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Section 1

Preparation of Operating and Maintenance Manuals for Shell Doors

A. General

1. Application

Operating and Maintenance Manuals (OMM) being subject of this guideline apply to shell doors such as bow doors with the associated inner doors, side shell doors and stern doors with respect to the GL Rules I – Ship Technology, I – Seagoing Ships, I – Hull Structures, Section 6, H. and J., the IACS Unified Requirements S8, S9, S15 and S16 as well as SOLAS 74 as amended.

Exceeding common operating instructions, OMM shall provide full information to the ship's staff for maintaining and monitoring the sound condition of all elements of the shell door systems, relevant for the safety of the vessel. Detailed information on the procedures of maintenance and function tests are to be prepared.

The provision of the OMM is required for:

- Ro-Ro Passenger Ships
- Ro-Ro Cargo Ships with bow door, and keel laying on or after 1996-07-01, if the bow door/inner door gives access to an enclosed superstructure
- Ro-Ro Cargo Ships with side or stern door, and keel laying on or after 1997-07-01, if the side or stern door gives access to enclosed spaces

The OMM is subject to Class approval. Submission to GL in 4fold (incl. drawings) is required for the distribution of the approved copies:

- on board
- owner's office
- GL-Head Office
- national administration (upon request)

The OMM must be prepared in a language understood by the users. If this language is not English, a translation into English is to be included.

In the following a framework of the conceptual layout is described. Deviations could make sense in case of the existing design and documentation concept, e. g. with door systems of simple design.

2. Operational instructions for the master

Special safety precautions shall emphasize the importance of closed openings for granting seaworthiness of the vessel. It shall be pointed out that special care must be taken when opening of shell doors at sea becomes necessary e. g. for embarkation of pilots or in case of emergency.

The required sign "To be kept closed at sea!" at the inside of the shell doors is to be mentioned at appropriate text passages in the OMM. That concerns also to the notice plates with warning indicator lights at the operating panels that give instructions to the effect that all securing devices are to be closed and locked before leaving harbour. It should be noted that the operating panels for the operation of doors are to be inaccessible to unauthorized persons.

3. Ship's particulars

A summary of principal dimensions, Character of Classification, GL register No, service conditions, service area restrictions, flag, port of registry, call sign and IMO No is to be included.

4. Manufacturer

The supplier and sub-supplier, if applicable, of the door system is to be named. Addresses of world-wide service stations shall be added, as far as existing.

B. Door and Ramp Systems

1. General description

1.1 Drawings of the door systems' arrangement form the basis of the technical documentation. Details are to be described, in order to arrange for the crew a clear understanding of the functionality. Safety features are to be particularly emphasized. Where the shell doors or the inner doors next to the bow doors also serve as ramps for loading and unloading, the content of the OMM needs to be extended accordingly.
1.2 Design criteria and operating conditions of the shell doors and especially of the ramps are to be commented on, such as:

- quay support of ramps:
  Generally it must be pointed out that the ramps are to be laid down on the pier before starting the loading/unloading procedure. The load limit when using purpose designed preventers or standers must be expressed.
- permissible loads
- ship/shore interaction:
  quay limit level relative to ship's draught or permissible range of inclination of the vamp
- limiting trim and heeling angles during cargo handling and door operations
- limiting range of ambient temperatures

1.3 Structural design of ramps /doors

Key plans on the steel structure are to be inserted. Detailed drawings on the steel structure surrounding the mechanical elements and the bearings need to be provided, both of the door and of the hull structure.

1.4 Sealing arrangement

The arrangement of the sealings dedicated to maintain the weather- or watertightness of the outer and inner doors needs to be described. In addition to the drawings on the typical profile sections detail drawings need to be attached on formed components, packing retaining channels, drainages etc. The rubber material is also to specify.

1.5 Mechanical equipment

Depending on the complexity of the design an appropriate combination of drawings and text information shall be provided. Safety aspects and the importance of individual elements in that respect shall be stressed. The scope of the information level shall be adequate to enable the staff a quick understanding of the operational procedures as well as of the functionality of all the individual systems. Production drawings are usually not suitable for the OMM. Typically they contain too many detailed information. Nevertheless sufficient information on wear parts should be provided for inspections and surveys in order to assess the present wear with respect to the as-built condition and to enable reproduction.

The nomenclature as subsequently defined must be kept:

- Supporting device is a device used to transmit external or internal loads from the door to a hinge, stopper or other fixed device into the ship's structure. Especially in case of internal load transmission a securing device might also be an active link that transmits loads from the door to the ship's structure.
- Securing device is a device such as a cleat, pin locker, pivoted hook, knee-lever interlock etc. used to keep the door closed by preventing it from rotating about its hinges.
- Locking device is a device that locks a securing device in the closed position by means of a pin locker, self-locking cylinder etc.

Key plans are to be included into the OMM containing at least information on:

- arrangement of the shell doors and ramps on board, including operating console, hydraulic unit, switchboards etc.
- arrangement of supporting, securing and locking devices
- arrangement of the systems for opening and closing

Detail drawings are to be appended providing information on:

- supporting devices inclusive main hinges, limit wear and tear of individual elements and couples of elements, if applicable as criterion for rejection
- securing and locking devices:
  could be combined with function description
- locking devices for the opened position of the door
- location and adjustment of sensors, e.g. limit switches, proximity switches
- significant details that need to be monitored during the function test procedures
- references for the maintenance procedures
- check points for gap gauging of the supporting devices such as thrust bearings:
  The limiting tolerances are to be entered into the drawings or a separate data sheet needs to be established.
- check points for the measurement of wear and tear of battening bolts, cleats, bearings of hinges etc. for comparison with limiting values as entered into the drawings or into separate data sheets
- measurements to be performed intentionally without dismantling e.g. of main bearings during intermediate surveys; respective guidances are additionally be entered into the drawings
- references for the spare parts in case of damages, see 1.11
- lubricant recommendation

1.6 Hydraulic and electrical system

Documents to be prepared:
– description of hydraulic power supply unit
– hydraulic diagram and wiring diagram
– labelling of electrical components in conjunction with the labels mounted on board
– electrical power supply including independent power supply of the indicator systems
– parts list
– specification of recommended hydraulic fluid
– function description including information on the emergency operation, see also C.

1.7 Water leakage detection system

The following descriptions are to be laid down:

– system and components
– location on board
– monitors (on the navigation bridge and in the engine control room)
– functionality
– test procedures

See also I – Ship Technology, Part 1 – Seagoing Ships, Chapter 3 – Electrical Installations, Section 16, E.

1.8 Drainage system for the space between bow door and inner door or the ramp

The following descriptions are to be laid down:

– system and components
– location on board
– functionality
– test procedure

See also I – Ship Technology, Part 1 – Seagoing Ships, Chapter 3 – Electrical Installations, Section 16, E.

1.9 Indicator system on the navigating bridge for the correct closing state of the shell doors

A description of the system including the independent power supply by shall be included. Test procedures for the lamp test are also to be laid down. Moreover it needs to be described how the independency of the power supply from the control system of the door's operation and the back-up power supply can be checked.

Note

Lamp signals are to be provided at the operating panel and on the navigation bridge to show that the shell doors and the inner door behind the bow door are closed and that their securing and locking devices are properly positioned. Deviations from the correct closing state are to be indicated by visual alarms. A mode-selection switch "Harbour/ Sea Voyage" for an additional audible alarm on the navigation bridge during the "Sea Voyage" mode is mandatory and needs also to be documented in the OMM.

1.10 Television surveillance system

A description of the systems and their arrangement on board with the monitors on the navigation bridge and in the engine control room is to be included, see also I – Ship Technology, Part 1 – Seagoing Ships, Chapter 3 – Electrical Installations, Section 16, E.

1.11 List of components

For the purpose of addressing spare- and replacement parts lists of components are to be included. References e. g. code numbers shall be established with parts as defined in the drawings.

C. Documented Operating Procedures for Opening/Closing and Securing of the Doors and Ramps

The documentation must enable the user to operate the shell doors, inner doors and ramps, if applicable, in a safe manner. The closing and securing functions need to be described particularly clear. Besides safety precautions also the manoeuvres running automatically must be explained in detail in order to provide a full understanding of the functions.

References shall be given for troubleshooting of faults and failures and measures to be taken consequently. Emergency stops and emergency operation e. g. in case of energy supply loss shall be described.

The documentation on the operating procedures is to be posted on board at appropriate places.

D. Function Test, Survey and Maintenance

1. Periodic inspections

Individual job instruction forms for the maintenance and function tests are to be prepared. The completed lists shall be attached to the OMM and shall cover the current class period. In addition the forms belonging to the previous class period shall be retained for two (2) years.
It shall be noted that any damages such as dents, cracks, interferences, uneven courses of motion or tightness of mechanical elements, extraordinary wear and other irregularities recorded during such inspections are to be entered into the "Register of damages, inspections, repairs and renewals" with reference to E. and are additionally to be reported to GL.

It shall also be mentioned that the inspections are to be performed under supervision of a competent mate from the deck or machinery crew.

Guides for accident prevention are to be incorporated wherever hazards are conceivable.

2. Maintenance

All components are to be checked and maintained as to the supplier's schedule and recommendation.

The subsequent scope of work is commonly used and shall be given as a reference.

- Mechanical elements:
  - condition check and maintenance of fixtures and fittings for greasing
  - lubricating of sliding-contact bearings, supporting, securing and locking devices, mechanical elements of the lifting appliances for ramps and doors, using recommended lubricants
  - condition check of wire ropes for the lifting appliances:
    - visual inspection for detection of broken wires, deteriorated core, external and internal corrosion, deformations such as waviness, strand extrusion, local changes in diameter, flats
    - measurement of diameter mainly with respect to local changes
    - lubrication according to maker's recommendation
    - renewal of the wire ropes due to actual condition or maker's lifespan recommendation
  - Sealing arrangement (weathertight/watertight) of the outer and inner doors:
    - visual inspection of rubber gaskets with respect to wear, aging, hardening, distortion
    - permanent impression to be measured and compared with limit permanent impression
    - replacement due to maker's lifespan recommendation or resulting from visual inspection, as there could be exceeding limit value of permanent impression, cracks due to aging or hardening etc.
    - cleanliness (surface shall not be painted over)

- greasing of surface especially for operating in cold climate
- visual inspection of the packing retaining channels

- Hydraulic system:
  - oil level check, maintenance of oil filters according to maker's recommendation
  - condition check of hydraulic oil: treatment and replacement according to maker's recommendation
  - condition check and replacement of the hydraulic oil hoses according to maker's recommendation
  - cleanliness and tightness check of the entire hydraulic system

- Electrical system:
  - lamp test of the indication/monitoring systems
  - check of cables, especially joints and terminals, input sensors and solenoid valves
  - cabinets and junction boxes:
    - inside check with respect to signs of overheating, contamination, wetness, corrosion etc.
  - electric motors: bearings, barrier etc.

3. Function test

During the function tests checks of all vital elements with respect to ship's safety of the doors and ramps have to be performed. Since each individual building group such as a securing device is to be observed closely, repeated opening and closing is to be performed analogously to the described operating steps as per C. Further checks are particular measurements such as of bearing clearances which shall provide representative information on the overall condition, being extended when defects are indicated. Also the indication and monitoring systems as well as the drainage systems in the area of the shell doors are to be checked.

It shall be noted in the OMM that function tests be carried out by the ship's staff at monthly intervals or following such incidents that could result in damage, including heavy weather or contact in the region of the shell doors. The completion of the inspections is to be recorded in the "Register of damages, inspections, repairs and renewals" and confirmed by the mate in charge. Any damages recorded during such inspections are to be reported to GL.

Procedures are to be elaborated individually with special attention to the following items:
condition of supporting, securing and locking devices by close visual inspection for cracks, extraordinary wear, deformations etc.: It needs to be determined which checks are to be performed in the opened and/or closed condition of the doors and ramps.

performance of motion of the doors and ramps:
Visual inspection with special scope at free, steady and symmetrical movement into end positions should be performed during opening and closing. Attention should be drawn to unusual noises and vibrations, proper engaging of the thrust bearings (supporting devices) and securing in the open position, if applicable.

operating performance of the securing and locking devices:
Each individual device needs to be observed closely during the opening/closing procedures with respect to steady movement and non-interference with adjoining structures. The contact surfaces of the joints must be under close scrutiny. Possible cracks, distortions and wear at bolts, pins, hooks etc. need to be ascertained. Each individual group of components should appear in the checklist separately. Comments are to be entered into the "Register of damages, inspections, repairs and renewals" with reference to E.

control devices, solenoid valves etc. to be checked, as far as reasonable

indicator lights and audible alarms, considering also the independency of the power supply

input sensors to be tested and checked for proper adjustment according to maker's recommendation

condition of all visible wiring and hydraulic piping

check of the hydraulic power supply unit:
Pressures, temperatures and filter indicators to be compared with nominal value range of maker's recommendation, including operational behaviour of switches, valves, air breathers, electric motors.

check of hydraulic cylinders for tightness, condition of rods, pins and spherical bearings if applicable

check of hydraulic oil hoses for interference and sharp bends and turns, rents, blisters

checking procedure of the water leakage detection system

checking procedure of the drainage system in way of shell doors

4. Survey

Due-dates of surveys have to be in accordance with the requirements of GL or on occasion.

In excess to the visual inspections as mentioned under 2. and 3., respectively, further checking procedures are to be performed. It is advisable to prepare a checklist. Subsequently a selection of important items to be checked shall be added.

Note
Additional measures might be required by GL or the attending GL surveyor individually.

– The steel structural elements will be treated according to the normal procedures of GL. On request of the GL surveyor a thorough examination with NTD is to be carried out in order to detect cracks. In cases of already visible cracks at vital elements such examination is mandatory to determine the extension of the cracks as well as further possible damages and to decide about the repair method. Furthermore, thickness measurements are to be conducted to assess the corrosion diminution.

– Gap gauging of the supporting devices (hinges, bearings, articulated joints) is to be performed with reference to B.1.5. Hinges and articulated joints need to be dismantled for Class Renewal Surveys and in case of irregularities observed during function tests in order to inspect the contact and wear pattern and to detect possible damages. Subsequently wear measurements are to be accomplished and non-destructive testing (NDT) is to be carried out, which applies also to the adjacent steel structure.

For annual as well as intermediate surveys it should be investigated if there are reliable opportunities to measure the actual wear without dismantling of the bearing elements. Appropriate guides should be given in the OMM and should refer to indications in the drawings with reference to B.1.5.

– In particular cases any direct access to stoppers and chocks does not exist to check the clearances during the closed condition of the door. In such cases it makes sense to check the wear or deformations at relevant reference points indirectly. It is recommended to provide additional instructions also in the drawings of the supporting, securing and locking devices.

– The securing and locking devices including the adjacent structure are to be treated as the supporting devices. Consequently they also need to be dismantled at Class Renewal Surveys. NDT-programs to detect possible cracks as well as thickness measurements are to be performed.
– sealing arrangement (weathertight or watertight): see D.2. In addition tightness is to be checked by hose tests or by means of equivalent accepted procedures.

– failure scenario of the hydraulic system:
Loss of hydraulic fluid pressure of the securing and locking devices system must be suitable of being simulated. The test procedure needs to be explained in the OMM. Observation is necessary especially with respect to the securing/locking devices keeping the closed position. Additionally the optional safe separation from all other hydraulic systems needs to be checked.

– indicator system: see B.1.9

– water leakage detection system: see B.1.7

– television surveillance system: see B.1.10

E. Register of Damages, Inspections, Repairs and Renewals

A form sheet is to be prepared in the OMM, where inspections and repairs are to be recorded, see also D.1.

A column for the entry of any irregularities and observations which appear during any inspection and common operational procedure is to be prepared.

The subsequent remarks shall be added:

– Any damages recorded are to be reported immediately to GL.

– Repair and especially welding activities at the hinges, supporting, securing and locking devices are to be performed only under supervision of GL.

Note

In cases when the shell door inspection activity planning and reporting have been incorporated into the on-board maintenance scheme, adequate cross references must appear in the OMM. For the Port State Control Inspections it is advisable that print-outs of the executed crew activities are being filed in the OMM as enclosure or in case of appropriate suitability as replacement of the form "Register of Damages, Inspections, Repairs and Renewals".