Amended 2016-01:
Section 4 and Section 5 of these rules are not applicable for naval vessels transferred to the common DNV GL production system from the date of transfer. For such naval vessels, see DNV GL rules for classification of naval vessels, Pt.1 Ch.4 and Pt.1 Ch.5.
The following Rules come into force on 1 May 2012.

Alterations to the preceding Edition are marked by beams at the text margin.

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"General Terms and Conditions" of the respective latest edition will be applicable (see Rules for Classification and Construction, I - Ship Technology, Part 0 - Classification and Surveys).

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Published by: Germanischer Lloyd SE, Hamburg
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Section 1

Introduction to Naval Classification

A. Reasons for Naval Classification

Traditionally, navies were responsible for the design, build, maintenance and operations of their platforms and had systems in place to ensure the safety and fitness for purpose of their platforms. These systems were designed around this model. Furthermore naval ships are not required to comply with international Conventions and Codes, like IMO and other institutions.

Naval Classification is a relative new concept. Over the last 25 years navies have undergone significant changes in the pursuit of efficiencies in the areas of acquisition and support of their platforms. This included embracing commercial standards and practices which led to commercialization of naval facilities such as drawing offices and dockyards and the outsourcing the design, built and support of naval platforms. This in turn resulted in reduction in naval manpower and loss of in-house expertise and corporate knowledge.

All this changes created a safety impact and therefore navies decided to adopt a regulatory model similar to the commercial one to minimize the risk the new arrangements posed. As part of this model navies embraced the classification process to obtain independent assurance of the material state of their ships and Classification Societies were encouraged to develop rules appropriate for naval ships as the existing commercial rules were not fully appropriate for all type of naval ships, especially units to be engaged in direct combat.

B. The Process

Naval Classification is the Classification of naval surface ships and naval submarines. Classification is a certification process which provides independent assurance of the safety and environmental compliance of a ship or structure based on Class Rules and statutory Regulations. Classification covers primarily hull, machinery, electrical systems and automation of the ship as platform for military equipment. Weapons and military sensors are only included as far they are interfering with the platform and are to be delivered with power.

The process employs a regime of reviews, surveys, and tests performed by the Classification Society throughout the life cycle of the naval ship to establish compliance with a set of Rules which have been developed by the Classification Society in cooperation with navies, ship designers and ship builders around the world. Continuous feedback and ongoing Research and Development are used for further developing the rules.

The Classification process on the basis of Naval Rules involves the following steps:

- selection of appropriate design and build standards (Character of Classification, Class Notations, international and national standards, standards required by the Naval Administration, etc.)
- design reviews to ensure compliance with the selected standards
- approval of manufacturing facilities
- approval of subcontractors
- materials and equipment certification
- approval of procedures
- issue of type approvals
- Surveyor authorisation
- surveys during construction to ensure ongoing compliance with the selected standards
- equipment installation and setting to work tests
- harbour and sea trials
- in-service surveys to ensure compliance with the selected standards
- approval of repairs and modifications

After establishing compliance with the selected requirements the ship or structure is assigned the relevant Class Notation and issued a Certificate of Class. The ship is “kept in Class” if it continues to comply with the relevant requirements to be proven by periodical surveys.

C. Certification

There is also the possibility to entrust GL in addition and beyond the scope of the Classification Process according to B. with the supervision of design, construction and trials of special systems against a building specification or agreed standard. On special request also analytic investigations concerning naval ships may be performed by GL and its experienced partners.

If conformity with the specifications or standards defined by the Naval Administration, the Shipyard or other Clients is proven by GL, a Certificate of Con-
formity (CoC) may be issued and a corresponding Notation added to the Class Designation.

D. The GL Naval Rules

The Germanischer Lloyd (GL) Naval Ship Rules are the product of the long experience in classification of naval ships and submarines GL gained over the years supporting navies around the globe. GL has adopted - in areas where reasonable - a goal based approach in developing these rules thus avoiding the problems prescriptive requirements present both to the owner and the designer. This approach offers the flexibility to incorporate in design and construction new technologies and develop innovative solutions that provide a high level of safety. This approach, along with the Formal Safety Assessment method provide a set of powerful tools for the development of safety standards and have both been adopted by the International Maritime Organization (IMO) and the International Naval Safety Association (INSA).

GL has taken extra care to ensure that its rules, while based on the warship design philosophy adopt also commercial practices in areas that are considered appropriate to take advantage of the efficiencies both in cost and operation such solutions provide.

The GL Rules are considering the recently developed Naval Ship Code and together they form a coherent set of requirements that provides an internationally acceptable level of safety. Therefore the Rules include in Part 0 an Introduction to the Naval Ship Code and in every of the following Chapters a detailed prove of the Rules in relation to the performance requirements, which are defined in the Naval Ship Code. If the Class Notation NSC (Chapter) shall be assigned, detailed compliance with the different Chapters of the Naval Ship Code can be certified by GL.

Naval Classification is only one part of the required full assurance for a naval ship as it covers only the hull, mechanical and electrical systems as well as automation of the platform. The other part is formed by international statutory requirements which are in general not binding for naval ships but may be required by the Naval Administration. Environmental protection as an example can be covered directly by the GL Naval Rules if the Class Notation EP shall be assigned.

E. Conclusion

As demonstrated above, the Naval Classification Rules of Germanischer Lloyd are able and successful to form the missing link between the basic design principles of the Naval Administration and other statutory or operational requirements and the detailing design and construction of an executing shipyard or system contractor.
Section 2

Classification

Preamble

Reference is made to the latest version of General Terms and Conditions of Germanischer Lloyd (GL) for the Classification of Ships specified in GL Rules Classification and Surveys (I-0), Section 1.

A. Scope, Application

1. Scope, prerequisites

1.1 The Rules for Classification and Surveys of Naval Ships cover the Classification of naval surface ships and naval submarines as defined in 2. and in Section 3, C. and D.

"Classification" essentially means the
– examination of design documents, construction plans and material specifications in comparison with the applicable Rules, Guidelines and Regulations according to B.
– supervision of construction/fabrication of new-buildings or conversions
– supervision of ships in service by regular surveys in order to ascertain that a condition is maintained, which complies with Class requirements

See also E. and Sections 4 and 5.

1.2 Classification covers the ship's hull and machinery including electrical installations as well as special equipment and installations as far as agreed in the building specification between the Naval Administration and the Shipyard. Classification aims primarily at ensuring reliability of the hull structure and machinery systems on board resulting in an adequate level of safety of personnel and environmental protection.

However, Classification is not intended to ensure the effectiveness of the intended missions.

1.3 Structures, machinery and equipment determining the type of ship are subject to examination within the scope of Classification, in accordance with the Character of Classification and affixed Notations.

Other systems and components may be included in the Classification and/or certification procedure upon request of the Naval Administration.

1.4 Particular systems and components for military use (esp. weapons and their sensors) are normally exempted from Classification, depending also on the indication of the Naval Administration and on legal or contractual restrictions. However, influences from such systems possibly affecting safety of the ship as their platform (e.g. static and dynamic loads, explosion or fire hazards, power supply, etc.) shall be taken into account in the design appraisal for Classification.

1.5 Design appraisal within the Classification procedure will normally include the review or recalculation of stability investigations. This requires the relevant information, on (e.g. combat-related) damages to be taken into account, to be submitted by the Naval Administration.

1.6 It is assumed that all parties involved in the planning and design, materials and components production and installation have the professional qualifications required and/or suitable facilities/equipment for fabrication. This will normally be established or confirmed by means of a certified quality assurance management system in accordance with ISO 9000 series, AQAP or equivalent.

2. Application

2.1 These Rules apply to:
– seagoing surface ships and craft
– seagoing manned submarines
intended for naval activities.

2.2 Classification according to these Rules applies primarily to newbuildings constructed under surveillance of GL. Classification may also be applied to existing ships by a survey for Admission to Class, if sufficient documentation is available, see E.2.

3. Confidentiality

3.1 GL maintains confidentiality with respect to all documents and other kinds of information received in connection with the orders entrusted to GL.

GL shall comply with the security procedures agreed upon with the Naval Administration.

3.2 GL will instruct its personnel engaged in a naval project to follow the security procedures, including the necessary safe handling and storage of confi-
dentification information and documentation as agreed upon with the Naval Administration.

B. Rules, Guidelines and Regulations

1. GL Rules

1.1 The GL Rules III – Naval Ship Technology, Part 1 – Surface Ships (see Table 2.1)
   – Part 2 – Sub-Surface Ships (see Table 2.2)

will be applied for structural elements and for components of the machinery and electrical installation of naval ships, subject to agreement between the Naval Administration and the Shipyard for the Classification order to GL.

For weapons and military sensors see A.1.4.

Table 2.1 Rules for Classification and Construction of Naval Surface Ships

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Table 2.2 Rules for Classification and Construction of Sub-Surface Ships

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^1 to be replaced by latest GL Rules Unmanned Submersibles (ROV, AUV) and Underwater Working Machines (1-5-3)

1.2 Additional GL Rules and Guidelines which may be used for naval ships, without pretension for completeness, are listed in Table 2.3.

1.3 Ships, not in compliance with 1.1 and 1.2 may be classed, provided that their structural elements or any installations are found to be equivalent for the respective Character of Classification including Notations regarding design, function and safety.

2. Other construction rules and Maritime Regulations

2.1 The review and appraisal of design and construction particulars by GL will be exclusively based on rules and guidelines, agreed upon in the specification of the Classification contract between the Naval Administration or the Shipyard and GL.

2.2 In addition, national construction rules for naval ships may be applied upon agreement with the relevant Administration and if defined in the specification of the Classification contract between the Naval Administration or the Shipyard and GL. For example the German Federal Office for Defence Technology and Procurement (BWB) use their own construction rules “German Naval Standard”.

2.3 The application of national regulations of the respective Flag State to the naval ship under consideration shall be checked by the Naval Administration and the Shipyard and agreed upon in the particular case.

2.4 IMO Conventions, Resolutions, Codes, etc., may be applicable in certain cases and/or for certain aspects, e.g. pollution prevention. Details shall be clarified and laid down in the Classification specification in the particular case.

3. Industry Codes, Standards, etc.

Internationally recognized Standards and Codes published by military organisations, national industry organisations or standardisation institutions may be used upon agreement in particular cases as a design and fabrication basis.

Examples: STANAG, MIL-STD, DEF, DIN, IEC, ISO.

C. Definitions

1. Classification

The term “Classification” is used as defined under A.1.1. Classification is documented by a valid Certificate to be carried on board of the ship.

For validity see D.2.2.

2. Class designation

The Class designation consists in:

- the Character of Classification, i.e. a sequence of abbreviations indicating the extent of compliance with the applicable Rules and the duration of the Class period
Notations, affixed to the Character of Classification, indicating particular features capability, service restrictions or special equipment and installations included in the Classification.

For details see Section 3.

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<td>3 Guidelines for Sea Trials of Motor Vessels</td>
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<tr>
<td><strong>Part 12 – Environment Protection</strong></td>
</tr>
<tr>
<td>1 Guidelines for the Environmental Service System</td>
</tr>
</tbody>
</table>

3. **Period of Class**

Period of Class $p$ is the nominal interval [years] between two Class Renewal Surveys, see Section 3, B.1. and Section 4, B.1.4 or Section 5, C.3.

4. **Naval Administration**

Naval Administration is the Government Authority respectively an authorized institution responsible for the definition, purchase and operation of the naval ship. In some cases the above mentioned responsibi-
ties are split up between different Authorities or Institutions.

5. **Naval ship**
A naval ship is a vessel designed and operated for naval and related activities commanded by a Navy or Coast Guard.

6. **Shipyard**
The Shipyard is the contractual partner of the Naval Administration, entrusted with managing the design, construction and equipment of the naval ship, generally together with a series of subcontractors and manufacturers.

7. **Building specification**
The building specification is part of the building contract between the Naval Administration and the Shipyard and specifies the technical parameters and all other details for the construction of the naval ship.

8. **GL**
GL means Head Office of Germanischer Lloyd SE in Hamburg/Germany.

9. **Classification specification**
The Classification specification is part of the Classification contract between the Shipyard and GL during construction and between the Naval Administration and GL after delivery. It specifies the Rules, guidelines and regulations forming the technical basis of the Classification as well as scope and necessary details of the Classification and survey procedures and refers to the building specifications as far as necessary.

D. **Validity of Class**

1. **Period of Class**
   
   **1.1** The hull, the machinery as well as special equipment and installations classed have the same period of Class (duration of one Class period), see also Section 3, B.1. The class continues to be valid, provided that hull and machinery are subject to all surveys stipulated and any repairs required are carried out to the satisfaction of GL, see Sections 4 and 5.

   **1.2** For reassignment of Class after conversions see 3.4.

2. **Prerequisites for validity of Class**
   
   **2.1** The Class assigned by GL is valid only subject to the conditions stated in the Class Certificate (e.g. range of service, freeboard, main engine output).

   Class assignment is conditional upon the ship, including her machinery, being loaded and operated such as to comply with the design concept, and with the applicable rules and regulations.

   This also applies to the distribution of loads and ballast, if necessary to the securing of supplies etc., as well as to the operation of the ship in heavy weather.

   **2.2** If the hull and/or machinery are not subjected to the prescribed surveys on their due dates, ship’s Class will be suspended or withdrawn for both hull and machinery.

   If some special equipment classed is not subjected to the prescribed surveys on their due dates or is no longer intended to be carried on board, the Class for that equipment only will be suspended or withdrawn.

   **2.3** GL or one of its representations are to be immediately informed about any average, damage or deficiency to the hull, machinery or equipment classed, where these may be of relevance to the ship's Class. A survey will have to be arranged for a date not later than that of the ship's arrival at the next port.

   If the survey reveals that the ship's Class has been affected, the ship’s Class will be maintained only on condition that the repairs or modifications demanded by GL are carried out within the period and under the operating conditions specified by the Surveyor. Until full settlement of these demands the Class will be restricted.

   **2.4** Any damage or excessive wastage beyond allowable limits to side shell frames, their end attachments and/or adjacent shell plating, the deck structure and deck plating, the bottom structure and bottom plating, the watertight or oiltight bulkheads and the hatch covers or coamings that affect a ship's Class, is to be permanently repaired immediately after the survey.

   For locations where adequate repair facilities are not available, consideration may be given to allow a ship to proceed directly to a repair yard. This may require temporary repairs for the intended voyage.

   Damages or excessive wastage at the areas noted above and not immediately affecting the ship's structural or watertight/weathertight integrity may be temporarily repaired for a period to be defined.

   **2.5** Spare parts as stipulated in the Construction Rules are to be carried on board and have to be in a condition ensuring usability.

   **2.6** In exceptional cases, following inspection of hull and machinery, performance of the repairs required for maintenance of the original Class may be dispensed with, if the Naval Administration agrees to the Class and/or the range of service being restricted, or possibly a higher freeboard being assigned.
2.7 Apart from the Class Certificate, any other documentation of significance for Classification is to be kept on board and made available to the Surveyor on request, such as:

- reports on surveys previously performed
- approved drawings and other documentation handed out to the Naval Administration together with the class certificates and containing particulars or instructions of significance in respect of the Classification requirements (e.g. use of higher strength hull structural steel or lists of spare parts)

2.8 Weapons and other systems for military use are exempted from Classification, see A.1.4. However, any changes in such systems that may affect the safety of operations and hence validity of the ship's Class, including its classified installations, shall be notified to GL in due course. This applies particularly to cases, where system changes lead to structural conversions or important changes in the machinery and electrical installation.

2.9 GL provides a notification system to remind the Naval Administration of surveys becoming due, or of any other matters of interest or urgency in connection with the Classification of the ship. However, in principle it remains the responsibility of the Naval Administration to comply with the Class conditions and to observe the dates for the prescribed surveys.

3. Repairs, conversions

3.1 Where parts are damaged or worn to such an extent that they no longer comply with the requirements of GL, they are to be repaired or replaced.

3.2 Maintenance work, repairs and conversions of classed ships and special equipment have to be carried out under the supervision of GL to ensure maintenance or reassignment of Class.

3.3 The areas affected by repairs or conversion shall be treated in the same way as for new buildings, irrespective of whether the hull, the machinery including the electrical installation, automated systems or other classed equipment are concerned, see also E.1.3.1.2.

3.4 If following major conversions a new Character of Classification and/or new Notations are assigned so that the Class Certificate has to be re-issued, commencement of a new period of Class may be agreed upon.

4. Class expiry

4.1 Where hull and machinery are not longer complying with the requirements on which Class assignment had been based, or where the Naval Ad-
be dismantled and sea trials or function tests have to be carried out in excess of the requirements mentioned above. For parts and installations replaced or added in the meantime, the scope of examinations and tests to be carried out for Admission to Class shall be as for newbuildings.

E. Classification Procedures

1. Classification of newbuildings

1.1 Order for Classification

1.1.1 The written order for Classification is to be submitted to GL by the Shipyard or by the Naval Administration. The order has to be given by the client, who on the basis of the building contract has the duty to observe the Rules of GL.

1.1.2 Where orders for the production of components are placed with subcontractors, GL will have to be advised accordingly indicating the scope of the production. The client is responsible for observance of the rules, guidelines and regulations by subcontractors.

1.1.3 Where the order considers particulars already having been approved by GL (for previous newbuildings) to be used for the Classification, this will have to be specifically stated in the order. Amendments to the Construction Rules having been introduced meanwhile shall be taken into account.

1.2 Examination of design and construction particulars

1.2.1 Particulars/documents for examination such as construction plans, calculations, details on materials, etc. are to be submitted in due time prior to commencement of construction as detailed in the Construction Rules. To facilitate a smooth and efficient approval process they shall be submitted electronically via GLOBE ¹. In specific cases and following prior agreement with GL they can also be submitted in paper form in triplicate.

The particulars to be submitted in German or English language shall contain all details required to verify compliance with the Construction Rules. GL reserves the right to request additional information and particulars to be submitted.

1.2.2 The particulars and drawings to be submitted, of components subject to approval, will be examined by GL. Where applicable, they will be provided with a mark of approval and returned in one copy.

1.2.3 Any deviations from the approved documents require to be approved by GL prior to being realized.

1.3 Supervision of construction and trials

1.3.1 General

1.3.1.1 GL will assess the production facilities and procedures of the Shipyard, subcontractors and other manufacturers, to determine whether they meet the requirements of the GL Rules. In general, approvals based on such assessments are pre-requisite for acceptance of products subject to testing.

1.3.1.2 Materials, components, appliances and Installations subject to inspection are to comply with the relevant rule requirements and are to be presented for inspection by GL Surveyors, unless otherwise provided as a result of special arrangements agreed upon with GL.

New installation of materials which contain asbestos, e.g. materials used for hull structure, machinery, electrical installations and equipment, is not permitted for all new and existing ships.

1.3.1.3 For each inspection, an appointment is to be arranged in time with the local GL representation.

1.3.1.4 In order to enable the Surveyor to fulfill his duties, he is to be given free access to the ship and the workshop, where part requiring approvals are manufactured, assembled or tested. For performance of the tests required, the Shipyard, subcontractors and other manufacturers are to give the Surveyor any assistance necessary by providing the staff and the equipment needed for such tests.

1.3.2 Supervision of construction

During the phase of construction of the ship or installation, GL will satisfy themselves by surveys and inspections that:

– parts for hull, machinery and electrical installations or special equipment subject to approval have been constructed in compliance with the approved drawings and particulars

– all tests and trials stipulated by the Rules for Classification and Construction are performed satisfactorily

– workmanship is in compliance with current engineering Standards and/or GL Rule requirements

– welded parts are produced by qualified welders having undergone the required regular tests

– Test Certificates have been presented for components requiring approval. The Shipyard, subcontractors or other manufacturers will have to ensure that any parts and materials requiring approval will only be delivered and installed, if the appropriate certificates have been issued.

¹ Detailed information about GLOBE submission can be found on GL’s website www.gl-group.com/globe.
– type-tested appliances and equipment are used, in accordance with the Rule requirements, where individual certificates are not required

1.3.3 Tests at the manufacturer’s works

As far as practicable, the machinery including electrical installations as well as special equipment and installations classed will be subjected to operational trials at the manufacturer’s premises to the scope specified in the Construction Rules. This applies also to engines produced in series.

Where the machinery, electrical installation or special equipment and installations are of novel design or have not yet sufficiently proved their efficiency and reliability under actual service conditions on board, GL may require performance of trials under specified severe conditions.

For refrigeration installations see 1.3.5.

1.3.4 Shipboard trials

Upon completion of the ship, all hull, machinery including electrical installations as well as special equipment and installations classed will be subjected to operational trials in the presence of the GL Surveyor prior to and during the sea trials. This will include, e.g.:

– tightness, operational and load tests of tanks, hatches and hatch covers, shell ports, ramps, etc.
– operational and/or load tests of the machinery, installations (propulsion plant, electrical installations, steering gear, anchor equipment, etc.) of importance for safe operation

During a final survey, checks will be made to ensure that any deficiencies found, for instance during the sea trials, have been eliminated.

1.3.5 Refrigerating installations

1.3.5.1 Refrigerating machines are to be subjected to operational tests at the manufacturer’s works.

1.3.5.2 Fitting of the refrigerating installation will be supervised by the Surveyor, who will examine the workmanship and perform the prescribed tightness and operational tests.

1.3.5.3 Upon completion the entire installation will be subjected to operational trials in accordance with the requirements of the Construction Rules.

1.3.5.4 For refrigerating installations deviating in design from installations in common use, GL reserve the right to require additional tests to be performed, schedule special survey dates and make special entries in the refrigerating installation certificate and in the Register.

1.4 Reports, certificates, documentation

1.4.1 Testing of materials, components, machinery, etc. at subcontractor's works will be certified by the Surveyor and/or the local GL representation.

1.4.2 Upon completion of the ship and the shipboard trials, the Surveyors will prepare construction reports, on the basis of which GL will issue the Class Certificate.

1.4.3 The Classification data of each ship will be included in the GL data file and treated as strictly confidential. An extract of these ship data will be entered in the Register Book published by GL if the Naval Administration agrees.

1.4.4 Where GL has been entrusted in addition and beyond the scope of the Rules mentioned under B. with supervision of construction in accordance with the building specification, a Certificate of Conformity (CoC) will be issued and a corresponding Notation added to the Class designation, see Section 3, C.1.4.

2. Admission to Class of existing ships

2.1 Order

2.1.1 Orders for the Classification of ships or special equipment not constructed under the supervision of GL are to be addressed to GL in writing, in triplicate. The order for Classification is to be accompanied at least by the particulars specified in 2.2 and 2.3., respectively.

2.1.2 GL is to be informed about the previous Class status and period, as well as about any Conditions of Class (recommendations) imposed by the previous Classification Society.

2.2 Particulars for hull and machinery:

The following particulars and/or drawings are to be submitted:

– particulars of the type and main dimensions of the ship, building year, building yard, major conversions, if any, freeboard, stability documentation and details of the anchor equipment
– particulars of the type, output and main data, building year and manufacturer of the main engine(s) and of the auxiliary machinery essential for operational safety, the electrical installations, the automatic/remote-control system, the safety arrangements, the steering gear and the windlasses
– general arrangement, capacity plan, hydrostatic and cross curves, loading manual, where required, midship section, longitudinal and transverse sections, transverse bulkheads, decks, shell expansion, engine and boiler foundations, stem and stern frame, rudder and rudder stock, hatch covers
2.3 Particulars for special equipment (refrigeration installations, diving systems)

The application for Classification for special equipment (refrigeration installations, diving systems) is to be accompanied by particulars to the extent as indicated in the Construction Rules. Results of the trials under working conditions are to be submitted; if an operational trial has not yet been performed, it will have to be carried out.

2.4 Performance of Admission to Class

2.4.1 The drawings and other particulars of relevance to Classification are checked for compliance with the applicable GL Construction Rules and/or equivalent other rules.

2.4.2 For Admission to Class the extent of the Classification survey for the hull and machinery installation respectively the special equipment will be especially determined by GL depending on the ship's age and type. If the result of the survey is satisfactory, GL Class will be effective as of the date of performance of the concluded survey.

2.4.3 If the ship and/or her special equipment hold the valid Class of another recognized Classification Society and if sufficient proof has been furnished regarding the Class status, GL may dispense with the examination of drawings and computations.

In such cases, the period of Class will remain as assigned by the previous Classification Society.

2.4.4 A ship will not be admitted to Class if the relevant drawings and computations are not submitted.

2.4.5 If the ship complies with the requirements of GL, a Class Certificate will be issued in accordance with the Surveyor's report on the condition of the ship. Once a ship and/or her equipment have been classed with GL, the Rules in force as well as procedures applicable to ships and/or special equipment constructed under supervision by GL will apply.

2.4.6 If a sufficient proof of the loosing Society regarding the ship's previous Class status is not as yet available the survey status information provided by the Naval Administration may be used. An "Interim Class Certificate" may be issued after completion of the surveys requested for Admission to Class with a statement that Conditions of Class (recommendations) which are overdue, if received after issuance of the Interim Class Certificate are to be dealt with at the next port of call.

F. Documents to be Carried on Board

To allow quick action in case of surveys, special operation and especially in case of damage, the following documentation has to be kept on board and shall be made available to the GL Surveyor on request:

- Class Certificate – all Survey Statements and reports
- Stability Handbook and Loading Manual, if required
- description of corrosion protection system
- "as built" drawings and other documentation containing particulars or instructions of significance as far as GL is concerned, e.g. use of special steel, etc.
- list of important testing/monitoring procedures to be followed in connection with validity of Class
Section 3

Class Designation for Surface Ships and Submarines

A. General, Definitions

1. The Class of naval surface ships and naval submarines complying with the GL Rules is expressed by the "Character of Classification", assigned for hull and machinery including electrical installations, see B.

Details about hull, machinery including electrical installations as well as special equipment and installations included in the Classification procedure are indicated by "Notations" affixed to the Character of Classification, see C. and D.

2. Class designation

The following examples show Class designations for hull and machinery of naval ships:

<table>
<thead>
<tr>
<th>Part of the ship</th>
<th>Character of Classification</th>
<th>Notations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hull</td>
<td>100N5</td>
<td>FRIGATE RSD SFP</td>
</tr>
<tr>
<td>Machinery</td>
<td>MC</td>
<td>CM NBC DEG</td>
</tr>
</tbody>
</table>

Naval submarine:

<table>
<thead>
<tr>
<th>Part of submarine</th>
<th>Character of Classification</th>
<th>Notations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hull</td>
<td>100N6</td>
<td>SUBMARINE</td>
</tr>
<tr>
<td>Machinery</td>
<td>MC U</td>
<td></td>
</tr>
</tbody>
</table>

B. Characters of Classification

1. Meaning of the Characters

The Characters of Classification for naval surface ships and submarines have the meaning specified in Table 3.1.

Table 3.1 Characters of Classification

<table>
<thead>
<tr>
<th>Application</th>
<th>Character of Classification</th>
<th>Definition</th>
</tr>
</thead>
</table>
| Hull                         | 100Np                      | The ship's hull fully complies with the requirements of the GL Construction Rules or other rules considered to be equivalent. 
|                              |                            | p as a figure is indicating the duration of the nominal Class period [years]. Normally p = 5, but GL may agree to adjustment to the material and maintenance scheme of a Naval Administration. 
|                              |                            | The nominal Class period can be reduced in exceptional cases and for a limited time, if the ship does not fully comply with the Rules but has been allowed to operate under restrictions, e.g. regarding the service range and/or weather conditions. |
| Machinery                    | MC                         | The machinery of the surface ship including electrical installations complies with the requirements of the GL Construction Rules or other rules considered to be equivalent. |
| Surface ships                | MC                         | The machinery of the surface ship including electrical installations does not fully comply with the requirements of the GL Construction Rules, but functional safety and seaworthiness are ensured for the envisaged service. |
### Table 3.1  Characters of Classification (continued)

<table>
<thead>
<tr>
<th>Application</th>
<th>Character of Classification</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Machinery Submarines</strong></td>
<td><strong>MC U</strong></td>
<td>The machinery of the submarine including electrical installations complies with the requirements of the GL Construction Rules or other rules considered to be equivalent.</td>
</tr>
<tr>
<td><strong>Survey, Supervision of Construction</strong></td>
<td><strong>MC U</strong></td>
<td>The machinery of the submarine including electrical installations does not fully comply with the requirements of the GL Construction Rules, but functional safety and seaworthiness are ensured for the envisaged service.</td>
</tr>
</tbody>
</table>
| **Hull, machinery and/or special equipment (e.g. refrigerating installation) have been constructed:** | **(*)** | Hull, machinery and/or special equipment (e.g. refrigerating installation) have been constructed:  
- under the supervision and in accordance with the GL Rules at the shipyard and/or subcontractors supplying construction complements / hull sections  
- with certification by GL of components and materials requiring inspection, subject to the GL Construction Rules  
*Note*  
For the hull of surface ships, this Character of Classification can only be assigned, if proof of damage stability is not required and/or dispensed with. |
| **Subdivision, Damage Stability** | | Hull, machinery installation or special equipment have been constructed under the supervision of and in accordance with the rules of another recognized Classification Society and have later on been classed with GL. Deviations from the GL Rules may be accepted. |
| **Surface ships** | | For the hull proof of subdivision and damage stability has been furnished. |
| | | As for example, hull, which has been constructed under supervision, and for which proof of subdivision and damage stability has been furnished, one of the two markings, shown on the left are assigned. |

### C. Notations for Naval Surface Ships

#### 1. General indications

1.1 There are different kinds of Notations, describing particular features, capabilities, service restrictions or special equipment and installations included in the Classification, as defined in the following.

1.2 The Notations to be affixed to the Character of Classification are optional and may be elected by the Naval Administration. The chosen scope of Notations has to be defined in the Classification specification as well as in the building specification.

1.3 It will be the Naval Administration decision to have the Notations, together with the whole Class designation, included in the published Register of GL or not, see Section 2, E.1.4.3.

1.4 Certificate of Conformity (CoC)

This Notation will be assigned and the Certificate issued if, in addition to the investigations and surveys usually associated with Classification of the hull/machinery, GL has been entrusted with supervising construction, outfitting and trials of the ship regarding conformity with the building specification agreed
in the contract between the Naval Administration and the Shipyard, see Section 2, E.1.4.4.

This Notation can only be assigned if the requirements of the building specification are not contrary to or of a lower level than GL Rules in force.

Note
If GL is only entrusted with supervising construction, outfitting and trials of the ship regarding conformity with the building specification agreed upon in the contract between the Naval Administration and the Shipyard, a Certificate of Conformity can be issued without GL Classification.

2. Notations for hull and machinery

2.1 Restricted service area for seagoing naval ships

Naval ships complying with the Construction Rule requirements for a restricted service area only will have the Notations specified in Table 3.2 affixed to their Character of Classification.

2.2 Ice strengthening

2.2.1 Ships, which comply with the requirements of the Construction Rules relating to strengthening for navigation in ice, will have one of the "Ice Class" Notations specified below affixed to the Character of Classification. Except for Class Notation E, which on request may be assigned to the hull or the machinery installation only, hull and machinery shall always be assigned the same ice class. If the hull is constructed such as to comply with a higher ice class, this will be indicated in the Technical File.

2.2.2 Notations E, E1, E2, E3, E4

Hull and machinery have been designed such as to comply with the requirements for navigation in ice, with index 4 representing the highest Notation. Notations E1 to E4 correspond to ice classes IC to IA Super of the Finnish- Swedish Ice Class Rules, as amended (see Finnish Maritime Administration Bulletin Nos. 10 / 10.12. 2008 and 14 / 20.12.2005).

2.2.3 Notations PC7, PC6, PC5, PC4, PC3, PC2, PC1

Hull and machinery have been designed such as to comply with the requirements for navigation in ice, with index 1 representing the highest Notation. Notations PC7 to PC1 are based on the GL Guidelines for the Construction of Polar Class Ships (I-1-22).

2.2.4 ICEOPS

Class Notation ICEOPS is defined in Table 3.3.

Note
For navigation in the arctic waters of Canada reference is made to the requirements of the Canadian "Arctic Shipping Pollution Prevention Regulations", October 1972. GL is authorised to issue the relevant "Arctic Pollution Prevention Certificate".

Table 3.2 Notations for restricted service area

<table>
<thead>
<tr>
<th>Notation</th>
<th>Service area restriction</th>
</tr>
</thead>
<tbody>
<tr>
<td>RSA (200)</td>
<td>This area of service of the naval ship is restricted, in general, to operate along the coast, provided that the distance to the nearest port of refuge as well as the offshore distance do not exceed 200 nautical miles. This applies also to operation in the North Sea and within enclosed seas, such as the Mediterranean, the Black Sea and waters with similar seaway conditions. Journeys to Iceland, Spitsbergen and the Azores is exempted</td>
</tr>
<tr>
<td>RSA (50)</td>
<td>This area of service of the naval ship is restricted, in general, to operate along the coasts, provided that the distance to the nearest port of refuge as well as the offshore distance do not exceed 50 nautical miles. This applies also to operation within enclosed seas, such as the Baltic Sea and gulfs with similar seaway conditions. Where a permissible distance of less than 50 nautical miles has been fixed for a ship, the relevant distance will be indicated in the Class Certificate, e.g. RSA (20).</td>
</tr>
<tr>
<td>RSA (SW)</td>
<td>This area of service of the naval ship is restricted to operate in shoals, bays, haffs and firths or similar waters, where heavy seas do not occur.</td>
</tr>
</tbody>
</table>

The Notations may possibly be assigned on the basis of the seaway conditions prevailing in the respective service area (e.g. official seaway statistics). Observance of the range of service boundaries is a prerequisite for validity of the Class. GL may, on request, agree to the range of service being extended for a limited period and/or with certain reservations. This will have to be documented.
2.3 Ambient conditions and environmental standards

2.3.1 Ambient conditions
Where more severe ambient conditions are expected by the Naval Administration, one of the two Notations defined in Table 3.4 may be affixed to the Character of Classification.

2.3.2 Environmental standards
Class Notations EP and BWM are defined in Table 3.4.

2.3.3 Stabilization in the Seaway
SEAKEEP
If the naval surface ship is designed and equipped with the aim to reduce the movement (heel, trim and roll) in the seaway the Notation SEAKEEP may be affixed to the Character of Classification. The requirements to be met are specified in the GL Rules for Ship Operation Installations and Auxiliary Systems (III-1-4), Section 2, C. to J.

2.4 Naval Ship Code
Class Notation NSC (Chapter) is defined in Table 3.5.

2.5 Application of Rules for seagoing ships
Class Notations SEA-NH, SEA-NM, SEA-NE, SEA-NQ are defined in Table 3.6.
It has definitely to be specified and agreed with GL in written form which systems and elements are to be designed, constructed and tested according to the following underlying Rules and not according to the GL Naval Rules.

2.6 Laid-up ships
LAID-UP SHIP
If a naval ship is not in operation for a certain time the period of Class will not be interrupted. Upon expiry of Class a survey will be performed and the entry LAID-UP SHIP will be made in the Class Certificate and also indicated in the Register. See also Section 2, D.5.

3. Notations for hull and equipment

3.1 Ship type Notations
3.1.1 Generally, the type Notation will be assigned according to the indications or suggestions of the Naval Administration.
A relevant descriptive Notation indicating the ship type will be added to the Class designation, such as defined as examples in Table 3.7.

3.1.2 Where the intended duties of the ship include support functions which may be described by Notations also used for commercial and/or state-operated non-military craft, such Notations may be assigned instead of or in addition to the Notations referred to under 2.1, see GL Rules for Classification and Surveys (I-0), Section 2, C.

An example for such Notations is:

SUPPLY VESSEL

Note
This is applicable also in the case that the ship is armed, e.g. for defence purposes; regarding inclusion of weapons/military systems in the Classification procedure, see Section 2, A.1.3 and A.1.4.

3.1.3 High speed craft
HSC-N
Special ship types such as catamarans, SWATH, hydrofoil craft, surface effect ships and air cushion vehicles are designed in accordance with the GL Construction Rules for High Speed Craft (I-3-1).

HSDE
Notation for craft which have been constructed by using elements of GL Rules for High Speed Craft (I-3-1) and which are not subject to the IMO HSC Code. Details regarding rule application are specified in the Class Certificate.

3.2 Special considerations for hull structures
The Notations defined in Table 3.8 may be applied to the hull of naval surface ships.

3.3 Bridge design
Where ships are to be operated by one person only, or a very limited number of personnel, the workplaces on the bridge shall be arranged according to ergonomic principles, see GL Rules for One-Man Control Console (I-1-11).

NAV-O The bridge is designed for ocean area
NAV-OC The bridge is designed for ocean area and coastal waters.

3.4 Novel design
EXP
Ships and equipment have been constructed in accordance with a design, for which sufficient experience is not available. GL will decide at what intervals the required periodical surveys will have to be carried out. Where experience over a prolonged period of time has proved the efficiency of the design, the Notation EXP may be cancelled.
### Table 3.3  Class Notation ICEOPS

<table>
<thead>
<tr>
<th>Notation</th>
<th>Characterization</th>
<th>Underlying Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICEOPS</td>
<td>Ship and machinery equipment is designed for operation in very low temperatures and for minimization of accretion of ice and other relevant problems.</td>
<td>GL Rules Ship Operation Installations and Auxiliary Systems (III-1-4), Section 19</td>
</tr>
</tbody>
</table>

### Table 3.4  Class Notations for severe ambient conditions and environmental standards

<table>
<thead>
<tr>
<th>Notation</th>
<th>Characterization</th>
<th>Underlying Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC1</td>
<td>The parameter for ship inclination, for ship movement and the limit conditions are increased against the standard requirements.</td>
<td>GL Rules for Hull Structures and Ship Equipment (III-1-1), Section 1, A.4. Tables 1.1 and 1.2, fourth column GL Rules for Ship Operation Installations and Auxiliary Systems (III-1-4), Section 1.</td>
</tr>
<tr>
<td>ACS</td>
<td>The special requirements for unusual types and/or tasks of naval ships are agreed upon case by case.</td>
<td>GL Rules for Hull Structures and Ship Equipment (III-1-1), Section 1, A.4. GL Rules for Ship Operation Installations and Auxiliary Systems (III-1-4), Section 1.</td>
</tr>
<tr>
<td>EP</td>
<td>Technical requirements for the permissible emissions to the sea and into the air are defined in detail. Optional additional measures may also be documented in the Environmental Passport.</td>
<td>GL Rules for Ship Operation Installations and Auxiliary Systems (III-1-4), Section 10. GL Guidelines for the Environmental Service System (VI-12-1)</td>
</tr>
<tr>
<td>BMW</td>
<td>Ballast water discharges from ships are prominently responsible for transferring organisms between geographically separated water bodies. <strong>BMW</strong> serves the purpose of speeding up and simplifying the process of producing a ballast water management plan to optimize the safe operation of the naval ship.</td>
<td>GL Guidelines on Ballast water Management (VI-11-10)</td>
</tr>
</tbody>
</table>

### Table 3.5  Class Notation NSC (Chapter)

<table>
<thead>
<tr>
<th>Notation</th>
<th>Characterization</th>
<th>Underlying Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSC (Chapter)</td>
<td>The overall aim of the Naval Ship Code as NATO standard ANEP 77 is to provide a frame-work for a naval surface ship safety management system. If the requirements of certain Chapters of the NSC are fulfilled, GL may issue the Class Notation for the relevant Chapter(s).</td>
<td>GL Rules for Classification and Surveys (III-0), Section 8 GL Rules for Hull Structures and Ship Equipment (III-1-1), Section 24 GL Rules for Propulsion Plants (III-1-2), Section 11 GL Rules for Electrical Installations (III-1-3a), Section 19 GL Rules for Automation (III-1-3b), Section 11 GL Rules for Ship Operation Installations and Auxiliary Systems (III-1-4), Section 21</td>
</tr>
</tbody>
</table>
### Table 3.6  Class Notation SEA-NH, SEA-NM, SEA-NE, SEA-NQ

<table>
<thead>
<tr>
<th>Notation</th>
<th>Characterization</th>
<th>Underlying Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEA-NH</td>
<td>The requirements for the ship’s hull follow GL Rules for non-naval ships.</td>
<td>GL Rules for Structures (I-1-1)</td>
</tr>
<tr>
<td>SEA-NM</td>
<td>The requirements for the ship’s machinery and systems follow GL Rules for non-naval ships.</td>
<td>GL Rules for Machinery Installations (I-1-2)</td>
</tr>
<tr>
<td>SEA-NE</td>
<td>The requirements for the ship’s electrical installations and/or automation follow GL Rules for non-naval ships.</td>
<td>GL Rules for Electrical Installations (I-1-3) GL Rules for Automation (I-1-4)</td>
</tr>
<tr>
<td>SEA-NQ</td>
<td>The requirements for the ship’s equipment follow GL Rules for non-naval ships.</td>
<td>GL Rules for Hull Structures (I-1-1) GL Rules for Machinery Installations (I-1-2) and others</td>
</tr>
</tbody>
</table>

**Note**

Also other GL Rules and Guidelines in I – Ship Technology, V – Analysis Techniques, VI – Additional Rules and Guidelines for seagoing ships, inland navigation vessels and special craft may be applied.

---

### Table 3.7  Ship type Notations

<table>
<thead>
<tr>
<th>Notation</th>
<th>Characterization</th>
<th>Underlying Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIRCRAFT CARRIER</td>
<td>Large naval ship with a displacement greater than 10000 tons which is capable of operate with a flight deck, hangar, etc. a greater number of different types of naval aircraft at the same time.</td>
<td>GL Rules Naval Ship Technology (III-1) Especially: Aircraft carriers</td>
</tr>
<tr>
<td>CRUISER</td>
<td>Large naval ship with a displacement greater than 5000 tons which is capable to develop control commanding tasks and mainly sea and air in a mission theatre at the same time.</td>
<td>GL Rules for Ship Operation Installations and Auxiliary Systems (III-1-4), Section 23</td>
</tr>
<tr>
<td>AMPHIBIOUS WARFARE SHIP</td>
<td>Large marine ship with a displacement above 5000 tons which is capable to operate mainly helicopter and landing craft at the same time, the latter often via stern dock.</td>
<td>GL Rules for Ship Operation Installations and Auxiliary Systems (III-1-4), Section 22</td>
</tr>
<tr>
<td>DESTROYER</td>
<td>Larger naval ship with a displacement above 4000 tons which is capable to develop at least two control tasks at the same time.</td>
<td></td>
</tr>
<tr>
<td>FRIGATE</td>
<td>Medium sized naval ship with a displacement above 15000 tons which is capable to develop sea or air or submarine control alternatively.</td>
<td></td>
</tr>
<tr>
<td>CORVETTE</td>
<td>Small naval ship with a displacement below than 15000 tons which is capable to undertake limited missions.</td>
<td>GL Preliminary Rules for Patrol Boats (I-3-6)</td>
</tr>
<tr>
<td>MINE WARFARE VESSEL</td>
<td>This type includes mine countermeasure vessels, mine hunters and mine laying ships</td>
<td></td>
</tr>
</tbody>
</table>
### Table 3.7 Ship type Notations (continued)

<table>
<thead>
<tr>
<th>Notation</th>
<th>Characterization</th>
<th>Underlying Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>PATROL</td>
<td>This type of naval ship is a patrol ship/vessel/boat/unit with a length $L \geq 24$ m. If the length $L$ would reach about 80 m special agreement with GL will become necessary for some design aspects. The tasks are similar to patrol boats, but may include a wider range of the possible activities.</td>
<td>GL Rules for Hull Structures and Ship Equipment (III-1-1), Section 3</td>
</tr>
<tr>
<td>PATROL BOAT</td>
<td>Small naval, coast guard or police vessel, smaller in size than a corvette, commonly engaged in military patrol and reconnaissance missions, border protection roles, including anti-smuggling, anti-terrorist, anti-piracy, fishery patrols and law enforcement. It is also often used rescue operations and can be diversified in smaller Inshore Patrol Vessels and larger Offshore Patrol Vessels. It is assumed that the length $L$ of a patrol boat/vessel/unit is $&lt; 24$ m.</td>
<td>GL Rules for Hull Structures and Ship Equipment (III-1-1), Section 4</td>
</tr>
</tbody>
</table>

### Table 3.8 Special Notations for hull structures

<table>
<thead>
<tr>
<th>Notation</th>
<th>Characterization</th>
<th>Underlying Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIGHER STRENGTH HULL STRUCTURAL STEEL</td>
<td>The use of normal strength hull structural steel will not be specially indicated. If other materials are employed for the hull, this has to be indicated in the Class Certificate. Material selection, design, dimensioning and manufacturing of hull structures made of FRP are to be agreed upon case by case with GL Head Office.</td>
<td>GL Rules for Hull Structures and Ship Equipment (III-1-1), Section 3</td>
</tr>
<tr>
<td>ALUMINIUM</td>
<td></td>
<td>GL Rules for Hull Structures and Ship Equipment (III-1-1), Section 4</td>
</tr>
<tr>
<td>FRP (Fibre Reinforced Plastics)</td>
<td></td>
<td>GL Rules for Hull Structures and Ship Equipment (III-1-1), Section 4</td>
</tr>
<tr>
<td>RSD (Rational Ship Design)</td>
<td>Special analysis procedures are applied including: - first principle design procedures by means of e.g. finite element analysis techniques - additional fatigue strength calculations - calculation of usage factors and assessment of highly stressed structures - determination of explicit corrosion margins of structural members The analysis results will be stored in a date base.</td>
<td>GL Rules for Hull Structures and Ship Equipment (III-1-1), Section 4</td>
</tr>
<tr>
<td>RSM (Residual Strength)</td>
<td>The construction of the hull fulfils the requirements for residual strength following a defined extent of structural damage due to military effects.</td>
<td>GL Rules for Hull Structures and Ship Equipment (III-1-1), Section 21</td>
</tr>
</tbody>
</table>
Table 3.8 Special Notations for hull structures (continued)

<table>
<thead>
<tr>
<th>Notation</th>
<th>Characterization</th>
<th>Underlying Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERS (Emergency Response Service)</td>
<td>The geometry and structural data of the ship are made available in a data base to provide the assistance necessary for limiting damages and/or taking the adequate measures in case of average, with the aid of special computer programs.</td>
<td>GL Rules for Hull Structures and Ship Equipment (III-1-1)</td>
</tr>
<tr>
<td>SFP (Structural Fire Protection)</td>
<td>Additional requirements concerning fire-resisting divisions, combustible materials, ventilation, etc. are to be applied.</td>
<td>GL Rules for Hull Structures and Ship Equipment (III-1-1), Section 20</td>
</tr>
<tr>
<td>IW (In Water surveys)</td>
<td>The ship’s hull is specially equipped for in-water surveys, i.e. surveys of the underwater part carried out in floating condition instead of dry docking. Fixed markings and inscriptions are not required, but means for the diver to determine his respective position shall be in place.</td>
<td>For technical requirements, see GL Rules for Hull Structures (I-1-1), Section 34</td>
</tr>
<tr>
<td>COLL 1 – COLL 6 (Strengthening against Collisions)</td>
<td>Ships, the side structure of which are specially strengthened on order to resist collision impacts.</td>
<td>GL Rules for Hull Structures (I-1-1), Section 33</td>
</tr>
</tbody>
</table>

4. Machinery Notations

4.1 Automation

Machinery installations which comply with the Rules of GL for automated and/or remote-controlled systems, will have the Notations specified in Table 3.9 affixed to the Character of Classification (not applicable if Class Notations for high-speed craft have been assigned). Other Notations for a detailed description are possible.

4.2 Redundant propulsion and steering systems

Naval ships with propulsion and steering systems which meet the redundancy requirements of GL obtain one of the Notations specified in Table 3.10 affixed to the Character of Classification.

4.3 Dynamic positioning systems

Notations specified in Table 3.11 for ships designed to maintain a desired position within the normal excursions of the control system under defined environmental conditions. The Class Notation required for a particular operation, and the desired system reliability should be agreed between the Naval Administration and GL on an analysis of a consequence of a loss of position.

4.4 Condition monitoring of propeller shaft at stern tube

CM-PS

Where the propeller shaft runs within the stern tube in oil, the possibility exists, to prolong the intervals between shaft withdrawals, if the requirement according to the GL Rules for Machinery Installations (III-1-2), Section 5, D.5.6 are fulfilled.

4.5 Fuel cell systems

FC-xxx

Notation for ships and boats with fuel cell systems the nominal power of which is equal or exceeds 10 % of the total nominal power of the machinery installation (excluding the emergency supply power) and complying with the GL Guidelines for the Use of Fuel Cell Systems on Board of Ships and Boats (VI-3-11).

"xxx" means the percentage of the fuel cell system related to the nominal power of the machinery installation.

with FC

Notation for fuel cell systems the nominal power of which is below 10 % of the nominal power of the machinery installation.

4.6 Towing arrangements

TOW

Notation for naval ships which are equipped with towing equipment like towing winches or warping capstans, towing lines or towing hooks, etc. according to the requirements specified in GL Rules for Ship Operation Installations and Auxiliary Systems (III-1-4), Section 5, D. and Hull Structures and Ship Equipment (III-1-1), Section 18 and Electrical Installations (III-1-3a), Section 16.
### Table 3.9 Notations for machinery with automated or remote controlled systems

<table>
<thead>
<tr>
<th>Notation</th>
<th>Characterization</th>
<th>Underlying Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUT-N</td>
<td>The machinery installation is fitted with equipment for unattended machinery spaces, so that it does not require to be operated and/or maintained for periods of at least 24 hours.</td>
<td>GL Rules for Automation (III-1-3b), Section 2, A.</td>
</tr>
<tr>
<td>AUT-Nnh</td>
<td>The period during which attendance to and maintenance of equipment is not required, is less than 24 hours, with nh indicating that the machinery space may remain unattended for n hours.</td>
<td>GL Rules for Automation (III-1-3b), Section 2, B.</td>
</tr>
<tr>
<td>RC</td>
<td>Small naval vessels with a length $L \leq 48$ m are provided with a system for remote control of the main propulsion plant from the navigation bridge.</td>
<td>GL Rules for Automation (III-1-3b), Section 2, C.</td>
</tr>
</tbody>
</table>

### Table 3.10 Notations for redundant propulsion and steering systems

<table>
<thead>
<tr>
<th>Notation</th>
<th>Characterization</th>
<th>Underlying Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>RP1x%</td>
<td>The ship has at least two propulsion machines, which are independent or can be disconnected from each other. This also applies to the auxiliary systems which are needed to operate the propulsion machines. No redundancy of propeller, shaft line, gearbox and steering system is required.</td>
<td>GL Rules for Redundant Propulsion and Steering Systems (I-1-14)</td>
</tr>
<tr>
<td>RP2x%</td>
<td>This ship has at least two propulsion systems and two steering systems, each of which is independent or can be disconnected from each other. This also applies to each of the auxiliary systems which are needed to operate the propulsion and/or steering systems.</td>
<td></td>
</tr>
<tr>
<td>RP3x%</td>
<td>This ship has at least two propulsion systems and two steering systems, each of which is independent or can be disconnected from each other and is installed in separate compartments. This also applies to each of the auxiliary systems which are needed to operate the propulsion and/or steering systems.</td>
<td></td>
</tr>
</tbody>
</table>

The additional index x% denotes what percentage of the main propulsion power of the ship is provided by redundant ship’s propulsion system.

### Table 3.11 Notations for dynamic positioning systems

<table>
<thead>
<tr>
<th>Notation</th>
<th>Characterization</th>
<th>Underlying Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>DP 0</td>
<td>Loss of position may occur (only functionality)</td>
<td>GL Rules for Propulsion Plants (III-1-2), Section 7, I.</td>
</tr>
<tr>
<td>DP 1</td>
<td>Loss of position may occur, meets IMO Class 1 (non-redundant)</td>
<td>GL Rules for Dynamic Positioning Systems (I-1-15)</td>
</tr>
<tr>
<td>DP 2</td>
<td>No loss of position in the event of a single fault in an active component, meets IMO Class 2 (redundant)</td>
<td></td>
</tr>
<tr>
<td>DP 3</td>
<td>No loss of position in the event of a single fault in an active or static components, meets IMO Class 3 (redundant installation in separate components)</td>
<td></td>
</tr>
</tbody>
</table>

**Note**

For **DP 2** and **DP 3** a redundancy concept document (FMEA of basic design) with worst case failure design intent is to be submitted in due time.
4.7 Carriage of dangerous goods

**DG**
Notation for naval ships equipped for the carriage of dangerous goods in packaged form according with the GL Rules for Ship Operation Installations and Auxiliary Systems (III-1-4), Section 9, N.

4.8 Novel designs

**EXP**
The machinery installations or essential parts have been constructed in accordance with a design, for which sufficient experience is not available. GL will decide at what intervals the required periodical surveys will have to be carried out. Where experience over a prolonged period of time has proved the efficiency of the design, the Notation **EXP** may be cancelled.

5. Notations for special military requirements

5.1 Dynamic loads

The Notations for abilities of the naval ship to limit the effects created by dynamic loads are specified in Table 3.12.

5.2 Flight operations

The Notations for the different abilities to execute flight operations are specified in Table 3.13.

5.3 Special Notations for military requirements

Additional Notations for military requirements are specified in Table 3.14.

5.4 Analytic investigations

Notations for various analytic investigation for optimization of the design of naval surface ships are defined in Table 3.15.

6. Overview of possible Notations for naval surface ships

Table 3.16 gives an overview for the various Notations which may be assigned to naval surface ships. Additional information is given in the respective Chapters.

<table>
<thead>
<tr>
<th>Table 3.12 Notations to limit the effect of dynamic loads</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Notation</strong></td>
</tr>
<tr>
<td>SHOCK</td>
</tr>
<tr>
<td>NOISE</td>
</tr>
<tr>
<td>VIBR</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 3.13 Notations for flight operations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Notation</strong></td>
</tr>
<tr>
<td>FO (Flight operations)</td>
</tr>
<tr>
<td>FO (HELIW)</td>
</tr>
<tr>
<td>FO (HELIL)</td>
</tr>
<tr>
<td>FO (HELILF)</td>
</tr>
<tr>
<td>FO (DRONE)</td>
</tr>
</tbody>
</table>
## Table 3.14 Notations for special military requirements

<table>
<thead>
<tr>
<th>Notation</th>
<th>Characterization</th>
<th>Underlying Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>LA (Lifting Appliances)</td>
<td>Equipped with classified lifting appliances other than those need in connection with RAS.</td>
<td>GL Rules for Ship Operation Installations and Auxiliary Systems (III-1-4), Section 3</td>
</tr>
<tr>
<td>LA (CRANE)</td>
<td>Equipped with classified lifting appliances like cranes, gantry cranes, A-frames etc. which are able to work up to a certain sea state to be defined by the Naval Administration.</td>
<td>GL Rules for Ship Operation Installations and Auxiliary Systems (III-1-4), Section 3</td>
</tr>
<tr>
<td>RAS Replenishment at Sea)</td>
<td>Equipped with installations for the transfer of liquids, such as fuel, oil, water, stores and persons while operating at sea. This Notation may be assigned to the supplying ship as well as to the receiving ship.</td>
<td>GL Rules for Ship Operation Installations and Auxiliary Systems (III-1-4), Section 4</td>
</tr>
<tr>
<td>NBC (Nuclear, biological and chemical warfare)</td>
<td>Designed and equipped to meet the requirements for protection within a citadel against the fall-out of nuclear, as well as biological and chemical weapons.</td>
<td>GL Rules for Ship Operation Installations and Auxiliary Systems (III-1-4), Section 11</td>
</tr>
<tr>
<td>DEG (Degaussing)</td>
<td>Equipped with an active system for degaussing (magnetic self-protection) by means of amplified cable windings in the ship which reduce the magnetic signature.</td>
<td>GL Rules for Electrical Installations (III-1-3a), Section 12, F.</td>
</tr>
<tr>
<td>DI (Diving Installations)</td>
<td>Equipped with diving installations for production, bottling and storage of breathing gases.</td>
<td>GL Rules for Ship Operation Installations and Auxiliary Systems (III-1-4), Section 18</td>
</tr>
<tr>
<td>ARM PLT (Armour)</td>
<td>Equipped with special (light weight) armour to protect sensible elements.</td>
<td>–</td>
</tr>
<tr>
<td>EMC (Electromagnetic compatibility)</td>
<td>Special measures are provided for the laying of cables to optimize electromagnetic compatibility.</td>
<td>GL Rules for Electrical Installations (III-1-3a), Section 12</td>
</tr>
<tr>
<td>SAM (Storage of AMunition)</td>
<td>Equipped with special measures to store safely ammunition, missiles, torpedos, etc. with minimized risk for the naval ship.</td>
<td>GL Rules for Ship Operation Installations and Auxiliary Systems (III-1-4), Section 3, F. and Section 9, O.</td>
</tr>
</tbody>
</table>

## Table 3.15 Notations for analysis investigations

<table>
<thead>
<tr>
<th>Notation</th>
<th>Characterization</th>
</tr>
</thead>
<tbody>
<tr>
<td>VA (Vulnerability analysis)</td>
<td>An analytical investigation has been conducted in order to minimize the effects of flooding, fire and damage to the structure of the vessel.</td>
</tr>
<tr>
<td>OPSIM (operational simulation)</td>
<td>An analytical investigation has been conducted in order to determine and optimize the behaviour of the ship during special operations e.g. RAS and VERTREP</td>
</tr>
<tr>
<td>ERG (Ergonomic analysis)</td>
<td>An analytical investigation has been conducted in order to determine and optimize the layout of bridges or CIC’s with regards to ergonomic aspects.</td>
</tr>
</tbody>
</table>

## D. Notations for Naval Submarines

### 1. Ship type Notation

**SUBMARINE**

Notation for naval manned underwater ships with the ability to perform military missions. The requirements are specified in the GL Rules for **Submarines (III-2-1)**. Weapons and military sensors are not included in these Rules.

### 2. Other underwater vehicles

Non-naval manned or unmanned underwater vehicles are designated as Submersibles. Non-manned submersibles as Remote Operated Vehicles (ROV) or Autonomous Underwater Vehicles (AUV) may in anyway also be used for naval operations, e.g. for mine hunting and destroying. The requirements for these types of submersibles are specified in the GL Rules for **Unmanned Submersibles (ROV, AUV) and Underwater Working Machines (I-5-3)**. Also here no weapons or military sensors are included in these Rules.
### Table 3.16 Summary of Notations for naval surface ships

<table>
<thead>
<tr>
<th>Part 0</th>
<th>Part 1</th>
<th>Part 1</th>
<th>Part 1</th>
<th>Part 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classification and Surveys</td>
<td>Hull Structures and Ship Equipment</td>
<td>Propulsion Plants</td>
<td>Electrical Installations / Automation</td>
<td>Ship Operations, Installations and Auxiliary Systems</td>
</tr>
<tr>
<td>Ship type:</td>
<td>Ambient conditions:</td>
<td>Redundant propulsion:</td>
<td>Automation:</td>
<td>Flight operation:</td>
</tr>
<tr>
<td>AIRCRAFT CARRIER</td>
<td>AC1</td>
<td>RP1 x %</td>
<td>AUT-N</td>
<td>FO</td>
</tr>
<tr>
<td>CRUISER</td>
<td>ACS</td>
<td>RP2 x %</td>
<td>AUT-Nnh</td>
<td>FO (HELIW)</td>
</tr>
<tr>
<td>AMPHIBIOUS WARFARE SHIP</td>
<td>Material: HIGHER STRENGTH HULL STRUCTURAL STEEL</td>
<td>RP3 x %</td>
<td>Remote control:</td>
<td>FO (HELIL)</td>
</tr>
<tr>
<td>DESTROYER</td>
<td>ALUMINIUM FRP</td>
<td>Dynamic positioning:</td>
<td>RC</td>
<td>FO (HELILF)</td>
</tr>
<tr>
<td>FRIGATE</td>
<td>Navigation in ice:</td>
<td>DP0</td>
<td>Degaussing:</td>
<td>FO (DRONE)</td>
</tr>
<tr>
<td>CORVETTE</td>
<td>E, E1, E2, E3, E4 PC7, PC6, PC5, PC4, PC3, PC2, PC2</td>
<td>DP1</td>
<td>Electromagnetic compatibility:</td>
<td>Lifting appliances:</td>
</tr>
<tr>
<td>MINE WARFARE VESSEL</td>
<td>Restricted service area:</td>
<td>DP2</td>
<td>EMC</td>
<td>LA</td>
</tr>
<tr>
<td>PATROL</td>
<td>RSA (200)</td>
<td>DP3</td>
<td>Dangerous goods:</td>
<td>Lifting appliances at sea state:</td>
</tr>
<tr>
<td>PATROL BOAT</td>
<td>RSA (50)</td>
<td>Fuel cell systems:</td>
<td>DG</td>
<td>LA(CRANE)</td>
</tr>
<tr>
<td>SUPPLY VESSEL</td>
<td>RSA (SW)</td>
<td>FC-xxx with FC</td>
<td></td>
<td>Replenishment at sea:</td>
</tr>
<tr>
<td>High speed craft:</td>
<td>Rational ship design:</td>
<td></td>
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Section 4

Surveys for Surface Ships

A. General Indications

1. Surveys for maintenance of Class

1.1 For maintenance of Class, the regular periodical and non-periodical surveys of hull and machinery, including electrical installations as well as special equipment and installations agreed to be in the scope of Classification have to be performed as detailed in the following, see also Section 2, D.2.2.

For other surveys performed by GL see 4.

1.2 Surveys required for maintenance of Class, e.g. in the case of repairs of, or modifications to any parts subject to Classification, are to be agreed with GL Head Office or the local GL representations in due time, so that the measures envisaged may be assessed and supervised as required.

1.3 The Surveyors are to be given access at any time to the ship and/or to the workshops, so that they may perform their duties. See also Section 2, E.1.3.3.

In this connection all areas to be surveyed have to be cleared, cleaned and are to be made gas-free, as deemed necessary by the Surveyor.

The Class Certificate and other documents related to Classification and carried on board, are to be made available to the Surveyor on request.

1.4 Surveys conducted during a voyage may be agreed and credited to periodical surveys due. The prerequisites, procedure and specific conditions to be met, e.g. weather, will be fixed case by case. The decision as to feasibility of the survey may only be taken in agreement with the Surveyor.

1.5 GL will inform the Naval Administration about the status of Class, indicating the last recognized surveys and the next due dates. However, even if not provided with such information, the Naval Administration is obliged to have the surveys stipulated by the present Rules performed.

1.6 Upon request GL may agree to testing, monitoring and analysis procedures as a supplement to or equivalent substitute for conventional survey and inspection such as by uncovering/opening up of components, see also B.1.5.6.

1.7 GL reserves the right for given reasons, e.g. in the light of special experience gained during operation, to extend the scope of survey and/or inspection or to carry that out with two Surveyors, if needed.

1.8 GL reserves the right to demand surveys to be held between the due dates of regular surveys, if this is necessary, see B.2.

1.9 If a ship has to be surveyed in a port beyond the reach of a GL Surveyor (also in the events of force majeure or of armed conflicts); GL Head Office will have to be notified. Upon checking of the facts, the further procedure will then be decided on.

In extraordinary cases and with GL Head Office agreement, it is possible to call for an external expert, whose report is, however, subject to examination by GL, who will decide on whether or not the ship will have to be re-surveyed.

2. Selection of Surveyors

On principle, the acting Surveyors will be chosen by GL. However, the Naval Administration is free to have any findings of surveys and decisions resulting there from, which deem to be doubtful, checked by other GL Surveyors upon special request to Head Office.

3. Documentation of surveys, confirmation of Class

3.1 The records of each survey, as well as any requirements upon which maintenance of Class has been made conditional, will be entered into the respective Survey Statement. By his signature in the Certificate and other documents the Surveyor only certifies what he himself has seen and checked during the particular survey.

3.2 The reports prepared by the Surveyor will be sent to GL Head Office. If there are no objections, the results will be documented in the GL Register, see Section 2, E.1.4.3, and the confirmation of Class effected by the Surveyor in the Certificate will acquire final validity.

3.3 In the Register the dates of the surveys will be indicated, such as Class Renewal, intermediate and annual Class surveys, boiler surveys, surveys in connection with continuous Class Renewal, bottom and propeller shaft surveys. Records on periodical repeat tests on steam boilers will be also entered in special Test Certificates, which are to be kept on board.

3.4 A confirmation of class effected by the Surveyor relates to the kind of survey referred to in the
report and is valid under the reservation that examination will not give cause for any objections, see 3.2.

3.5 On request, the Class may be confirmed in writing by a separate Certificate. However such Certificates are valid only if issued by GL Head Office or if in exceptional cases, Head Office has expressly authorized the field service representatives to do so.

3.6 Where defects are repaired provisionally only, or where the Surveyor does not consider immediate repair or replacement necessary, the ship’s Class may be confirmed for a limited period by making an entry in the Survey Statement of the Certificate of Classification. Cancellation of such limitations will also have to be indicated in the Survey Statement, see also Section 2, D.2.4.

4. Surveys required by the Naval Administration

4.1 Where surveys are requested by the Naval Administration on account of international conventions and/or of corresponding laws and regulations of a Flag State, GL will carry them out by order or within the framework of the contract between GL and the Naval Administration based on the respective provisions.

This includes surveys according to SOLAS 74, LL66/68 or MARPOL 73/78. Where possible, such surveys will be carried out simultaneously with the Class surveys.

4.2 GL will also undertake on request other surveys and checks stipulated by additional regulations and requirements of the flag state. Such surveys are subject to agreements made in each individual case and/or to the regulations of the country concerned.

4.3 All activities outlined in 4.1 and 4.2 and, where applicable, issuance of relevant certificates are likewise subject to the general conditions of Section 1.

4.4 If for some reason a ship’s Class has expired or has been withdrawn by GL, all certificates according 4.1 issued by GL will automatically become void. If subsequently the Class is renewed or reassigned, the validity of these certificates may be revived within the scope of their original period of validity, provided that all surveys meanwhile having fallen due have been carried.

5. External service suppliers

Personnel or firms engaged in services affecting Classification and statutory work are subject to approval by GL.

6. Calibration of measuring equipment

The inspection, measuring and test equipment used in workshops, shipyards and on board ships, which may form the basis for Surveyor’s decisions affecting Classification or statutory work, shall be appropriate for the services to be performed. The firms shall individually identify and calibrate each unit of such equipment to a recognized national or international standard.  

B. Surveys for Maintenance of Class, Definitions, Due Dates

1. Periodical surveys

1.1 General

1.1.1 The periodical surveys listed in the following are to be conducted for the hull, machinery including electrical installations as well as special equipment and installations included in the Classification of the ship.

If for some obvious reason, e.g. a temporary out-of-service condition of certain equipment, parts included in the Classification cannot be surveyed, this will be noted in the Survey Statement.

For scope and details of the surveys, see C.

1.1.2 Where Flag State regulations are applicable which impose inspection intervals deviating from the Class related intervals, the intervals will be harmonized in the individual case to reduce the number of single surveys, where possible.

1.2 Annual surveys

1.2.1 Annual surveys are to be conducted at nominal intervals of 12 months, as from the date of commencement of the Class period p indicated in the Class Certificate, see C.1.

1.2.2 The survey has to be carried out within a time interval of 3 months before to 3 months after the day at which one year of the current Class period expires.

1.3 Intermediate surveys

Extended annual surveys are referred to as intermediate surveys, see C.2.

The intermediate survey falls due at half the nominal time interval between two Class Renewal Surveys (i.e. p/2). If p is an uneven number of years, the survey may be carried out on the occasion of the preceding or following annual survey. If p is an even number of years, the intermediate survey replaces the annual survey.

1.4 Class Renewal Surveys

1.4.1 Class Renewal Surveys – also called special surveys – are to be carried out for the ship’s hull,  

1 For requirements, see UR Z19 of IACS
machinery, including the electrical plant and, for any special equipment classed at the intervals \( p \) indicated by the Character of Classification.

In exceptional cases extension of the Class period by 3 month at the most may be granted by GL upon request.

1.4.2 A Class Renewal Survey may be carried out in several parts. The survey may be commenced at the last annual survey during the Class period and must have been completed by the end of the Class period. Considering 1.2.2, the total survey period of the Class Renewal Survey shall not exceed 15 months. Regarding dry-docking, see 1.10.

1.4.3 The periodical surveys and inspections of propulsion systems and machinery as per 1.6 and 1.7 form an integral part of the surveys required for Class Renewal, unless otherwise specified in the following.

1.4.4 Class Renewals for the hull are numbered in the sequence I, II, III, etc. Class Renewal IV and subsequent ones correspond to Class Renewal III. Regarding their scope see C.3.2. A survey planning meeting is to be held prior to the upcoming survey, see also D.1.2.

1.4.5 The new period of Class will commence:

- with the following day, after which the previous Class expires, provided that the Class Renewal Survey has been completed within the 3 months preceding that date. This applies also to a granted extension of the Class period by 3 months at the most.
- with the date on which the Class Renewal Survey has been completed, if this is the case more than 3 months before expiry of the previous Class.

1.5 Continuous Class Renewal Surveys

1.5.1 On request of the Naval Administration, the surveys required for Class Renewal may be split, according to a schedule to be agreed, such as to extend over the entire period of Class so that about 20% of all surveys required for Class Renewal will be completed every year.

This means that all areas subject to survey as defined by GL Head Office are to be surveyed at least once per Class period, unless closer intervals are prescribed by the Naval Administration or relevant standards, see Section 2, B.3. The time interval between two subsequent surveys of each individual area or part shall not exceed 3 years.

For ships more than 10 years of age, the ballast tanks are to be internally examined twice in each five-year class period, i.e. once within the scope of the intermediate survey and once within the scope of the Continuous Class Renewal Survey (hull).

The survey in dry-dock for Continuous Class Renewal (hull) may be held at any time within the \( p \) year Class period provided all the requirements of 1.8 are also complied with.

1.5.2 Regarding the duration of the period of Class and due dates of surveys, the requirements as per 1.4.1 and 1.4.4 remain mandatory.

1.5.3 Continuous Class Renewal may be separately requested for hull, machinery as well as special equipment and installations.

1.5.4 Surveys held within the Continuous Class Renewal procedure may be combined with annual and intermediate surveys in a reasonable manner. However, the requirements for annual and intermediate surveys remain mandatory.

1.5.5 At the end of the Class period, for the purpose of Class Renewal, a final survey will be performed, during which the Surveyors will satisfy themselves as to whether all areas required to be surveyed have been surveyed throughout and with satisfactory results. If there are special reasons, a Surveyor may inspect individual parts again.

1.5.6 Surveys based on Planned Maintenance System

1.5.6.1 On request of the Naval Administration, an optimized Continuous Class Renewal system may be agreed upon as outlined in the following for ships the machinery of which is maintained with the aid of an approved, computer-assisted maintenance system.

The Naval Administration will introduce a Planned Maintenance System comprising at least the survey scopes/systems as covered by the normal Continuous Class Renewal system.

1.5.6.2 For approval by GL, the following documentation shall be submitted:

- detailed description of the maintenance system, indicating the flow of information
- list of components/systems to be covered by the optimized Continuous Class Renewal system (inventory content)
- indication of intervals for each of the maintenance measures in general
- list of maintenance intervals (time between overhaul - TBO) and of the expected lifetime (LT) of the main and auxiliary machinery components essential for operation, taking into account manufacturers’ recommendations and specific operational requirements
- list of instructions (Maintenance Procedures) underlying the maintenance concept
- description of maintenance documentation (reports containing important operational informa-
tion, component condition, offset sheets, measures carried out)
– documentation on the maintenance strategy applied prior to filing of the application

1.5.6.3 Within the scope of a shipboard survey the GL Surveyor will confirm that:
– the current maintenance system complies with the approved documentation
– the current maintenance system takes into account, without reservations, the specific service conditions
– the maintenance documentation permits conclusions to be drawn as to the construction condition and operability of the machinery
– the personnel in charge of operation of the machinery is properly qualified and hold the necessary qualification certificates

1.5.7 Surveys based on Condition Monitoring System

Machinery or technical installations, which are subject to a Condition Monitoring System, may be surveyed in line with the requirements and prerequisites described in the GL Rules for Guidelines for Machinery Condition Monitoring (I-1-17). Prerequisite for this special Survey Arrangement CM is the existence of a computerized Planned Maintenance System (PMS). The elements of the PMS considering the machinery components or part of them covered by Condition Monitoring shall be approved by GL according to 1.5.6.

The Condition Monitoring System is not limited to the equipment used to determine the machinery's condition, but includes also the applied procedures and schedules for data collection and analysis.

If the Condition Monitoring information are giving evidence to the Surveyor that the machinery, or part of it, is in an acceptable running condition, he may grant a waiver from dismantling of the machinery, or part of it, for direct inspection. Any item of the installation or machinery not covered by the Survey Arrangement CM shall be surveyed and credited in the conventional way.

1.5.8 Class extension

See 1.4.1.

1.6 Periodical surveys of propeller shafts and tube shafts, propellers and other systems

For maintenance of the Class, periodical surveys and tests of propeller shafts and tube shafts, propellers and other systems of naval ships are to be carried out. The scope of surveys and tests unless specifically restricted is defined in C.4.

1.6.1 Propeller shafts and tube shafts

The following surveys are applicable:
– normal survey
– modified survey
– partial survey

1.6.1.1 Normal survey

Propeller shafts and tube shafts are to be sufficiently drawn to permit entire examination at the following intervals unless alternative means are provided to assure the condition of the shaft.

1.6.1.1.1 Where the propeller shafts and tube shafts are fitted with continuous liners or approved oil sealing glands, or are made of corrosion resistant materials, the interval of survey is to be:
– 3 years for single shafting arrangement
– 4 years for multi-shafting arrangement

The interval of drawing may be raised to:
– p years for single shafting arrangement
– p years for multi-shafting arrangement

at the most, in any of the following three cases:
– where
  – the design details are approved
  – the propeller is fitted to a keyed shaft taper
  – the shaft is protected from seawater
  – a non-destructive examination is made at each survey by an approved crack-detection method of the after end of the cylindrical part of the shaft (from the after end of the liner, if any), and of about one third of the length of the taper from the large end, or
– where
  – the design details are approved
  – the propeller is fitted keyless to the shaft taper
  – the shaft is protected from seawater
  – a non-destructive examination is made at each survey by an approved crack detection method of the after end of the cylindrical part of the shaft (from the after end of the liner, if any), and of about one third of the length of the taper from the large end, or
– where
  – the design details are approved
  – the propeller is fitted to a solid flange coupling at the aft end of the shaft
  – the shaft and its fittings are not exposed to corrosion

Non-destructive examination of the fillet radius of the propeller shaft flange may be required if the visual examination of the area is not satisfactory.

– where
  – the design details are approved
  – the propeller is fitted keyless to the shaft taper
  – the shaft is protected from seawater
  – a non-destructive examination is made at each survey by an approved crack detection method of the after end of the cylindrical part of the shaft (from the after end of the liner, if any), and of about one third of the length of the taper from the large end, or
  – where
  – the design details are approved
  – the propeller is fitted to a solid flange coupling at the aft end of the shaft
  – the shaft and its fittings are not exposed to corrosion

Non-destructive examination of the fillet radius of the propeller shaft flange may be required if the visual examination of the area is not satisfactory.

– where
  – the design details are approved
  – the propeller is fitted keyless to the shaft taper
  – the shaft is protected from seawater
  – a non-destructive examination is made at each survey by an approved crack detection method of the after end of the cylindrical part of the shaft (from the after end of the liner, if any), and of about one third of the length of the taper from the large end, or
  – where
  – the design details are approved
  – the propeller is fitted to a solid flange coupling at the aft end of the shaft
  – the shaft and its fittings are not exposed to corrosion

Non-destructive examination of the fillet radius of the propeller shaft flange may be required if the visual examination of the area is not satisfactory.
method of the forward part of the aft shaft taper

In all other cases the nominal interval of survey is to be \( \frac{p}{2} \) years with an admissible time window of \( \pm 6 \) months.

1.6.1.2 Propeller shafts and tube shafts are to be sufficiently drawn to permit entire examination. For further details see C.4.1.1.1.

For oil lubricated arrangement, the shaft need not be drawn at the occasion of the normal survey, provided that all exposed areas of the after shaft area as described in 1.6.1.1.1 are examined by an approved crack-detection method where

- the clearances and wear down of the bearings
- the records of lubricating oil analysis, oil consumption and bearing temperature
- the visible shaft areas

are examined and found satisfactory. The crack detection test of the aft flange fillet area may be dispensed with for the solid flange couplings fitted at the end of the shaft, see also 1.6.1.1.1.

Lubricating oil and bearing temperature controls are to be performed as specified in 1.6.1.2.2. For further details see C.4.1.1.2. Where any doubt exists regarding the findings of the above, the shaft is to be sufficiently drawn to permit an entire examination.

1.6.1.2 Modified survey

1.6.1.2.1 For single and multi-shafting arrangements a modified survey may be accepted instead of the normal survey at alternate \( p \) yearly survey intervals, at the most, subject to:

- the design details are approved
- the shaft is fitted with oil lubricated bearings and oil sealing glands
- the shaft and its fittings are not exposed to corrosion
- new oil seals may be fitted without removal of the propeller (except in the case of keyed propeller)

and provided that the clearances of the aft bearing are found in order and the lube oil and the oil sealing arrangements have proved effective in any of the following three cases:

- where the propeller is keyed on the shaft taper and suitable crack-prevention measures are taken, or
- where the propeller is fitted to a solid flange coupling at the end of the shaft, or
- where the propeller is fitted keyless to the shaft taper

The maximum interval between two successive normal surveys is not to exceed 2\( p \) years.

1.6.1.2.2 The shaft is to be sufficiently drawn to permit examination of the aft bearing contact area of the shaft. For further details see C.4.1.2.1.

Drawing of the shaft to expose the aft bearing contact area of the shaft may not be required where a lubricating oil analysis is carried out regularly at intervals not exceeding 6 months, and the oil consumption and bearing temperature are recorded and considered to be within permissible limits. The documentation on lubricating oil analysis is to be available on board and be checked. Each analysis should include the minimum parameters:

- water content
- chloride content
- content of bearing metal particles
- oil aging (resistance to oxidation)

Oil samples should be taken under service conditions. For further details see C.4.1.2.2.

The Class Notation CM-PS assumes the fulfilment of these requirements.

Where any doubt exists regarding the findings of the above, the shaft is to be sufficiently drawn to permit an examination according to C.4.1.2.1.

1.6.1.3 Partial survey

1.6.1.3.1 Upon request by the Naval Administration for shafts where the modified survey is applicable and a prolonged service fatigue life of seals is expected due to the appropriate combination of materials and controlled pressures in way of seals consideration may be given to a prolongation of the \( p \)-yearly interval between normal surveys, provided a partial survey is performed.

In no case shall the interval between normal surveys exceed 1,5 times the due interval.

1.6.1.3.2 The partial survey consists of checking the oil sealing glands and the clearance of the bearings. For keyed propellers, the propeller is to be dismantled to expose the forward part of the taper, and a non-destructive examination by an approved crack detection method is to be performed. For further details see C.4.1.3.

1.6.2 Propellers

During normal or modified surveys of the propeller shafts and tube shafts, the propellers as well as the remote and local control gear of controllable pitch propellers are to be surveyed at the Surveyor’s discretion, depending on the findings.

1.6.3 Other systems

Other systems for main propulsion purposes, such as rudder and steering propellers, azimuthing propulsor
systems, pump jet units, etc., are subject to the same survey intervals as propeller shafts and tube shafts.

1.7 Periodical surveys and tests of individual machinery items

1.7.1 The periodical surveys of individual machinery items or installations listed below are to be carried out in addition to those prescribed in 1.4 and C.1.3 for maintenance of class.

1.7.2 Auxiliary steam boiler plants

1.7.2.1 Steam boilers are to be subjected to the following examinations and tests at regular intervals. The term 'steam boilers' includes exhaust gas boilers and warm water and hot water generators (except where they are heated by steam or liquids).

1.7.2.2 External inspection

Boilers are to be subjected at annual intervals to an external inspection in accordance with the GL inspection programme.

For the external inspection a time window of ±3 months is applicable.

1.7.2.3 Internal inspection

Steam boilers are to be subjected to internal inspections at least twice in every Class period. On no account the maximum interval between two internal inspections shall exceed 3 years.

1.7.2.4 An extension of the internal inspection of the boiler up to 3 months can be granted under exceptional circumstances. The extension may be granted by GL after the following is satisfactorily carried out:

- external inspection of the boiler
- functional test of the boiler safety valves
- functional test of the boiler protective devices
- review of the following records since the last internal inspection:
  - operational documentation
  - maintenance documentation
  - repairs carried out
  - records of water analysis

1.7.3 Steam pipes

1.7.3.1 Steam pipes are to be examined regularly every \( p \) years, possibly in connection with a class renewal survey. Starting from Class Renewal II the steam pipes are to be examined as to their internal and, where advisable, as to their external condition as well, employing non-destructive testing methods, where necessary, see C.5.3.

1.7.3.2 Steam pipes with service temperatures exceeding 500 °C are to be examined for expansion at \( p \) year intervals, starting from class Renewal II, at the latest.

1.7.4 Pressure vessels

1.7.4.1 Pressure vessels which are subject to survey by GL according to the Construction Rules, are to be examined internally and externally every \( p \) years, possibly in connection with a Class Renewal Survey.

1.7.4.2 Pressure vessels having a product of pressure [bar] by cubic capacity [l] of \( p \cdot l \leq 200 \) are to be surveyed on the occasion of checking of the pertinent piping system.

1.7.4.3 Periodical tests of CO\(_2\) cylinders and other gas cylinders for fire-extinguishing purposes are to be carried out at intervals not exceeding \( 2p \) years, as follows:

At least 10% of the gas cylinders provided are to be subjected to an internal inspection and hydrostatic test. If one or more gas cylinders fail, a total of 50% of the gas cylinders provided are to be subjected to an internal inspection and hydrostatic test. If further gas cylinders fail at the extended test, all gas cylinders are to be subjected to foregoing tests. In any case, all gas cylinders having failed shall be replaced by new ones.

Halon containers of existing fixed Halon fire-extinguishing systems are exempted from this requirement.

Irrespective thereof, on the occasion of recharging CO\(_2\) cylinders, Halon containers and other gas cylinders are to be tested, if the last test dates back 10 years or more.

1.7.4.4 Low pressure CO\(_2\) bulk storage containers are subject to internal survey if the content has been released and the container is more than 5 years old but not more frequently than once within five years.

1.7.4.5 In the case of vessels for powder extinguishing agents, periodical pressure tests may be dispensed with, provided that their internal inspection does not reveal any deficiencies.

1.7.4.6 Receivers in hydraulic or pneumatic control systems are to be examined during maintenance and repairs at the system; air receivers with a product of pressure by cubic capacity \( p \cdot l \geq 1000 \) (p in bar) are to be subjected to an internal inspection at least once during each class period and/or at intervals not exceeding 5 years.

1.7.4.7 The intervals between surveys as referred to may be reduced, depending on the findings.

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2 For steam boiler plants on board seagoing vessels, where GL is authorised to carry out the statutory inspections, more extensive regulations of the country, where the ship is registered, have to be observed.
1.7.5 Automation equipment

1.7.5.1 For confirmation of the Class Notation, machinery having been assigned the Notations AUT-N or AUT-Nnh is to be inspected in accordance with GL Survey programmes during Annual, Intermediate or Class Renewal Surveys, respectively.

1.8 Bottom surveys

1.8.1 Naval ships are generally to be subjected to a bottom survey twice during the Class period \( p \). As a matter of principle, Class Renewal includes the second bottom survey. The first required bottom survey shall be planned as follows:

For \( p = 5 \), the bottom survey may be carried out in connection with the second or third regular annual survey within the Class period, but not later than 36 months after the last bottom survey.

For \( p = 6 \), the bottom survey should be carried out on the occasion of the intermediate survey, but not later than 39 months after the last bottom survey.

In exceptional circumstances, an extension of examination of the ship’s bottom of 3 months beyond the due date can be granted.

1.8.2 Bottom surveys will generally have to be carried out in dry-dock. For in-water surveys see 1.9. Bottom surveys serve the purpose of periodical checking the underwater hull, the openings and closures in the shell relating to machinery systems and externally arranged components of the steering and propulsion systems. For details, see C.4. and C.6.

1.8.3 If a bottom survey is intended to be credited to a Class Renewal, all checking of hull and machinery prescribed for the respective Class Renewal and usually requiring dry-docking will have to be carried out.

A bottom survey for Class Renewal may be carried out up to 15 months before completion of the Class Renewal Survey, see 1.4.

1.8.4 It is also expected that for each bottom survey performed in addition to the bottom surveys stipulated by the Classification requirements a GL Surveyor will be called to attend.

1.8.5 Bottom surveys at an "Extended dry-dock interval" can be credited as IW survey during Intermediate and Class Renewal Surveys in terms of the 1,5\( p \) years interval, see 1.4.

1.9 In-water surveys

1.9.1 For ships assigned the Class Notation IW, an in-water survey may be performed with the assistance of approved divers may be recognized as a substitute for every second periodical bottom survey in a dry-dock, see C.4.

1.9.2 On request and in exceptional cases only, in-water surveys with the assistance of approved divers may also be carried out as a substitute for every second bottom survey in a dry-dock for ships not carrying the Class Notation IW. In any such case GL Head Office is to be informed. The relevant permission will be endorsed in the annex to the Class Certificate.

1.9.3 Special consideration should be given to ships aged 15 years and over, prior to permission being granted to carry out an in-water survey in lieu of a bottom survey in dry-dock.

1.10 Extended dry-dock interval

The "Extended dry-dock interval" applies also to naval ships.

1.10.1 The "Extended dry-dock interval" for 1,5\( p \) years is limited from the delivery of the ship to the age of 15 years.

1.10.2 At the 7,5 years interval it is possible to perform the first two forthcoming bottom surveys as underwater survey in the scope of an in-water survey. The third bottom survey at 1,5\( p \) years has to be performed in dry-dock. The interval is independent whether the bottom survey will be performed at an Intermediate or Class Renewal Survey.

1.10.3 The Naval Administration has the possibility to join the “Extended dry-dock interval” from delivery of the ship or between the years to an age of 10 years. The interval of bottom survey will be adapted according to the date of entry. The necessary bottom surveys with in-water survey and dry-docking will be performed in accordance with interval created by date of entry.

1.10.4 Necessary requirements for implementation of the "Extended dry-dock interval":

- Planned Maintenance System Hull according to the GL Guidelines for Extended Dry-Dock Interval (VI-11-5), Section 2
- Planned Maintenance System Machinery according to "Instructions for Planned Maintenance System"
- Shaft bearing and sealing system of approved design and regular monitoring procedures implemented
- Hull, rudder and shafting systems to be inspectable during in-water survey

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3 Exceptional circumstances", e.g. means unavailability of dry-docking facilities, unavailability of repair facilities, unavailability of essential materials, equipment or spare parts, or delays incurred by action taken to avoid severe weather conditions.
The extended Dry-Docking Scheme is in any case subject to approval by the Naval Administration.

2. Non-periodical surveys

2.1 Damage and repair surveys

Damage and repair surveys fall due whenever the ship’s hull, machinery or electrical installations, as well as special equipment classed have suffered a damage which might affect validity of Class, or if damage may be assumed to have occurred as a consequence of an average or some other event, see Section 2, D.2.3.

2.2 Voyage repairs and maintenance

Where repairs to hull, machinery or equipment, which affect or may affect Classification are to be carried out by a riding crew during a voyage, they are to be planned well in advance. A complete repair procedure including the extent of proposed repair and the need for Surveyor’s attendance during the voyage is to be submitted to and agreed upon with GL. Failure to notify GL in advance of the repairs may result in suspension of the ship’s Class.

The above is not intended to include maintenance and overhaul to hull, machinery and equipment in accordance with the recommended manufacturer’s procedures and established marine practice and which does not require the GL’s approval, however, any repair as a result of such maintenance and overhauls which affects or may affect classification is to be noted in the ship’s log and submitted to the attending Surveyor for use in determining further survey requirements.

2.3 Conversion surveys

In the case of conversions of a ship’s hull or machinery, surveys are to be conducted in accordance with the relevant approved particulars, as in the case of new buildings, see Section 2, D.3.

2.4 Extraordinary surveys

GL reserves the right to require extraordinary surveys to be held independently of any regular surveys. Such surveys may become necessary for examining the ship’s technical condition and are understood to be a part of GL’s Quality Assurance System.

3. Special equipment

Periodical surveys and tests of special equipment covered by the Class, such as diving installations, firefighting installations, incinerators or sea-water desalination systems, are to be carried out in accordance with the respective programmes fixed or to be fixed by GL for such special equipment characteristic of a particular type of ship.

For refrigerating installations see F.

For diving installations see G.

For towing gear see H.

4. Additional Safety Measures

For all concerned ships the strength of the small hatches and their securing devices fitted on the exposed fore deck, are to comply with additional requirements 4 for these structures.

The strength requirements to resist sea forces of items, such as air and ventilator pipes and their closing appliances, and the securing of windlasses located within the forward quarter length, are to comply with additional requirements 5 for fore deck fittings and equipment.

C. Performance and Scope of Periodical Surveys

1. Annual surveys

1.1 General

Unless a dry-docking survey is due, see B.1.8, annual surveys may be carried out with the ship afloat.

1.2 Hull structure and related equipment

1.2.1 The main structural elements of the hull are to be subjected to a general visual inspection, as far as accessible. Engine rooms, storages and service spaces, ro-ro decks are to be surveyed at on demand, depending on the ship type and the age and general condition of the ship. Where damages or excessive wastage affecting the Class are suspected, the Surveyor is entitled to carry out further investigations.

1.2.2 Hatches and covers, bulkhead doors, ramps and any openings in the outer shell shall be surveyed at each opportunity arising, but at least once a year, regarding structural integrity as well as tightness and operability of all closures.

Additionally to the overall survey the following structural members of bow, side and stern doors are to be thoroughly inspected:

- all hinges and the pertinent hydraulic cylinders in way of their securing points
- all securing elements of the locking devices and stoppers

Bow, side and stern doors with a clear opening of less than 12 m² are to be checked as per the surveyor’s instructions for their operability and unobjectionable technical condition. Car decks are to be surveyed in respect of operational safety, technical condition and accident prevention.

1.2.3 The rudder and manoeuvring arrangement and the anchor equipment are to be checked for visible

4 Additional requirements see UR S 26 of IACS

5 Additional requirements see UR S 27 of IACS
damages. For the related machinery and for operability, see 1.3.

1.2.4 For ballast tanks, in the case of substantial corrosion damages, annual surveys may be required, see 2.2.1.

1.3 Machinery

The machinery including electrical installations will be subjected to the following surveys and operational checks:

– general inspection of machinery and boiler rooms, with special regard to the propulsion system, the auxiliary engines, possible fire and explosion sources, and checking of emergency exits as to their free passage
– external inspection of boilers and pressure vessels, with their appliances and safety devices. For details regarding boilers, see 5.2.
– inspection and checking of the remote control, quick-closing/stopping devices of pumps, valves, ventilators, etc.
– random checking of the remote control and automation equipment
– inspection and checking of the main and auxiliary steering gear, including their appliances and control systems
– checking of all communication systems between bridge and machinery, boiler and steering gear rooms
– inspection of the bilge system, including remote control actuators and bilge filling level monitors
– checking of the main and emergency power supply systems, including the switch gear and other important electrical installations
– survey of explosion-proof installations
– checking of further permanently installed installations to the Surveyor's discretion, e.g. provision cooling plant, air conditioning, incinerating plant, etc.

For Class Notation CM-PS the stern tube lubrication oil system has to be surveyed and the correct performance of oil sampling, evaluation of the temperature of the stern tube bearings and the evaluation of the oil consumption as well as the results of the required measurements according CM-PS record file (F 233 AE) have to be checked and confirmed in the relevant forms of the record file.

1.4 Fire-extinguishing and fire alarm systems

1.4.1 The following items/systems are subject to inspection and/or testing, where applicable:

– fire mains system, including at least 20 % of hoses and nozzles
– gas fire-extinguishing system
– dry powder fire-extinguishing system
– foam fire-extinguishing system
– sprinkler system, including water mist sprinkler System, if applicable
– water and/or foam drencher system
– any other fixed fire-extinguishing system provided
– portable fire-extinguishers, mobile fire extinguishers, including portable foam application units
– fire detection and alarm systems
– emergency stops for ventilation fans, boiler forced draft fans, fuel transfer pumps, fuel oil purifiers
– quick-closing fuel valves
– fire closures, fire dampers, etc.
– fire-fighter's outfits

1.4.2 Additional requirements

1.4.2.1 Fixed fire-extinguishing systems

Fixed fire-extinguishing systems, such as gas, foam, dry powder or water mist systems, are subject to maintenance by approved or recognized specialists every 2 years. Water-spray systems supplied by the fire main and consisting solely of an isolating valve and open nozzles may be excluded from this requirement and may be subjected to the shipborne maintenance scheme (e.g. for paint store).

On the occasion of these inspections all CO₂ hose assemblies shall be subjected to a visual check. All CO₂ hose assemblies shall be replaced by type approved CO₂ hose assemblies not later than 10 years from the date of manufacture.

1.4.2.2 Pressure vessels

Pressure vessels of fixed gas based fire extinguishing systems are subject to level checks every 2 years. These checks may be performed by the ship’s staff, provided that the results are recorded and an entry is made into the ship’s log.

In the event of loss of more than 10 % of CO₂, respectively more than 5 % of other extinguishing gases including halon, charging is to be arranged for.

For periodical testing, see 3.3.5.

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6 “Substantial Corrosion” is an extreme of corrosion such that assessment of corrosion pattern indicates wastage in excess of 75 % of allowable margins, but within acceptable limits.
1.4.2.3 Fixed foam fire-extinguishing systems
Foam concentrate for fixed foam fire-extinguishing systems is to be examined not later than 3 years after filling into the system, and yearly thereafter. The examination is to be performed by the manufacturers or by an independent laboratory. Reports are to be presented to the Surveyor. Manufacturers’ certificates stating the properties of the foam concentrate shall be available onboard for reference of the Surveyor.

1.4.2.4 Portable foam applicator units
The foam concentrate for the portable foam applicator units is to be renewed on the occasion of every 5 years.

1.4.2.5 Portable and mobile fire-extinguishers
Portable fire-extinguishers and mobile fire-extinguishers are subject to periodical inspections in accordance with the manufacturer’s instructions and shall be serviced at intervals not exceeding one year.

Inspection and service shall only be undertaken by, or under the supervision of, a person with demonstrable competence and should follow the inspection guide in Table 9.1.3 of IMO Res. A.951(23). Each fire-extinguisher is to be provided with a label showing the date of inspection and name and signature of the competent person.

At least one portable fire-extinguisher of each type manufactured in the same year shall be test discharged as part of a fire drill at 5 yearly intervals. Fire-extinguishers used shall be provided with a visual indication of discharge. Instructions for recharging fire-extinguishers are to be supplied by the manufacturer and be available for use on board.

All portable fire-extinguishers together with propellant cartridges, if any, shall be hydraulically tested in accordance with the recognized standard or the manufacturer’s instruction at intervals not exceeding 10 years.

Records of inspections at fire-extinguishers are to be kept on board. They shall show the date of inspection, the type of maintenance carried out and whether or not a pressure test was performed.

1.4.2.6 More extensive regulations of the Naval Administration regarding other inspection intervals/per-formance of the tests should be observed.

1.5 Bridge control stand
On the occasion of the annual survey an operational test of the relevant equipment is to be performed on board of ships assigned the Class Notation NAV-O or NAV-OC.

1.6 Equipment related to the Notation NBC
Equipment and provisions, such as closures, ventilation systems, filters, sensors, alarms, etc., serving the protection against nuclear, biological or chemical fall-out, shall be surveyed according to the instructions established by the parties involved.

2. Intermediate surveys

2.1 General

2.1.1 Intermediate surveys shall include all the inspections and checks required for annual surveys. Additionally, the following requirements shall be observed.

2.1.2 The requirements apply to naval ships in general. Additional requirements may have to be observed for particular ship types, due to request of the Naval Administration or in connection with manufacturer's recommendations for special equipment.

2.2 Hull structure

2.2.1 Ballast tanks

2.2.1.1 In ships aged p to 2p years, selected ballast tanks are to be examined for corrosion damages and/or damages to their coatings. Depending on the survey result, and in particular in the case of poor hard protective coating condition, 7 if soft coating 8 or semi-hard coating has been applied, or if when built the tanks were not provided with a hard protective coating, the survey is to be extended to additional tanks of the same type.

2.2.1.2 If the hard protective coating in ballast tanks except the double bottom tanks is found to be in poor condition 7, but is not renewed, if soft coating 8 or semi-hard coating has been applied, or if when built, the tanks were not provided with a hard protective coating, or if corrosion respectively other defects are found, maintenance of Class is to be subject to the tanks in question being examined at annual intervals, and thickness measurements carried out as considered necessary.

Also in case of double bottom tanks, annual surveys may have to be carried out.

Semi-hard coatings in ballast tanks, if already applied, will not be accepted from the next special or intermediate survey commenced on or after 1 July 2010, whichever comes first, with respect to waiving the annual internal examination of ballast tanks as required in above.

2.2.1.3 In ships aged 2p years and over, during the intermediate survey, selected ballast tanks are to be examined for damages to the hull structural elements and to the hard protective coating, if applicable the procedure as outlined in 2.2.1.2 shall be followed.

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7 Poor condition: breakdown of protective coating over 20 % or more of areas, or hard scale at 10 % or more areas under consideration
8 “soft coating” means: Solvent-free coating on base of wool grease, grease, mineral oils and/or wax that remains soft so that it wears off when touched.
2.2.1.4 If such inspections reveal no visible structural defects, the examination may be limited to a verification that the corrosion protection system remains efficient.

2.2.1.5 If the hard protective coating is to be partly or totally renewed, only approved coating is applicable in case of a repair. The whole working procedure including the surface preparation has to be documented.

2.2.1.6 Compartments and rooms normally not accessible, or accessible only after special preparations, may be required to be opened for inspection, depending on the ship's age and available information about service conditions.

2.2.2 Bow, side and stern doors
Additional crack tests shall be carried out at structural members of bow, side and stern doors as per 1.2.2. Essentially, the crack tests will cover:
- main joining welds and their interfacial areas both on the ship's hull and on the doors
- highly stressed areas in way of the centres of rotation of the hinges, at the Surveyor’s discretion
- highly stressed areas of the locking devices and their stoppers, at the Surveyor’s discretion
- repair welding
For crack detection the dye penetration method or the magnetic particle inspection method shall be employed, and a test protocol is to be prepared.

2.3 Machinery and electrical installations

2.3.1 Measurements
The following measurements are generally to be performed and/or proved by up-to-date protocols that they have been carried out:
- crank web deflection, main engine(s)
- crank web deflection, auxiliary diesel engine(s) (where relevant)
- axial thrust bearing clearance of shafting system(s)
- axial thrust bearing clearance of main and auxiliary gas turbine rotors (where applicable)
- insulation resistance of generators and electrical motors, including cabling and switch gear

2.3.2 Operational tests
In addition to the requirements under 2.3.1 the following system components are to be subjected to operational tests:
- emergency generating set, including emergency switchboard (where applicable)
- emergency bilge valve(s)
- bilge, ventilation and monitoring systems for the carriage of dangerous goods
- drainage facilities of starting-air and control-air receivers
- general operational test of the machinery and electrical installation to demonstrate unrestricted operability, as indicated by the Surveyor

2.3.3 Automation equipment
The automation equipment is to be checked according to B.1.7.5.

2.3.4 Elastic mounting of deck houses
Elastic mounting of deckhouses have to be thoroughly checked for the general condition and operability of:
- the spring elements (possibly pre-stressing of screwed connections)
- the insulation
- the securing devices to prevent shifting and lifting
- the pipe and cable connections to the hull
If damages are suspected, mountings not easily accessible are to be dismounted and examined in detail.

3. Class Renewal Surveys

3.1 General

3.1.1 In addition to the surveys and checks to be carried out on occasion of the annual and intermediate surveys, for Class Renewal the following requirements shall be observed.

3.1.2 The Class Renewal Survey is in principle to be held when the ship is in dry-dock or on a slipway, unless a dry-docking survey has already been carried out within the admissible period, see B.1.8. The ship is to be placed on blocks of sufficient height so that the keel, the bottom plating, the rudder and any other installations at the bottom can be examined in a satisfactory manner.

3.1.3 For surveys normally requiring dry-docking, and where the Notation IW has been assigned, the requirements according to B.1.9 have to be observed.

3.2 Hull structure

3.2.1 Class Renewal I
Class Renewal I has to be performed at the end of the first Class period p. For definition see B.1.4.2.
3.2.1.1 Hull, general
At the Surveyor's discretion, the survey on principle covers the whole hull structure, particularly those areas which from experience are known to be exposed to fatigue and corrosion, such as openings in the shell and in the deck including doors and hatch coamings and covers, tanks, engine foundations and ends of superstructures. As a matter of principle, all machinery spaces, dry spaces, store rooms, pipe tunnels, cofferdams and void spaces are to be examined, including the piping systems.

3.2.1.2 Preparation for inspection
All spaces required to be inspected are to be cleared, cleaned and ventilated where necessary at the Surveyor's discretion so that all structural parts, such as frames, floor plates, stringers, inner bottom, etc. can be examined. For tanks, see 3.2.1.3.

Where soft or semi-hard coating has been applied, safe access is to be provided for the surveyor to verify the effectiveness of coating and to assess the internal structure. When safe access cannot be provided, it may be necessary to remove this soft or semi-hard coating, at least partially.

Where ships have no double bottom, it is left to the Surveyor's discretion to have portions of the bottom ceiling of each watertight compartment removed on either side of the ship, especially near the centre-line girder and in way of the bilge pipes and sounding pipes, so that the bottom structure below may be examined.

Where ships have a double bottom, the ceiling is to be removed at several points, at the Surveyor's discretion.

Where the structural elements are covered, the Surveyor may require parts of the covering to be removed. If deemed necessary by the Surveyor, defective cement and asphalt covering is to be removed.

The steel work is to be examined before painting or before the cement or other coverings are renewed.

3.2.1.3 Tank surveys
In principle all ballast tanks are to be inspected; if applicable; the procedure as outlined in 2.2.1.2 shall be followed.

If the inspection reveals no visible structural defects, the examination may be limited to a verification that the protective coatings remain efficient.

Fuel oil, lubricating oil and fresh water tanks need not to be emptied, if their tightness can be verified by an external examination while they are completely filled and there is no reason for doubt as to their unobjectionable condition. However, fore and after peak are in any case subject to internal examinations at each Class Renewal Survey, see also Table 4.1.

3.2.1.4 Tightness tests
Each compartment of the double bottom and all tanks, the boundary plating of which forms part of the ship’s main structure, are to be subjected to pressure tests. Fuel oil, lubricating oil and fresh water tanks may be tested by filling with the respective liquid.

The test pressure applied is to correspond to a head of water up to the top of the overflow/air pipe or up to the hatch of a tank, where applicable, whichever is higher.

The tightness of pipe tunnels outside the inner bottom, and of void spaces, may be tested by air pressure. Air pressure testing of other spaces is to be agreed with the Surveyor from case to case. The overpressure shall not exceed 0.2 bar.

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### Table 4.1 Minimum requirements for internal examination at Hull Class Renewal Surveys of structural fuel oil, lube oil and fresh water tanks

<table>
<thead>
<tr>
<th>Tank 1,2</th>
<th>I. age ≤ p</th>
<th>II. p &lt; age ≤ 2p</th>
<th>III. 2p &lt; age ≤ 3p</th>
<th>IV. and subsequent, age &gt; 3p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel oil bunker tanks (engine rooms)</td>
<td>None</td>
<td>None</td>
<td>One</td>
<td>One</td>
</tr>
<tr>
<td>Lube oil</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>One</td>
</tr>
<tr>
<td>Fresh water</td>
<td>None</td>
<td>One</td>
<td>All</td>
<td>All</td>
</tr>
</tbody>
</table>

1 If a selection of tanks is accepted to be examined, then different tanks are to be examined at each Class Renewal Survey, on a rotational basis
2 Fore peak tanks and after peak tanks are subject to internal examination at each Class Renewal Survey
3.2.1.5 Thickness measurements

If the Surveyor has reason to suspect premature in-admissible corrosion, he may require the rust to be removed from parts of the structure and thickness measurements to be carried out, see D.

3.2.1.6 Rudder, equipment, deck openings, etc.

The Class Renewal Survey also covers other parts essential for the operation and safety of the ship, such as rudder and steering gear, watertight doors, sluice valves, air and sounding pipes, gas-freeing and safety arrangements of cargo tanks, life-boat davits, companionways, hatches, scuppers and water drain pipes with their valves, fire protecting arrangements, masts, anchors, anchor chains and hawser.

Doors, if any, are to be checked, see 2.2.2.

The rudder, rudder couplings and bearings, as well as the stock are to be surveyed in mounted condition, the rudder clearance to be measured and documented. The steering gear is to be subjected to an operational trial.

If considered necessary in view of the inspection results, the rudder and/or parts of the steering gear may have to be dismantled.

3.2.1.7 Engine room structure

The engine room structure is to be examined. Particular attention is to be given to tank tops, shell plating in way of tank tops, brackets connecting side shell frames and tank tops, engine room bulkheads in way of tank top and the bilge wells. Where wastage is evident or suspected, thickness measurements are to be carried out.

3.2.1.8 Loading instruments and loading manual

Where necessary for the ship, at each Class Renewal, the satisfactory operation of the approved loading computer systems is to be tested in the presence of a GL Surveyor using the approved test conditions.

At least 3 test conditions are to be checked, and the results may not deviate from the approved figures by more than 5 %.

The weights of the cargo, ballast, fuel, etc. are to be read in step by step.

Where necessary for the ship, the Surveyor has to check that the approved Loading Manual is on board.

3.2.2 Class Renewal II (age of ship p to 2p years)

3.2.2.1 The requirements for the second Class Renewal include those for Class Renewal I. Additionally, the following investigations are to be carried out.

3.2.2.2 The structural parts behind ceilings, floor coverings and insulation are to be examined, as required by the Surveyor and depending on the general condition of the ship, see 3.2.1.2.

3.2.2.3 In principle, all tanks are to be examined internally. Lubricating oil and fresh water tanks are to be at least examined at random examinations, as required by the Surveyor, see also Table 4.1.

In the case of seawater ballast tanks the procedure as outlined in 2.2.1.2 shall be followed, if applicable. Peak tanks see 3.2.1.3.

3.2.2.4 The chain cables are to be ranged so that they can be examined for wear and damages throughout their length. The mean diameter of the anchor chain cables is to be determined on at least 3 links per length.

3.2.2.5 For thickness measurements, see 6.

3.2.2.6 Where hull structural members are made of steel with yield strength of 460 N/mm² and above, additional ultrasonic testing of the butt welds is to be carried out according to the provisions of the GL Supplementary Rules for Application of Steel with yield strength of 460 N/mm².

3.2.3 Class Renewal III and subsequent ones (Age of ship over 2p years)

3.2.3.1 The requirements for the third and the subsequent Class Renewals include those for the Class Renewal II. Additionally, the following investigations are to be carried out.

3.2.3.2 Ceilings, linings and insulation of all spaces adjacent to the shell plating and the inner bottom shall be removed, as indicated by the Surveyor, to enable the steel structure to be examined in detail. For Class Renewals IV and subsequent ones the inner bottom ceilings are to be completely removed and the tank top is to be carefully cleaned, such as to enable proper assessment of the tank top’s condition.

3.2.3.3 The wall lining underneath windows in the outer shell is to be lifted as required by the Surveyor so that the structure behind may be examined.

3.2.3.4 All tanks are to be examined internally. The fuel oil, lubricating oil and fresh water tanks are to be examined internally and tested to the maximum working overpressure, at the Surveyor’s discretion, see 3.2.1.3 and Table 4.1. In the case of seawater ballast tanks the procedure as outlined in 2.2.1.2 shall be followed, if applicable.

3.2.3.5 The rudder body is to be examined. The connections to the rudder stock and, if fitted, to the pintle and pertinent securing devices are to be inspected. For clearances, see 6.2.2.

The rudder stock is to be surveyed as far as accessible. If deemed necessary in view of findings during this external inspection, the stock is to be dismantled. In way of the bearings, stock and pintle are to be examined for corrosion.

3.2.3.6 The weight of the anchors is to be checked.
3.3 Machinery including electrical installations

3.3.1 General

3.3.1.1 Except for individual machinery components as indicated in the following, the scope of all Class Renewal Surveys related to the machinery including electrical installations is identical. If the Continuous Class Renewal system is applied, the indications according to B.1.5 are to be observed.

3.3.1.2 Surveys requiring dry-docking

While the ship is in dry-dock, the sea inlet and discharge valves are to be examined as to their condition and to be opened up and overhauled once within a Class period.

Bow thrusters and positioning equipment are to be subjected to a general survey, and to trials upon floating of the ship.

For propeller(s), propeller and stern tube shaft(s), see 4.

3.3.2 Propulsion system

3.3.2.1 Inspection of the propulsion system is mainly to cover:

– intermediate shafts and bearings, including thrust bearings
– gearing
– mechanical and flexible couplings
– turning gear
– the main propulsion engines or gas turbines, see 3.3.2.2 and 3.3.2.3; for auxiliary engines see 3.3.3

For electrically driven propellers, see 3.3.8

Spring elements made of rubber ring - with or without plies of fabric – of rubber ring clutches with or without plies of fabric and under shear load, and other rubber or fibre reinforced plastic couplings are to be renewed, if required on account of negative inspection results.

3.3.2.2 Main propulsion engines

The following components are to be inspected and checked in the dismantled condition, where deemed necessary by the Surveyor:

– cylinders, cylinder covers, pistons, piston rods and bolts, cross heads, crankshaft and all bearings
– camshaft, with drive and bearings
– tie rods, frame, foundation and fastening elements
– injection system, attached pumps and compressors, superchargers, suction and exhaust lines, charging air coolers, filters, monitoring, control, protective and safety devices, starting, reversing and manoeuvring equipment

Note

In case of medium speed diesel engines, dismantling and replacement of main and crank bearings may be postponed until the service life limits have been reached. The acceptable intervals between overhauls are determined by GL Head Office.

3.3.2.3 Main propulsion gas turbines

On occasion of each Class Renewal, the vibration behaviour of the main propulsion gas turbines is to be investigated, possibly by regular checks during operation. Depending on the result and as required by the Surveyor, the turbine casing(s) will have to be opened up and the rotor(s), bearings, etc. inspected in detail.

The safety arrangements of the turbines are to be tested.

3.3.3 Auxiliary engines

For all essential auxiliary engines, the survey scope is identical to that applying to the main engines. A reduction in the scope of survey may be agreed to upon examination of the maintenance protocols.

3.3.4 Steam boilers

3.3.4.1 For internal and external inspections of boilers, see 5.2.

3.3.4.2 Steam pipes and heating coils shall be examined according to agreed procedures.

3.3.5 Pressure vessels

3.3.5.1 Pressure vessels are to be inspected internally and externally.

Pressure vessels for which pressure [bar] times cubic capacity [l] is less than or equal to 200 are to be surveyed on the occasion of checking of the pertinent piping system.

3.3.5.2 Where pressure vessels cannot be satisfactorily examined internally and where their unobjectionable condition cannot be clearly stated during the internal inspection, approved non-destructive test methods and/or hydraulic pressure tests are to be carried out.

The hydraulic pressure test is to be performed at a test pressure of 1,5 times the maximum allowable working pressure. If the maximum allowable working pressure is less than 2 bar, then the test pressure should be at least 1 bar more than the maximum allowable working pressure. Pressure vessels manufactured in accordance with DIN Standard 4810 are, subject to that Standard, to be tested to 1,3 times the admissible working pressure. The test pressure must in no case exceed the initial test pressure.
3.3.6 Auxiliary machinery, equipment and piping

The following machinery components are to be inspected and tested in dismantled condition, where deemed necessary by the Surveyor:

- all pumps of the essential systems
- air compressors, including safety devices
- separators, filters and valves
- coolers, pre-heaters, see 3.3.5
- main and auxiliary steering gear
- anchor and other windlasses, including drives
- piping, pipe connections, compensators and hoses
- emergency drain valves and bilge piping systems
- tank filling level indicators
- installations preventing the ingress of water into open spaces
- freshwater distillation plant, where provided
- oil purifier and sewage systems
- additional systems and components, where deemed necessary by the Surveyor, as well as special equipment and installations if included in the scope of Classification

3.3.7 Automation equipment

The monitoring equipment and the automated functions of the machinery installation are to be subjected to operational trials under service conditions in port. The bridge remote control equipment of the propulsion system will be examined as required.

Details are given in the GL survey programme AUT 4, see also 2.3.3.

3.3.8 Electrical installations

3.3.8.1 Propulsion machinery

If the ship is propelled by electrical machinery, the propulsion motors, the propulsion generators and exciters, particularly the windings of these machines, and their ventilating systems are to be examined and tested. Checking of the electric switch gear for operability is to cover also the protective, safety and interlocking devices. The electric cables and their connections are to be inspected. The insulation resistance of all electric machinery and equipment is to be tested.

3.3.8.2 Dynamic positioning systems

Dynamic positioning systems according to Section 3, C.4.3, including control systems, are to be subjected to operational tests.

3.3.8.3 Auxiliary machinery

The electrical machinery and equipment, including the generators, the motors of the essential services, the switch gear including its protective and interlocking devices, as well as the cable network are to be inspected externally. The insulation resistance is to be measured.

3.3.8.4 Explosion protection

Electrical installations, including machinery and equipment located in spaces in which there is a risk of inflammable gas or vapour/air mixtures accumulating, spaces with explosive and ammunition are to be checked as to the explosion protection provided.

3.3.9 Pipes in tanks

Where pipes are led through tanks, they are to be examined and, if required by the Surveyor, subjected to hydraulic tests, if for the respective tanks an internal examination is required according to 3.2.1.3. Depending on the results obtained, thickness measurements may be required. If heating coils are installed, pressure testing is required.

3.3.10 Fire-extinguishing and fire alarm systems

3.3.10.1 General requirements

Proof is to be furnished to the Surveyor that the entire fire-extinguishing equipment is ready for operation and in a satisfactory condition. For details and trials, see 1.4.

Emergency exits/escapes are to be inspected.

CO₂ cylinders (Halon bottles, where still used), see 5.4.3 and for due dates B.1.7.4.

On the occasion of every Class Renewal Survey all CO₂ hose assemblies shall be subjected to a visual check. All CO₂ hose assemblies shall be replaced by type approved CO₂ hose assemblies not later than 2 years from the date of manufacture.

3.3.10.2 Periodical tests of CO₂ cylinders for fire extinguishing purposes are to be carried out at intervals not exceeding 2 years. At least 10 % of the gas cylinders provided are to be subjected to an internal inspection and hydrostatic test. Halon containers of existing fixed Halon fire-extinguishing systems are exempted from this requirement. Irrespective thereof, on the occasion of recharging CO₂ cylinders and Halon containers are to be tested, if the last test dates back 2 years or more. Following a hydraulic pressure test, the vessels or bottles are to be carefully dried.

3.3.10.3 In the case of vessels for powder extinguishing agents, periodical pressure tests may be dispensed with, provided that their internal inspection does not reveal any deficiencies.
The intervals between surveys as referred to may be reduced, depending on the findings.

For automation equipment see 5.5.

In ships carrying the Class Notation DG the equipment for the carriage of dangerous goods, e.g. special fire-fighting, alarm, ventilation and explosion protection equipment is to be surveyed as required.

Dangerous goods

Spare parts

Spare parts are to be checked for completeness as per the Rule requirements and/or according to the lists approved by GL and kept in the ship’s files, as well as for their operability.

Trials

Upon completion of the surveys for Class Renewal, the Surveyor shall be satisfied that the entire machinery installation including electrical installations and steering gear, as well as special equipment and installations are operable without any restrictions. In case of doubt, trials and/or operational tests may be necessary.

Periodical surveys of propeller shafts and tube shafts, propellers and other systems

The periodical surveys and tests of propeller shafts and tube shafts, propellers and other systems defined in B.1.6 are to be performed as follows.

Propeller shafts and tube shafts

Normal survey

The prerequisites are defined in B.1.6.1.1. It is distinguished between:

- survey with drawing of the shaft
- survey without drawing of the shaft

Survey with drawing of the shaft

The scope of the normal survey consists in the following:

- dismantling of propeller and key, where fitted, visual inspection of all parts of the shaft especially the cone, the keyway, the bearing contact areas of the shaft, the bearings, and the thread of the propeller nut, or the fillet of the flange, examination of the propeller fit
- non-destructive examination by an approved crack-detection method of the aft end of the cylindrical part of the shaft and of about one third of the length of the taper from the large end and of the area of the keyway for keyed propellers, or of the forward part of the aft shaft taper for keyless propellers, or of the after fillet flange area of the shaft for solid flange coupling propellers. The crack detection test of the aft flange fillet area may be dispensed with for the solid flange couplings fitted at the end of the shaft, see also B.1.6.1.1.1.
- examination of the bearing clearances and/or wear down before dismantling and after reassembling of the shaft with recording of the values measured
- overhaul of the shaft sealing glands according to manufacturer’s instructions (sealing rings, liners, etc.)

Survey without drawing of the shaft

Where the prerequisites as defined in B.1.6.1.2 apply, for oil lubricating arrangement the scope of normal survey without drawing of the shaft consists in the following:

- examination of all accessible parts of the shaft including the propeller connection to the shaft
- non-destructive examination by an approved crack-detection method of the aft end of the cylindrical part of the shaft and of about one third of the length of the taper from the large end and of the area of the keyway for keyed propellers, or of the forward part of the aft shaft taper for keyless propellers, or of the after fillet flange area of the shaft for solid flange coupling propellers. The crack detection test of the aft flange fillet area may be dispensed with for the solid flange couplings fitted at the end of the shaft, see also B.1.6.1.1.1.
- examination of the bearing clearances, respectively wear down of the aft bearing
- overhaul of the shaft sealing glands according to manufacturer’s instructions (sealing rings, liners, etc.)
- examination of the records of all regularly carried out lubricating oil analyses
- examination of the records of the oil consumption and the bearing temperatures

Where doubts exist regarding the findings, the shaft is to be drawn to permit an entire examination.

Modified survey

The prerequisites are defined in B.1.6.1.2. It is distinguished between:

- survey with exposing the aft bearing contact area of the shaft
- survey without exposing the aft bearing contact area of the shaft

Survey with exposing the aft bearing contact area of the shaft

The scope of the modified survey consists in the following:
– drawing the shaft to expose the aft bearing contact area of the shaft
– examination of the forward bearing as far as possible and of all accessible parts of the shaft including the propeller connection to the shaft
– examination and overhaul of the oil sealing glands according to manufacturer’s instructions (sealing rings, liners, etc.)
– examination of the bearing clearances and/or wear down of the shaft with recording of the values measured
– examination of the lubricating oil analysis and consumption to be within permissible limits
– for keyed propellers, performing a non-destructive examination by an approved crack-detection method of about one third of the length of the taper from the large end, for which dismantling of the propeller is required, examination of the propeller fit

Where doubts exist regarding the findings, the shaft is to be further dismantled, respectively drawn.

4.1.2.2 Survey without exposing the aft bearing contact area of the shaft

Where the prerequisites as defined in B.1.6.1.2.2 apply, the scope of the modified survey without exposing the aft bearing contact area of the shaft consists in the following:
– examination and overhaul of the oil sealing glands according to manufacturer’s instructions (sealing rings, liners, etc.)
– examination of the bearing clearances and/or wear down of the shaft with recording of the values measured
– for keyed propellers, performing a non-destructive examination by an approved crack-detection method of about one third of the length of the taper from the large end, for which dismantling of the propeller is required, examination of the propeller fit

In addition to this, the survey shall include the following:
– examination of the records of all regularly carried out lubricating oil analyses
– examination of the records of the oil consumption and the bearing temperatures

Where doubts exist regarding the findings, the shaft is to be further dismantled, respectively drawn.

4.1.3 Partial survey

The prerequisites are defined in B.1.6.1.3. The partial survey consists in the following:
– checking of the oil sealing for leakages
– examination of the bearing clearances and/or wear down of the shaft with recording of the values measured
– examination of the records of the lubricating oil analysis
– examination of the records of the oil consumption and the bearing temperatures

Where the propeller is fitted to a keyed shaft taper, in addition:
– dismantling of the propeller and examination of the propeller fit
– non-destructive examination by an approved crack-detection method of the aft end of the cylindrical part of the shaft and of about one third of the length of the taper from the large end and of the area of keyway are to be performed.

Where doubts exist regarding the findings, the shaft is to be further dismantled, respectively drawn.

4.2 Propellers

Propellers are to be examined visually on the occasion of each propeller shaft or tube shaft survey. Damages, such as cracks, deformation, cavitation effects, etc. are to be reported and repaired at the Surveyor’s discretion.

Controllable pitch propellers are to be checked for oil leakages. The function of the controllable pitch propellers has to be tested. The maintenance according to manufacturer’s instructions has to be checked.

4.3 Other systems

As far as practicable, the gearing and control elements of rudder and steering propellers are to be examined through inspection openings. For other systems such as pod propulsion systems, pump jet units, etc., the scope of survey is to be agreed with GL Head Office. The maintenance according to manufacturer’s instructions is to be checked. A function test is to be carried out.

5. Periodical surveys and tests of individual machinery items

5.1 The periodical surveys and tests of individual machinery items defined in B.1.7 are to be performed as outlined below.

5.2 Steam boilers

5.2.1 External inspection

External inspection including functional test of the safety and protective devices as well as the test of the safety valves is to be carried out annually.

The operability and general condition of the entire boiler, including its valves and fittings, pumps, piping, insulation, foundation, control and regulating
systems and its protective and safety equipment, are to be examined. Also, the boiler records, operating instructions and qualifications of the operating personnel are to be checked.

For exhaust gas boilers, the safety valves are to be functional tested by the Chief Technical Officer at sea within the boiler external survey window. This test is to be recorded in the log book for review by the attending Surveyor prior to crediting the Annual Survey of Machinery.

### 5.2.2 Internal inspection

Where deemed necessary by the Surveyor, the boiler is to be cleaned on the water and flue gas and exhaust gas sides, if required, its outside surfaces are to be exposed as well, so that all walls subject to pressure may be examined.

At each survey the boilers, superheaters and economizers are to be examined on water and steam side as well as flue gas or exhaust gas side. Boiler mountings and safety valves are to be examined at each survey. They are to be opened up as considered necessary by the Surveyor.

The set pressure and the function of the safety valves are to be verified during each internal boiler inspection. For exhaust gas boilers, if steam pressure cannot be raised at port, the safety valves are to be adjusted at the test bench. The correct set pressure is to be verified by the Chief Technical Officer at sea and the results to be recorded in the log book for review by GL.

Review of the following records since the last boiler survey is to be carried out as part of the survey:

- operational documentation
- maintenance documentation
- repairs carried out
- records of water analysis

Where the design of the boiler does not permit an adequate internal inspection, hydraulic tests may be required. It is left to the Surveyor's discretion to have the internal inspection supplemented by hydraulic tests, if considered necessary on account of the general condition/appearance of the boiler.

Where there are doubts concerning the thickness of the boiler walls, measurements shall be made using a recognised gauging method. Depending on the results, the allowable working pressure for future operation is to be determined.

The hydraulic pressure test is to be carried out to a test pressure of 1.5 times the allowable working pressure. If the maximum allowable working pressure is less than 2 bar, the test pressure shall be at least 1 bar above the maximum allowable working pressure. In no case the test pressure should exceed the test pressure applied during the constructional check and hydrostatic pressure test of the boiler after completion.

### 5.2.3 Extraordinary inspection

Beyond the above mentioned periodical inspections extraordinary inspections including non-destructive tests and hydraulic pressure tests may be required at the Surveyor's discretion, e.g. in case of damages, repairs and maintenance work.

### 5.3 Steam pipes/heating coils

#### 5.3.1 Steam pipes with steam temperatures of up to 350 °C and with outside diameters of more than 75 mm, are to be examined at random. Examinations of the internal condition of the pipelines, especially of pipe bends, or additional more detailed examinations may be required. Instead of the internal inspection, a hydraulic test may be affected to a pressure equal to 1.5 times the design pressure, but not exceeding that of the prescribed test pressure for the pertinent boiler plant.

#### 5.3.2 In the case of steam pipes with steam temperatures exceeding 350 °C (at least two) selected individual parts of pipes are to be dismounted from each piping system (main steam pipe and auxiliary steam pipes of each service group) having an outside diameter exceeding 32 mm. Approximately 10 % of the welding seams at bends, flanges or tee-branches are to be subjected to an inspection for cracks by recognized non-destructive test methods.

Before being used again, removed screws of flanged joints are to be inspected for their general condition and cracks and renewed, if necessary.

#### 5.3.3 Steam pipes designed to resist steam temperatures exceeding 500 °C and welded piping systems are to be examined as follows:

Flanged pipes in accordance with B.1.7.3.2; however, the inspection for cracks has to cover at least 20 % of the welded seams.

If internal examination of welded piping systems through the inspection holes appears to be inadequate or if their reliable assessment is not possible even by ultrasonic testing or an equivalent examination method, it may be necessary to cut out certain parts of pipes. At least 20 % of the welding seams are to be inspected for cracks.

Removed screws of flanged joints, see above 5.3.2.

#### 5.3.4 Heating coils in oil tanks and vessels are to be subjected to a pressure test to 1,5 times the allowable working pressure.

The same applies to heating coils in cargo tanks.

### 5.4 Pressure vessels

#### 5.4.1 Subject to B.1.7.4, pressure vessels are to be inspected internally and externally.
5.4.2 Supplementary tests

Where pressure vessels cannot be satisfactorily examined internally and where their unobjectionable condition cannot be clearly recognized during the internal inspection, recognized non-destructive test methods are to be applied and/or hydraulic pressure tests are to be carried out.

The hydraulic pressure test is to be performed at a test pressure of 1.5 times the maximum allowable working pressure. If the maximum allowable working pressure is less than 2 bar, then the test pressure should be at least 1 bar more than the maximum allowable working pressure. Pressure vessels manufactured in accordance with DIN Standard 4810 are, subject to that Standard, to be tested to 1.3 times the admissible working pressure. The test pressure shall in no case exceed the initial test pressure.

5.4.3 CO₂ low-pressure fire-extinguishing systems and halon tanks

The surfaces are to be checked for corrosion at the Surveyor's discretion.

Insulated vessels are to be exposed at some selected points, such as to offer a general impression of the vessel's external condition.

Following a hydraulic pressure test, the vessels and/or bottles are to be carefully dried, see also B.1.7.4.4.

5.5 Automation equipment

The monitoring equipment and the automated functions of the machinery installation are to be subjected to operational trials according to B.1.7.5. The bridge remote control equipment of the propulsion system will be examined as required.

6. Dry docking surveys

6.1 General

For the survey the ship is to be placed on sufficiently high and secure blocks, so that all necessary examinations can be carried out. It may be necessary to clean the bottom and outer shell and/or remove rust from some areas.

6.2 Hull bottom survey

6.2.1 The survey covers an examination of the bottom and side plates of the shell plating, including any attachments, the rudder, the scuppers and water drain pipes, including their closures.

6.2.2 Steering gear

The rudder, rudder couplings and bearings, as well as stocks and pintles, are to be surveyed in place, the rudder clearance is to be measured and documented. The steering gear is to be subjected to an operational trial. If considered necessary in view of the inspection results, the rudder or parts of the steering gear will have to be dismantled.

Bow thrusters are normally to be inspected in place.

6.2.3 Machinery and propulsion systems

6.2.3.1 For propeller(s), propeller shaft(s), stern tube(s), see 4.2.

6.2.3.2 Sea and discharge valves - including those of special equipment, if any - are to be checked as to their condition during each dry-docking survey and to be opened up and overhauled once within a period of Class.

7. In-water surveys

7.1 Approvals

7.1.1 The diving firm assisting in in-water surveys has to be approved by GL for this purpose.

7.1.2 The validity of the approval will depend on the continued qualification for satisfactorily carrying out the work required. The approval will have to be renewed after a period not exceeding 5 years.

7.2 Performance of survey

7.2.1 Unless accessible from outside with the aid of the ship’s trim and/or heel, underwater parts are to be surveyed and/or relevant maintenance work is to be carried out with assistance by a diver whose performance is controlled by a Surveyor, using an underwater camera with monitor, communication and recording systems.

7.2.2 Surveys of the underwater body are to be carried out in sufficiently clear and calm waters. The ship should be in light ship condition. The shell sides below the water-line and the bottom shall be free from fouling.

7.2.3 The underwater pictures on the surface monitor screen shall offer reliable technical information such as to enable the Surveyor to judge the parts and/or the areas surveyed.

7.2.4 Documentation suited for video reproduction including voice is to be made available to GL.

7.3 Additional examinations

7.3.1 Where, for instance, grounding is assumed to have taken place, the Surveyor may demand individual parts of the underwater body to be additionally inspected from inside.

7.3.2 If during the in-water survey damages are found which can be assessed reliably only in dry-dock or require immediate repair, the ship is to be dry-docked. If the coating of the underwater body is in a condition which may cause corrosion damages
to the Surveyor’s discretion. The minimum requirements for thickness measurements on the occasion of Class Renewal Surveys are stated in Table 4.2, depending on the ship’s age. Respective thickness measurements to determine the general level of corrosion are to be carried out.

3.2 The extent of thickness measurements may be reduced, in comparison with those stated in Table 4.2, provided during the close-up examination according to Table 4.3 the Surveyor satisfies himself that there is no structural diminution, and the protective coating, where applied, continues to be effective.

The Surveyor may extend the scope of the thickness measurement as deemed necessary. This applies especially to areas with substantial corrosion.

Transverse sections should be chosen where largest corrosion rates are suspected to occur or are revealed by deck plating measurements.

3.3 Seawater ballast tanks

In the case of major corrosion damages, the structural elements of seawater ballast tanks are to be checked by thickness measurements, see C.2.2.1.

3.4 Where special reasons exist, the Surveyor may demand thickness measurements to be carried out already on the occasion of Class Renewal I, also outside the area of 0.5 \( \text{L} \) amidships, see C.3.2.1.5. The same applies in the case of conversion or repair of a ship.

3.5 In order to be used as a basis for Class Renewal, thickness measurements should, as far as practicable, be carried out already on the occasion of the \( p - 1 \), i.e. fourth respectively fifth annual survey respectively \( 2p - 1 \) for Class Renewal II.

3.6 Hull equipment

In Class Renewal II and all subsequent Class Renewals the cross-sectional areas of the anchor chain cables are to be determined (chains Renewal II + anchors Renewal II). The mean diameters of the anchor chain cables are to be determined by representative measurements, approx. 3 links per length of 27.5 m, made at the ends of the links where the wear is greatest.

4. Corrosion and wear tolerances

4.1 Where thickness measurements according to 3. result in corrosion and wear values exceeding those stated in the following, the respective hull structural elements will have to be renewed.
GL reserves the right where applicable to modify the indicated values according to 4.3 and 4.5.3 referring to the maximum permissible large-surface corrosion allowances.

Where reduced material thickness was admitted for the new building (effective system of corrosion prevention), the permissible corrosion allowances are to be based on the unreduced rule thickness.

### 4.2 Longitudinal strength

Maximum permissible reduction of midship section modulus: 10 %.

### 4.3 Local strength

#### 4.3.1 Steel

Where applicable, the maximum permissible large-surface reduction $t_k$ of plate thickness and web thickness of profiles is:

- $t_k = 0,5 \text{ mm in general}$
- $t_k = 0,7 \text{ mm for lubrication oil, gas oil or equivalent tanks}$
- $t_k = 1,0 \text{ mm for water ballast tanks}$
- $t_k = \text{ as agreed with GL in case of special applications}$

If $t_k = 0,0 \text{ mm}$, the fabrication tolerances as defined in GL Rules Metallic Materials (II-1), shall not be exceeded. Maximum permissible locally limited reduction of thickness: 0,1 t.

#### 4.3.2 Aluminium alloys

If the measures for corrosion protection described in the GL Rules for Hull Structures and Ship Equipment (III-1-1), Section 3, F. are fully applied, the corrosion reduction $t_k$ can be assumed as 0,0 mm for steel. The requirements for aluminium alloys are defined in Section 3, C.3.2.3. In no case the under-thickness tolerances as defined in C.3.2.2.2 and C.3.2.3.3 shall be exceeded.

### 4.4 Anchor equipment

Maximum permissible reduction of the mean diameter of chain links: 12 %.

Maximum permissible reduction in weight of anchors: 10 %.

### 4.5 High speed craft

#### 4.5.1 Longitudinal strength

Maximum permissible reduction of midship section modulus: 10 %.

#### 4.5.2 Local strength

Where applicable, the maximum permissible large-surface reduction $t_k$ of plate thickness and web thickness of profiles is:

- for $t \leq 10,5 \text{ mm}$: $t_k = 0,5 \text{ mm}$
- for $t > 10,5 \text{ mm}$: $t_k = 0,03 t + 0,2 \text{ mm}$, max. 1,0 mm

Tank bottoms: $t_k = 1,0 \text{ mm}$

Maximum permissible locally limited reduction of thickness: 0,1 t.

If the measures for corrosion prevention described in the GL Rules for High Speed Craft (I-3-1), Section 3, C.3.1.5 are fully applied, the corrosion reduction $t_k$ can be assumed as 0,0 mm for steel. The requirements for aluminium alloys are defined in Section 3, C.3.2.3. In no case the under-thickness tolerances as defined in C.3.2.2.2 and C.3.2.3.3 shall be exceeded.

### E. Damage and Repair Surveys

1. Where damage has occurred to the ship’s hull, machinery including electrical installations or special equipment and installations, the automatic/remote-control systems, etc., the damaged parts are to be made accessible for inspection in such a way that the kind and extent of the damage can be thoroughly examined and ascertained, see also Section 2, D.2.3. In the case of grounding, dry docking or, alternatively, an in-water survey is required.

2. The repair measures are to be agreed with the Surveyor such as to render possible confirmation of the Class without reservations upon completion of the repairs. In general, a Class confirmation with Conditions of Class, e. g. in the case of a preliminary repair ("emergency repair"), requires to be approved by GL Head Office.

3. Surveys conducted in the course of repairs are to be based on the latest experience and instructions by GL. In exceptional cases advice is to be obtained from GL Head Office, in particular where doubts exist as to the cause of damage.

4. For older ships, in the case of repairs and/or replacement of parts subject to Classification, as a matter of principle, the Construction Rules in force during their period of construction continue to be applicable. This does not apply in the case of modifications required to the structure in the light of new knowledge gained from damage analyses, with a view to avoiding recurrence of similar damages.
5. Regarding the materials employed and certificates required, the requirements for new buildings are applicable, see Section 2, D.3.

6. Regarding damages or excessive wastage beyond allowable limits that affect the ship's Class, see Section 2, D.2.4.

F. Refrigerating Installations
For the surveying requirements of refrigerating installations see GL Rules for Classification of Surveys (I-0), Section 3. D.

G. Diving Systems
For surveys diving systems, diving simulators and diver pressure chambers see the GL Rules for Diving Systems and Diving Simulators (I-5-1) and also the GL Rules for Ship Operation Installations and Auxiliary Systems (III-1-4), Section 18.

H. Towing Gear
If Class Notation TOW (see Section 3, C.4.6) shall be assigned, see GL Rules for Ship Operation Installations and Auxiliary Systems (III-1-4), Section 5, D. and GL Rules for Hull Structures (I-1-1), Section 25, C.

| Table 4.2 Class Renewal Surveys (Hull) - Minimum Requirements for Thickness Measurements |
|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| **Class Renewal Survey [No.] and ship’s age [years]** |
| I. age ≤ p | II. p < age ≤ 2p | II. 2p < age ≤ 3p | IV. and subsequent, age > 3p |
| Suspect Areas through the ship |
| One transverse section within 0,5 L amidships | Two transverse sections within 0,5 L amidships | Three transverse sections within 0,5 L amidships |
| All covers and coamings (plating and stiffeners) | All exposed main deck plating within 0,5 L amidships | All exposed main deck plating full length |
| All wind- and water strakes within 0,5 L amidships | All wind- and water strakes full length |
| Internals in forepeak and after peak tanks | Internals in forepeak and after peak tanks |
| Lowest strake and strakes in way of tween decks of selected transverse bulkheads together with internals in way | Lowest strake and strakes in way of tween decks of selected transverse bulkheads together with internals in way |
| Representative exposed superstructure deck plating | |
| All keel plates full length. Also, additional bottom plates in way of cofferdams, machinery space and aft ends of tanks | Plating of sea chests. Shell plating in way of overboard discharges as considered necessary by the Surveyor |

1 For ship seagoing ships with L ≤ 100 m only two sections may be investigated.
Table 4.3  Class Renewal Survey - Minimum Additional Requirements for Close-up Surveys

<table>
<thead>
<tr>
<th>Class Renewal Survey [No.] and ship’s age [years]</th>
<th>I. p age ≤ 2p</th>
<th>II. p &lt; age ≤ 2p</th>
<th>III. 2p &lt; age ≤ 3p</th>
<th>IV. and subsequent, age &gt; 3p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selected shell transverse frames in one forward and one aft compartment and associated tween deck space</td>
<td>Selected shell transverse frames in all compartments and associated tween deck spaces</td>
<td>All shell frames in the forward lower compartment and 25% of frames in each of the remaining compartments, and tween deck spaces including upper and lower end attachments and adjacent shell plating</td>
<td>All shell frames in all compartments and tween deck spaces including upper and lower end attachments and adjacent shell plating</td>
<td></td>
</tr>
<tr>
<td>One transverse bulkhead in one selected compartment including bulkhead plating, stiffeners and girders</td>
<td>One transverse bulkhead in each compartment including bulkhead plating, stiffeners and girders</td>
<td>All compartment transverse bulkheads including bulkhead plating, stiffeners and girders</td>
<td>Other items: As for Class Renewal Survey No. III</td>
<td></td>
</tr>
<tr>
<td>All hatch covers and coamings (plating and stiffeners)</td>
<td>All hatch covers and coamings (plating and stiffeners)</td>
<td>All hatch covers and coamings (plating and stiffeners)</td>
<td>All hatch covers and coamings (plating and stiffeners)</td>
<td></td>
</tr>
<tr>
<td>One transverse web frame or watertight transverse bulkhead with associated plating and framing in two representative water ballast tanks of each type</td>
<td>All transverse web frames or watertight transverse bulkheads with associated plating and framing in each water ballast tank</td>
<td>All areas of inner bottom plating</td>
<td>All areas of inner bottom plating</td>
<td></td>
</tr>
</tbody>
</table>

**Note**

Close-up survey of transverse bulkheads to be carried out at the following levels:

1. Mid-height of the bulkheads for holds without tween decks
2. Immediately below the main deck plating and tween deck plating.
Section 5

Surveys for Submarines

A. General Indications

1. For surveys of submarines see also the GL Rules for Submarines (III-2-1), Section 1.

2. For the general aspects of:
   – surveys for maintenance of Class
   – selection of Surveyors
   – documentation of surveys, confirmation of Class
   – surveys required by the Naval Administration
   – external service suppliers
   – calibration of measuring equipment
   see Section 4, A.

B. Surveys for Maintenance of Class, Definitions, Due Dates

For surveys for maintenance of Class, definitions and due dates, see Section 4, B.

C. Performance and Scope of Periodical Surveys

The individual scope of surveys is based on the design of the submarine and determined during the plan approval phase. In general the following surveys have to be performed:

1. Annual Survey

The Annual Survey of the submarine shall include at least the following tests and checks:

1.1 Inspection of the documents relating to the submarine and scrutiny of the maintenance records.

1.2 A tightness test is to be performed on the pressure hull at an internal underpressure of at least 0,05 bar below atmospheric pressure.

1.3 The pressure hull and external structure including all fixtures, penetrations, doors and covers, seals, locking systems, etc. are to be inspected for visible damage, cracks, deformation, corrosion attacks and fouling.

1.4 All other pressure vessels, heat exchangers and filters, as well as valves, fittings and safety equipment are to be subjected to external inspection.

1.5 The entire machinery installation including the electrical equipment is to be subjected to external inspection.

1.6 The function of the electrical power supply is to be tested.

1.7 Insulation measurements are to be performed on the electrical equipment.

1.8 The accuracy of all important instrument readings is to be checked, e.g. depth gauge, gas analyzer, etc.

1.9 Wherever appropriate, all emergency and safety systems are to undergo a functional test.

1.10 High-pressure hoses (dynamic load characteristics) are to be checked for visible damage and tightness.

1.11 The communication system is to be subjected to a functional test.

1.12 The functional efficiency of the total system, especially the manoeuvring and diving equipment is to be checked by means of a trial dive.

1.13 Functional test of single escape trunk and visual inspection of all life support systems.

2. Intermediate Survey

Extended annual surveys are referred to as intermediate surveys. The intermediate survey falls due at half the nominal time interval between two Class Renewal Surveys (i.e. p/2). If p is an uneven number of years, the survey may be carried out on the occasion of the preceding or following annual survey. If p is an even number of years, the intermediate survey replaces the annual survey.

An Intermediate Survey is an Annual Survey extended as follows unless it coincides with the Class Renewal Survey in accordance with 3.:

2.1 Performance of a tightness test on pressure hull penetrations and closing appliances, e.g. by application of an underpressure inside the submarine.
2.2 Pressure chambers/diver’s lock in / lock out are to undergo a tightness test at maximum operating depth.

2.3 Tightness test or functional test on diving/ballasting, regulating/compensating and trimming systems.

2.4 Verification of the set pressures of safety valves and of safety and alarm systems.

2.5 Functional tests on mechanical and electrical equipment.

2.6 Visual, tightness or functional tests (if possible) on life support systems.

2.7 Functional tests and visual inspection on fire warning of extinguishing systems.

2.8 Functional tests on all alarm systems.

2.9 Functional test and purity check on all breathing gas compressors and all air breathing components.

2.10 After ten years, all compression chambers and all pressure vessels, heat exchangers and filters which cannot be subjected to satisfactory internal inspection are to undergo a hydrostatic pressure test.

3. Class Renewal Survey

A Class Renewal Survey is performed every p years. The following tests and examinations are to be carried out in addition to the inspections called for under 1. and 2.:

3.1 A tightness test is to be performed on the pressure hull at an internal underpressure of at least 0,18 bar below atmospheric pressure.

3.2 Dimensional checks and non-destructive tests (wall thickness, cracks etc.) are to be performed on the pressure hull and lockouts. Where necessary, buoyancy aids, cladding and layers of thermal insulation are to be removed for this purpose.

3.3 Buoyancy tests are to be performed.

3.4 In the case of pressure vessels, heat exchangers and filters which cannot be satisfactorily inspected internally and those whose satisfactory condition cannot be fully verified by internal inspection, another non-destructive test method is to be used.

3.5 Where surveys are performed on a submarine or parts thereof during the period of Class, the scope of which corresponds to a Class Renewal Survey, then the regular Class Renewal Survey for the parts concerned may at the operator's request be deferred accordingly.

4. Damage Survey

4.1 If the submarine or its ancillary systems has suffered damage affecting its Class or if such damage may be assumed, a Damage Survey is to be carried out.

4.2 Following damage, the submarine is to be presented for survey in such a way that a satisfactory inspection can be carried out. The extent of the Damage Survey will be determined by GL in each individual case.

5. Extraordinary Survey

5.1 When any modification is made in respect of design, mode of operation or equipment and after major repairs to the submarine, an Extraordinary Survey is to be carried out.

5.2 Where modifications are made to the submarine which affect its buoyancy or stability, appropriate heeling and trim experiments are to be performed in the presence of the Surveyor.

D. Surveys other than for Classification

1. Survey by special agreement

Where surveys are required by the Naval Administration, international agreements or other provisions, GL will perform them on request, and by official order in accordance with the relevant provisions.

2. Surveys relating to the safety of equipment

2.1 For all components with an important safety aspect (e.g. pressure vessels, heat exchangers and filters, etc.), GL will, on request, examine the drawings, carry out all the necessary surveys, acceptance tests and pressure tests and issue the relevant certificates.

2.2 On request, GL will also perform the subsequent surveys required for pressure vessels, heat exchangers and filters.

E. Certification

On request, GL will issue an appropriate Certificate in respect of submarines or parts thereof which, while not classified by GL, are built under the survey of and in accordance with the Rules of GL or other recognized rules for the construction of submarines.
A. **Scope**

In order to estimate the scope of Classification and Services of naval surface ships, GL needs to be provided with the following general information and data as far as already available in the initial phase of the project.

B. **Basic Design Data for Initial Information**

1. **Functional military demands**

   Relevant information covers:
   - planned type of ship, see Section 3, C.
   - military tasks, such as:
     - general patrol
     - anti air warfare
     - anti submarine warfare
     - flight operations
     - military transport
     - landing operations
     - mine warfare, etc.

2. **Detailed military demands**

   The detailed military demands include:
   - military loads caused by the weapons and sensors, etc. of the naval ship and influencing the hull girder strength
   - extent/location of storage rooms for explosives
   - military loads for transport tasks, if any
   - acoustic and electromagnetic demands
   - equipment and materials causing radiation hazards
   - shock strength demands
   - special demand to withstand local impacts
   - residual strength demands
   - damage control zones
   - fire resisting divisions
   - extent of NBC (nuclear-biological-chemical) citadel, if requested
   - scope of redundancies for main propulsion and auxiliaries
   - replenishment at sea
   - planned duty conditions, like action stations, combat readiness, cruise, etc.

3. **Basic surface ship parameters**

   The basic parameters are:
   - main design parameters
   - area of operation
   - operational profile
   - ambient conditions
   - intact and damage stability requirements
   - materials for construction including special properties, corrosion protection measures, etc.
   - expected lifetime [years]

4. **Regulations**

   Additional international and national regulations, as well as regulations of the Naval Administration to be applied.

5. **Building specification**

   Preliminary building specification or technical part of a building contract, if already available.

6. **Strength calculations**

   Intended direct strength calculations of the hull structures, as well as extent and type of software to be used, are to be stated.

   On request, GL may perform selected direct strength calculations.

7. **Updates and changes**

   Updates and changes of all relevant design assumptions shall be forwarded to GL.

C. **Main Ship Parameters**

1. **General**

   For the definition of parameters only SI units (metric system) should be used.
2. Principal dimensions

2.1 Length L

The length \( L \) of the ship is the length from the moulded side of the plate stem to the fore side of the stern or transom measured on the waterline at draught \( T \). Other forms of stem are to be specially considered.

2.2 Length \( L_{OA} \)

The length over all \( L_{OA} \) is the distance between the most forward and most aft element of the ship, permanent outfit included, measured parallel to the design waterline.

2.3 Breadth B

The breadth \( B \) is the maximum moulded breadth at the design waterline.

2.4 Breadth \( B_{MAX} \)

The breadth \( B_{MAX} \) is the greatest moulded breadth of the ship. For ships with unusual cross section the breadth will be specially considered.

2.5 Depth H

The depth \( H \) is the vertical distance, at the middle of the length \( L \), from the moulded base line to top of the deck beam at side on the uppermost continuous deck.

2.6 Draught T

The draught \( T \) is the vertical distance, at the middle of the length \( L \), from base line to deepest design waterline, as estimated for the lifetime of the ship.

2.7 Draught \( T_{MAX} \)

The draught \( T_{MAX} \) is the vertical distance between the lowest point of the immersed hull including appendages (e.g. domes, rudders, propellers, thrusters, etc.) and the design waterline, movable parts considered retracted.

3. Ship speed

3.1 Rated speed \( v_0 \)

Expected maximum, continuous ahead speed \([kn]\) of the ship in calm water at the draught \( T \) when the total available rated driving power is exclusively used for propulsion purposes.

3.2 Maximum speed \( v_{max} \)

Expected maximum ahead speed \([kn]\) of the ship in calm water at the draught \( T \), when the total available maximum driving power is exclusively used for propulsion purposes. This speed is related to an overload condition, permissible only for a defined and relatively short time period.

3.3 Cruising speed \( v_M \)

Expected economic, continuous ahead cruising speed \([kn]\) of the ship, in calm water at the draught \( T \), which provides the maximum radius of action.

4. Rated driving power

The rated driving power \([kW]\) is defined as continuous power to be delivered by the propulsion machinery when running at rated speed.

5. Auxiliary electrical power

The auxiliary electrical power \([kVA]\) is defined as the continuous electrical power which is not directly used for propulsion of the ship at continuous speed \( v_0 \), but for driving all kinds of auxiliary devices and equipment. The degree of redundancy shall be defined in the building specification.

D. Production Standard

A production standard which considers the special requirements for the manufacturing of naval ships has to be defined by the Shipyard and accepted by GL.

E. Documents to be Submitted for Approval

1. Before the start of manufacture, plans of the total system and drawings of all components subject to compulsory inspection, wherever applicable and to the extent specified in Table 6.1 are to be submitted to GL for approval. To facilitate a smooth and efficient approval process they should be submitted electronically via GLOBE 1. In specific cases and following prior agreement with GL they can also be submitted in paper form in triplicate.

2. All documents have to be submitted to GL in German or English language.

3. The drawings shall contain all the data necessary to check the design and loading of the equipment. Wherever necessary, calculations relating to components and descriptions of the system are to be submitted.

4. Calculations shall contain all necessary information concerning reference documents (parts of the specification, relevant drawings, etc.). Literature used for the calculations has to be cited, important but not commonly known sources shall be added in copy. The choice of computer programs according to "State of the Art" is free. The programs may be checked by

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1 Detailed information about GLOBE submission can be found on GL’s website www.gl-group.com/globe.
through comparative calculations with predefined test examples. A generally valid approval for a computer program is, however, not given by GL.

The calculations have to be compiled in a way which allows identifying and checking all steps of the calculations in an easy way. Hand-written, easily readable documents are acceptable.

Comprehensive quantities of output data shall be presented in graphic form. A written comment to the main conclusions resulting from the calculations has to be provided.

5. GL reserves the right to request additional documentation if the submitted one is insufficient for an assessment.

6. Once the documents submitted have been approved by GL, they become binding on the manufacturer. Any subsequent modifications require GL’s consent before they are implemented.

Table 6.1 Documentation to be submitted for Classification of naval surface ships

<table>
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<th>Description</th>
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<td>- arrangement of watertight doors</td>
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<td>- arrangements and details of hatches</td>
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<td>- arrangement and details of air pipes and ventilators</td>
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<td></td>
<td>- arrangement and details of side shell penetration by scuppers and discharges</td>
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<td>- details of spurling pipes and chain lockers</td>
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<td>- arrangement and details of side scuttles, windows and skylights</td>
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<td></td>
<td>- arrangement and details of deck drainage</td>
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<td>4.12</td>
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<td>5.2</td>
<td>Detailed drawings of the complete engine, including cross/longitudinal sections</td>
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<td>5.3</td>
<td>Documentation on provisions or additional equipment for low load operation of the engines, if applicable</td>
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<td>6.4</td>
<td>Documentation on the starting system</td>
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<td>6.6</td>
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<td>Spare parts list</td>
</tr>
<tr>
<td>16.3</td>
<td>Trial programs (FAT, HAT, SAT)</td>
</tr>
<tr>
<td><strong>Auxiliary Systems and Equipment</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Pressure vessels</strong></td>
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<tr>
<td>17.1</td>
<td>List of pressure vessels and equipment</td>
</tr>
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<td><strong>Auxiliary steam boilers</strong></td>
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<td>18.1</td>
<td>Design drawings for all pressurized parts of the steam boiler</td>
</tr>
<tr>
<td>18.2</td>
<td>Documentation on strength calculations</td>
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<tr>
<td>18.3</td>
<td>Documentation on types and location of the fittings of the boiler</td>
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<tr>
<td>18.4</td>
<td>Description of the installation of the boiler plant in the naval ship</td>
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<tr>
<td>18.5</td>
<td>Cross sections of every burner type to be used</td>
</tr>
<tr>
<td><strong>Tanks and piping</strong></td>
<td></td>
</tr>
<tr>
<td>19.1</td>
<td>Details on fuel and oil tanks</td>
</tr>
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<td>19.2</td>
<td>Diagrammatic plants of all piping systems</td>
</tr>
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<td>19.3</td>
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<td>Supply and transfer for replenishment at sea system, if applicable</td>
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<td>19.5</td>
<td>Manipulation systems for liquids</td>
</tr>
<tr>
<td>Serial No.</td>
<td>Description</td>
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</tr>
<tr>
<td><strong>Auxiliary Systems and Equipment</strong></td>
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<td><strong>Tanks and piping</strong></td>
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<td>19.6</td>
<td>Aircraft refuelling system, if applicable</td>
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<tr>
<td><strong>Fire-extinguishing system</strong></td>
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<td>20.1</td>
<td>General water fire-extinguishing equipment</td>
</tr>
<tr>
<td>20.2</td>
<td>CO₂ fire-extinguishing system or systems using other gases</td>
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<td>20.3</td>
<td>Portable and mobile fire-extinguishers</td>
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<td>20.4</td>
<td>Foam extinguishing systems</td>
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<td>20.5</td>
<td>Pressure water spraying systems</td>
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<tr>
<td>20.6</td>
<td>Fire-extinguishing systems for special rooms, like paint lockers, flight decks and hangars, etc.</td>
</tr>
<tr>
<td>20.7</td>
<td>Systems for carriage of dangerous goods in packaged form</td>
</tr>
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<td>20.8</td>
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<td>20.11</td>
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<td><strong>Equipment</strong></td>
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<td>21.2</td>
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<td>21.3</td>
<td>Anchor windlasses</td>
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<tr>
<td>21.4</td>
<td>Fire door control system</td>
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<tr>
<td>21.5</td>
<td>Replenishment at sea system</td>
</tr>
<tr>
<td>21.6</td>
<td>Manipulation systems, lifts, etc.</td>
</tr>
<tr>
<td>21.7</td>
<td>Aircraft handling system</td>
</tr>
<tr>
<td>21.8</td>
<td>Hydraulic systems for special devices, if safety-relevant</td>
</tr>
<tr>
<td><strong>Other documents</strong></td>
<td></td>
</tr>
<tr>
<td>22.1</td>
<td>Operation and maintenance manuals, if required</td>
</tr>
<tr>
<td>22.2</td>
<td>Spare parts list</td>
</tr>
<tr>
<td>22.3</td>
<td>Trails programs (FAT, HAT, SAT)</td>
</tr>
</tbody>
</table>
Section 7

General Information and Project Data for Submarines

A. Scope

1. Manned submarines

In order to estimate the scope of Classification and Services, GL need to be provided with the following general information and data as far as already available in the initial phase of the project. See also GL Rules for Submarines (III-2-1), Section 2.

2. Unmanned submersibles

If unmanned submersibles shall be used for military demands the GL Rules for Unmanned Submersibles (ROV, AUV) and Underwater Working Machines (I-5-3) shall be applied.

B. Basic Design Data for Initial Information

1. Functional military demands

Relevant information covers:
- planned type of submarine
- military tasks, such as:
  - general patrol
  - reconnaissance missions
  - control of sea traffic in a defined zone of the sea
  - warfare against other submarines
  - warfare against surface ships
  - warfare against targets on land
  - mine laying
  - transport of special forces

2. Detailed military demands

The detailed military demands include:
- military loads caused by weapons and sensors influencing hull strength
- extent/location of weapons and storage spaces for weapons
- military loads for transport tasks, if critical for stability
- location and size of diver’s lockout, if required
- acoustic and electromagnetic demands
- equipment and materials causing radiation hazards
- shock strength demands
- special demand to withstand local impacts
- damage control zones
- fire resisting divisions
- planned duty conditions, like action stations, combat readiness, cruise, etc.

3. Basic submarine parameters

The basic parameters are:
- main design parameters
- area of operation
- ambient conditions
- buoyancy, intact and damage stability requirements
- materials for construction including special properties, corrosion protection measures, etc.
- expected lifetime [years]

4. Regulations

Additional international and national regulations, as well as regulations of the Naval Administration to be applied.

5. Building specification

Preliminary building specification or technical part of a building contract, if already available.

6. Strength calculations

Intended direct strength calculations of the structure of the pressure hull, as well as extent and type of software to be used, are to be stated.

On request, GL will perform selected direct strength calculations.

7. Updates and changes

Updates and changes of all relevant design assumptions shall be forwarded to GL.
C. Main Submarine Parameters

1. General

For the definition of parameters only SI units (metric system) should be used.

2. Principal dimensions

2.1 Length between perpendiculars L<sub>PP</sub>

The length L<sub>PP</sub> is the distance between the aft and forward perpendicular [m].

2.2 Length L<sub>OA</sub>

The length over all L<sub>OA</sub> is the distance between the most forward and most aft element of the submarine, permanent outfit included, measured parallel to the design waterline [m].

2.3 Radius of main cylindrical shell R<sub>m</sub>

The radius R<sub>m</sub> is the mean radius of the main cylindrical shell of the pressure hull [m].

2.4 Breadth B<sub>MAX</sub>

The breadth B<sub>MAX</sub> is the greatest breadth of the submarine. For submarines with unusual cross section the breadth will be specially considered [m].

2.5 Total height H

The total height H is the total vertical height from the baseline to the upper edge of the submarine including all permanently installed parts of the equipment [m].

2.6 Draught T

The draught T in surfaced position is the maximum vertical distance between the baseline and the water surface [m].

2.7 Displacement

The displacement of the surfaced submarine ready for surfaced operation is Δ↑, the displacement of the completely dived submarine is Δ↓.

2.8 Nominal diving depth NDD

The nominal diving depth NDD is the maximum depth to which the submarine is designed to dive an unlimited number of times.

2.9 Collapse diving depth CDD

The collapse diving depth CDD is the diving depth decisive for design of the pressure hull, where a collapse of the pressure hull is to be expected [m].

3. Speed

3.1 Speed v<sub>0↑</sub>,

The speed v<sub>0↑</sub> is the maximum operational speed of the surfaced submarine [kn] at a number of revolutions of the propeller according to the maximum continuous propulsion power surfaced.

3.2 Speed v<sub>0↓</sub>

The speed v<sub>0↓</sub> is the maximum operational speed of the dived submarine [kn] at a number of revolutions of the propeller according to the maximum continuous propulsion power dived.

4. Rated power

The rated power [kW] is defined as continuous power to be delivered by the propulsion machinery when running at rated speed and the auxiliary power for driving all kinds of auxiliary machinery and systems.

D. Production Standard

A production standard which considers the special requirements for the manufacturing of naval submarines has to be defined by the Shipyard and accepted by GL.

E. Documents to be submitted for Approval

1. Before the start of manufacture, plans of the total system and drawings of all components subject to compulsory inspection, wherever applicable and to the extent specified in Table 7.1 are to be submitted to GL for approval. To facilitate a smooth and efficient approval process they should be submitted electronically via GLOBE 1. In specific cases and following prior agreement with GL they can also be submitted in paper form in triplicate.

2. All documents have to be submitted to GL in German or English language

3. The drawings shall contain all the data necessary to check the design and loading of the equipment. Wherever necessary, calculations relating to components and descriptions of the system are to be submitted.

4. Calculations shall contain all necessary information concerning reference documents (parts of the specification, relevant drawings, etc.).

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1 Detailed information about GLOBE submission can be found on GL’s website www.gl-group.com/globe.
used for the calculations has to be cited, important but not commonly known sources shall be added in copy.

The choice of computer programs according to "State of the Art" is free. The programs may be checked by GL through comparative calculations with predefined test examples. A generally valid approval for a computer program is, however, not given by GL.

The calculations have to be compiled in a way which allows identifying and checking all steps of the calculations in an easy way. Hand-written, easily readable documents are acceptable.

Comprehensive quantities of output data shall be presented in graphic form. A written comment to the main conclusions resulting from the calculations has to be provided.

GL reserves the right to request additional documentation if the submitted one is insufficient for an assessment.

Once the documents submitted have been approved by GL, they become binding on the manufacturer. Any subsequent modifications require GL's consent before they are implemented.

Table 7.1 Documentation to be submitted for Classification of submarines

<table>
<thead>
<tr>
<th>Serial No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>Equipment and specification for materials, manufacture, welding and testing</td>
</tr>
<tr>
<td>Total system</td>
<td></td>
</tr>
<tr>
<td>2.1</td>
<td>A description of the submarine with details of its mode of operation, the proposed application and essential design data including:</td>
</tr>
<tr>
<td></td>
<td>– maximum diving depth</td>
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<tr>
<td></td>
<td>– maximum operation time and maximum survival time</td>
</tr>
<tr>
<td></td>
<td>– maximum number of persons in pressure hull</td>
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<tr>
<td></td>
<td>– diver’s compression chamber</td>
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<tr>
<td></td>
<td>– diver lock out/in</td>
</tr>
<tr>
<td></td>
<td>– diving procedure</td>
</tr>
<tr>
<td></td>
<td>– speed (surfaced and submerged)</td>
</tr>
<tr>
<td></td>
<td>– type of propulsion and manoeuvring equipment</td>
</tr>
<tr>
<td></td>
<td>– weight of submarine, deadweight and ballast, displacement (submerged)</td>
</tr>
<tr>
<td></td>
<td>– further requirements defined by the Naval Administration</td>
</tr>
<tr>
<td>2.2</td>
<td>General arrangement plan and drawings showing design details of the submarine.</td>
</tr>
<tr>
<td>2.3</td>
<td>A comprehensive presentation of the intended corrosion protection measures.</td>
</tr>
<tr>
<td>2.4</td>
<td>Trial program</td>
</tr>
<tr>
<td>Pressure hull</td>
<td></td>
</tr>
<tr>
<td>3.1</td>
<td>Drawings and calculations for the pressure hull are to be submitted with all essential particulars and details necessary for appraising the safety. The drawings are to show all the internal and external fixtures of the pressure hull (e.g. strengthening ribs, machine bedplates, mountings, etc.), welding details, etc.</td>
</tr>
<tr>
<td>3.2</td>
<td>In addition, component drawings of the pressure hull equipment are to be submitted including:</td>
</tr>
<tr>
<td></td>
<td>– entry and exit hatches</td>
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<tr>
<td></td>
<td>– door panels and door frames</td>
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<tr>
<td></td>
<td>– block flanges</td>
</tr>
<tr>
<td></td>
<td>– pressure hull penetrations and their arrangement</td>
</tr>
<tr>
<td></td>
<td>– pressure bulkheads</td>
</tr>
<tr>
<td></td>
<td>– lockouts</td>
</tr>
<tr>
<td>3.3</td>
<td>Drawings and descriptions of the space allocation and internal arrangements are to be submitted.</td>
</tr>
<tr>
<td>Exostructure</td>
<td></td>
</tr>
<tr>
<td>4.1</td>
<td>Plans and sectional drawings of the submarine's envelope and supporting structure are to be submitted including details of such pressure hull fixtures as diving/ ballasting tanks, stabilizing fins, rudders, streamlining elements, extension devices, snorkels, anchors, etc.</td>
</tr>
<tr>
<td>Serial No.</td>
<td>Description</td>
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<tr>
<td>------------</td>
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</tr>
<tr>
<td><strong>Diving/ballasting, regulating/compensating and trimming tanks</strong></td>
<td></td>
</tr>
<tr>
<td>5.1</td>
<td>Arrangement details of diving/ballasting, regulating/compensating and trimming tanks with calculated proof of the vessel's static diving capability and stability when submerged and on the surface, including the intermediate conditions occurring when the submarine is diving or surfacing both normally and under emergency conditions.</td>
</tr>
<tr>
<td><strong>Pressure vessels, heat exchangers and filters</strong></td>
<td></td>
</tr>
<tr>
<td>6.1</td>
<td>Drawings of the pressure vessels, heat exchangers and filters are to be submitted with all essential particulars and details necessary for appraising the safety of the equipment and including the specifications for materials, manufacture, welding and testing.</td>
</tr>
<tr>
<td><strong>Piping systems, pumps and compressors</strong></td>
<td></td>
</tr>
<tr>
<td>7.1</td>
<td>Schematic diagrams of all piping systems including details of: materials, maximum allowable working pressure/temperature, dimensions (diameter, wall thickness), media carried, type of valves and connections used, type of hoses used.</td>
</tr>
<tr>
<td>7.2</td>
<td>Description of pumps, compressors and their drives together with all important design and operating data.</td>
</tr>
<tr>
<td><strong>Control systems for depth, positive and negative buoyancy and trim</strong></td>
<td></td>
</tr>
<tr>
<td>8.1</td>
<td>Description of the control systems for depth, positive and negative buoyancy and trim, including the necessary piping diagrams and component drawings. This includes drawings of: compressed air system for blowing diving/ballasting tanks, freeing systems, regulating/compensating and trimming system.</td>
</tr>
<tr>
<td><strong>Propulsion and manoeuvring equipment</strong></td>
<td></td>
</tr>
<tr>
<td>9.1</td>
<td>Drawings and descriptions are to be submitted of the propulsion and manoeuvring equipment including engines, gears, couplings, shafting, propellers and rudders with details of: method of power generation, mode of operation and control of the systems, power consumption (type and quantity), method of power transmission to propulsion unit, seals of pressure hull penetrations, operating range and response time of rudder.</td>
</tr>
<tr>
<td><strong>Electrical equipment</strong></td>
<td></td>
</tr>
<tr>
<td>10.1</td>
<td>A general arrangement drawing of the electrical equipment containing at least the following information: voltage rating of the systems, power or current ratings of electrical consumers, switchgear, indicating settings for short-circuit and overload protection; fuses with details of current ratings, cable types and cross-sections.</td>
</tr>
<tr>
<td>10.2</td>
<td>Power balance of the main and emergency/redundant power supply systems.</td>
</tr>
<tr>
<td>10.3</td>
<td>Drawings of switchgear and distribution equipment with parts lists.</td>
</tr>
<tr>
<td>10.4</td>
<td>Complete documentation for electric motor drives with details of control and monitoring systems.</td>
</tr>
<tr>
<td>10.5</td>
<td>Battery installation drawing with details of battery types, chargers and battery room ventilation.</td>
</tr>
<tr>
<td>10.6</td>
<td>Details of electrical penetrations pressure hull, bulkheads, watertight or airtight bulkheads.</td>
</tr>
<tr>
<td>10.7</td>
<td>Diagrams showing allocation of pressure hull penetrations.</td>
</tr>
<tr>
<td>10.8</td>
<td>Diagrams showing arrangement of emergency light fittings.</td>
</tr>
</tbody>
</table>
Table 7.1 Documentation to be submitted for Classification of submarines (continued)

<table>
<thead>
<tr>
<th>Serial No.</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>10.9</td>
<td>Calculation of short-circuit conditions with details of circuit-breakers, power protection switches and fuses.</td>
</tr>
<tr>
<td>10.10</td>
<td>Hazardous area lay out</td>
</tr>
<tr>
<td>10.11</td>
<td>A list of electrical components installed in hazardous area including the type of explosion protection of these components. The ex certificates have to be added.</td>
</tr>
</tbody>
</table>

**Control and monitoring, communications, navigation and locating systems**

| 11.1 | Description of the complete instrumentation layout. |
| 11.2 | Description of the control and operating elements for the submarine and its equipment |
| 11.3 | Description of the navigational and diving instrumentation, including speed and position indicators. |
| 11.4 | A description of the safety and alarm systems |
| 11.5 | Arrangement drawings/block diagrams of monitoring systems including lists of measuring points. |
| 11.6 | Documentation for electronic components such as instrument amplifiers, computers and peripheral units. |
| 11.7 | General diagrams and equipment lists for the communication systems and signalling equipment |
| 11.8 | General diagram and description of the surveillance/camera system, if applicable. |
| 11.9 | Descriptions, general diagrams and equipment lists for the locating equipment |

**Life support systems**

| 12.1 | Piping diagrams, block diagrams and descriptions of the systems and equipment used for breathing gas supply, circulation, purification and conditioning of the atmosphere in the pressure hull, including the monitoring equipment, for both under normal and emergency conditions including all calculation of air supply rate, CO₂ absorption, etc. |
| 12.2 | Calculated proof of the adequate capacity of the breathing gas supply and air renewal systems under normal and emergency conditions. |
| 12.3 | Description of the facilities for supplying water, food and medicines and for the removal of waste |

**Fire protection and fire-extinguishing equipment**

| 13.1 | Description of preventive fire precautions |
| 13.2 | Fire protection plans |
| 13.3 | Details of the nature and quantity of combustible materials in the submarine |
| 13.4 | Drawings and descriptions of: |
| | - fire detectors |
| | - fire alarms |
| | - fire extinguishers |
| | - fire extinguishing system |
| 13.5 | Analysis of the potential dangers in the event of fire |

**Rescue system**

| 14.1 | Drawings and descriptions of the systems and equipment used for recovering the submarine and rescuing the crew are to be submitted. |
| 14.2 | The safety plan indicating where damage control equipment is stored and exit route is to be submitted. The frequency of checking and certifying the equipment must be submitted with the plan. |

**Mating system**

| 15.1 | Description of system with details of operating parameters |
| 15.2 | Design drawings of mechanical, electrical, hydraulic and pneumatic operating equipment. |
Section 8

Introduction to the Naval Ship Code (NSC)

A. The Naval Ship Code

1. Publishing organisation

The Naval Ship Code (NSC) is a non-classified Code of the North Atlantic Treaty Organisation (NATO) / NSA published as ANEP 77 (Edition 2)

2. Application

The NSC can be applied for ships of NATO navies, but also for any naval ship of other nations, if the relevant Naval Administration requires its application.

3. Scope

The scope of NSC includes the following Chapters:
- Introduction
- Chapter I: General Provisions
- Chapter II: Structure
- Chapter III: Buoyancy and Stability
- Chapter IV: Engineering Systems
- Chapter VI: Fire Safety
- Chapter VII: Escape, Evacuation and Rescue
- Chapter VIII: Radio communications (not Class relevant for GL)
- Chapter IX: Navigation and Seamanship not Class relevant for GL
- Chapter X: Dangerous Goods

4. Impact of the NSC on the Naval Rules of Germanischer Lloyd

4.1 For the application of the NSC Germanischer Lloyd (GL) would have the role as Recognized Organization, which is authorized by the relevant Naval Administration and confirms verification of compliance and issues Certificates.

4.2 For the classification of a naval ship or boat in the frame work of the Classification and Construction Rules of GL the full or partly use of the NSC can be established by assigning the Class Notation NSC (Chapter). This Notation makes clear that performance requirements of the defined Chapter(s) of NSC are fulfilled.

4.3 The text of the NSC Code is not directly included in the main text of the GL Rules for Naval Ship Technology because a direct integration of NSC structure and wording would have required a massive change in GL’s existing and proven rule structure.

4.4 To offer the ability to check the performance requirements of NSC against the GL Rules, the relevant performance requirements of NSC are summarized at the last Section of each Chapter of the GL Rules. Alternatively there is stated for each NSC performance requirement:

- reference to the exact position in the GL Rules, where this subject is treated
- definition of detailed measures to fulfil the NSC performance requirement in the view of GL

If the GL Class Notation NSC (Chapter) is assigned, the performance requirements of NSC can be included in the GL Classification procedure.

B. Philosophy of NSC

(Introduction, 5.)

1. The Naval Ship Code adopts a goal based approach. The basic principle of a goal based approach is that the goals should represent the top tiers of the framework, against which ship is verified both at design and construction stages, and during ship operation. This approach has several advantages over more traditional prescriptive standards:

a. The Naval Ship Code can become prescriptive if appropriate for the subject, or alternatively, remain at a high level with reference to other standards and their assurance processes.

b. The goal based approach permits innovation by allowing alternative arrangements to be justified as complying with the higher level requirements.

c. Non-compliances can be managed in a more controlled manner by referring to the higher level intent.

2. For the development of the Naval Ship Code, a hierarchy of tiers has been adopted as shown in Figure 8.1. The increasing width of the triangle as the Naval Ship Code descends through the tiers implies an increasing level of detail.
The following example, based on escape, evacuation and rescue, illustrates how the methodology is used:

a. Tier 0 Aim. The overall Aim, Philosophies and Principles of the Naval Ship Code (covered in Regulation 0 of Chapter I).

b. Tier 1 Goal. For each subject covered by a chapter in the Naval Ship Code, such as escape, evacuation and rescue, a goal is established. This is recorded in each Chapter as Regulation 0. For example, the Goal for Escape, Evacuation and Rescue may include the statement:

“The arrangements for the escape, evacuation and rescue of embarked persons shall be designed, constructed and maintained to...provide a safe means of evacuation from the ship”.

c. Tier 2 Functional Areas. Once the goal has been set, Functional Areas are defined that provide a structure to the chapter so that relevant requirements and acceptance criteria can be captured. Typically, each Functional Area is covered by a Regulation in the chapter; one Functional Area might be “Stretchers”. Functional Objectives can then be defined as a lower level goal for each Functional Area such as:

“Stretchers shall enable embarked persons to transport incapacitated persons during the escape and evacuation process”.

d. Tier 3 Performance Requirements. The performance requirements are relevant to the Functional Areas which are to be complied with and are to be verified during design, construction and operation, to meet the aforementioned aim, philosophies and goals. The performance requirements are independent of the technical or operational solution and have a qualitative character. This will allow for future alternative technical or operational solutions, which were not available at the time of development of the Naval Ship Code text. A performance requirement for stretchers may be:

“Stretchers shall...enable crew members to transport any embarked person throughout the vessel, without that person’s assistance”

e. Tier 4 Verification Methods. The method for confirming that the arrangements on the ship are compliant with the requirement is to be defined in one of three ways; (1) a prescriptive requirement, (2) a performance based solution or (3) through delegation to a Recognised Organisation for confirmation that the requirement has been met. For stretchers, the verification methods are likely to be prescriptive in nature as the subject is well understood (eliminating the need for a option (2)) and is not well covered by the standards of a typical Recognised Organisation (eliminating option (3)). A verification method for a stretcher could include:

“The chosen stretchers shall allow the casualty to be lifted vertically with the stretcher either vertical or horizontal”

f. Tier 5 Justification. Finally, statements justifying how the Performance Requirements and associated Verification Methods meet the Principles, Aim and Philosophies of the Naval Ship Code and the Goal for the subject. As opposed to other tiers, Tier 5 is developed for future management of the Naval Ship Code. Key issues are captured in the Guide to the Naval Ship Code.

4. For some Chapters it may considered sufficient to establishing requirements for the upper tiers only. In such cases establishing Tier 4 and 5 will be the responsibility of Recognised Organisations such as a Classification Society; with the Naval Administration retaining responsibility for
accepting the lower Tiers support the higher level Tiers.

C. Principles of NSC (Chapter I, Regulation 1a)

1. The purpose of this Code is to provide a regulatory safety framework for naval surface ships that recognises their operational usage and the needs of Navies. The philosophy behind this Code is based on the management of risk which is addressed through:

   1.1 the definition of the Concept of Operations that describes the role, ship attributes, required survivability, the environment, and the operating and maintenance philosophies;

   1.2 the selection of verification methods appropriate to the Concept of Operations and the safety goal outlined at Regulation 0 Goal above;

   1.3 the assessment of the ship against the verification methods by which achievement of the safety goal can be judged;

   1.4 the issue of certificate(s) by the Naval Administration (or its Recognised Organisation) to provide a visible demonstration of safety management and compliance with the safety goal; and

   1.5 periodic survey to ensure that the identified verification methods are being met and compliance with the safety goal is maintained.

2. This Code shall be applied as a comprehensive set of requirements. It contains requirements for design and construction and maintenance of naval ships, and sets levels of safety which are equivalent to those of merchant ships.

3. The regulatory function implied in this Code requires as a minimum that the ship offers:

   3.1 an equivalent level of safety to that were it regulated under international conventions or regulations applicable to merchant shipping;

   3.2 an additional level of safety for normally occurring hazards that reflect the foreseeable operations on which a naval ship is or may be engaged;

   3.3 an appropriate level of safety under extreme threat conditions as determined by the Naval Administration.

4. This Code expects the majority of persons normally embarked on naval ships to be able-bodied with a fair knowledge of the layout of the ship and have received some training in safety procedures and the handling of the ship’s safety equipment.

5. In addition to the requirements contained elsewhere in this Code, naval ships shall be designed, constructed and maintained in compliance with the structural, mechanical and electrical requirements of a Classification Society which is recognised by the Naval Administration in accordance with the provisions of Regulation 6 Inspection and Survey, or with applicable national standards of the Naval Administration which provide an equivalent level of safety.

D. Application

1. Involved parties (Introduction, 6.1)

Application of NSC involves originally three parties:

a. The Owner is responsible for ensuring that design, material and equipment selection, construction and in-service operation and maintenance are carried out and demonstrating that this is undertaken correctly in accordance with standards agreed with the Naval Administration in the Concept of Operations Statement. Where verification of compliance and the issue of certification are not to be provided by the Naval Administration, the Owner is, with the agreement of the Naval Administration, to task a Recognised Organisation to do this;

b. The Naval Administration is responsible for putting in place arrangements for safety assurance and ensuring that standards are available that are suitable for naval ships. The Naval Administration is also responsible for ensuring the Owner has access to either the Naval Administration or a suitable and authorised Recognised Organisation who will confirm verification of compliance and issue certification against the ship role, operating and

c. The Recognised Organisation (typically a Classification Society like Germanischer Lloyd) authorised by the Naval Administration who will, when tasked by the Owner, confirm verification of compliance and issue certification. The Recognised Organisation may also be called upon by the Naval Administration to assist in the development of safety assurance arrangements that supplement the Recognised Organisation’s own standards.

For classification of naval ships within the framework of GL Rules for Naval Ship Technology (III) it is assumed, that the Naval Administration or the building shipyard are the contractual partners of GL.
2. **Applied ship types**  
(Chapter I, Regulation 2, 1.38)

*Ship Types* (where the plain character indicates construction and arrangements generally consistent with IMO SOLAS and the additional 
(H) indicates ships/craft generally consistent with the IMO Code of Safety for High Speed Craft) are:

2.1 **Ship Type A** includes ships not restricted in the number of non-crew members, which are designed for world wide operation and are generally above 140 metres in length or with a displacement greater than 10,000 tonnes. Where less than 50 non-crew members are to be carried, the ship may be considered as a Type B.

**Note:** Typically, these ships are used for the deployment of aircraft or equipment and ships that may be used as centres of command or for supply duties including aircraft carriers, helicopter and amphibious support ships, assault and auxiliary supply ships.

2.2 **Ship Type B or B(H)** includes ships not capable of carrying more than 200 non-crew members, which are designed for world wide operation and are generally of length 70 metres to 140 metres with displacements of 1,300 tonnes to 20,000 tonnes. If more than 200 non-crew members are to be carried, the ship will be within the scope of Type A.

**Note:** Typically, Type B ships may be part of a task force or act as independent units and have a variety of sole or multiple roles such as air defence, anti submarine, sea defence and shore support. They may include frigates, cruisers, destroyers, corvettes and auxiliary supply ships.

2.3 **Ship Type C or C(H)** includes ships not capable of carrying more than 50 non-crew members, which have an unrestricted area of operation and are generally below 1500 tonnes displacement. If more than 50 non-crew members are to be carried, the ship will be within the scope of Type B.

**Note:** Typically, Type C ships have a military role but are not covered by Type A, B or D descriptions. They may operate independently or as part of a task force for specific roles including mine sweeping, fast attack and patrol duties.

2.4 **Ship Type D or D(H)** includes vessels not capable of carrying more than 50 non-crew members, which have a restricted service area and are generally below 1500 tonnes displacement.

**Note:** Typically, these vessels/craft have a military role but are not covered by Type A, B or C descriptions. Their role may be mine sweeping, beach landings, coastal defence, fast attack or patrol duties.

The ship types of NSC defined above are not directly used in GL Rules for Naval Ship Technology (III-1), but similar ship types and sizes are defined, where necessary, in a form usually in use with GL, compare Section 3, C., Table 3.9.

3. **Not applied ships**  
(Chapter I, Regulation 3 and Introduction, 2)

Naval Ship Code, unless expressly provided otherwise, does not apply to:

3.1 **Ships not exempt from SOLAS by the Flag State Administration**

3.2 **Ships not operated by or on behalf of the navy, coastguard or other government protection and security department or agency or State.**

3.3 **Ships which are operated for both commercial and naval purposes while engaged for commercial purposes.**

3.4 **Ships where the Naval Administration has accepted an alternative regulatory regime as offering an equivalent level of safety.**

3.5 **Ships that are nuclear powered.**

E. **Concept of Operations Statement**

1. **General**

The Concept of Operations (ConOps) according to NSC describes the role, ship attributes, required survivability, the environment and the operating and maintenance philosophies.

2. **Detailed information and project data**

If a Class Notation NSC (Chapter) shall be assigned by GL according to the request of the Naval Administration and/or shipyard a Concept of Operations Statement (ConOps) according to Annex A to this Section has to be submitted to GL, if the information is not already given according to the requirements of Section 6.

F. **Detailed Information**

Detailed information in complete and binding form has to be gained directly from the original wording of the Project data: Naval Ship Code, see www.nato.int/docu/stanag/anep77/ANEP-77.pdf.
# CHAPTER I ANNEX A  CONCEPT OF OPERATIONS STATEMENT

<table>
<thead>
<tr>
<th>Particulars Of The Ship</th>
<th>Concept Of Operations Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ship Name</td>
<td>(pennant number and name)</td>
</tr>
<tr>
<td>Class</td>
<td>(name)</td>
</tr>
<tr>
<td>Date last updated</td>
<td>(date)</td>
</tr>
</tbody>
</table>

The Owner

defines the ship details, role and extreme threat survivability and agrees the Ship Type, foreseeable damage survivability, maintenance philosophy, principal standards and environmental conditions.

Signed

Name

Position

Address

Date of Signature

The Naval Administration

agrees the ship details, role and extreme threat survivability and defines the Ship Type, foreseeable damage survivability, maintenance philosophy, principal standards and environmental conditions.

Signed

Name

Position

Address

Date of Signature

Official Seal

Original
### Primary and secondary roles

<table>
<thead>
<tr>
<th>Primary Roles</th>
<th></th>
</tr>
</thead>
</table>

(high level overview of primary role in sufficient detail for standards to be selected and the design completed)

<table>
<thead>
<tr>
<th>Secondary Roles</th>
<th></th>
</tr>
</thead>
</table>

(high level overview of secondary role in sufficient detail for standards to be selected and the design completed)

### Ship Attributes

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ship Design Life</td>
<td>(years)</td>
</tr>
<tr>
<td>Length Overall</td>
<td>(m)</td>
</tr>
<tr>
<td>Length between perpendiculars</td>
<td>(m)</td>
</tr>
<tr>
<td>Breadth Overall</td>
<td>(m)</td>
</tr>
<tr>
<td>Lightship Displacement</td>
<td>(t)</td>
</tr>
<tr>
<td>Full load Displacement</td>
<td>(t)</td>
</tr>
<tr>
<td>Design Draught</td>
<td>(m)</td>
</tr>
<tr>
<td>Full Load Draught</td>
<td>(m)</td>
</tr>
<tr>
<td>Scantling Draught</td>
<td>(m)</td>
</tr>
<tr>
<td>Speed (maximum)</td>
<td>(knots)</td>
</tr>
<tr>
<td>Cruise speed</td>
<td>(knots)</td>
</tr>
<tr>
<td>Range at cruise</td>
<td>(nautical miles)</td>
</tr>
<tr>
<td>Endurance</td>
<td>(mission length in days)</td>
</tr>
<tr>
<td>Area of Operation</td>
<td>(restricted by range to refuge limits time, speed, sea state, restricted to sheltered waters)</td>
</tr>
</tbody>
</table>
### Cargo / Payload

- Aircraft:
  - Landing Craft:
  - Vehicles:
  - Weapon Systems Installed:
  - Munitions:
  - Fluids in tanks:
  - Stores:
  - Other:

  *(weights, volumes and locations)*

### Emergency Loading

*(weights, volumes and locations)*

### Embarked personnel

- Crew:
- Embarked forces:
- Special personnel:
- Wounded personnel allowance:
- Passenger and other embarked persons:
- Persons carried in an emergency:

  *(numbers by type, persons carried in an emergency to an estimated practical limit)*

### Accommodation

*(space, access, facilities)*

### Survivability

*(Scenarios to be defined for foreseeable damage survivability and if applicable extreme threat survivability)*

<table>
<thead>
<tr>
<th>Scenario reference number</th>
<th>Damage Extent</th>
<th>Damage Location</th>
<th>Vulnerability</th>
<th>Post-damage Capability</th>
<th>Recovery Philosophy</th>
<th>Supplementary Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DCM Limited</td>
<td>DCM Exterior</td>
<td>DCM Interior</td>
<td>P1 Basic, F1 Moderate</td>
<td>F1 Operational</td>
<td>Relevant additional notes for clarification</td>
</tr>
<tr>
<td>2</td>
<td>DCM Limited</td>
<td>DCM Exterior</td>
<td>DCM Interior</td>
<td>P1 Basic, F1 Moderate</td>
<td>F1 Operational</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>DCM Limited</td>
<td>DCM Exterior</td>
<td>DCM Interior</td>
<td>P1 Basic, F1 Moderate</td>
<td>F1 Operational</td>
<td></td>
</tr>
</tbody>
</table>
### Environment

**A - Meteorology and climatology (above surface)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind</td>
<td>(maximum Beaufort Force or speed for operation and for survival)</td>
</tr>
<tr>
<td>Precipitation</td>
<td>(if specifically required, eg Tropical Storm)</td>
</tr>
<tr>
<td>Air temperature – high</td>
<td>(specify eg. Maximum mean daily max)</td>
</tr>
<tr>
<td>Air temperature – low</td>
<td>(specify eg. Minimum mean daily min)</td>
</tr>
<tr>
<td>Air humidity</td>
<td>(if not 100% relative humidity at all altitudes)</td>
</tr>
<tr>
<td>Visibility</td>
<td>(if specifically required, eg night operations)</td>
</tr>
<tr>
<td>Atmospheric pressure</td>
<td>(if specifically required)</td>
</tr>
<tr>
<td>Solar radiation</td>
<td>(if specifically required, eg equatorial)</td>
</tr>
<tr>
<td>Electro-magnetic discharge</td>
<td>(if specifically required)</td>
</tr>
<tr>
<td>Air quality</td>
<td>(if specifically required, eg operations in coastal waters near deserts)</td>
</tr>
<tr>
<td>Flora and fauna</td>
<td>(if specifically required, eg in waters of snow high activity)</td>
</tr>
</tbody>
</table>

**B - Sea surface (interface)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waves</td>
<td>(Sea State, significant wave height, maximum wave height)</td>
</tr>
<tr>
<td>Waves – other situations</td>
<td>(if specifically required, eg operations in surf, tidal bore)</td>
</tr>
<tr>
<td>Tides</td>
<td>(range (height) and maximum speed (relevant to bathing))</td>
</tr>
<tr>
<td>Green seas and spray</td>
<td>(area affected, frequency)</td>
</tr>
<tr>
<td>Ice navigation</td>
<td>(if specifically required, eg icebreaking)</td>
</tr>
<tr>
<td>Sea surface quality (loading objects, pollution)</td>
<td>(if specifically required, eg operations in estuaries)</td>
</tr>
</tbody>
</table>
### Ship motions

<table>
<thead>
<tr>
<th>Motion</th>
<th>Maximum from equilibrium</th>
<th>Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roll</td>
<td>degrees</td>
<td>seconds</td>
</tr>
<tr>
<td>Pitch</td>
<td>degrees</td>
<td>seconds</td>
</tr>
<tr>
<td>Yaw</td>
<td>degrees</td>
<td>seconds</td>
</tr>
<tr>
<td>Heave</td>
<td>metres</td>
<td>seconds</td>
</tr>
<tr>
<td>Surge</td>
<td>metres</td>
<td>seconds</td>
</tr>
<tr>
<td>Sway</td>
<td>metres</td>
<td>seconds</td>
</tr>
</tbody>
</table>

(*design values for deviations from the static position)*

### Vibration

(*motion induced and wave induced)*

### C - Bathymetry and oceanography (below surface)

- **Pressure (depth)**
  - *(for specific features in head of sea water)*
- **Ocean currents**
  - *(if specifically required, eg drift)*
- **Water quality**
  - *(if specifically required, eg operations in estuaries)*
- **Sea temperature**
- **Flora and fauna**
  - *(if specifically required, eg in waters of known high activity)*

### D - Geotechnical

- **Bottom/Ground conditions**
  - *(if specifically required)*
- **Banks (inc. canals)**
  - *(dimensions, bottom conditions if specifically required)*

### E - Human Caused Environment

- **Berthing**
  - *(maximum speed of contact)*
- **Beaching**
  - *(bottom conditions if specifically required, eg landing craft)*
- **Towing and salvage**
  - *(bottom conditions if specifically required, eg landing craft)*
- **Acoustic fields**
  - *(if specifically required)*
- **Electro-magnetic fields**
  - *(if specifically required)*
- **Launching**
  - *(assumptions for build)*
- **Noise and vibration**
  - *(if additional to statutory limits for accommodation and working spaces)*

### Operating philosophy

- **Naval or civil meaning**
  - *(types and level of expertise, eg training craft)*
<table>
<thead>
<tr>
<th>Restrictions and limitations</th>
<th>Cargo restrictions:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loading restrictions:</td>
<td>Structural limitations:</td>
</tr>
<tr>
<td>Other:</td>
<td>(including all restrictions and limitations that are acceptable under the role of the ship)</td>
</tr>
<tr>
<td>Role Specific Operations</td>
<td>(requirements relating to the specific role of the vessel, e.g. cargo handling, requirement for low flashpoint fuels in their storage etc)</td>
</tr>
<tr>
<td>Aircraft Operations</td>
<td>(embarked, visiting etc)</td>
</tr>
<tr>
<td>Boat Operations</td>
<td>(launching, recovery, wellboat, requirement for low flashpoint fuels in their storage etc)</td>
</tr>
<tr>
<td>Replenishment at Sea (RAS)</td>
<td>(Requirement for liquid / solid replenishment / VERTREP, supply / receive etc)</td>
</tr>
<tr>
<td>Anchoring and Mooring</td>
<td>(Frequency of use, limitations due to sea conditions)</td>
</tr>
<tr>
<td>Towing (other than for emergencies)</td>
<td>(Requirement for routine towing / being towed, operational scenarios etc)</td>
</tr>
<tr>
<td>CBRN (NRCD) Operation</td>
<td>(Citadel, Machinery requirements, Pre-vet etc)</td>
</tr>
<tr>
<td>Management of hull strength</td>
<td>(approach to management of structure, e.g. survey regime, loading etc)</td>
</tr>
<tr>
<td>Buoyancy and stability</td>
<td>(approach to management of stability, e.g. stability information book approval, loading tool, damage control philosophy)</td>
</tr>
</tbody>
</table>
### Operating Philosophy:

- Modes of operation (i.e., where equipment operated from), redundancy, emergency means of propulsion & generation, acceptable degradation in emergency conditions (i.e., essential safety functions), frequency of use, unattended machinery spaces, watch patterns, operating envelopes, profiles (% time in particular operating condition).

### Equipment
- Propulsion system:
- Maneuvering system:
- Other machinery systems:
- Electrical generation system:
- HV power supply & distribution:
- LV power supply & distribution:
- Control systems:

(Description of major equipment and systems, quantity, CBRN operation, etc.)

### Fire Safety
- Firefighting philosophy:

(including number of safety zones, number of fires to be considered at any one time, the use of boundary cooling, re-entry of spaces and smoke clearance (i.e., ventilation during fire)

### Fire Safety Equipment and Systems
- Fire detection:
- Fire extinguishing:
- Smoke clearance:

(Description of equipment and systems)

### Escape, Evacuation, Rescue
- Pertinent aspects including issue of personnel equipment, communication, mustering.

### Radiocommunications
- Requirements in addition to statutory requirements (e.g., secure communications, sea area).

### Navigation
- Requirements in addition to statutory requirements.
### Carriage of dangerous goods

**(requirements in addition to statutory requirements eg. carriage as cargo / for ship’s use, embarking at sea, storage, movement on board, breaking out)**

### Ship Type, principal standards and authorities

<table>
<thead>
<tr>
<th>Ship Type</th>
<th>A, B, E(H), C, C(H), D, D(H)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ship Description</td>
<td>(eg. Aircraft carrier, Frigate, Patrol craft, Tanker)</td>
</tr>
<tr>
<td>Ship Designation</td>
<td>(Combatant / Auxiliary)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NSC Chapter</th>
<th>Principal standards (and modifications if required)</th>
<th>Naval Administration</th>
<th>Recognised Organisation</th>
<th>Recognised Organisation delegation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter II Structure</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chapter III Buoyancy and Stability</td>
<td></td>
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<tr>
<td>Chapter IV Engineering Systems</td>
<td></td>
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<td></td>
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<tr>
<td>Chapter V NOT USED</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chapter VI Fire Safety</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Chapter VII Escape, Evacuation and Rescue</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chapter VIII Radiocommunications</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Chapter IX Safety of Navigation</td>
<td></td>
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<td></td>
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<tr>
<td>Chapter X Carriage of Dangerous Goods</td>
<td></td>
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</tr>
<tr>
<td>Other relevant information relating to the standards or Naval Administration</td>
<td></td>
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</tr>
</tbody>
</table>

### Survey, Maintenance and Disposal philosophy

<table>
<thead>
<tr>
<th>Survey philosophy</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(overview of survey and inspection philosophy)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Survey schedule</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(survey cycle and scope of survey if different from that laid down in the present Naval Ship Code, in-water survey etc)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance philosophy</td>
<td>(overview of maintenance philosophy)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------------</td>
<td>-------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance schedule</td>
<td>(maintenance cycles and depth of planned maintenance)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disposal philosophy</td>
<td>(overview of disposal philosophy)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>