

1.4.2 Operational Requirements

1 Emergency release operation is to be possible from the bridge and from the winch control station on deck. The winch control station on deck is to be in a safe location. A position in close proximity to the winch is not regarded as "safe location", unless it is documented that the position is at least protected against towline break or winch failure.

2 The emergency release control is to be located close to an emergency stop button for winch operation, if provided, and are to be clearly identifiable, clearly visible, easily accessible and positioned to allow safe operability.

3 The emergency release function is to take priority over any emergency stop function. Activation of the winch emergency stop from any location is not to inhibit operation of the emergency release system from any location.

4 Emergency release system control buttons are to require positive action to cancel, the positive action may be made at a different control position from the one where the emergency release was activated. It is to always be possible to cancel the emergency release from the bridge regardless of the activation location and without manual intervention on the working deck.

5 Controls for emergency use are to be protected against accidental use.

6 Indications are to be provided on the bridge for all power supply and/or pressure levels related to the normal operation of the emergency release system. Alarms are to activate automatically if any level falls outside of the limits within which the emergency release system is fully operational.

7 Wherever practicable, control of the emergency release system is to be provided by a hard-wired system, fully independent of programmable electronic systems.

8 Computer based systems that operate or may affect the control of emergency release systems are to meet the requirements for Category III systems in accordance with **Chapters 1**, **2** and **3, Part X**.

9 Components critical for the safe operation of the emergency release system are to be identified by the manufacturer.

1.5 Test Requirements

1.5.1 General

1 All testing defined within Section 4 is to be witnessed by the Surveyor.

2 For each emergency release system or type thereof, the performance requirements of **1.4.1** are to be verified either at the manufacturer's works or as part of the commissioning of the towing winch when it is installed on board. Where verification solely through testing is impracticable (e.g. due to health and safety), testing may be combined with inspection, analysis or demonstration in agreement with the Society.

3 The performance capabilities as well as instructions for operation, of the emergency release system are to be documented by the manufacturer and made available on board the ship on which the winch has been installed.

4 Instructions for surveys of the emergency release system are to be documented by the manufacturer, agreed by the Society and made available on board the ship on which the winch has been installed.

5 Where necessary for conducting the annual and special surveys of the winch, adequately sized strong points are to be provided on deck.

1.5.2 Installation Trials

1 The full functionality of the emergency release system is to be tested as part of the shipboard commissioning trials to the

satisfaction of the surveyor. Testing may be conducted either during a bollard pull test or by applying the towline load against a strong point on the deck of the tug that is certified to the appropriate load.

2 Where the performance of the winch in accordance with **1.4.1** has previously been verified, the load applied for the installation trials is to be at least the lesser of 30% of the maximum design load or 80% of the ship's bollard pull.

Contents

GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

Part O WORK-SHIPS

O1 GENERAL

O1.1 Application and Equivalency

O1.1.1 Application

1 With respect to the reduction of scantlings of the structural members of ships to be classed for restricted service, the provisions in **1.1.1-2, Part CS of the Rules** are to apply except for those specially prescribed in this Part.

2 The "special consideration" referred to in **1.1.1-6, Part O of the Rules** means that measures deemed appropriate by the Administration (for example, the application of the *IP* Code, application of the *SPS* Code or risk assessments and treatments for ships which have large embarking capacities) are to be taken.

O1.2 General

O1.2.4 Class Notations

With respect to ships complying with relevant requirements given in this part, notations corresponding to the purpose of those ships defined in **1.3.2, Part O of the Rules** are affixed to the classification characters as follows:

(1) Dredgers: *Dredger* (abbreviated to *D*)

(2) Crane ships

(a) Ship-type ships: *Crane Vessel* (abbreviated to *CV*)

(b) Barge-type ships: *Floating Crane* (abbreviated to *FC*)

(3) Vessels engaged in towing operations

(a) Tugs: *Tug*

(b) Ocean Tugs: *Towing Vessel* (abbreviated to *TV*)

(c) Escort Tugs: *Escort Vessel* (abbreviated to *EV*)

(4) Pusher tugs: *Pusher*

(5) Fire fighting vessels

With respect to fire fighting vessels, the following notations corresponding to the installed fire fighting equipment defined in **O6.4.2-1** are affixed.

(a) FFV1 vessels: *Fire Fighting Vessel-Type 1* (abbreviated to *FFV1*)

(b) FFV2 vessels: *Fire Fighting Vessel-Type 2* (abbreviated to *FFV2*)

(c) FFV3 vessels: *Fire Fighting Vessel-Type 3* (abbreviated to *FFV3*)

In cases where the fire fighting equipment specified in **Table O1.2.4** is installed, additional descriptions can be affixed. (For example, *Fire Fighting Vessel-Type 1 equipped with WSS, MFG*)

In addition, if foam monitor systems for fire fighting complying with the requirements given in **O6.4.2-9** are installed, the following additional descriptions are affixed. (For example, *Fire Fighting Vessel-Type 3 equipped with WSS, FMS3*)

(d) *FMS1*: Have capacities of more than 1,000*l*/ *minute*

(e) *FMS2*: Have capacities of more than 3,000*l*/ *minute*

(f) *FMS3*: Have capacities of more than 6,000*l*/*minute*

(g) *FMS4*: Have capacities of more than 12,000 *l*/*minute*

(h) *FMS5*: Two fixed low expansion foam monitors that have capacities more than 5,000 *l/minute*

(6) Offshore supply vessels: *Offshore Supply Vessel* (abbreviated to *OSV*)

(7) Anchor handling vessels: *Anchor Handling Vessel* (abbreviated to *AHV*)

(8) Vessels engaged in laying objects on the seabed

(a) Cable laying vessels: *Cable Layer* (abbreviated to *CL*)

(b) Pipe laying vessels: *Pipe Layer* (abbreviated to *PL*)

(9) Oil Recovery Vessels: *Oil Recovery Vessel* (abbreviated to *ORV*)

(10) Wind turbine installation ships

(a) Ship-type ships: *Wind Turbine Installation Ship* (abbreviated to *WTIS*)

(b) Barge-type ships: *Wind Turbine Installation Barge* (abbreviated to *WTIB*)

(c) Self-elevating ships: *Self-elevating Wind Turbine Installation Ship* (abbreviated to *SEWTIS*) or *Self-elevating Wind Turbine Installation Barge* (abbreviated to *SEWTIB*)

(d) Column-stabilized ships: *Column-stabilized Wind Turbine Installation Unit* (abbreviated to *CSWTIU*)

(11) Wind Farm Support Vessel

(a) Ships primarily engaged in transporting workers to the offshore wind turbines and serving as accommodation facilities for workers

Wind Farm Support Vessel - Service Operation Vessel (abbreviated as *WFSV-SOV*)

(b) Ships primarily engaged in transporting workers

Wind Farm Support Vessel -Crew Transfer Vessel (abbreviated as *WFSV-CTV*)

In addition, in cases where **12.8.2-3, Part O of the Rules** is applied and when requested by shipowners, the following additional notation may be affixed.

"*Heavy Deck Cargo*" (abbreviated as *HDC*)

(12) Notations, except for that mentioned above, corresponding to intended purposes of work-ships

within the **(1)** to **(11)** mentioned above, notations corresponding to each purpose are affixed. (For example, Tugs-cum-Fire fighting vessels: *Tug/Fire Fighting Vessel-Type 1*)

Table O1.2.4 Fire Fighting Equipment

Fire fighting equipment	Additional descriptions
Water-spray system	*WSS*
Mobile high expansion foam generator	*MFG*
Foam monitor system	*FMS*

O1.2.6 Load Lines

With respect to the provisions of **1.2.6-3, Part O of the Rules**, the requirements in **Chapter 8, Part P of the Rules** are to be correspondingly applied to self-elevating and column-stabilized ships.

O1.2.9 Operating Manual

An Operating Manual is to include appropriate information from the following, as applicable to the particular ship, so as to provide suitable guidance to the operating personnel with regard to the safe operation of the ship:

(1) General description of the ship;

(2) Pertinent data for each approved mode of operation, including design and variable loading, environmental conditions, draught, etc.;

(3) The lowest atmospheric and sea water temperatures assumed at the design stage;

(4) General arrangement showing watertight compartments, closures, vents, allowable deck loadings, etc.;

(5) Hydrostatic curves or equivalent data;

(6) Capacity plan showing the capacities of tanks, centres of gravity, free surface corrections, etc.;

(7) Instructions for operation, including precautions to be taken in adverse weather, changing mode of operation, any inherent limitations of operation, etc.;

(8) Plans and description of the ballast system and instructions for ballasting. If permanent ballast is to be used, the weight, location

and substance used are to be clearly indicated;

(9) Hazardous areas plan;

(10) Fire control plan;

(11) Arrangement of life-saving appliances together with escape routes;

(12) Light ship data based on the results of an inclining experiment, etc.;

(13) Stability information

(14) Information regarding the effects of deck cargo on stability;

(15) Diagrams of main and auxiliary wiring systems;

(16) Instructions for the operation of dynamic positioning system;

(17) For self-elevating ships, instructions for operation which show deck elevation and pre-loading procedures;

(18) Other instructions deemed necessary by the Society.

O1.3 Definitions

O1.3.2 Work-ship

Pusher tugs defined in **1.3.2(4)**, **Part O of the Rules** are categorized into the following **(1)** or **(2)** according to the way they are connected to barges

(1) Easy separation type pusher tugs:

Connected by a pin and can be separated quickly and easily during an emergency.

(2) Unity type pusher barge:

Pusher tugs which are tightly connected to barges so that a single structure is formed. More specifically,

(a) Connection by a bolt and so on

(b) Has an uneven form structure so that they complement each other in the connecting part, and can be secured by wire ropes and so on after connection is made.

O2 DREDGERS

O2.2 Stability

O2.2.1 General

Ships are to comply with the following requirements corresponding to their designated operations in addition to the requirements given in **2.2.1**, **Part U of the Rules**. However, in cases where other stability requirements deemed appropriate by the Society are in effect, this requirement may be dispensed with.

Stability curves are to comply with the following:

The residual area between a righting lever curve and a heeling lever curve due to designated operations is not to be less than 0.09 *m-rad*. The area is to be determined between the first intercept of the two curves and the second intercept or the angle of down flooding, whichever is less.

O3 CRANE SHIPS

O3.2 Stability

O3.2.2 Stability Requirements during Lifting Operations

"Stability requirements which are separately specified by the Society" specified in **3.2.2, Part O of the Rules** refers to requirements specified in **Annex U1.1.1-4 "GUIDANCE FOR REQUIREMENTS ON INTACT STABILITY DURING LIFTING OPERATIONS", Part U of the Guidance**.

O3.4 Hull Equipment

O3.4.1 General

"At the discretion of the Society" referred to in **3.4.1-3, Part O of the Rules** is to be in accordance with the requirements in the **Rules for Cargo Handling Appliances**.

O4 VESSELS ENGAGED IN TOWING OPERATION

O4.2 Stability

O4.2.1 General

Ships engaged in towing operations are to comply with the following requirements or the requirements given in **Annex O4.2.1"GUIDANCE FOR INTACT STABILITY FOR SHIPS ENGAGED IN TOWING OPERATIONS"**, in addition to the requirements of **2.2.1, Part U of the Rules**.

(1) The initial transverse metacentric height (G_0M) is not to be less than 0.15 *m*.

(2) The stability curves are to comply with the following **(a)** or **(b)**:

(a) The residual area between a righting lever curve and a heeling lever curve developed from the bollard pull force is not to be less than 0.09 *m-rad*. The area is to be determined between the first interception of the two curves and the second interception or the angle of down flooding whichever is less. (The area as specified by "*A*" in **Fig. O4.2.1**)

(b) The area under a righting lever curve ("*A*" + "*B*" in **Fig. O4.2.1**) is not to be less than 1.4 *times* the area under a heeling lever curve developed from the bollard pull force ("*B*" + "*C*" in **Fig. O4.2.1**). The areas are to be determined between 0 *degree* and the 2nd interception or the angle of down flooding whichever is less.

In the application of the above requirements, the heeling lever (l_h) curve developed from the bollard pull force is to be derived by using the following formula. For ships intended for towing astern, such lever is to be that for towing ahead or that for towing astern, whichever is larger.

$$l_h = \frac{\kappa \cdot T \cdot h \cdot \cos\theta}{9.81 \cdot \Delta} \quad (m)$$

where

κ: Coefficient relating to type of propulsion, is to be taken equal to 0.7 for ships with azimuth thruster(s) and 0.5 for other ships.

T: Maximum bollard pull (*kN*). In principle, maximum bollard pull is to be derived from the actual test at the maximum continuous output of the engine(s). However, a nominal bollard pull specified by constructor of the considered ship may be accepted, provided that such value is not less than value given by **Table O4.2.1** as a standard, unless records of bollard pull tests in similar ships or sufficient information provided by the constructor.

h: Vertical distance (*m*) between the towing hook and the centre of the propeller.

Δ: Displacement (*ton*)

(3) Maximum bollard pull used in the application of **(2)** above is to be clearly stated in the ship's stability information and drawings relating to ship's towing arrangements. Such maximum bollard pull is also to be indicated at an appropriate position on each of the ship's towing arrangements.

(4) In principle, towing winches are to be provided with an appropriate device being capable of releasing the towing cable in an instant. Notwithstanding the above, towing winches of ships only engaged in coasting service or equivalent (except for winches to which **4.4.2-3, Part O of the Rules** applies), such device may be dispensed with, provided that appropriate safety procedures for emergency are to be stated in the ship's stability information.

Fig. O4.2.1 Heeling Lever Curve Developed from the Bollard Pull Force

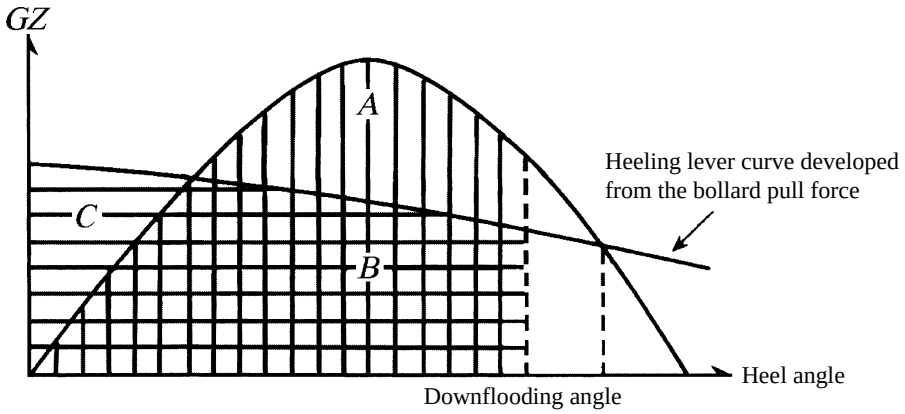


Table O4.2.1 Maximum Bollard Pull (*kN*)

	Towing ahead	Towing astern	
		For azimuth thruster(s)	For others
For propeller(s) not fitted with nozzles	0.16H	0.14H	0.08H
For propeller(s) fitted with nozzles	0.19H	0.17H	0.10H

H: Maximum continuous output of engine(s) (*kW*)

Note:

For ships other than conventional ships having propulsion(s) in the aft end, a special consideration is to be given for each ship.

O4.3 Hull Construction

O4.3.5 Supporting Structures of Towing Equipment

With respect to the provisions of **4.3.5, Part O of the Rules**, the allowable stress values for each member of the supporting structures of towing equipment are, in principle, to be as given below. Different values, however, may be used in consideration of the arrangements, etc. of the supporting structures.

$\sigma = 166/K(N/mm^2)$

$\tau = 96/K(N/mm^2)$

$\sigma_e = 196/K(N/mm^2)$

σ: $\sigma_a + \sigma_b$(Normal stress)

σ_a: Axial stress

σ_b: Bending stress

τ: Shearing stress in plane

σ_e: $\sigma_e = \sqrt{\sigma^2 + 3\tau^2}$ (Equivalent stress)

K: Coefficient corresponding to the kind of steel

e.g. 1.0 for mild steel, the values specified in **3.2.1.2-2, Part 1, Part C of the Rules** for high tensile steel

O4.4 Hull Equipment

O4.4.1 General

"At the discretion of the Society" referred to in **4.4.1-3, Part O of the Rules** is to be in accordance with the requirements in the **Rules for Cargo Handling Appliances**.

O4.4.2 Towing Equipment

The breaking strength of towlines is to be the maximum design towline force times at least 2.5.

O5 PUSHER TUGS

O5.1 General

O5.1.1 Application

Integrated pusher tugs are to comply with relevant requirements given in **Part O of the Rules** as pusher tugs integrated with barges in addition to complying with relevant requirements given in **Part O of the Rules** as pusher tugs.

O5.2 Stability

O5.2.1 General

Ships are to comply with the following requirements corresponding to their designated operations in addition to the requirements given in **2.2.1**, **Part U of the Rules**. However, in cases where other stability requirements deemed appropriate by the Society are in effect, this requirement may be dispensed with.

Stability curves are to comply with the following:

The residual area between a righting lever curve and a heeling lever curve due to designated operations is not to be less than 0.09*m-rad*. The area is to be determined between the first intercept of the two curves and the second intercept or the angle of down flooding, whichever is less.

O6 FIRE FIGHTING VESSELS

O6.2 Stability

O6.2.1 General

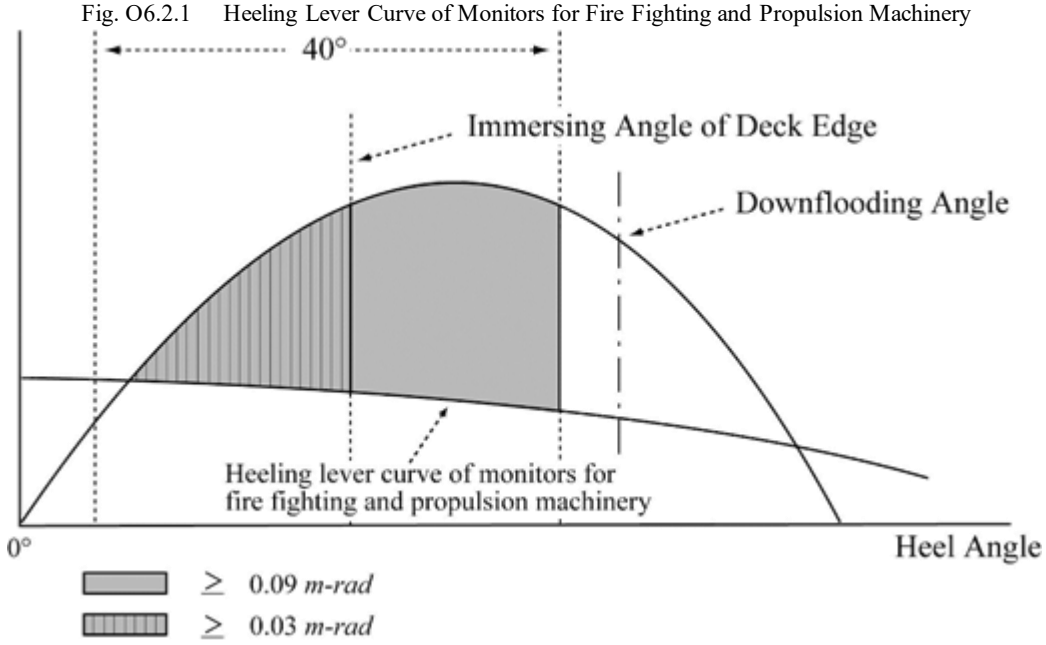
Fire fighting vessels are to comply with following requirements in addition to the requirements given in 2.2.1, Part U of the Rules.

(1) Stability curves are to comply with the following **(a)** and **(b)**:

(a) The residual area between a righting lever curve and a heeling lever curve of monitors for fire fighting and propulsion machinery such as thrusters for ship positioning is not to be less than 0.09*m-rad*. The area is to be determined between the first intercept of the two curves and the angle up to an angle of heel of 40 *degrees* beyond the angle of the first intercept or the downflooding angle, whichever is less.

(b) The residual area between a righting lever curve and a heeling lever curve of monitors for fire fighting and propulsion machinery such as thrusters for ship positioning is not to be less than 0.09*m-rad*. The area is to be determined between the first intercept of the two curves and the downflooding angle or the immersing angle of the deck edge, whichever is less. In such cases, the immersing angle of the deck edge is to be according to U2.3.1-1(2).

Fig. O6.2.1 Heeling Lever Curve of Monitors for Fire Fighting and Propulsion Machinery



O6.4 Hull Equipment

O6.4.2 Fire Fighting Equipment for Fighting Fires on Other Vessels

1 Fire fighting vessels are to comply with O6.4.2 as either type specified in Table O6.4.2.

2 The fuel oil tanks of fire fighting vessels are to be capable of carrying sufficient fuel oil for fire fighting operations with all fixed water monitors in use at maximum and continuous propulsion operation during the operation time specified in Table O6.4.2.

3 Water monitors for fire fighting are to be according to following **(1)** to **(5)**:

(1) The range and height of trajectory of monitor jets are to be not less than those specified in Table O6.4.2 with all fixed water monitors in use simultaneously.

(2) Water monitors are to be capable of adequate adjustment in the vertical and horizontal directions.

(3) Means are to be provided for preventing monitor jets from impinging on ship structure and equipment.

(4) Water monitors are to be capable of being operated and maneuvered both locally and at a remote-control station. The water monitor remote-control station is to have adequate overall operational visibility and protection.

(5) Control systems are to be suitably protected from external damage.

4 The pump capacity of water monitors is to be not less than that specified in **Table O6.4.2**.

5 Hoses and nozzles for fire fighting are to be according to following **(1)** to **(3)**:

(1) Each nozzle is to be capable of producing a jet and spray.

(2) Hoses are to be not less than 38*mm* or more than 65*mm* in diameter, and are to be at least 15*m* in length.

(3) A water jet flow of at least 12*m* is to be provided.

6 Fire-fighter's outfits are to be according to following **(1)** to **(3)**:

(1) Fire-fighter's outfits are to be according to **23.2.1**, **Part R of the Rules**.

(2) At least one set of fully charged spare air bottles is to be provided for each apparatus.

(3) Means for fully recharging free from contamination the air cylinders used for breathing apparatus in a time not exceeding 30 *minutes* are to be suitably located.

7 Searchlights are to be capable of providing effective horizontal and vertical ranges of coverage.

8 In cases where additional mobile high expansion foam monitors are provided according to **O1.2.4(5)**, each mobile high expansion foam monitor is to have a minimum capacity of $100m^3/minute$. In addition, total foam forming liquid carried is to be capable of at least 30 *minutes* of foam production.

9 In cases where additional foam monitor systems for fire fighting are provided according to **O1.2.4(5)**, foam monitor systems are to be according to following **(1)** to **(3)**:

(1) Two fixed low expansion foam monitors are to be installed.

(2) The foam expansion ratio is not to be more than 15 to 1. In addition, the total foam forming liquid carried is to be capable of at least 30 *minutes* of foam production.

(3) A foam throw height of at least 50*m* above sea level with foam monitors in simultaneous use at maximum foam generation is to be provided.

Table O6.4.2 Minimum Requirements for Fire Fighting Vessels

	FFV1	FFV2			FFV3	
Total pump capacity (m^3/h)	2,400	7,200			9,600	
Number of pumps(1), (2)	1	2			2	
Number of water monitors	2	2	3	4	3	4
Discharge rate per monitor (m^3/h) (3)	1,200	3,600	2,400	1,800	3,200	2,400
Monitor range (m)	120	150			150	
Height of water jets of monitors (m) (4)	45	70			70	
Number of hose connections on each side of vessel	4	8			8	
Number of fire-fighter's outfits	4	8			8	
Fuel oil capacity (*hours*)	24	96			96	
Number of search lights	2	2			2	

Notes:

(1) Pumps used for extinguishing fires onboard a vessel may be used for fighting fires on other vessels.

(2) It is recommended that fire pump suction velocity generally not exceed 2*m/sec* and discharge piping to water monitors generally not exceed 4*m/sec* operational velocity in order to assure adequate system capacity.

(3) Provided that total discharge capacity of water monitors installed on FFV2 or FFV3 fire fighting vessels is equal to total pump capacity, the discharge rate per monitor may be less than that specified in the above Table. However, in all cases, the discharge rate per monitor of each monitor is to be more than $1{,}800m^3/h$.

(4) The range of water jets is to be more than 70*m* from the nearest part of the fire fighting vessel. The height of water jets from sea level is to be at least that specified in the above table.

O6.5 Machinery

O6.5.5 Sea Inlets for Fire Fighting Operations

The “shut off valves” specified in **6.5.5-4** to **-6**, **Part O of the Rules** may be also used as sea valves.

O6.7 Fire Protection, Means of Escape and Fire Extinguishing Systems

O6.7.4 Water-spray Systems

Water-spray systems are to have a capacity of $10l/minute/m^2$ for protected areas of uninsulated steel and $5l/minute/m^2$ for protected areas which are insulated internally to *A*-60 standards.

O7 OFFSHORE SUPPLY VESSELS

O7.2 Stability

O7.2.1 General

1 With regard to intact stability, 2.4, Part B of *IMO Res. MSC*.267(85) "*International Code on Intact Stability 2008 (2008 IS Code)*" is to apply in addition to **Part U of the Rules**.

2 "Those ships specifically approved by the Society" refers to the offshore supply vessels complying with the requirements of *IMO Resolution MSC*.235(82), as amended.

3 For offshore supply vessels, the following requirements are to apply in cases where the requirements in **1.3.9, Annex U1.2.1 Guidance for Stability Information for Master, Part U of the Guidance** apply.

(1) The following conditions are to be included in the standard loading conditions in addition to those specified in **1.3.9-1, Annex U1.2.1 Guidance for Stability Information for Master, Part U of the Guidance.**

(a) The following **i)** to **iii)** full load departure conditions and full load arrival conditions:

i) The condition is to be as a ship with cargo distributed below deck and with cargo specified by position and weight on deck, corresponding to the worst service condition.

ii) If the ship has tanks for liquid cargo, the effective deadweight in the loading conditions therein described is to be distributed according to the following two assumptions: with cargo tanks full and with cargo tanks empty.

iii) In cases where pipes are carried on deck, a quantity of trapped water equal to a certain percentage of the net volume of the pipe deck cargo is to be assumed in and around the pipes. The net volume is to be taken as the internal volume of the pipes, plus the volume between the pipes. This percentage is to be:

1) 30 if the freeboard amidships is equal to or less than $0.015L_f$; and

2) 10 if the freeboard amidships is equal to or greater than $0.03L_f$.

3) For intermediate values of the freeboard amidships, the percentage may be obtained by linear interpolation.

However, if the effects of sheer aft, actual trim and area of operation are taken into account, these requirements may be waived.

(b) Ship in the worst anticipated operating condition

(2) A realistic stowage weight, the height of the cargo and its centre of gravity are to be stated in addition to the items specified in **1.3.9-2, Annex U1.2.1 Guidance for Stability Information for Master, Part U of the Guidance**.

O7.3 Hull Construction

O7.3.5 Superstructure and Deckhouses

The water head used for the calculation of the scantlings of structure end bulkheads and deckhouse boundary walls is not to be less than that obtained from **Table O7.3.5**.

Table O7.3.5

Exposed front bulkhead and wall of the first tier	8.0(m)
Side walls, aft bulkheads and aft walls	3.3(m)

O7.4 Hull Equipment

O7.4.1 General

"At the discretion of the Society" referred to in **7.4.1-3, Part O of the Rules** is to be in accordance with the requirements in the **Rules for Cargo Handling Appliances**.

O7.4.2 Fenders

In cases where ships are fitted with fenders, such ships are to be according to the following **(1)** and **(2)**:

(1) Fender materials are to be not less than the steel required for Grade A materials.

(2) Carling plates are to be arranged between the side frames bearing the fender loads.

O7.4.3 Protection of Decks

The thickness of wooden sheathing is to be at least $50mm$.

O7.4.4 Cargo Loading Equipment

The section moduli of cargo rails and stanchions are to be not less than that required by the following equation:

Stanchion: $7.8CbHSh\,cm^3$

Cargo rail: $7.8CbHSh^2 \qquad cm^3$

C : 1.3 for stanchions, and 0.11 for cargo rails

b : breath of cargo deck, between cargo rails (m)

H : mean height of cargo (m)

S : spacing of cargo rail stanchion (m)

h : height of cargo rail (m)

O8 ANCHOR HANDLING VESSELS

O8.2 Stability

O8.2.1 General

Ships are to comply with the requirements given in **Annex O8.2.1 "GUIDANCE FOR INTACT STABILITY FOR SHIPS ENGAGED IN ANCHOR HANDLING OPERATIONS"** in addition to the requirements given in **2.2.1, Part U of the Rules**. However, in cases where other stability requirements deemed appropriate by the Society are in effect, this requirement may be dispensed with.

O8.3 Hull Construction

O8.3.2 Supporting Structures of Anchor Handling Equipment

With respect to the provisions of **8.3.2, Part O of the Rules**, the allowable stress values for each member of the supporting structures of anchor handling equipment and in way of parts where anchors are stored as cargo are, in principle, to be as given below. Different values, however, may be used in consideration of the arrangements, etc. of the supporting structures.

$\sigma = 166/K(N/mm^2)$

$\tau = 96/K(N/mm^2)$

$\sigma_e = 196/K(N/mm^2)$

σ: $\sigma_a + \sigma_b$ (Normal stress)

σ_a: Axial stress

σ_b: Bending stress

τ: Shearing stress in plane

σ_e: $\sigma_e = \sqrt{\sigma^2 + 3\tau^2}$ (Equivalent stress)

K: Coefficient corresponding to the kind of steel

e.g. 1.0 for mild steel, the values specified in **3.2.1.2-2, Part 1, Part C of the Rules** for high tensile steel

O8.4 Hull Equipment

O8.4.1 General

"At the discretion of the Society" referred to in **8.4.1-3, Part O of the Rules** is to be in accordance with the requirements in the **Rules for Cargo Handling Appliances**.

O8.4.2 Protection of Deck Areas

Cases "deemed appropriately by the Society" refer to those where the plate thickness is increased by $2.5mm$.

O9 VESSELS ENGAGED IN LAYING OBJECTS ON THE SEABED

O9.2 Stability

O9.2.1 General

Ships are to comply with the following requirements corresponding to their designated operations in addition to the requirements given in **2.2.1, Part U of the Rules**. However, in cases where other stability requirements deemed appropriate by the Society are in effect, this requirement may be dispensed with.

Stability curves are to comply with the following:

The residual area between a righting lever curve and a heeling lever curve due to designated operations is not to be less than 0.09*m-rad*. The area is to be determined between the first intercept of the two curves and the second intercept or the angle of down flooding, whichever is less.

O9.4 Hull Equipment

O9.4.1 General

"At the discretion of the Society" referred to in **9.4.1-3, Part O of the Rules** is to be in accordance with the requirements in the **Rules for Cargo Handling Appliances**.

O10 OIL RECOVERY VESSELS

O10.2 Stability

O10.2.1 General

Ships are to comply with the following requirements corresponding to their designated operations in addition to the requirements given in **2.2.1, Part U of the Rules**. However, in cases where other stability requirements deemed appropriate by the Society are in effect, this requirement may be dispensed with.

Stability curves are to comply with the following:

The residual area between a righting lever curve and a heeling lever curve due to designated operations is not to be less than 0.09*m-rad*. The area is to be determined between the first intercept of the two curves and the second intercept or the angle of down flooding, whichever is less.

O10.9 Fire Protection, Means of Escape and Fire Extinguishing Systems

O10.9.2 Ventilation Systems Installed in Hazardous Areas

The ventilation fans which are "designed so as not to emit sparks" specified in **10.9.2(1)(b), Part O of the Rules** mean those ventilation fans complying with the requirements of **R4.5.4-1(2)**. For the purpose of this requirement, protection screens of not more than 13*mm* square mesh are to be fitted in the inlet and outlet ventilation openings of the ducts fitted with such fans on the open deck.

O11 WIND TURBINE INSTALLATION SHIPS

O11.2 Stability

O11.2.2 Stability Requirements during Lifting Operations

"Stability requirements which are separately specified by the Society" specified in **11.2.2, Part O of the Rules** refers to requirements specified in **Annex U1.1.1-4 "GUIDANCE FOR REQUIREMENTS ON INTACT STABILITY DURING LIFTING OPERATIONS", Part U of the Guidance**.

O11.5 Hull Equipment

O11.5.1 General

Where **11.5.1-2, Part O of the Rules** is applied and dynamic positioning systems (hereinafter referred to as "DPS") are provided in accordance with **10.2.1(2), Part P of the Rules**, the number of required mooring equipment for temporary mooring may be reduced to one. However, the DPS provided in such cases are to satisfy the following:

(1) They are either a the Class 2 or Class 3 DPS specified in **10.2.3, Part P of the Rules**.

(2) They take into account the environmental conditions specified in **Table 14.3.1-1, Part 1, Part C of the Rules** and the assumed position keeping time. However, in the case of ships for restricted service, the environmental conditions may be specified by the owner.

(3) The operational procedure followed when they are used in conjunction with mooring equipment for temporary mooring is to be included in the operation manual specified in **18.2.2, Part P of the Rules**.

O11.7 Machinery

O11.7.1 General

With respect to the provisions of **11.7.1-1, Part O of the Rules**, **13.6.5, Part D of the Rules** need not be applied to non self-propelled self-elevating ships.

O11.7.3 Jacking Systems

1 In applying **11.7.3-2, Part O of the Rules**, materials are to meet the specified values for impact tests equivalent to or greater than those of steels used for hull construction in cases where materials are used for which there are no specified values for the impact tests in **Part K of the Rules**.

2 The wording "permanently attended control station" specified in **11.7.3-3, Part O of the Rules** means the locations where jacking systems are controlled. In cases where fixation systems are separately provided as holding mechanisms, the locations where such systems are controlled are also included.

3 The wording "requirements specified otherwise by the Society" specified in **11.7.3-7, Part O of the Rules** means the requirements specified in **Annex 5.3.1, Part D of the Rules**.

O11.10 Fire Extinguishing Systems

O11.10.1 General

In **11.10.1-2, Part O of the Rules,** ships not engaged in international voyages which are also intended for restricted service may be exempted from **15.2.2-11(1)** or **(2), Part P of the Rules**.

O11.11 Helicopter Facilities

O11.11.1 General

With respect to the requirements of **11.11.1-1(5), Part O of the Rules**, in cases where the pumps used for the foam fire-extinguish system required by **Chapter 18, Part R of the Rules** are also used as main fire pumps, operation of a foam fire-extinguish system at its required output is to permit the simultaneous use of the minimum required number of jets of water at the required pressure from the fire main. This requirement is also to be applied to the submersible pumps of self-elevating ships required by **11.10.1-2, Part O of the Rules** in cases where the foam fire-extinguish system is fed from it.

O12 Wind Farm Support Vessels

O12.2 Stability

O12.2.1 General

1 "Ships specially approved by the Society" referred to in **12.2.1-1, Part O of the Rules** means ships complying with **O7.2.1-2**.

2 The intact stability for the ships referred to in **-1** above is to comply with **O7.2.1-1**.

3 For ships compling with *IMO* Resolution *MSC*.235(82), as amended., the **O7.2.1-3** is to comply with where **1.3.9, Annex U1.2.1 "Guidance for Stability Information for Master", Part U of the Guidance** is applied.

O12.4 Hull Equipment

O12.4.2 Personnel Transfer Arrangements

The "Personnel Transfer Arrangements" referred to in **12.4.2, Part O of the Rules** includes fenders installed on the bow parts of ships, which come into contact with offshore structures for personnel transfer.

O12.8 Special Requirements for Ships Engaged in Transporting Workers to Offshore Wind Turbines and Serving as Accommodation Facilities for Such Workers

O12.8.1 Stability

The "stability requirements separately specified by the Society" referred to in **12.8.1-2, Part O of the Rules** refers to **O11.2.2**.

O12.8.2 Hull Construction

Water heads used for calculating the scantlings of structure end bulkheads and deckhouse boundary walls are to comply with **O7.3.5**.

O12.8.3 Hull Equipment

1 In cases where ships are fitted with steel fenders, such ships are to be in accordance with **O7.4.2**.

2 The thickness of wooden sheathing is to be in accordance with **O7.4.3**.

3 The section moduli of cargo rails and stanchions are to be in accordance with **O7.4.4**.

O12.8.4 Helicopter Facilities

With respect to **12.8.4-1(5), Part O of the Rules**, in cases where pumps used for the foam fire-extinguish systems required by **Chapter 18, Part R of the Rules** are also used as main fire pumps, operation of a foam fire-extinguish system at its required output is to permit the simultaneous use of the minimum required number of jets of water at the required pressure from the fire main.

Annex O4.2.1 GUIDANCE FOR INTACT STABILITY FOR SHIPS ENGAGED IN TOWING OPERATIONS

1.1 General

1.1.1 General

This guidance applies to ships engaged in port, coastal or ocean towing operations.

1.1.2 Definition

"Towing point" is the location where the towline force is applied to the ship. The towing point may be a towing hook, staple (rope guide for towing), fairlead or equivalent fitting serving that purpose.

1.2 Heeling Lever for Towing Operations

1.2.1 Calculation for the Self-tripping Heeling Lever

The self-tripping heeling lever is calculated according to the following **(1)** and **(2)**.

(1) A transverse heeling moment is generated by the maximum transverse thrust exerted by the ship's propulsion and steering systems and the corresponding opposing towline pull.

(2) The heeling lever, in m, as a function of the heeling angle θ, is to be calculated according to the following formula:

$$HL_\theta = \frac{B_p C_T (h\cos\theta - r\sin\theta)}{g\Delta}$$

B_P: bollard pull, in kN, which is the documented maximum continuous pull obtained from a static bollard pull test performed in accordance with **Appendix O1**. However, a nominal bollard pull specified by constructor of the considered ship may be accepted, provided that such value is not less than value given in **Table 1** as a standard, unless records of bollard pull tests in similar ships or sufficient information is provided by the constructor.

C_T: the value is to be according to the following formula.

for ships with conventional, non-azimuth propulsion units

$C_T = 0.5$

for ships with azimuth propulsion units installed at a single point along the length

$$C_T = \frac{0.90}{1 + {}^{l}/_{L_f}}$$

However, C_T is not to be less than 0.7 for ships with azimuth stern drive towing over the stern or tractor tugs towing over the bow, and not less than 0.5 for ships with azimuth stern drive towing over the bow or tractor tugs towing over the stern. For tugs with other propulsion and/or towing arrangements, the value of C_T is to be established on a case by case basis to the satisfaction of the Society.

Δ: displacement, in t

l: longitudinal distance, in m, between the towing point and the vertical centreline of the propulsion unit(s) relevant to the towing situation considered.

h: vertical distance, in m, between the towing point and the horizontal centreline of the propulsion unit(s) as relevant for the towing situation considered.

g: gravitational acceleration, in m/s^2, to be taken as 9.81

r: the transverse distance, in m, between the centreline and the towing point, to be taken as 0 when the towing point is at the centreline.

L_f: length for freeboard as defined in **2.1.3, Part A**.

Table 1 Bollard Pull (*kN*)

	Towing ahead	Towing astern	
		For azimuth thruster(s)	For others
For propeller(s) not fitted with nozzles	0.16*H*	0.14*H*	0.08*H*
For propeller(s) fitted with nozzles	0.19*H*	0.17*H*	0.10*H*

H : Maximum continuous output of engine(s) (*kW*)

Note:

For ships other than conventional ships having propulsion(s) in the aft end, a special consideration is to be given for each ship.

1.2.2 Calculation for the Tow-tripping Heeling Lever

The tow-tripping heeling lever is calculated according to the following formula.

$$HL_\theta = \frac{C_1 C_2 r V^2 A_P (h\cos\theta - r\sin\theta + C_3 d)}{2g\Delta}$$

C_1 : lateral traction coefficient according to the following formula.

$$C_1 = 2.8\left(\frac{L_s}{L_{pp}} - 0.1\right)$$

$0.10 \le C_1 \le 1.00$

C_2 : correction of C_1 for angle of heel according to the following formula.

$$C_2 = \frac{\theta}{3\theta_D} - 0.1$$

$C_2 \ge 1.00$

θ_D: angle of deck edge according to the following formula.

$$\theta_D = \arctan\left(\frac{2f}{B}\right)$$

C_3 : distance from the centre of A_P to the waterline as fraction of the draught related to the heeling angle according to the following formula.

$$C_3 = \left(\frac{\theta}{\theta_D}\right) \times 0.26 + 0.30$$

$0.50 \le C_3 \le 0.83$

γ : specific gravity of water, in t/m^3

V : lateral velocity, in *m/s*, to be taken as 2.57 (5 *knots*)

A_P : lateral projected area, in m^2, of the underwater hull.

r : the transverse distance, in *m*, between the centreline and the towing point, to be taken as 0 when the towing point is at the centreline.

L_S : the longitudinal distance, in *m*, from the aft perpendicular to the towing point.

L_{PP} : length between perpendiculars, in *m*

θ: angle of heel, in *degrees*

f: freeboard amidship, in *m*

B : moulded breadth, in *m*

h : vertical distance, in *m*, from the waterline to the towing point.

d : actual mean draught, in *m*

1.3 Heeling Lever for Escort Tugs

1.3.1 General

1 For the evaluation of the stability particulars during escort operations, the ship is considered to be in an equilibrium position determined by the combined action of the hydrodynamic forces acting on hull and appendages, the thrust force and the towline force as shown in **Fig. 1**.

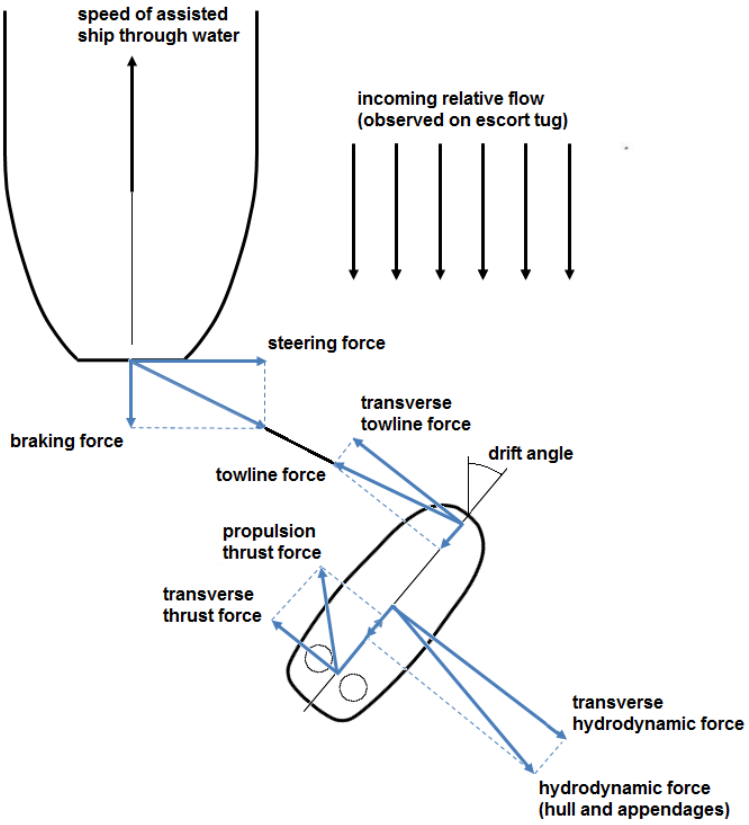
2 For each equilibrium position, the corresponding steering force, braking force, heel angle and heeling lever are to be obtained from the results of full scale trials, model tests, or numerical simulations in accordance with a methodology acceptable to the Society.

3 For each relevant loading condition, the evaluation of the equilibrium positions is to be performed over the applicable escort speed range, whereby the speed of the assisted ship through the water is to be considered. The typical escort speed range is 6 to 10 *knots* in such cases.

4 For each relevant combination of loading condition and escort speed, the maximum heeling lever is to be used for the evaluation of the stability particulars.

5 For the purpose of stability calculations, the heeling lever is to be taken as constant.

Fig. 1 Escort tug equilibrium position



1.4 Stability Criteria

1.4.1 General

1 In addition to the stability criteria specified in **2.2** and **2.3 Part U**, the following stability criteria are to be complied with.

2 For ships engaged in port, coastal or ocean towing operations, the area A contained between the righting lever curve and the heeling lever curve calculated in accordance with **1.2.1**, as measured from the heel angle, θ_e, to the angle of the second intersection, θ_c, or the angle of down-flooding, θ_f, whichever is less, is to be greater than the area B contained between the heeling lever curve and the righting lever curve, as measured from the heel angle is 0 to the heel angle, θ_e.

where

θ_e : Angle of first intersection between the heeling lever and righting lever curves.

θ_f: Angle of down-flooding. Openings required to be fitted with weathertight closing devices but which are required to be kept open for operational reasons are to be considered as down-flooding points in stability calculations.

θ_c: Angle of second intersection between the heeling lever and righting lever curves.

3 For ships engaged in port, coastal or ocean towing operations, the first intersection between the righting lever curve and the heeling lever curve calculated in accordance with **1.2.2** is to occur at an angle of heel less than the angle of down-flooding, θ_f.

4 For ships engaged in port, coastal or ocean escort operations, the maximum heeling lever determined in accordance with **1.3** complies with the following **(1)** to **(3)** and **Fig. 2**.

(1) Area A ≥ 1.25 × Area B

(2) Area C ≥ 1.40 × Area D

(3) θ_e ≤ 15 *degrees*

Area A : Righting lever curve area measured from the heel angle θ_e to a heel angle of 20 *degrees*.

Area B : Heeling lever curve area measured from the heeling angle θ_e to a heel angle of 20 *degrees*.

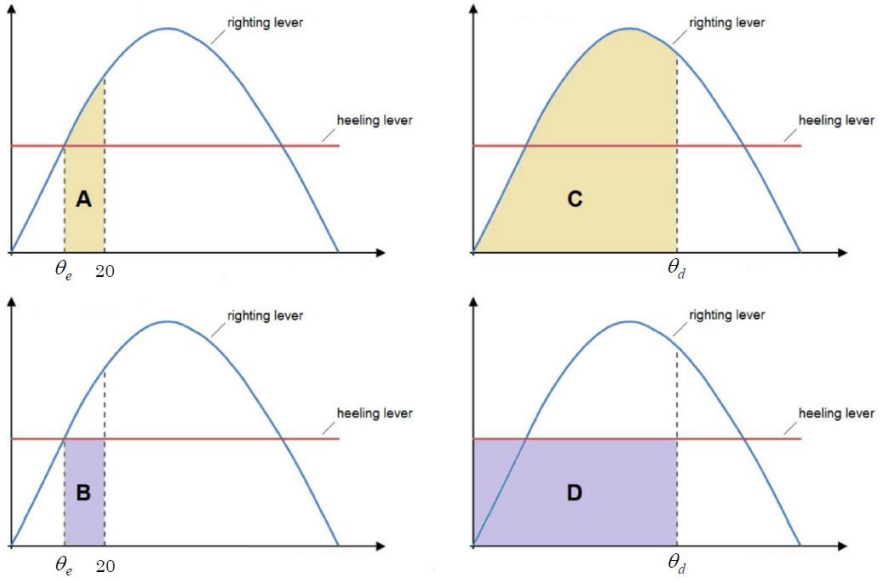
Area C : Righting lever curve area measured from the heel angle of 0 *degrees* to θ_d.

Area D : Heeling lever curve area measured from the heel angle of 0 *degrees* to θ_d.

θ_e: Equilibrium heel angle, corresponding to the first intersection between heeling lever curve and the righting lever curve.

θ_d: The heel angle corresponding to the second intersection between heeling lever curve and the righting lever curve or the angle of down-flooding or 40 *degrees*, whichever is less.

Fig. 2



1.5 Constructional Precautions Against Capsizing

1.5.1 General

1 Access to the machinery space, excluding emergency access and removal hatches, are to be arranged within the forecastle if possible. Any access to the machinery space from the exposed cargo deck is to be provided with two weathertight closures, if practicable. Access to spaces below the exposed cargo deck is to preferably be from a position within or above the superstructure deck.

2 The disposition of the freeing ports are to be carefully considered to ensure the most effective drainage of water trapped on the working deck and in recesses at the after end of the forecastle. In ships operating in areas where icing is likely to occur, no shutters are to be fitted in the freeing ports.

3 A ship engaged in towing operations is to be provided with means for quick release of the towline. Ships provided with towing winch systems also are to be provided with means of quick release.

1.6 Stability Information

1.6.1 Standard Loading Condition

1 The following loading conditions are to be included in addition to the standard loading conditions.

(1) Maximum operational draught at which towing or escorting operations are carried out, considering full stores and fuel.

(2) Minimum operational draught at which towing or escorting operations are carried out, considering 10% stores and fuel.

(3) Intermediate condition with 50% stores and fuel.

2 Allowance is to be made for the anticipated weight of cargo on and below deck, chains in lockers, anticipated types of wires or ropes on storage reels and wires on the winches when calculating loading conditions.

1.6.2 Additional Information

1 The stability information booklet for ships applying this guidance is to contain the following **(1)** to **(8)** as additional information.

(1) Maximum bollard pull

(2) Details on the towing arrangement, including the location(s) and type(s) of towing point(s), such as towing hooks, staples (rope guides for towing), fairleads or any other point serving that purpose.

(3) Identification of critical down-flooding openings.

(4) Recommendations on the use of roll reduction systems.

(5) Clear guidance on the quantity and size, in cases where any wires, etc. is included as part of the lightship weight.

(6) Maximum and minimum draughts for towing and escort operations.

(7) Instructions on the use of quick-release devices.

(8) For ships engaged in escort operations, the following additional operating information.

(a) A table with permissible limits of heel angles in accordance with 1.3.1-4 as functions of loading condition and escort speed.

(b) Instructions on the available means to limit heel angles within permissible limits.

Annex O8.2.1 GUIDANCE FOR INTACT STABILITY FOR SHIPS ENGAGED IN ANCHOR HANDLING OPERATIONS

1.1 General

1.1.1 General

This guidance applies to the ships engaged in anchor handling operations.

1.1.2 Definition

"Wire" means a dedicated line (wire rope, synthetic rope or chain cable) used for the handling of anchors by means of an anchor handling winch.

1.2 Heeling Lever

1.2.1 Calculation for the Heeling Lever

A heeling lever, HL_θ, generated by the action of a heeling moment caused by the vertical and horizontal components of the tension applied to the wire is to be calculated according to the following formula.

$$HL_\theta = \left(\frac{M_{AH}}{\Delta_2}\right)\cos\theta$$

$$M_{AH} = F_p(h\sin\alpha\cos\beta + y\sin\beta)$$

Δ_2 : Displacement of a loading condition in *t*, including action of the vertical loads added *Fv*, at the centreline in the stern of ship. Where *Fv* is to be calculated as follows.

$$F_V = F_p\sin\beta$$

α : The horizontal angle in *degrees* between the centreline and the vector at which the wire tension is applied to the ship in the upright position, positive outboard.

β : The vertical angle in *degrees* between the waterplane and the vector at which the wire tension is applied to the ship, positive downwards. This is to be taken at the maximum heeling moment angle according to the following formula.

$$\beta = \tan^{-1}\left(\frac{y}{h\sin\alpha}\right)$$

but not less than $\beta = \cos^{-1}\left(\frac{1.5B_P}{F_p\cos\alpha}\right)$

B_P : The Bollard pull in *kN*, that is the documented maximum continuous pull obtained from a static pull test on sea trial according to *Appendix O1* or an equivalent value is to be at the discretion of the Society.

F_p : Permissible tension in *kN*, the wire tension which can be applied to the ship as loaded while working through a specified tow pin set, at each α, for which all stability criteria can be met. F_p is to in no circumstance be taken as greater than F_d.

F_d : Design maximum wire tension in *kN*, the maximum winch wire pull or maximum static winch brake holding force, whichever is greater.

h : The vertical distance in *m* from the centre of the propulsive force acting upon the ship to the following **(1)** or **(2)**.

(1) The uppermost part at the towing pin.

(2) A point on a line defined between the highest point of the winch pay-out and the top of the stern or any physical restriction of the transverse wire movement.

y : The transverse distance in *m* from the centreline to the outboard point at which the wire tension is applied to the ship according to the following formula but not greater than *B*/2.

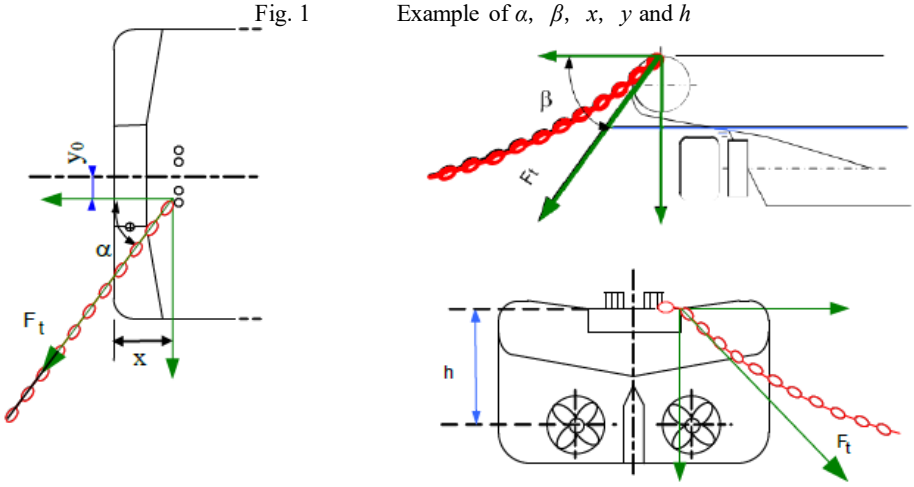
$$y = y_0 + x\tan\alpha$$

B : The moulded breadth in *m*

y_0 : The transverse distance in *m* between the ship centreline to the inner part of the towing pin or any physical restriction of the transverse wire movement.

x : The longitudinal distance in m between the stern and the towing pin or any physical restriction of the transverse wire movement.

Fig. 1 Example of α, β, x, y and h



Note;

F_t : The vector of the applied wire tension.

1.2.2 Permissible Tension

1 The permissible tension as function of α, defined in **1.2.1**, is not to be greater than the tension given by **-2**.

2 The permissible tension as function of α can be calculated by direct stability calculations, provided that the following **(1)** to **(4)** are met.

(1) The heeling lever is to be taken as defined in **1.2.1** for each α.

(2) The stability criteria in **1.3** are to be met.

(3) α is not to be taken less than 5 *degrees*, except as permitted by **-3**.

(4) Intervals of α are not to be more than 5 *degrees*; however, larger intervals may be accepted, provided that the permissible tension is limited to the higher α by forming working sectors.

3 For the case of a planned operation to retrieve a stuck anchor in which the ship is on station above the anchor and the ship has low or no speed, α may be taken as less than 5 *degrees*.

1.3 Stability Criteria

1.3.1 General

1 For the loading conditions intended for anchor handling but before commencing operations, the stability criteria given in **2.2** and **2.3, part U of the Rules** are to be applied. During operations, under the action of the heeling moment, the criteria following **-2** to **-4** are to be applied.

2 The residual area between the righting lever curve and the heeling lever curve calculated in accordance with **1.2.1** is not to be less than 0.070 *m-rad*. The area is determined from the first intersection of the two curves to the angle of the second intersection or the angle of down-flooding, whichever is less.

3 The maximum residual righting lever GZ between the righting lever curve and the heeling lever curve calculated in accordance with **1.2.1** is to be at least 0.2 m.

4 The static angle at the first intersection between the righting lever curve and the heeling lever curve calculated in accordance with **1.2.1** is not to be greater than the following **(1)** to **(3)** whichever is less.

(1) The angle at which the righting lever equals 50 % of the maximum righting lever.

(2) The deck edge immersion angle.

(3) 15 *degrees*

5 A minimum freeboard at the stern on the centreline of at least 0.005 L is to be maintained in all operating conditions, with a displacement as defined in **1.2.1**. In the case of the anchor retrieval operations covered by **1.2.2-3**, a lower minimum freeboard may be accepted provided that due consideration has been given to this in the operation plan.

1.4 Constructional Precautions Against Capsizing

1.4.1 General

1 A stability instrument may be used for determining the permissible tension and then checking compliance with relevant stability criteria. The following two types of stability instruments may be used on board

(1) Software checking either the intended or actual tension on the basis of the permissible tension curves.

(2) Software performing direct stability calculations to check compliance with the relevant criteria, for a given loading condition (before application of the tension force), a given tension and a given wire position (defined by angles α and β).

2 Access to the machinery space, excluding emergency access and removal hatches, is to be arranged within the forecastle if possible. Any access to the machinery space from the exposed cargo deck is to be provided with two weathertight closures. Access to spaces below the exposed cargo deck is to preferably be from a position within or above the superstructure deck.

3 The disposition of the freeing ports is to be carefully considered to ensure the most effective drainage of water trapped in working deck and in recesses at the after end of the forecastle. In ships operating in areas where icing is likely to occur, no shutters are to be fitted in the freeing ports.

4 Winch systems are to be provided with means of emergency release.

5 For ships engaged in anchor handling operations, the following recommendations for the anchor handling arrangements are to be considered.

(1) Stop pins or other design features meant to impede the movement of wire further outboard are to be installed.

(2) The working deck is to be marked with contrasting colours or other identifiers such as guide pins, stop pins or similar easily identifiable points that identify operational zones for the line to aid operator observation.

1.5 Stability Information

1.5.1 Standard Loading Condition

1 The following loading conditions are to be included in addition to the standard loading conditions.

(1) Service loading condition at the maximum draught at which anchor handling operations may occur with the heeling levers in accordance with **1.2.1** for the line tension the ship is capable of with a minimum of 67 % stores and fuel, in which all the relevant stability criteria as specified in **1.3** are met.

(2) Service loading condition at the minimum draught at which anchor handling operations may occur with the heeling levers in accordance with **1.2.1** for the line tension the ship is capable of with 10 % stores and fuel, in which all the relevant stability criteria as specified in **1.3** are met.

2 Allowance is to be made for the anticipated weight of cargo on and below deck, chains in lockers, anticipated types of wires or ropes on storage reels and wires on the winches when calculating loading conditions.

3 The compliance with the relevant stability criteria is to be made for each set of towing pins and its associated permissible line tensions, including any physical element or arrangement that can restrict the line movement.

4 When applying the design tension F_d for the tow pin set nearest to centreline, the stability criteria specified in **1.3** is to be met at the condition specified in **-1** as a minimum for the lowest α equal to 5 *degrees*.

1.5.2 Additional Information

The stability information booklet for ships applying this guidance is to contain the following **(1)** to **(5)** as additional information.

(1) Maximum bollard pull, winch pull capacity and brake holding force.

(2) Details on the anchor handling arrangement such as the location of the fastening point of the wire, type and arrangement of

towing pins, stern rollers, all points or elements where the tension is applied to the ship.

(3) Identification of critical down-flooding openings

(4) Guidance on the permissible tensions for each mode of operation and for each set of towing pins, including any physical element or arrangement that can restrict wire movement, as a function of all relevant stability criteria.

(5) Recommendations on the use of roll reduction systems.

Appendix O1 BOLLARD PULL TESTING PROCEDURE

(APPENDIX A to MSC/Circ.884 "GUIDELINES FOR SAFE OCEAN TOWING")

1 A proposed test programme should be submitted prior to the testing.

2 During testing of continuous bollard pull (*BP*) the main engine(s) should be run at the manufacturer's recommended maximum torque according to maximum continuous rating. Verification of the actual output should be requested during the test.

3 During testing of overload pull, the main engine(s) should be run at the manufacturer's recommended maximum rating that can be maintained for minimum 30 *minutes*.

The overload test may be omitted.

4 The propeller(s) fitted when performing the test should be the propeller(s) used when the vessel is in normal operation.

5 All auxiliary equipment such as pumps, generators and other equipment which are driven from the main engine(s) or propeller shaft(s) in normal operation of the vessel should be connected during the test.

6 The length of the towline should not be less than 300 *metres*, measured between the stern of the vessel and the test bollard. A minimum length of twice the vessel length might be accepted.

7 The water depth at the test location should not be less than 20 *metres* within a radius of 100 *metres* of the vessel. If the water depth of 20 *metres* cannot be obtained at the test location, then a minimum water depth which is equal to twice the maximum draft of the vessel may be accepted. It should be noted that reduced water depth may adversely affect the test results.

8 The test should be carried out with the vessel's displacement corresponding to full ballast and half fuel capacity.

9 The vessel should be trimmed at even keel or at a trim by stern not exceeding 2% of the vessel's length.

10 The vessel should be able to maintain a fixed course for not less than 10 *minutes* while pulling as specified in items 2 or 3 above. Certified continuous bollard pull is the average reading of the 10 *minutes* period.

11 The test should be performed with a wind speed not exceeding 5 *m/sec*.

12 The current at the test location should not exceed 0.5 *m/sec*. in any direction.

13 The load cell used for the test should be approved by a competent body and be accurate within +/- 2% within the range of loads to be measured and for the environmental conditions experienced during the test.

14 An instrument giving a continuous read-out and also a recording instrument recording the bollard pull graphically as a function of time should both be connected to the load cell. The instruments should if possible be placed and monitored ashore.

15 The load cell should be fitted between the eye of the towline and the bollard.

16 The figure certified as the vessel's continuous bollard pull shall be the towing force recorded as being maintained without any tendency to decline for a duration of not less than 10 *minutes*.

17 Certification of bollard pull figures recorded when running the engine(s) at overload, reduced *RPM* or with a reduced number of main engines or propellers operating can be given and noted on the certificate.

18 A communication system shall be established between the vessel and the person(s) monitoring the load cell and the recording instrument ashore, by means of *VHF* or telephone connection, for the duration of the test.