

## Technical Regulation on Lifting Appliances and Loose Gear on Ships<sup>1)</sup>

In pursuance of Section 1 (2), Section 3, Section 5, Section 17 (5), and Section 32 (4) in the Act on Safety of Life at Sea, cf. consolidated Act no. 554 of 21 June 2000, as well as in pursuance of Section 1 (2), Sections 4-6, Section 11 (2), Section 12 (2), and Section 28 in Act no. 98 of 12 March 1980 on Ship Safety, etc., as amended, and in consultation with the Faeroese Government and Greenland's Home Rule Having, and by authority of the Minister for Trade and Industry, the following provisions are laid down:

**Section 1.** This Technical Regulation applies to lifting appliances and loose gear, suspended platform decks and ramps used alongside a quay or in sheltered waters on board Danish ships, as well as on foreign ships located in Danish territorial waters, to the extent that they are not covered by the Act on Health and Safety at Work.<sup>2)</sup>

*Subsection 2.* Lifting appliances and loose gear that are to be used in open waters must comply with the rules laid down by a recognised classification society concerning such lifting appliances and loose gear.

*Subsection 3.* However, in the case of foreign ships registered in a state which is a contracting party to the *Protection against Accidents (Dockers) Convention (Revised), 1932, No. 32*, requirements are not imposed which are more stringent than those which follow from the provisions of the Convention.

*Subsection 4.* The Technical Regulation has been drawn up on the basis of the *Occupational Safety and Health (Dock Work) Convention, 1979, No. 152*.

**Section 2.** The detailed rules for lifting appliances and loose gear on board ships are given as an Annex to the Technical Regulation.

*Subsection 2.* Danish ships with lifting appliances, as well as foreign ships with lifting appliances located in Danish territorial waters and registered in a state which is a contracting party to ILO Convention No. 152, shall be able to document performance of the five-yearly loading test mentioned in 14.4 of the Annex by 15 July 2001, at the latest.

*Paragraph 3.* Fishing vessel derricks marked with a safe working load (SWL) of maximum 100 kg do not, in Danish ports, need to be provided with certificates for loading tests and examination of the blocks, shackles, chains, hooks, swivels and rings belonging to the lifting appliance if it can be proved that the parts

- 1) are of a recognised make,
- 2) have been made of slow-ageing materials exempt from heat treatment, and
- 3) have been marked with a SWL of at least 250 kg.

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1 The technical regulation has been notified in draft form in accordance with *European Parliament and Council Directive 98/34/EC (the Information Procedure Directive)*, as recently amended by *Directive 98/48/EC*.

2 The Act on Health and Safety at Work applies to shipping and fisheries insofar as concerns loading and unloading of ships, including fishing vessels, on-board shipbuilding work, and work that may be considered as equivalent.

Pursuant to this Act, regulations on, inter alia, the loading and unloading of ships have been issued which apply to all cargo-handling work carried out in Denmark on both Danish and foreign ships.

**Section 3.** The provisions of the Technical Regulation shall not preclude on-board use of other equipment, materials, fittings, apparatuses, etc., or the implementation of other measures representing at least the same level of safety as stipulated in this Technical Regulation, including the systems of approval of lifting appliances of recognised classification societies.

*Subsection 2.* The Danish Maritime Authority accepts tests that are performed by recognised testing agencies, including those in other EU Member States and states which are contracting parties to the Agreement on the European Economic Area, and which provide appropriate and satisfactory guarantees of a technical, expert and independent nature.

**Section 4.** Contravention of the provisions of the Annex mentioned in Section 2 shall be punishable by fine, mitigated imprisonment or imprisonment of up to 1 year.

*Subsection 2.* The punishment may be increased to mitigated imprisonment or to imprisonment of up to 2 years if

- 1) the contravention causes, or threatens to cause, loss of life or damage to health,
- 2) an injunction or order has previously been issued for the same or equivalent conduct, or
- 3) the violation achieves, or seeks to achieve, financial gain for the party committing the contravention or for another party.

*Subsection 3.* It shall be considered a particularly aggravating circumstance if the contravention causes, or threatens to cause, loss of life or damage to the health of persons under 18 years of age, cf. Subsection 2 (1).

*Paragraph 4.* If the proceeds of a contravention are not confiscated, particular account must be taken when determining fines, including additional fines, of the amount of any financial gain that has been achieved or sought achieved.

*Subsection 5.* Liability to punishment may be imposed on companies, etc., (legal personalities) in accordance with the provisions of Chapter 5 of the Penal Code.

*Subsection 6.* If the conduct is only covered by the *Act on Ship Safety, etc.*, only a fine or mitigated imprisonment may be imposed.

**Section 5.** The Technical Regulation shall enter into force on 1 December 2000.

*Subsection 2.* Lifting appliances and loose gear in ships the keel of which have been laid before this technical regulation enters into force shall comply with the requirements of this technical regulation no later than 15 July 2001, cf. Subsection 2 (2). For those ships, the provisions stipulated in 3-9 of the Annex shall not apply if they comply with the regulations in force before this technical regulation. These regulations apply fully to rebuildings of lifting appliances on existing ships.

*Subsection 3.* Guidance no. 9 of 1 November 1995 on lifting appliances in ships is repealed.

Danish Maritime Authority, 12 October 2000  
Christian Breinholt / Peter Lauridsen

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Safety and Environmental Legislation Division, file no. 199900906

# Lifting Appliances and Loose Gear, etc. on Board Ships

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## Definitions and General Provisions

### 1 Definitions

1.1 *"Lifting appliances"*: All stationary or mobile cargo handling appliances used on board ships for suspending, raising or lowering loads or moving them from one position to another while suspended or supported (including cranes for handling provisions and engine room overhead travelling cranes).

1.2 *"Loose gear"*: Any gear by means of which a load can be attached to a lifting appliance but which does not form an integral part of the appliance or load.

1.3 *"Recognised codes of practice"*: Danish codes of practice or equivalent international standards as well as the rules concerning lifting appliances laid down by recognised classification societies.

1.4 *"New ship"*: A ship, including a barge, the keel of which has been laid, or which is at a corresponding stage of construction, on or after the date on which this Technical Regulation enters into force. A ship that is rebuilt on or after the said date and where the rebuilding affects the lifting appliances as well is also regarded as a new ship.

1.5 *"Existing ship"*: A ship, including a barge, which is not a new ship.

1.6 *"Approved"*: Approved by the Danish Maritime Authority, cf. however Section 3 (2) of the Technical Regulation.

1.7 *"Responsible person"*: A person appointed by the master of the ship or the owner of the lifting appliance to be responsible for the performance of a specific duty or duties and possessing the necessary technical knowledge and experience.

1.8 *"Thorough examination"*: A detailed visual examination carried out by a competent person and supplemented, if necessary, by other suitable means or measures in order to arrive at a reliable conclusion as to the safety of the appliance or gear examined.

1.9 *"Inspection"*: A visual inspection carried out by a responsible person to decide whether, as far as can be ascertained in such a manner, the gear or sling is safe for continued use.

1.10 *"Competent party"*: A person or company approved to construct, design, test and certify lifting appliances and loose gear or a specific part thereof. In Denmark, a competent party is approved by the Danish Maritime Authority on application. The party in question must be able to prove its expertise and experience. Three types of competent parties are distinguished:

- a) **Category A competent party**: approved for first certification of lifting appliances and loose gear. To receive such approval, the party in question shall, in conjunction with a workshop, have performed the construction, design, work monitoring, testing, inspection and certification of a complete rig arrangement to the satisfaction of the

Danish Maritime Authority. The recognised classification societies are regarded as approved category A competent parties.

- b) **Category B competent party:** approved for periodic certification and certification following minor repair of existing lifting appliances and loose gear. To receive such approval, the party in question must have carried out periodic monitoring, testing, inspection and certification of an existing lifting appliance to the satisfaction of the Danish Maritime Authority.
- c) **Category C competent party:** approved for certification connected with annual inspections, as well as certification following minor repair of existing lifting appliances and loose gear. The ship's master, first officer, chief engineer and first engineer are regarded as category C competent parties.

## **2 General Provisions**

2.1 Lifting appliances and loose gear shall have the required strength, shall be of appropriate construction, and shall be kept in proper condition. When in use, they must not be loaded beyond their safe working load. However, with the permission of the Danish Maritime Authority, a lifting appliance may, by way of exception, be subjected to greater loading, provided the necessary precautions are taken.

2.2 Rigging plans and *Crane Handbooks* must be kept on board together with the ship's certificates. If they are applicable to the rigging of the actual ship, plans shall be prepared using a recognised standard as a model. However, more simple documentation may be permitted for small vessels.

2.3 Rules in force abroad that are fully based on ILO Convention No. 152 are regarded as equivalent to the rules of this Technical Regulation.

## **Construction and Strength**

### **3 Design Methods and Constructional Requirements**

3.1 Cranes and derrick arrangements shall be designed in accordance with recognised codes of practice. A competent party shall check the strength of lifting appliances and loose gear and verify that the necessary calculations have been made in this regard. The crane groups used, the constructional criteria and the operating conditions shall be specified in the arrangement's *Crane Handbook*, cf. 9.

3.2 For special types of lifting appliance, the Danish Maritime Authority may require or permit that the arrangement be constructed in accordance with a special standard, or that other safety factors be used than those prescribed in 3.1 and 3.3.

3.3 Loose gear such as wire ropes, chains, hooks, shackles, blocks, swivels and rings shall be designed and constructed in accordance with recognised codes of practice. The following

safety factors shall be used with regard to the material fracture strength, and they shall be calculated on the basis of the maximum theoretical static loading:

	<i>Safety Factor</i>
Wire ropes as a general rule (see also 3.2)	5
Chains	4.5
Other loose gear such as hooks, shackles, blocks, swivels, rings, etc.	5
Cordage	7

3.4 In addition to the above, cranes and derrick arrangements shall be designed for a list of 5°, or for the maximum list of the vessel with the safe working load (SWL) and the maximum jib radius of the derrick or crane (maximum factor). Cranes and derricks in a stowed position shall be able to withstand a list of up to 35°.

#### **4 Requirement for Loose Gear of Non-ageing Material**

4.1 Loose gear may only be made of steel exempt from periodic heat treatment, i.e. non-ageing material.

#### **5 Constructional Details**

##### **5.1 Drums**

5.1.1 Wire rope drums shall be of such a size that they do not need more than three layers of wire on the drum. However, more layers may be permitted if this does not cause increased wear and tear and if good winding is achieved. The maximum intake angle must not be greater than permits good winding with minimum wear and tear on the wire rope. For grooved drums the intake angle should not be greater than 5°, and for ungrooved drums not greater than 3°. Drums and winding apparatus for wire rope shall be constructed so that the wire rope does not spool off the drum. When the drum is full, there must be an unfilled drum height equal to 2.5 x the wire rope diameter, or else a corresponding safeguard to prevent the wire rope from spooling off.

5.1.2 The ratio of the drum diameter to the wire rope diameter shall be in accordance with the specification of the wire rope manufacturer, but in any case not less than 18:1.

5.1.3 There must be at least three turns of wire rope left on the hoist drum when the hook is at its lowest operating position and the derrick or crane jib at its highest operating position. The lowest position normally means the bottom of the hold or, if lower, the lightest water line.

5.1.4 There must be at least three turns of wire rope left on the derrick hoist drum when the derrick or crane jib is at its lowest position.

## 5.2 Securing the Wire Rope to the Drum

5.2.1 All wire rope shall be secured to the drum using wire rope clips, plate clamps or another form of fastening so that the end hold withstands at least 80% of the wire rope's effective breaking load.

5.2.2 The fastening of the wire rope shall be easy to inspect and it must be possible to tighten it.

## 5.3 Derricks, Derrick Bearings, Top Fixings and Fittings for Guys and Preventers

5.3.1 Derricks shall be constructed in accordance with recognised codes of practice. The loads from guys, etc., must be examined and taken into account where they are significant.

5.3.2 Derrick bearings and top fixings shall be constructed in accordance with recognised codes of practice.

5.3.3 If guys are not dimensioned for side loading such as acts, for example, when derricks are used in union purchase, a preventer of suitable strength must be rigged as a precaution against the guy breaking. Guys and preventers must be independently fastened to the derrick and the deck or rail. The fixing for guys and preventers shall be constructed in accordance with recognised standards.

## 5.4 Wire Rope Sheaves and Blocks

5.4.1 Wire rope sheaves and blocks shall be constructed in accordance with recognised standards. The ratio of the sheave diameter to the wire rope diameter shall be in accordance with the guidelines of the wire rope manufacturer, but in any case not more than 15:1 for running rigs and 11:1 for stationary rigs.

5.4.2 Open blocks or sheaves are only permitted on cranes if they are located so that persons cannot come into contact with them during operation.

5.4.3 The leading down of wire rope from multiple-sheave suspended blocks on the mast should be avoided due to crooked pulling and, hence, increased wear and tear. If there are three or more parts in the suspended wire, the suspended wire block on the mast should comprise at least two blocks, the block carrying the descending wire being single-sheave.

5.4.4 The base block element should be fitted with a friction mechanism for the leading block's eye or crutch so that the leading block remains in position even if the tension in the suspended wire is slackened.

## 5.5 Swivels, Cargo Hooks and Leads

5.5.1 All lifting appliances with hoist wire rope with a single part shall be fitted with swivels to prevent the hoist wire rope from twisting. Swivels may also be incorporated in hooks, block eyes and leads.

5.5.2 Load hooks must be designed so that the slings are prevented from falling out and so that they do not get stuck in projections, etc.

9.5.3 Strength members in swivels and hooks shall be executed in material grade RST 42-2 or corresponding materials. Welding must not be carried out on hooks.

5.5.4 Leads or balls shall be used if the weight of the hook and swivel is not sufficient to pull the runner out when the hook is unloaded and when lowering at full speed. The continuous strength of the lead section shall be made of steel.

## 5.6 Wire Rope

5.6.1 All wire rope shall be made in accordance with a recognised code of practice and shall be suitable for the intended use.

5.6.2 Wire rope for stationary and running rigs shall be made in accordance with recognised codes of practice, but with a minimum safety factor against breaking as given below:

<i>Safe Working Load (SWL) in the Hook</i>	<i>Safety Factor</i>
0-10 tons or if there is a single part in the hook	5
10-25 tons	$5 - (SWL-10)/30$
25-60 tons	$4.5 - (SWL-25)/70$
60 tons and more	4.0

5.6.3 All wire rope for running rigs shall have a minimum of 114 strands and shall be of a preformed type, i.e. the parts shall remain laid up when the wire rope is cut.

5.6.4 Non-rotating wire rope must not be used for suspensions.

5.6.5 Wire runners for cranes rigged with a single part should be of the non-rotating type.

## 5.7 Hoist Slings

5.7.1 Wire rope hoist slings used to lift loads of less than 10 tons shall have a safety factor of at least 6. Other hoist slings shall have at least the same safety factor as the associated wire rope, cf. 5.6.2.

5.7.2 After special assessment, the Danish Maritime Authority may, on the basis of calculations for well-defined lifts of 100 tons and more, approve safety factors down to 3.0 for the maximum loaded section of the sling. In the case of slings for lifting less than 100 tons, the provisions of 5.7.1 apply.

5.7.3 All wire rope slings shall be made of certified wire rope.

5.7.4 The splicing of loops in slings shall be executed against the direction in which the wire rope is pulled and shall have at least three tucks with a whole strand of rope and two tucks with one half of the wires cut out of each strand. Other equivalent splicing methods with the same strength may also be approved.

5.7.5 Rope slings shall be made of certified natural or man-made fibre rope of the highest quality and with known breaking strength. The safety factor against breaking shall be at least

7. The safe working load (SWL) must never exceed the breaking load divided by the safety factor.

## 5.8 Thimbles

5.8.1 Thimbles shall be made in accordance with recognised codes of practice.

## 5.9 Ferrule-secured eye terminations

5.9.1 Ferrule-secured eye terminations shall be correctly formed and in Denmark they shall be marked with the manufacturer's mark in addition to the prescribed marking, cf. 12.

## 5.10 Wire Rope Clips

5.10.1 Wire rope clips with two gripping faces shall be used (the U-bolt type is not permitted) and the manufacturer's guidelines shall be followed. The number of wire rope clips must not be less than three, and the free ends of the wire rope shall have a length of at least five times the wire rope diameter.

## 5.11 Winches

5.11.1 The type and size of winch shall be chosen so that the other equipment is designed for the load to which the maximum pulling power of the winch subjects it.

5.11.2 For simple cargo handling winches, the pulling power shall not normally be able to exceed the safe working load for the associated wire rope. If the cargo handling winch is also to be used for other purposes, this must be assessed separately.

5.11.3 If guy or head turning winches are to be used, the guy force shall be determined. The pulling power of the guy-winch must not exceed the safe working load of the pulling part, but shall at least give a component of force equal to the maximum guy forces, taking into account the number of blocks in the guy tackle.

5.11.4 All winches shall be fitted with a stopping device capable of holding the greatest load for which the winch is designed. If the power supply fails, the brake shall automatically switch into brake and stop the maximum safe working load at full speed, or there shall be a manual brake with the same capacity that can be operated from the control station, cf. 5.13. In the case of simple cargo handling winches, there shall be a direct connection between the stopping device, the operating device and the drums so that freefall cannot occur. In the case of combined winches, the drum may be disconnectable, in which case the arrangement must be such that the drum cannot be unintentionally disconnected during normal operation.

5.11.5 Cogwheels, winding apparatuses and other moving parts on winches and cranes, both above and below deck, shall be securely guarded. The same applies to gear trains from motors to winches, steam pipes, hydraulic hoses, electric conductors, etc. Good accessibility must be provided for maintenance, etc.

5.11.6 If the winch is operated by remote control or from another point, special fencing or railings shall be erected to prevent persons from coming into contact with wire rope, blocks, drums, or other moving parts. A sign shall be erected advising that the winch is remote-controlled and may start up without prior warning.

## 5.12 Operating Levers

5.12.1 Operating levers shall be fitted so that they are moved in the direction of the load and with the "stop" vertical, the "lower" towards the hatchway and the "raise" with the lever pushed away from the hatchway (towards the winch operator).

5.12.2 Control devices for winches and cranes shall be arranged so that they quickly return to the marked centre position (stop) when they are released, and it must be possible to lock them in the centre position when the winch or crane is not in operation.

5.12.3 Operating levers must be durably marked with clear standard symbols or designations indicating usage.

5.12.4 Ergonomic principles shall be used in constructing control devices.

## 5.13 Control Station for Winches, Cranes, etc.

5.13.1 The control station shall afford the winch operator a secure position with the best possible view of the load, wire and winch drums. The control station shall afford the operator maximum protection against falling loads and injury that may be caused by the wire rope breaking.

5.13.2 The control station shall be arranged so that the operator has a good foothold. Special grating may be required if the control station is exposed to water, oil-spill, etc.

5.13.3 In the case of winches controlled by loose cabling, the cable shall be long enough for the operator to be able to choose a generally secure position with a good view of the lifting operation.

## 5.14 Crane Cabs

5.14.1 Loading and unloading cranes shall normally be provided with a cab. This shall be solidly built and must afford the operator protection against falling objects.

5.14.2 The cab shall have an internal free height of minimum 2.0 m, shall be isolated against cold, heat and noise (maximum 80 dB(A)), shall have adequate ventilation and heating, and shall be equipped with a portable fire extinguisher of the powder type (minimum 2 kg for small cranes).

5.14.3 All windows in the cab shall be made of toughened or laminated glass, and there must be safe access for cleaning the windows externally. The windows shall be fitted with the required number of motor-driven wipers, heating filaments or air fans so that vision through the windows is not significantly reduced due to rain, steam, ice, etc.

5.14.4 There shall be safe access to the cab and a safe means of escape irrespective of the position of the crane.

5.14.5 The driver's seat, the control lever and other fittings shall be executed according to ergonomic principles.

## 5.15 Access and Passages

5.15.1 There shall be safe access to control stations for winches and all parts of cranes and derrick arrangements that need to be maintained and inspected.

5.15.2 There shall be a free passage between stationary and moving parts on cranes, winches, etc., where people generally move about. This shall have a width of minimum 0.6 m up to a height of 2.0 m.

5.15.3 Ladders, railings, etc. shall satisfy the requirements of the regulations for such arrangements on deck.

## 5.16 Stowing Derricks

5.16.1 For stowing derricks and cranes during sailing, fixed or dismountable "derrick braces", or similar stowing devices shall be fitted that can hold the derrick or crane in a fixed position. Concerning the design of these, see 3.4 above.

## 5.17 Hydraulic, Pneumatic and Electric Systems

5.17.1 Hydraulic and pneumatic systems shall be fitted with a safety valve. The safety valve shall be sealed by a competent party after the cargo handling appliance has been load tested so that it cannot be set higher than the permitted working pressure of the system. If the seal is broken, a new special five-yearly thorough examination shall be carried out by a competent party.

5.17.2 It shall be possible to connect control gauges to the main pressure systems.

5.17.3 Hoses, pipes and conductors shall be laid so that they are optimally protected against shock, pressure, heat, vibrations, etc. Hoses shall also be protected in such a way that the operator is not injured if the hose breaks, and they shall be easy to replace and maintain.

5.17.4 Hydraulic cylinders shall be arranged so that they stop or ease off the controller if the power supply fails or if hoses or pipes break.

5.17.5 Pressure systems shall be constructed according to a recognised standard. The standard shall be specified and confirmed by a competent party.

5.17.6 Electrical equipment shall be constructed according to a recognised standard that also takes account of the zone on board where the crane is located in respect of area classification. The standard shall be specified in the *Crane Handbook* and confirmed by a competent party.

5.18 A competent party shall verify that the lifting appliance and loose gear have been constructed in accordance with the requirements of this Section.

## 6 **Materials**

6.1 Only certified materials may be used for strength members. The steel grade shall be carefully chosen, taking due account of material fatigue, the importance of the construction, the type of load, material thickness, weldability and "design" temperature.

6.2 All steel materials for strength members in crane and derrick arrangements shall be deoxidised (killed) and shall be supplied with a factory certificate showing the physical and chemical properties of the material in relation to a recognised standard.

6.3 When choosing materials, it shall be ensured that they are suitable for their intended use in maritime operation.

6.4 A competent party shall verify that the specified materials have been used in lifting appliances and loose gear.

6.5 Material type and grade, any restrictions in weldability for repairs, etc., and any temperature restrictions in the use of the crane shall be specified in certificates and the *Crane Handbook* and shall be confirmed by a competent party.

## **7 Execution of Work**

7.1 All welding of strength members shall be carried out by certified welders with a certificate for the given type of welding.

7.2 Important welds shall be checked using a non-destructive method in accordance with the instructions and under the supervision of a competent party.

7.3 Radiographs shall generally satisfy the requirements of quality 4 (blue) pursuant to "II W Collection and Reference Radiographs of Welds", but less pore formation pursuant to quality 3 (green) may, however, be accepted.

7.4 A report specifying what has been inspected and the result of the inspection, confirmed by a competent party, shall be appended to the *Crane Handbook* (cf. 9.2).

## **8 Safety Equipment**

### **8.1 Limit Switches**

8.1.1 Cranes shall have limit switches if there are limits to the movements of the crane, the jib or the hook.

8.1.2 Limit switches shall be placed so that no damage or danger occurs even if the crane is stopped at full speed by these switches.

8.1.3 When the limit switches are activated, operation in the given direction shall automatically be halted. It must not be possible to reactivate the driving force or to release the brake before the relevant operator control has been placed in the 0 position and so that movement can occur only in a non-dangerous direction.

8.1.4 Bypassing of limit switches for the lowest position of the derrick or crane jib is permitted if it is necessary to stow the derrick. The bypass button must be located beneath a cover and apart from the other operator controls, but so that the operator can reach it from his fixed seat. A sign shall be erected stating that the end stop bypass must not be used for operations other than stowing the derrick.

8.1.5 Equipment that is driven hydraulically or pneumatically may, instead of limit switches, have automatic pressure limiting which prevents movement to the extreme points being accompanied by unacceptable effects or situations.

## 8.2 Overload Cut-Outs

8.2.1 Overload cut-outs are required for cranes capable of lifting more than the safe working load (SWL). Reconnection of the driving force or release of the brake must not be possible before the relevant operating lever has been placed in the 0 position and so that movement can occur only in a non-dangerous direction. It must not be possible for the safe working load to be exceeded by more than 5%.<sup>3)</sup>

## 8.3 Quick-Break Switches

8.3.1 Cranes with a safe working load that diminishes for increased radius and for a maximum safe working load (SWL) of more than 5 tons shall be fitted with a quick-break switch. Reconnection of the driving force or release of the brake must not be possible before the relevant operating lever has been placed in the 0 position and so that movement can occur only in a non-dangerous direction.

## 8.4 Wire Rope Slackness Stops

8.4.1 Cranes with a safe working load (SWL) of more than 5 tons shall be fitted with a "wire rope slackness stop" that automatically halts the lowering if the wire rope is released too quickly from the drum. However, this stop may be dispensed with if the operator has a full view of the drum.

## 8.5 Emergency Stop Devices

8.5.1 All cranes shall be fitted with an emergency stop switch that is accessible from the cab. The switch shall be red and shall be protected by a release pin or similar.

8.5.2 If the emergency stop switch is activated, all the brakes shall immediately act fully so that all movement is braked in a safe manner and stopped as quickly as possible.

8.5.3 On electric cranes, the emergency stop switches shall cut out the main power supply to the crane (all phases).

8.5.4 In the event of an emergency stop, all functions shall be returned to zero before the crane can be restarted.

8.5.5 For cranes running on rail tracks or belts, emergency stop switches accessible from the deck shall be fitted on the crane, if applicable on each crane leg. Such emergency stop switches shall stop the crane as quickly as possible. It must not be possible to reset the switch from the cab.

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3 For lifting appliances constructed in accordance with the rules of a recognized classification society, the class rules concerning overload cut-outs apply.

8.5.6 Cranes running on rail tracks or belts shall be fitted with flexible guards to prevent them from running over persons.

## 8.6 Warning Signals

8.6.1 Any crane with a cab shall be fitted with audible signalling devices to warn of danger. All cranes running on rails or belts shall have a warning bell or alarm that gives warning before the crane begins to move.

8.6.2 A competent party must verify that lifting appliances have been constructed in accordance with the guidelines in this Section.

## 9 *Crane Handbook*

9.1 There must be handbooks on board for all the types of cranes located on the ship, including cranes for handling provisions, engine room overhead travelling cranes and large derrick arrangements where the rigging plan (cf. 2.2) does not in itself give all the necessary information mentioned in 9.2.

9.2 The *Crane Handbook* shall contain a rigging plan and a full description of the lifting appliance with information concerning which standard it is based on, constructional criteria, which crane groups have been used, etc., operating conditions such as SWL, SWM, minimum and maximum crane jib or derrick angle and restrictions on oscillation, the service life in relation to the conditions of use, a plan showing the material grade for the entire crane, as well as reports on internal inspections carried out by the manufacturer in the form of welding checks, production control, etc., confirmed by a competent party, cf. 7. It shall also contain plans and diagrams of all safety equipment, a diagram of the electrical, hydraulic and pneumatic equipment stating the maximum permitted pressure, as well as rules for maintenance and inspection ("Servicing" section). The "Servicing" section shall, inter alia, contain a detailed description of the inspection of swivel bearings and crown grummetts, the moment which bolts must be tightened to, etc.

## Testing, Certification, Periodic and Other Inspections

### 10 *Testing of Lifting Appliances*

10.1 Before being put into use, all new loose gear shall be tested by a competent party using the following test loads:

<i>Object</i>	<i>Safe Working Load</i>	<i>Test Load</i>
Chains, rings, hooks, shackles, swivels, multi-sheave blocks, etc.	up to and inc. 25 tons	2 × SWL
	up to and inc. 30 tons	55 tons
	up to and inc. 35 tons	65 tons
	up to and inc. 40 tons	70 tons
	up to and inc. 45 tons	75 tons
	up to and inc. 50 tons	85 tons
	up to and inc. 55 tons	90 tons
	up to and inc. 60 tons	95 tons
	up to and inc. 65 tons	100 tons
	up to and inc. 70 tons	110 tons
	up to and inc. 75 tons	115 tons
	up to and inc. 80 tons	120 tons
	up to and inc. 85 tons	125 tons
	up to and inc. 90 tons	130 tons
	up to and inc. 95 tons	135 tons
	up to and inc. 100 tons	145 tons
	up to and inc. 110 tons	155 tons
	up to and inc. 120 tons	165 tons
	up to and inc. 130 tons	175 tons
	up to and inc. 140 tons	190 tons
up to and inc. 150 tons	200 tons	
up to and inc. 160 tons	215 tons	
up to and inc. 170 tons	230 tons	
up to and inc. 180 tons	240 tons	
over 180 tons	1.33 × SWL	
Single-sheave block:		4 × SWL
Single-sheave block with becket:		6 × SWL
Wire rope:		Breaking load
Lifting yoke, grab, etc.:		2.0 × SWL

10.2 When the test loading has been carried out, objects that have not been tested to breaking shall be carefully examined for any damage or deformation. In the case of blocks, the sheave shall be removed to examine axles and bearings to the extent deemed necessary by the competent party.

10.3 Testing and inspection pursuant to 10.1 and 10.2 shall be carried out by the gear manufacturer or by an authorised workshop.

10.4 Following testing and inspection, a competent party shall issue a certificate using Form No. 3 or Form No. 4.

10.5 A manufacturer or distributor who has had a batch of loose gear certified shall, when selling part of the batch, supply the purchaser with a copy of the original certificate specifically covering the loose gear in question.

10.6 Standard mass-produced loose gear may, on application to the Danish Maritime Authority, be permitted for certification on the basis of random inspection in accordance with a clearly specified model.

## **11 First-time Inspection and Testing of Lifting Appliances**

11.1 Before being taken into use, lifting appliances shall be tested, inspected and certified by a category A competent party.

11.2 Before cargo handling appliances are tested on board, the competent party shall verify that the documentation mentioned in 3 and 9 is available and that a certificate can be produced for all loose gear.

11.3 After having been installed on board, lifting appliances shall be load tested by the competent party using the following test loads:

<i>SWL</i>	<i>Test Load</i>
up to 20 tons	$1.25 \times SWL$
20 to 50 tons	$SWL + 5 \text{ tons}$
Above 50 tons	$1.1 \times SWL$

11.4 The test load shall be lifted using the ship's own equipment, and the derrick must not create an angle with the horizontal plane greater than 15°. If this is not possible or if the derrick has been constructed for a derrick angle greater or less than 15°, the derrick shall be placed at the smallest possible angle or at the derrick angle for which the arrangement has been designed. When the test load has been lifted, the arrangement shall be function tested using the test load, i.e. lifting, lowering, swinging and topping (if this can be carried out with the load hanging on the hook), and braking of the cited movements must be tested. If possible, the ship shall be given a list of 5° or the maximum list to which it is subject with the maximum safe working load to achieve the most realistic test possible (see 3.4). The smallest and, if applicable, greatest possible angles (if the derrick can be topped with the load) used during testing shall be stated on the certificate.

11.5 Derricks used in union purchase shall be tested in tandem using a test load in accordance with 11.3 and the safe working load for this loading method. The test shall be carried out with the derricks in the most unfavourable positions. Preventers shall be rigged, and the inspection shall also cover preventer fastenings and the parallel running of the winches during lifting, transferring, lowering and braking of the test load.

11.6 Cranes and other lifting machinery shall be load tested using the test load given in 11.3. The test load shall be lifted, lowered, swung and carried and the radius of the crane jib varied. Braking of the cited movements shall be tested. The crane jib shall be tested using the stipulated test load at the maximum and minimum radii. If it is not possible to lift the test load with a hydraulic winch due to the restriction of the pressure, it is sufficient to lift the maximum possible load. After load testing, the safety valve shall be set to the pressure that corresponds to the safe working load.

11.7 All load testing of lifting appliances shall be carried out primarily using loose weights (loads). This rule may not be waived for new arrangements. In connection with replacing or reconditioning, a spring or hydraulic balance may be used if loose weights cannot be provided. If spring or hydraulic balances are used, they shall be reliable and accurate, and the test load shall be applied with the lifting appliance swung as far as possible – first in one direction and then the other. The test is not satisfactory unless the indicator remains constant for at least two minutes.

11.8 Before and after testing, the competent party shall verify that the cargo handling appliance plus accessories are in accordance with the plans and that no part of it has been damaged or has suffered permanent deformations as a result of the tests. The competent party shall decide whether individual parts shall be disassembled for inspection.

11.9 The competent party shall certify the test using Form No. 2 for derricks and cranes and Form 2(U) for derricks and cranes used in union purchase and shall make an entry in the *Register of Ship's Lifting Appliances and Loose Gear* (cf. 15).

11.10 Before lifting appliances are commissioned, the Danish Maritime Authority or a category A competent party shall inspect and test that the safety equipment, e.g. limit switches, overload cut-outs, quick-break switches, wire rope slackness stops, emergency stop devices, warning signals, guards for moving parts, instrumentation and operating levers, is functioning and that it is in accordance with 5.11.4 up to and including 5.16 and 8 of this Technical Regulation, and that the marking has been executed in accordance with 12.

11.11 The Danish Maritime Authority or a category A competent party shall verify that the *Register of Ship's Lifting Appliances and Loose Gear*, any certificates, a satisfactory rigging plan and, if applicable, crane handbooks are located on board.

## **12 Marking**

12.1 Lifting appliances and loose gear shall be durably marked (chiselling, centre punching, steel stamp) with the safe working load (SWL) and the certificate/marketing number. Derricks and cranes shall also be marked with a reference number corresponding to their position in the rig arrangement/overview plan, diagram 3 or corresponding.

### **12.2 Derricks**

12.2.1 Derricks shall be marked with the safe working load (SWL) for a single part and for an angle of 15° or for the smallest angle greater than 15° to which the derrick will be lowered on the basis of the arrangement on board. For example: NR 3 SWL 5T 15°.

If the same derrick is designed to be able to lift 10 tons when it is rigged with one fixed and one loose block, double part, the marking is as follows: NR 3 SWL 5-10 T 15°.

12.2.2 Heavy derricks shall be marked with the smallest angle and the largest load for which the derrick and tackle are designed. For example: SWL 60T 30°.

12.2.3 If there is a risk of steep angling, the maximum permissible derrick angle shall also be given. For example: SWL 15T 15-60°.

12.2.4 If two derricks are able to work in tandem in union purchase, this shall be marked using special marking on a special sign set up at a suitable point between the derricks or the masts. For example: NR 3 + 4 SWL (U) 2T.

12.2.5 The derrick or crane numbers and the SWL shall be given in 80 mm tall figures and letters, whilst the derrick angle may be given in 60 mm tall figures. The marking shall be durable.

### 12.3 Cranes

12.3.1 Cranes with a constant safe working load for all radii shall be marked with the crane number, the safe working load (SWL) and the minimum and maximum radii for this load. For example: NR 5 SWL 5T 4-14M.

12.3.2 Cranes the safe working load of which varies with radius of the crane jib shall be marked with the maximum and minimum permissible working load and the corresponding radii. For example: NR 5 SWL 15T 5M, SWL 5T 15M.

12.3.3 The crane numbers and the safe working load shall be given in 80 mm tall figures and letters, whilst the crane radius may be given in 60 mm tall figures and letters.

12.3.4 If two cranes can work in tandem, the special mark for this shall be placed on a suitable sign set up at a suitable point between the cranes.

### 12.4 Loose Gear and Loose Parts

12.4.1 Loose gear and loose parts shall be marked in accordance with the requirements given in the following, and the marking shall be affixed so that it remains readable throughout the practical lifetime of the loose gear.

### 12.5 Blocks

12.5.1 The safe working load (SWL) for a single-sheave block is equal to the tension in the wire rope (i.e. half the force in the suspension element) if the block is used as a single load block. In the case of single-sheave blocks with becket, the safe working load is also equal to the tension in the wire rope, which, in this case, is a third of the force in the suspension element. In both cases, the block shall be marked with the safe working load equal to the tension in the wire rope.

12.5.2 In the case of a multi-sheave block, the safe working load is equal to the force in the suspension element and equal to the safe working load with which the block shall be marked.

### 12.6 Chains, Rings, Hooks, Shackles, Swivels, etc.

12.6.1 Chains, rings, hooks, shackles, swivels, etc. shall be marked with the safe working load (SWL) for which the part in question is certified.

### 12.7 Wire Rope

12.7.1 Wire ropes shall be supplied with a certificate stating the derrick/crane and the purpose (unloading runners, suspensions, guys, etc.) for which the wire rope is to be used. If not all the wire rope is used for the given purpose, the used length and any remainder shall be stated in

the certificate. This statement shall be dated and signed by a competent party at first-time inspection and later by the chief officer or the master.

## **12.8 Slings**

12.8.1 Slings and the like shall be marked with the safe working load in clear figures and letters, either on the sling itself or on a tablet or ring of durable material attached securely to the sling, or the safe working load shall be given on notices erected so that they are easily readable by all parties concerned. Wire rope equipped with ferrule-secured eye terminations shall be marked with the safe working load stamped on the ferrule-secured eye termination.

## **12.9 Lifting Yokes, Grabs, etc.**

12.9.1 Lifting yokes, grabs, etc. shall be marked with the safe working load (SWL) and weight.

## **12.10 Inspection**

12.10.1 A competent party shall verify that lifting appliances have been marked in accordance with this Section.

## **13 Annual Inspection**

13.1 Lifting appliances shall be inspected at least once every 12 months.

13.2 The annual inspection shall cover the inspection and function testing of all the ship's lifting appliances and loose gear as well as a visual inspection for deformation, wear and tear, corrosion, breakage and crack formation, etc. The inspection shall be carried out so that it gives as reliable as possible a confirmation of the safety of the examined parts.

13.3 If parts have been replaced, the certificate number of the new part shall be recorded in Section I of the inspection log and the certificate shall be appended, whilst the certificate of the replaced part shall be removed (cf. 22.4).

13.4 A competent party or the ship's chief officer, chief engineer or first engineer<sup>4)</sup> shall carry out the annual inspection and make the entry in the inspection log. On small vessels that do not have these categories of officer, the master shall carry out the cited inspection and make the required entry.

## **14 Five-Yearly Thorough Examination**

14.1 All the ship's lifting appliances and accessories shall be thoroughly examined and tested every 5 years.

14.2 The five-yearly thorough examination shall normally entail a full de-rigging and the opening or disassembly of loose devices and gear so that all the components may be inspected for deformation, wear and tear, corrosion, breakage and fissures. In the case of derrick arrangements, the gooseneck's boom pin shall be lifted, the top fastenings disassembled, blocks

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4 If the lifting appliances are so complex that it is not considered routine for the ship's officers to carry out the annual inspection, a competent party may perform it.

and winches opened, etc. Cranes shall be disassembled and examined pursuant to the specifications in the "Servicing" section of the crane handbook.

14.3 The five-yearly thorough examination shall be carried out at a workshop with the necessary testing equipment by personnel with satisfactory qualifications.

14.4 After the examination as per 14.1, the parts are re-assembled and the lifting appliances are load tested and inspected in accordance with 11.

14.5 A category B competent party (cf. 1.10(b)) shall take charge of the five-yearly thorough examination and issue new certificates, although it may also certify examination and testing with the workshop's stamp, date and signature on the reverse of existing Form No. 2 (for lifting appliances) or Form No. 3 (for loose gear). The competent party must then make an entry in the *Register of Ship's Lifting Appliances and Loose Gear*.

## **15 Keeping the Register of Ship's Lifting Appliances and Loose Gear**

15.1 Inspections and examinations of lifting appliances shall be recorded in the *Register of Ship's Lifting Appliances and Loose Gear* in accordance with the guidelines printed therein.

15.2 In order to keep a record of the ongoing overhaul and replacement of loose gear, the vessel's chief officer or master must complete the necessary data in Section II of the *Register of Ship's Lifting Appliances and Loose Gear*.

15.3 On vessels with extensive lifting appliances, the ship's chief officer may keep his own rigging protocol instead of completing Section I of the *Register of Ship's Lifting Appliances and Loose Gear*. The protocol shall have headings for the description (name, dimension, marking, SWL, quantity, certificate number) of the overhauled or replaced parts and space for explanatory notes, date and signature.

15.4 The *Register of Ship's Lifting Appliances and Loose Gear*, certificates and any rig protocol shall be available, at any time, to the Danish Maritime Authority, the authorities of other states and competent parties. They shall be kept for at least 5 years from the date of the final entry.

## **16 Inspection in Connection with Modifications**

16.1 Modifications or reconditioning of lifting appliances shall be carried out by a workshop with the necessary facilities and expertise.

16.2 Load testing and inspection shall be carried out in accordance with 11.

## **Miscellaneous Provisions concerning the Use of Lifting Appliances on Board**

### **17 Inspection Prior to Commencement of Loading or Unloading**

17.1 Lifting appliances shall be inspected to the necessary extent prior to or during use and a record of this shall be made in the logbook of the ship.

## **18 Treatment of Loose Gear**

18.1 Chains must not be shortened using knots. In order to prevent chain loops from coming into contact with sharp edges when lifting hard and heavy objects, suitable intermediary layers must be used.

18.2 Wire ropes shall normally be stored in a dry room at a constant temperature. During assembly, wire rope shall be withdrawn from the drum from the outer end to avoid kinks. All wire rope in running rigs shall be evenly lubricated with a suitable lubricant that penetrates to the core of the wire rope.

18.3 Slings made of wire rope shall be stored in such a way as to prevent harmful bends.

18.4 Loose gear that is not in use shall be stored in a suitable place where it is easy to locate tackle with the correct safe working load (SWL).

## **19 Winch Operator, Crane Driver, Signaller, etc.**

19.1 All winches that are in operation shall be attended.

19.2 Only persons aged 18 years or more may be employed as winch operators, crane drivers and signallers. Where it is necessary in respect of the safety of the workers, one or more signallers shall be used.

19.3 Where there are high hatch coamings or other obstacles to the signaller's vision, fixed or movable platforms shall be arranged.

## **20 Loading of Lifting Appliances**

20.1 Lifting appliances must never be loaded beyond the safe working load (SWL).

20.2 Cranes and derricks must only be used for lifting and lowering loads in the vertical direction, i.e. the load shall be located vertically beneath the loading block or crane sheave unless it is clear from the *Register of Ship's Lifting Appliances and Loose Gear* or the *Crane Handbook* that the arrangement is specially designed for other use, e.g. derrick pairs.

20.3 If the derrick or crane is used for removing or applying hatches, the runner wire shall run through a snatch block fixed vertically beneath the load block or crane sheave.

## **21 Handling Loads**

21.1 When the cargo handling appliance of the ship is in use, the ship's master is responsible for ensuring that suitable loose gear is used.

21.2 Nobody may be given other work in areas where cargo handling is taking place.

21.3 Special attention shall be paid when the work area in the hold is restricted to the area under the hatchway.

21.4 All protective features such as gratings, stays, lights, etc. that must be removed to give access for loading or unloading must not be moved without the work supervisor or a re-

sponsible officer being warned and giving his permission. The protective features shall be replaced as soon as possible.

## **22 Replacing Loose Gear and Wire Ropes**

22.1 Loose gear and wire ropes that are worn, corroded or damaged shall be replaced immediately and details of this shall be entered in the *Register of Ship's Lifting Appliances and Loose Gear* (Section II) or in the rigging protocol (cf. 15.2 and 15.3).

22.2 Loose gear, apart from wire ropes, shall be replaced if, due to corrosion or wear and tear, the weight or cross-sectional area of it has been reduced by 20%, although no reduction in the dimensions beyond 10% shall be permitted.

22.3 A wire rope shall be replaced if  
over a length corresponding to 8 diameters it can be seen that the total number of broken wires exceeds 10% of the total number of wires,  
it shows signs of harmful wear and tear or internal or external corrosion,  
it has been overloaded to the point of permanent deformation,  
it has other defects such as kinks, crushed individual parts, a tendency to form spirals or other deformations making it unsuitable for use.

22.4 Certificates using Form no. 3 (for new loose gear) and Form No. 4 (for wire rope) shall be appended to the *Register of Ship's Lifting Appliances and Loose Gear*, whilst the wire rope certificate may also be appended to the rigging protocol (cf. 15.3) if there is one. The certificates for the replaced parts shall be removed from the *Register of Ship's Lifting Appliances and Loose Gear* or the rigging protocol and shall be kept separately (cf. 15.4).

## **Special Provisions**

### **23 Departures from and Additions to the Regulations**

23.1 The Danish Maritime Authority may, under special circumstances, permit departures from the provisions of this Annex if they are considered proper from a safety point of view and do not contravene the international conventions to which Denmark is an accessory.

## **Tests and Inspections of Suspended Platform Decks and Ramps**

### **24 Construction and Strength of Suspended Platform Decks and Ramps**

The construction and strength of suspended platform decks and ramps shall comply with the requirements of "Notices from the Danish Maritime Authority B", Chapter II-1, Regulations 3-5.

### **25 Load Test of Suspended Platform Decks and Ramps**

25.1 Platforms and ramps shall be load tested with the proof loads stated in 11.3 if one or both ends are movable by stays or wires. If the platform rests at both ends, load testing shall not be carried out, but the entire load-bearing construction shall be inspected.

25.2 Ramps shall be load tested while statically supported at the movable end with proof loads as stated in 11.3.

25.3 The hydraulic system shall be pressure-tested at 1.5 times the maximum working pressure, however at a maximum of 7 N/mm<sup>2</sup> above the working pressure, or in accordance with the rules laid down by a recognized classification society in this respect.

25.4 Fall protection devices are not tested with ramps loaded, but a simulated tripping is carried out with the ramp resting on trestles or the like. Where a double-wire system has been installed instead of a fall protection device, the ramps shall be pressure-tested in horizontal position at the above proof load.

25.5 When ramp and platform lifting devices are used, a load test shall be carried out of each platform and ramp during movement from working position to stowed position, or as close to this as possible, with a proof load of 25% of the mass weight of the platform or ramp.

25.6 When the tests have been completed, the construction shall be thoroughly examined, and if any part of it shows distortion, cracking or any other damage of significance from a safety point of view, the damage shall be repaired, and a new test may be required by order of the Danish Maritime Authority in each individual case.

## **26 Annual Inspection of Suspended Platform Decks and Ramps**

26.1 Every year platforms, ramps and lifting devices shall be inspected and undergo a function test.

26.2 If the fall protection device is of a type or construction that renders it impossible to arrange a test, the function of all components of the system shall be tested and replaced if necessary.

## **27 Two-Yearly Inspection of Suspended Platform Decks and Ramps**

Every second year, ramps and platforms that are operated with persons on them shall be load tested, cf. 25.2, 25.5 and 25.6, as above under load testing of suspended platform decks and ramps.

## **28 Five-Yearly Inspection of Suspended Platform Decks and Ramps**

For ramps and platforms that are only operated without persons on them, the load tests, cf. 25.2, 25.5 and 25.6 as stated above under load testing of suspended platform decks and ramps, shall be carried out every fifth year followed by a thorough examination and function test of platforms, ramps and lifting arrangements, including fall protection devices.

## **29 Recording of Tests, Inspections and Repairs of Suspended Platform Decks and Ramps**

Loading tests, function tests, and repairs and replacements concerning platforms, ramps and lifting arrangements shall be recorded in the Register of Ship's Lifting Appliances and Loose Gear.

## Notes to the Technical Regulation on Lifting Appliances and Loose Gear on Ships

For the *Register of Ship's Lifting Appliances and Loose Gear*, only registers may be used which are, in respect of content and form, in accordance with the register for the certification of completed periodic examination and inspection of lifting appliances recommended by the International Labour Organisation (ILO).

The following registers, which have been drawn up in accordance with the above recommendations, may be used:

- "Register of Lifting Appliances and Loose Gear", Danish Maritime Authority.
- "Register of Machinery Chains, etc., and Wire Ropes", issued pursuant to the British "Dock Regulations".
- Registers from other recognised classification societies may also be used.

A ship's survey book may not be used as a register.

In several of the above registers, including that issued by the Danish Maritime Authority, there are no pre-printed pages for certifying completed load testing of lifting appliances and loose gear, including wire ropes and heat treatment of chains, etc. As a rule, such work is carried out by a shipyard or a specialist firm, whereafter a competent party issues a special test certificate. Such test certificates must be appended to the register and shown to the Danish Maritime Authority on demand.

The Danish Maritime Authority has had the following certificate forms issued based on the model form for ILO Convention No. 152 ("Model Forms of Register of Ship's Lifting Appliances and Certificates as Required by ILO Convention No. 152"), which may be used:

- Form No. 2: Certificate of Test and Thorough Examination of Lifting Appliances
- Form No. 2(U): Certificate of Test and Thorough Examination of Derricks Used in Union Purchase
- Form 3: Certificate of Test and Thorough Examination of Loose Gear
- Form No. 4: Certificate of Test and Thorough Examination of Wire Rope