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# **RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS**

**Part O** Work-Ships

**RULES**

## **2011 AMENDMENT NO.1**

Rule No.82      1st November 2011

Resolved by Technical Committee on 7th July 2011

Approved by Board of Directors on 27th September 2011

“Rules for the survey and construction of steel ships” has been partly amended as follows:

## **Part O Work-Ships**

### **Chapter 1 GENERAL**

#### **1.2 General**

Paragraph 1.2.6 has been amended as follows.

##### **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.

Paragraph 1.2.9 has been added as follows.

##### **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**

Paragraphs 1.3.2 and 1.3.3 have been amended as follows.

##### **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:

(Omitted)

##### **(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~~) Other ships**

“Other ships” are ships other than those specified in **(1)** to **(~~10~~)** above.

### 1.3.3 Type of ships

Ships are classified into the following two 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.

Chapter 11 has been added as follows.

## **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.

### **11.2 Stability**

#### **11.2.1 General**

- 1 Intact and damage stability are to be according to this 11.2 in addition to Part U and Chapter 4, 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.
- 3 Self-elevating ships are to be in accordance with Chapter 4, Part P in addition to the requirements in -1 and -2.
- 4 For ships carrying cargo on deck such as open pipes that may accumulate water inside, free surface effects are to be considered.

#### **11.2.2 Overturning Moments**

In the calculation of overturning moments, it is to be considered that:

- (1) The safe working load of cargo handling appliances and the maximum design wind load may be simultaneously acting
- (2) Crane positions, elevations and cargo weights are so arranged that the overturning moment may be at its maximum value
- (3) Wind loads may be acting on the cargo
- (4) For ships using counter-ballast during cargo handling operations, condition loads of cargo handling appliances may be suddenly lost. In addition, free water surface effects are also to be considered for ballasted tanks.

### **11.3.1 Hull Constructions**

#### **11.3.1 General**

- 1 Hull constructions are to be according to this 11.3 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.

### **11.3.2 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.

### **11.3.3 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.

### **11.3.4 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.

### **11.3.5 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.

### 11.3.6 Deckhouses

For self-elevating ships, where deckhouses are close to the side shell of the ship, their scantlings are to apply the requirements in Chapter 18, Part C. Other deckhouses are to be in accordance with the requirements in Chapter 19, Part C.

### 11.3.7 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 11.3.1-2. 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.

### **11.3.8 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 determined by the requirements in **Chapter 13, Part C**. In this case, 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.

### **11.3.9 Deck Elevating Apparatus and Load Carrying Members**

Load carrying members of self-elevating ships are to be in accordance with the requirements in following (1) and (2):

- (1) Scantlings of load carrying members which transmit loads from the legs to the hull are to have sufficient strength for the loads prescribed in **Chapter 3, Part P** and **11.3.7**.
- (2) Constructions of load carrying members are to be so arranged that loads transmitted from the legs are properly diffused into the hull structure.

## **11.4 Hull Equipment**

### **11.4.1 General**

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

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

## **11.4.2 Cargo Gear**

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

## **11.4.3 Supporting Equipment of Cargo Gear**

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

## **11.4.4 Protective Coatings of Tanks**

For pre-load tanks on self-elevating ships, the requirements in 25.2.2, Part C are to be applied as if they are seawater ballast tanks. However, spud cans on such ships need not comply with such requirements.

## **11.5 Machinery**

### **11.5.1 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, 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 11.5 in addition to Part D.

### **11.5.2 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.

### **11.5.3 Jacking Systems**

1 The driving gears, mechanisms, strength and safety devices of jacking systems are to be those deemed appropriate by the Society.

2 A jacking system is 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.

3 Where hydraulic or pneumatic systems are used as a source of power for a jacking system, 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 a ship which has a large embarking capacity).

4 Elevating systems are to be designed and constructed for the maximum lowering and lifting loads of a ship as specified in the ship’s operating manual.

5 Elevating systems are to be able to withstand the forces imposed upon a ship from the maximum environmental criteria for the ship.

- 6 Elevating systems are to be operable from central jacking control stations.
- 7 Jacking control stations are to be provided the following safety devices:
- (1) Audible and visual alarms for jacking system overload and out-of-level.
  - (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
- 8 A communication system is to be provided between the central jacking control and a location at each leg.

#### **11.5.4 Bilge Pipings**

The bilge pipings of self-elevating ships are 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) 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 5mm or more, standard pipes of one grade higher diameter are to be used.

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

$d'$ : 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 ( $m^2$ )

#### **11.5.5 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.

#### **11.5.6 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.

### **11.6 Electrical Installations**

#### **11.6.1 General**

Electrical installations of the ship are to be according to this 11.6 in addition to Part H.

### **11.6.2 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 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.

## **11.7 Fire Protection, Means of Escape and Fire Extinguishing Systems**

### **11.7.1 General**

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

### EFFECTIVE DATE AND APPLICATION

1. The effective date of the amendments is 1 May 2012.
2. Notwithstanding the amendments to the Rules, the current requirements may apply to ships for which the date of contract for construction is before the effective date.
3. Notwithstanding the provision of preceding 2., the amendments to the Rules may apply to ships for which the application is submitted to the Society before the effective date upon request by the owner.

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# **GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS**

**Part O** Work-Ships

**GUIDANCE**

**2011 AMENDMENT NO.1**

Notice No.90      1st November 2011

Resolved by Technical Committee on 7th July 2011

AMENDMENT TO THE GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

“Guidance for the survey and construction of steel ships” has been partly amended as follows:

## Part O Work-ships

### O1 GENERAL

#### O1.2 General

Paragraph O1.2.4 has been amended as follows

##### 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:

(Omitted)

(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 *SEWTB*)

(d) Column-stabilized ships: *Column-stabilized Wind Turbine Installation Unit* (abbreviated to *CSWTIU*)

~~(10)~~ (11) Notations, except for those mentioned above, corresponding to work purposes of work-ships

In addition, in cases where the purpose of work-ships which are designed to perform more than a single purpose within the (1) to (10) mentioned above, notations corresponding to each purpose are affixed. (For example, Tugs-cum-Fire fighting vessels: *Tug/Fire Fighting Vessel-Type 1*)

Paragraph O1.2.9 has been added as follows

##### 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.

## **O3 CRANE SHIPS**

Section O3.4 has been added as follows.

### **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**

### **O4.4 Hull Equipment**

Paragraph O4.4.1 has been added as follows.

#### **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.**

## **O7 OFFSHORE SUPPLY VESSELS**

### **O7.4 Hull Equipment**

Paragraph O7.4.1 has been added as follows.

#### **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.

## **O8 ANCHOR HANDLING VESSELS**

### **O8.4 Hull Equipment**

Paragraph O8.4.1 has been added as follows.

#### **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.

## **O9 VESSELS ENGAGED IN LAYING OBJECTS ON THE SEABED**

Section O9.4 has been added as follows.

### **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.

Chapter O11 has been added as follows.

## **O11 WIND TURBINE INSTALLATION SHIPS**

### **O11.2 Stability**

#### **O11.2.1 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 0.09m-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 smaller.

### **O11.4 Hull Equipment**

#### **O11.4.2 Cargo Gear**

“At the discretion of the Society” referred to in 11.4.2, Part O of the Rules is to be in accordance with the requirements in the Rules for Cargo Handling Appliances.

### EFFECTIVE DATE AND APPLICATION

1. The effective date of the amendments is 1 May 2012.
2. Notwithstanding the amendments to the Guidance, the current requirements may apply to ships for which the date of contract for construction is before the effective date.
3. Notwithstanding the provision of preceding 2., the amendments to the Guidance may apply to ships for which the application is submitted to the Society before the effective date upon request by the owner.