



CHINA CLASSIFICATION SOCIETY

**RULES FOR CLASSIFICATION OF
SEA-GOING STEEL SHIPS**

AMENDMENTS

2010

Effective from July 1 2010

Beijing

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PART ONE PROVISIONS OF CLASSIFICATION

CHAPTER 2 SCOPE AND CONDITIONS OF CLASSIFICATION

Section 1 GENERAL PROVISIONS

The existing subparagraph 2.1.3.1(30) is replaced by the following:

“(30) A dual class ship is one which is classed by two Societies between which there is a written agreement regarding sharing of work.”

Appendix 1 LIST OF CLASS NOTATIONS FOR SEA-GOING SHIPS

In Table A, the class notation “X carrier” is replaced by the following:

“

| Class notation | Description | | Technical requirements to be complied with |
|----------------|-------------|--|---|
| X Carrier | X Ship | Self-propelled ships carrying solid cargo, other than general dry cargo ships. Type notations to be assigned according to name of product carried and X to be substituted by such name. Typical type notations are: Cement Carrier; Forest Product Carrier; Wood Chip Carrier; Deck Cargo Ship; Refrigerated Cargo Ship; Livestock Carrier; Fly Ash Carrier; Sugar Carrier | Ch.2, Pt.2 of the Rules and relevant requirements |

”

In Table C, the class notation “Oil Recovery Ship A or B” is replaced by the following:

“

| Class notation | Description | | Technical requirements to be complied with |
|---|---|--|--|
| Oil Recovery Ship with Cargo Tank | Oil recovery ships equipped with means for the recovery and discharge of oil as well as with tanks for storing the recovered oil | Steel ships equipped for the recovery of oil floating on the sea with a flash point not exceeding 60°C (closed-cup test) and a Reid vapour pressure below atmospheric pressure | Ch.3, Pt.8 of the Rules |
| Oil Recovery Ship without Cargo Tank | Oil recovery ships without tanks for storing the recovered oil equipped with means for the recovery, but not for discharge of oil | Steel ships equipped for the recovery of oil floating on the sea with a flash point not exceeding 60°C (closed-cup test) and a Reid vapour pressure below atmospheric pressure | Ch.3, Pt.8 of the Rules |
| Oil Recovery Ship not suitable for products with a flash point of 60°C and less | Oil recovery ships equipped with means for the recovery of oil with a flash point exceeding 60°C | Steel ships equipped for the recovery of oil floating on the sea with a flash point exceeding 60°C (closed-cup test) and a Reid vapour pressure below atmospheric pressure | Ch.3, Pt.8 of the Rules |

”

In Table D, a new class notation is added as follows:

“

| Class notation | Description | | Technical requirements to be complied with |
|--|---|---|--|
| Holds Nos. xxx May Be Empty With Restrictions I m p o s e d B y SOLAS XII/14 | Restrictions from sailing with any hold empty | Existing ships, if not meeting the structural strength requirements for withstanding flooding of any one cargo hold as specified in SOLAS regulation XII/5.1 and requirements for strength standards and renewal criteria of single-side skin construction as specified in resolution MSC.168(79), are not to sail with any cargo hold loaded to less than 10% of the hold’s maximum allowable cargo weight when in the full load condition, on and after 1 July 2006 or reaching 10 years of age, whichever is later | SOLAS XII/14 |

”

In Table E, the class notation “PSPC” is replaced by the following:

“

| Class notation | Description | | Technical requirements to be complied with |
|----------------|--------------------|--|--|
| PSPC | Protective coating | <p>Ships of which specific spaces comply with IMO Performance Standard for Protective Coating are to be assigned this notation, with one or more of suffixes B, C, D and V being added thereafter. Meanings of the suffixes are as follows:</p> <p>B: protective coating applied in dedicated seawater ballast tanks of all type of ships</p> <p>C: protective coating applied in cargo oil tank spaces of crude oil tankers</p> <p>D: protective coating applied in double-side skin spaces of bulk carriers</p> <p>V: protective coating applied in void spaces of bulk carriers and oil tankers</p> <p>Note: B, C, D and V can operate both separately and together</p> | Relevant requirements of CCS Guidelines for Anticorrosion Inspection of Hull Structure |

”

In the column “Technical requirements to be complied with” for class notation “Electrical Propulsion System” of Table G, the words “Sec. 15, Ch. 2, Pt. 4” are replaced by the words “Ch.15, Pt. 8”.

CHAPTER 4 SURVEYS DURING CONSTRUCTION

Appendix 1 HULL SURVEY FOR NEW CONSTRUCTION

The existing paragraph 2.3.3 is replaced by the following:

“2.3.3 Witness is the attendance at scheduled inspections in accordance with the agreed Inspection and Test Plans or equivalent to the extent necessary to check compliance with the survey requirements.”

In paragraphs 3.2, 3.5 and 5.1, the words “hull structure” are replaced by the words “hull structure and coating”.

In the first sentence of paragraph 4.1, the words “through patrol, review and witness as defined in 2.1(3) of this Appendix” are inserted between “CCS Surveyors are to” and “verify”.

In paragraph 6.1, the first sentence “The construction facilities are to be reviewed by CCS prior to any steelwork or construction taking place in the following circumstances” is replaced by “CCS is to, by means of review, familiarize itself with the yard’s production facilities, management processes, and safety for consideration in complying with the requirements of Table 1 prior to any steelwork or construction taking place in the following circumstances”.

In paragraph 7.1, the words “Prior to commencing any newbuilding project” in the first sentence are replaced by the words “Prior to commencement of surveys for any newbuilding project”; the words “deal with subcontractors if it is known that the builder has decided to use them” in subparagraph (2) are replaced by the words “include the list of proposed subcontractors”; the existing subparagraph (3) is deleted; the existing subparagraphs (4), (5) are renumbered as (3), (4).

In paragraph 7.3, the first sentence “The record of the meeting is to be updated as the construction process progresses in the light of the following changing circumstances (but not limited to these):” is replaced by “The shipyard is requested to advise CCS of any changes to the activities agreed at the kick off meeting and these are to be documented. E.g.:”.

The existing paragraph 7.6 is replaced by the following:

“7.6 In the event of series ship^① production consideration may be given by CCS to waiving the requirement for a kick off meeting for the second and subsequent ships provided any changes are documented as required in paragraph 7.1.”

The existing paragraph 8.2 is replaced by the following:

“8.2 The plans and any modifications to them are to be submitted to the surveyors in sufficient time to allow review before the relevant survey activity commences.”

The existing paragraph 9.2 is deleted.

The following sentence is added at the end of paragraph 10.1:

“The Ship Construction File is to be reviewed for content in accordance with the requirements of paragraph 10.2.”

In subparagraph 10.2(1), the words “and 16” are added after the word “8”, and the word “and” before the word “8” is replaced by comma “,”; the words “for cargo oil tanks, holds and ballast tanks of oil tankers, bulk carriers and chemical carriers” are deleted.

The existing Table 1 is replaced by the following:

① For description of a series of ships, see 2.5.1.2(2) of Chapter 2 of this PART.

Hull Survey Requirements for New Construction **Table 1**

| No. | Shipbuilding function | Survey requirements for classification | Survey method required for classification | Rules and IACS [®] requirements | Statutory requirements and relevant reference | Documentation available to Surveyor during construction | Ship construction file | Specific activities | Proposals for the project |
|-----|---------------------------------------|---|--|--|---|---|------------------------|---|---|
| | Shipbuilding quality control function | | | | | | | | |
| 1 | Welding | | | | | | | | |
| 1.1 | Welding consumables | Works approval of the manufacturer by CCS | Review approval status and patrol, verify storage, handling and treatment in accordance with manufacturer's requirements | Chapter 2 of PART THREE of Rules for Materials and Welding | | Consumable specification and approval status | Not required | Identify consumables against approved list | |
| | | | | | | | | Verify temporary and permanent storage facilities | e.g. kept dry, covered, where applicable heated |
| | | | | | | | | Verify traceability | e.g. random batch number checking |
| 1.2 | Welder qualification | Qualified welders | Review of welder certification and patrol | IACS Rec.47 | | Shipyards with individual's identification records | Not required | Verify qualification standard, e.g. class or recognised standard approval | welder standard, e.g. class or recognised standard approval |

① IACS Recommendations indicated in this Table are not mandatory requirements, IACS UI are given in the GUIDELINES FOR IMPLEMENTATION OF STATUTORY SURVEYS (SHIPS ENGAGED ON INTERNATIONAL VOYAGES).

Table 1

Hull Survey Requirements for New Construction

| No. | Shipbuilding function | Survey requirements for classification | Survey method required for classification | Rules and IACS [®] requirements | Statutory requirements and relevant reference | Documentation available to Surveyor during construction | Ship construction file | Specific activities | Proposals for the project |
|------|--|---|---|---|---|---|------------------------|--|---------------------------|
| 1.3 | Welding – mechanical properties (welding procedures) | All weld joint configurations, and positions and materials to be covered by weld procedures approved by CCS | Review and patrol | Chapters 3 and 5 of PART THREE of Rules for Materials and Welding | | Approved procedure specification and welding plan relevant to the ship project or process | Not required | Verify welder approved for weld position Verify validity of qualification certificate Verify procedures are available at relevant workstations | |
| 1.3a | Welding equipment | CCS witnesses all new weld procedure qualification tests carried out in the shipyard whenever CCS is surveying in the shipyard Correctly calibrated and maintained | Patrol and review | | | Shipbuilder's maintenance and calibration records | Not required | Verify weld procedures records have been approved and cover all weld processes and positions in accordance with Rules or recognised standards and are available for the Surveyor's reference Verify condition of machinery and equipment Verify machines are calibrated by appropriate staff | |
| | | | | | | | | Verify calibration carried out in accordance with manufacturer's recommendations | |

Table 1

Hull Survey Requirements for New Construction

| No. | Shipbuilding function | Survey requirements for classification | Survey method required for classification | Rules and IACS® requirements | Statutory requirements and relevant reference | Documentation available to Surveyor during construction | Ship construction file | Specific activities | Proposals for the project |
|------|-----------------------------------|--|--|------------------------------|---|---|------------------------|---|---------------------------|
| 1.3b | Welding environment | Satisfactory environment | Patrol | IACS Rec. 47 | | | Not required | Verify calibration in accordance with maintenance schedule Verify welding areas clean, dry, well lit Confirm relevant measures taken for any pre or post heat treatment, drying of surfaces prior to welding Confirm shielding gases, fluxes protected | |
| 1.3c | Welding supervision | Sufficient number of skilled supervisors | Patrol | IACS Rec. 20 and Rec. 47 | | | | Verify supervision is effective | |
| 1.4 | Welding – surface discontinuities | Substantially free from significant indications, satisfactory profile and size | Visual examination, surface detection techniques, review of documents and of patrol operator | IACS Rec. 20 and Rec. 47 | | Shipbuilder's and recognised standards and Rules as applicable, welding and NDE plans, NDE report | Not required | Identify workstations where NDE is carried out, e.g. panel line butt welds, castings into hull structure Verify NDE carried out in accordance with approved plans where applicable Verify suitability of NDE methods | |

Table 1

Hull Survey Requirements for New Construction

| No. | Shipbuilding function | Survey requirements for classification | Survey method required for classification | Rules and IACS® requirements | Statutory requirements and relevant reference | Documentation available to Surveyor during construction | Ship construction file | Specific activities | Proposals for the project |
|-----|------------------------------------|--|--|------------------------------|---|---|------------------------|---|---------------------------|
| 1.5 | Welding – embedded discontinuities | NDE is to be carried out by qualified operators capable of ensuring that welds are substantially free from significant indications | Radiography and ultrasonic testing, review of documents and patrol of operator, examination of films | IACS Rec. 20 and Rec. 47 | | Shipbuilder's and recognised standards and Rules as applicable, welding and NDE plans, NDE reports, operator qualifications | Not required | Verify operators suitably qualified particularly where sub-contractors have been employed Verify NDE is carried out according to the acceptable process Review NDE records Identify workstations where NDE is carried out, e.g. panel line butt welds, castings into hull structure | |
| | | | | | | | | Verify NDE carried out in accordance with approved plans where applicable Verify suitability of NDE methods Verify operators suitably qualified particularly where sub-contractors have been employed Verify that records have been completed and in accordance with recognised standards, e.g. IQI and sensitivity recorded | |

Hull Survey Requirements for New Construction **Table 1**

| No. | Shipbuilding function | Survey requirements for classification | Survey method required for classification | Rules and IACS® requirements | Statutory requirements and relevant reference | Documentation available to Surveyor during construction | Ship construction file | Specific activities | Proposals for the project |
|-----|--|---|---|------------------------------|---|---|------------------------|--|---------------------------|
| 2 | Steel preparation and fit up | | | | | | | Verify that reports and radiographs have been evaluated correctly by the shipbuilder. Systematic review of radiographs carried out by the Surveyor | |
| 2.1 | Surface preparation, marking and cutting | Traceability and acceptability of material, check of steel plates & profiles, materials type, scantling identification, testing marks | Patrol | IACS Rec.47 | | Material certificates, shipbuilder's marking/cutting production documents at the workstation – documents retained at the facility | Not required | Verify equipment calibration satisfactory and in accordance with manufacturer's and recognised standards requirements Verify NDE is carried out according to the acceptable process | |
| | | | | | | | | Verify stockyard storage satisfactory | |
| | | | | | | | | Verify material traceability, e.g. stamping identification against material certification, archiving of records | |

Hull Survey Requirements for New Construction **Table 1**

| No. | Shipbuilding function | Survey requirements for classification | Survey method required for classification | Rules and IACS® requirements | Statutory requirements and relevant reference | Documentation available to Surveyor during construction | Ship construction file | Specific activities | Proposals for the project |
|-----|-----------------------|--|---|------------------------------|---|---|------------------------|--|---------------------------|
| | | | | | | | | Verify transfer marking after treatment line | |
| | | | | | | | | Verify standard of shot-blasting and priming | |
| | | | | | | | | Verify suitability of primer | |
| | | | | | | | | Verify that steel grades can be identified | |
| | | | | | | | | Verify machinery adjusted to maintain within IACS or manufacturer's recommendations | |
| | | | | | | | | Verify accuracy of marking and cutting | |
| | | | | | | | | Verify storage of piece parts | |
| 2.2 | Straightening | Approval of straightening methods/procedures against deformation | Patrol and review | IACS Rec.47 | | Recognised standards, approved procedures | Not required | Verify that straightening processes are approved for the grade and type of steel, e.g. TMCP, Z plate | |
| | | | | | | | | Verify that plates and sections are within recognised tolerances | |
| 2.3 | Forming | Maintain material properties. Acceptance of forming method against improper deformations | Patrol | IACS Rec. 47 | | Shipbuilder's procedure for hot forming | Not required | Verify that temperature control is exercised by the operator | |

Hull Survey Requirements for New Construction **Table 1**

| No. | Shipbuilding function | Survey requirements for classification | Survey method required for classification | Rules and IACS® requirements | Statutory requirements and relevant reference | Documentation available to Surveyor during construction | Ship construction file | Specific activities | Proposals for the project |
|-----|---|--|---|------------------------------|---|--|--|--|---------------------------|
| | | | | | | | | Verify that suitable methods of temperature control are available when forming special steels and materials | |
| 2.4 | Conformity with alignment/fit up/gap criteria | Check alignment/fit up/gap against reference standards | Patrol | IACS Rec. 47 | | Shipbuilder's and recognised standards and Rules as applicable | Not required | Verify that forming processes are acceptable Verify the processes to ensure satisfactory fit up and alignment at all workstations Verify that edge preparations are reinstated where lost during fitting operation | |
| 2.5 | Conformity for critical areas with alignment/fit up or weld configuration | Check alignment/fit up/gap against approved drawings | Patrol and review | IACS Rec. 47 | | Shipbuilder's and recognised standards and Rules as applicable, approved plan or standard, builder's records | Approved plans of critical areas if applicable | Verify remedial procedures are in place to compensate for wide gaps and alignment deviations Verify that the information relevant to the latest approved drawings is available at the workstations | |
| | | | | | | | | Verify the processes to ensure satisfactory fit up and alignment at all workstations | |

Table 1

Hull Survey Requirements for New Construction

| No. | Shipbuilding function | Survey requirements for classification | Survey method required for classification | Rules and IACS® requirements | Statutory requirements and relevant reference | Documentation available to Surveyor during construction | Ship construction file | Specific activities | Proposals for the project |
|-----|---|---|---|------------------------------|---|---|------------------------|--|---------------------------|
| 3 | Steelwork process, e.g. sub-assembly, block, grand and mega block assembly, pre-erection and erection, closing plates | Compliance with approved drawings, visual examination of welding material, check alignment and deformations | Patrol of the process and witness of the completed item | IACS Rec. 47 | | Approved plans, shipbuilder's inspection records, shipbuilder's and recognised standards and Rules as applicable, construction plan (steelwork subdivision) | | Verify that edge preparations are reinstated where lost during fitting operations Verify remedial procedures are in place to compensate for wide gaps and alignment deviations Verify that the information relevant to the latest approved drawings is available at the workstations | |
| | | | | | | | | Verify that correct weld sizes have been adopted | |
| | | | | | | | | Verify operation of the welding processes at the different work stages is satisfactory | |
| | | | | | | | | Verify that piece parts are identifiable | |
| | | | | | | | | Verify that fit ups are within recognised tolerances | |

Hull Survey Requirements for New Construction **Table 1**

| No. | Shipbuilding function | Survey requirements for classification | Survey method required for classification | Rules and IACS® requirements | Statutory requirements and relevant reference | Documentation available to Surveyor during construction | Ship construction file | Specific activities | Proposals for the project |
|-----|--|---|---|---|---|--|----------------------------|--|---------------------------|
| 4 | Remedial work and alteration | Welding, check against deformation, alignment | Review records and witness | IACS Rec. 47 | | Permanent record of shipyard surveyable items | | Verify that correct welding requirements specified in No. 1 of this Table have been adopted Verify processes for closing plates etc. are acceptable Confirm that steelwork is in accordance with the approved plan | |
| 5 | Tightness testing, including leak and hose testing, hydropneumatic testing | Absence of leaks | Patrol of the process and witness of the test | Section 3, Chapter 4 of PART ONE of the Rules | Reg. II-1/14 of SOLAS as amended | Approved tank testing plan, shipbuilder's inspection records | Approved tank testing plan | Verify that all deviations brought to the attention of the Surveyor by the shipbuilder are acceptable Confirm that tank testing is carried out in accordance with the approved plan | |
| | | | | | | | | Confirm the methods used to carry out leak testing | |
| | | | | | | | | Confirm that correct test pressures maintained for | |

Hull Survey Requirements for New Construction **Table 1**

| No. | Shipbuilding function | Survey requirements for classification | Survey method required for classification | Rules and IACS® requirements | Statutory requirements and relevant reference | Documentation available to Surveyor during construction | Ship construction file | Specific activities | Proposals for the project |
|-----|---|--|---|---|---|--|-------------------------------------|--|--|
| 6 | Structural testing | Structural adequacy of the design | Witness testing | Section 3, Chapter 4 of PART ONE of the Rules | Reg. II-1/14 of SOLAS as amended | Approved tank testing plan, shipbuilder's inspection records | Approved tank testing plan | leak, hose and hydro and hydropneumatic testing is satisfactory Verify that adequate records of the tank testing have been maintained Confirm that tank testing is carried out in accordance with the approved plan Confirm that correct test pressure maintained for testing is satisfactory | |
| 7 | Corrosion protection systems, e.g. coatings, cathodic protection, impressed current except for coating system subject to PSPC | Salt water ballast tanks with boundaries formed by the hull envelope | Review and report on builder's & manufacturer's documentation | Section 6, Chapter 1 of PART TWO of the Rules, UI SC122 | Reg. II-1/3-2 of SOLAS as amended | Manufacturer's and builder's specifications | Corrosion protection specifications | Verify that adequate records of the tank testing have been maintained Verify that applied coatings are approved and review records of application | Verify that adequate records have been maintained and copied to the ship construction file |

Hull Survey Requirements for New Construction **Table 1**

| No. | Shipbuilding function | Survey requirements for classification | Survey method required for classification | Rules and IACS [®] requirements | Statutory requirements and relevant reference | Documentation available to Surveyor during construction | Ship construction file | Specific activities | Proposals for the project |
|-----|--|---|---|--|--|--|---|--|---------------------------|
| | Application of Antifouling Systems | | Review | | AFS Convention | Painting Specification | Paint Specification and Mfg Declaration | Verify that adequate records have been maintained and copied to the ship construction file | |
| 7.1 | Application of Protective Coatings for Dedicated Seawater Ballast Tanks in all Types of Ships and Double-Side Skin Spaces of Bulk Carriers subject to PSPC | Monitor the implementation of coating inspection requirements | Patrolling and Review | UI SC223, PR34 | Reg. II-1/3-2 of SOLAS as amended | Coating Standard | Coating Technical File | Verify that applied coatings are approved and review records of application in accordance with Chapter 7 of Annex to MSC.215(82) | |
| 8 | Installation, welding and testing of the following: | | | | | | | | |
| 8.1 | Hatch covers | Tightness and securing | Witness | Section 3, Chapter 4 of PART ONE of the Rules and IACS Rec. 14 | Reg. 13, 14, 15 and 16 of ILLC '66 | Approved tank testing plan, shipbuilder's inspection records | Details required, structural drawings | Confirm leak test of hatch covers | |
| 8.2 | Doors and ramps integral with the shell and bulkheads | Tightness and securing | Witness | Section 3, Chapter 4 of PART ONE of the Rules | Reg. II-1/18 of SOLAS as amended, Reg. 12 and 21 of ILLC '66 | Approved tank testing plan, shipbuilder's inspection records | Details required | Confirm operation and securing test Confirm leak test | |
| | | | | | | | | Confirm operation and securing test | |
| | | | | | | | | Confirm safety device operation | |

Hull Survey Requirements for New Construction **Table 1**

| No. | Shipbuilding function | Survey requirements for classification | Survey method required for classification | Rules and IACS [®] requirements | Statutory requirements and relevant reference | Documentation available to Surveyor during construction | Ship construction file | Specific activities | Proposals for the project |
|-----|-----------------------|---|---|---|---|--|---|---|---------------------------|
| 8.3 | Rudders | Fitting | Witness | Section 3, Chapter 4 of PART ONE of the Rules | | Approved shipbuilder's inspection records | Details required, structural drawings | Ensure maintenance logs/manuals with the ship construction file Confirm alignment and mounting and fitting up to the connection to the tiller Confirm function test | |
| 8.4 | Forgings and castings | Compliance with approved drawings, visual examination of welding material, check alignment and deformations | Patrol of the process and witness of the completed item | Chapters 5 and 6 of Rules for Materials and Welding | | Approved shipbuilder's inspection records, shipbuilder's and recognised standards and Rules as applicable, construction plan (steelwork subdivision) | Copies of certificates of forgings and castings | Verify all fit up records including all clearances maintained and placed into ship construction file Verify castings and forgings against material certificate | |
| | | | | | | | | Verify that correct welding and fit up requirements specified in Nos. 1, 2.4 and 2.5 of this Table have been adopted | |

Hull Survey Requirements for New Construction **Table 1**

| No. | Shipbuilding function | Survey requirements for classification | Survey method required for classification | Rules and IACS® requirements | Statutory requirements and relevant reference | Documentation available to Surveyor during construction | Ship construction file | Specific activities | Proposals for the project |
|-----|--|--|---|--|---|--|------------------------|---|---------------------------|
| | | | | | | | | Verify that material certificates are included in the ship construction file | |
| | Appendages | | | | | | | Verify that correct welding and fit up requirements specified in Nos. 1, 2.4 and 2.5 of this Table have been adopted | |
| 8.5 | Equipment forming the watertight and weathertight integrity of the ship, e.g. overboard discharges, air pipes, ventilators | Tightness and securing | Witness | | Reg. II-1/19 of SOLAS as amended; Reg. 17, 18, 19, 20, 22, 23 of ILLC '66 | Approved tank testing plan, shipbuilder's inspection records | Details required | Verify that correct welding and fit up requirements specified in Nos. 1, 2.4 and 2.5 of this Table have been adopted | |
| | | | | Appendix 4 of Chapter 2, PART THREE of the Rules | | | | Verify compliance with Load Line Convention 1966 as amended - i.e. all fittings in accordance with the record of freeboard assignment | |
| | | | | | | | | Verify closing devices, e.g. air pipes, vents etc are of approved type | |
| | | | | | | | | Verify material certificates for overboard discharges where applicable | |

Hull Survey Requirements for New Construction

Table 1

| No. | Shipbuilding function | Survey requirements for classification | Survey method required for classification | Rules and IACS® requirements | Statutory requirements and relevant reference | Documentation available to Surveyor during construction | Ship construction file | Specific activities | Proposals for the project |
|-----|-----------------------------------|---|---|------------------------------|---|---|------------------------|--|---------------------------|
| | | | | | | | | Verify record of freeboard assignment and all material certificates included in the ship construction file | |
| | Freeboard marks and draft marks | Within allowable tolerances and in accordance with the freeboard assignment | Witness | UI-LL4 | Reg. 4, 5, 6, 7 and 8 of ILLC'66 | | Details required | Verify freeboard marks in accordance with load line assignment | |
| | | | | | | | | Verify draft marks in accordance with the agreed tolerances specified by the builder unless more onerous flag State requirements | |
| | Principal dimensions | Within allowable tolerances | Review and witness | IACS Rec. 47 | | | Details required | Verify principal dimensions in accordance with recognised standard | |
| | | | | | | | | Verify dimensions included in ship construction file | |
| | Safety Construction certification | No outstanding imperfections or defects | Witness | | Reg. 1/10 of SOLAS as amended | | | Verify that Administration requirements have been incorporated into the hull structure | |

CHAPTER 5 SURVEYS AFTER CONSTRUCTION

Section 1 GENERAL PROVISIONS

The existing paragraph 5.1.2 is replaced by the following:

“5.1.2 Reclassification

5.1.2.1 When reclassification is desired for a ship for which the class previously assigned by CCS has been canceled, CCS will carry out a survey appropriate to the age of the ship and the circumstances of the case. If, at such a survey, the ship is found or placed in a good and efficient condition in accordance with CCS rules, CCS will reinstate the original class or assign such other class as may be deemed necessary. The date of any reclassification will be recorded in the Register of Ships or its supplement.”

The existing subparagraph 5.1.5.1(8) is replaced by the following:

“(8) A **Corrosion prevention system** is normally considered a full hard protective coating. For the purpose of this Chapter, Hard Protective Coating is usually to be epoxy coating or equivalent. Other coating systems, which are neither soft nor semi-hard coatings^①, may be considered acceptable as alternatives provided that they are applied and maintained in compliance with the manufacturer’s specifications.”

The existing subparagraph 5.1.5.1(11) is replaced by the following:

“(11) **Wind and Water Strakes** are the strakes of a ship’s side shell plating between the ballast and deepest load waterline. Due to vessel’s trim, the strakes may vary over the length of the vessel.”

In subparagraph 5.1.5.1(9), the words “condition of classification” are replaced by the words “condition of classification, or recommendation”.

In subparagraph 5.1.5.2(1), the words “MARPOL I/13(3)” are replaced by the words “MARPOL I/18.3”.

In subparagraph 5.1.6.1(5), the words “or semi-hard” are added after the word “soft”.

In subparagraph 5.1.6.4(5), the words “or falling” are deleted in sub-item ④b, the words “for close-up survey of oil tankers only” are replaced by the words “for close-up survey of oil tankers and chemical tankers” in sub-item ④e, and a new sub-item f. is added as follows:

“f. only rough duty, inflatable rafts or boats, having satisfactory residual buoyancy and stability even if one chamber is ruptured, are to be used.”

The existing subparagraph 5.1.6.5(2) is replaced by the following:

“(2) In developing the Survey Programme, the following documentation (where applicable) is to be collected and consulted with a view to selecting tanks, areas, and structural elements to be examined:

- ① For bulk carriers:
 - a. survey status and basic ship information;
 - b. documentation on-board, as described in 5.1.7.2 and 5.1.7.3;
 - c. main structural plans (scantling drawings), including information regarding use of high tensile steels (HTS);
 - d. relevant previous survey and inspection reports from both CCS and the owner;

① As for the requirements regarding semi-hard coatings, these coatings, 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 the ballast tanks.

- e. information regarding the use of the ship's holds and tanks, typical cargoes and other relevant data;
- f. information regarding corrosion prevention level on the newbuilding;
- g. information regarding the relevant maintenance level during operation.

- ② For oil tankers and chemical tankers:
 - a. survey status and basic ship information;
 - b. documentation on-board, as described in 5.1.7.2 and 5.1.7.3;
 - c. main structural plans (scantling drawings) of cargo and ballast tanks, including information regarding use of high tensile steels (HTS) (for chemical tankers, also including information regarding use of clad steel and stainless steel);
 - d. Executive Hull Summary;
 - e. relevant previous damage and repair history;
 - f. relevant previous survey and inspection reports from both CCS and the owner;
 - g. details of the inert gas plant and tank cleaning procedures;
 - h. information and other relevant data regarding conversion or modification of the ship's cargo and ballast tanks since the time of construction;
 - i. description and history of the coating and corrosion protection system (including previous class notations), if any;
 - j. inspections by the owner's personnel during the last 3 years with reference to structural deterioration in general, leakages in tank boundaries and piping and condition of the coating and corrosion protection system if any;
 - k. information regarding the relevant maintenance level during operation including port state control reports of inspection containing hull related deficiencies, Safety Management System non-conformities relating to hull maintenance, including the associated corrective action(s);
 - l. any other information that will help identify suspect areas and critical structural areas;
 - m. cargo and ballast history for the last 3 years, including carriage of cargo under heated conditions (only for oil tankers);
 - n. information regarding the use of the ship's tanks, typical cargoes and other relevant data (only for chemical tankers).

The existing subparagraph 5.1.6.5(3) and items ②, ⑨, ⑩, ⑪ and ⑬ are replaced by the following:

“(3) The submitted survey programme is to account for and comply, as a minimum, with the requirements for close-up survey, thickness measurement and tank testing (also including pipe testing for chemical tankers), respectively, and is to include relevant information including at least:

-
- ② main structural plans (scantling drawings), including information regarding use of high tensile steels (HTS) (for chemical tankers, also including information regarding use of clad steel and stainless steel);
-
- ⑨ nomination of areas and sections for thickness measurement;
- ⑩ nomination of tanks for tank testing, (for chemical tankers, and the pipes that are to undergo pipe testing);
- ⑪ identification of the thickness measurement company (for oil tankers and chemical tankers);
- ⑬ critical structural areas and suspect areas, where relevant (for oil tankers and chemical tankers).”

In subparagraph 5.1.7.3(1), the words “and chemical tankers” are added after “for oil tankers” in item ⑥, and the words “and/or critical structural areas” are added after the words “suspect areas” in item ⑦.

In subparagraph 5.1.7.4(1), the words “Prior to inspection...” are replaced by “Prior to survey...”.

The existing paragraph 5.1.12.3 is replaced by the following:

“5.1.12.3 Where compatible with relevant laws and regulations, on dual class vessels, the requirement for two surveyors in 5.1.12.1 and/or 5.1.12.2 may be fulfilled by having one surveyor attend each from CCS and the Society related to the dual class.”

Section 2 TYPES AND PERIODS OF SURVEYS

The existing paragraph 5.2.9 is replaced by the following:

“5.2.9 Lay-up surveys

5.2.9.1 General requirements

- (1) The owner is to inform CCS of a ship laid up with CCS class in writing.
- (2) For maintaining the class of laid-up ships:
 - ① initial lay-up survey is requested at the beginning of the lay-up period;
 - ② annual lay-up condition survey is carried out during the lay-up period;
 - ③ reactivation survey is requested at the termination of the lay-up period.
- (3) Where a maintenance scheme agreed by CCS is available for a ship being laid up for a period beyond due date of the special classification survey, all surveys after construction which fall due during lay-up will then be held in abeyance until it is reactivated, subject to satisfactory completion of the annual lay-up condition survey stated in (2)② above.
- (4) At request of the owner, part or all of surveys after construction may be carried out for a laid-up ship, with particular attention being given to the scope and date of the surveys. Such surveys may be taken into account for determining the scope of a reactivation survey and/or determining the due date of next survey of the same type after construction.

5.2.9.2 Initial lay-up surveys

- (1) The purpose of the survey at the beginning of the lay-up period is to confirm compliance of safety condition, maintenance measures, location and mooring arrangement of the ship with the lay-up maintenance scheme agreed by CCS. The survey may be carried out in accordance with the relevant requirements of CCS Guidelines on Lay-up of Ships.
- (2) Upon satisfactory completion of the lay-up survey, the lay-up report is to be issued and the classification certificate is to be endorsed to the effect that the ship is laid up.

5.2.9.3 Annual lay-up condition surveys

- (1) An annual lay-up survey is to be carried out, in lieu of the normal annual survey during the lay-up period, to determine whether the ship remains in compliance with the lay-up maintenance scheme. The scope of the survey is to check whether the lay-up arrangement has been changed, and whether the ship maintenance and testing have been carried out in accordance with the maintenance requirements and recorded in the lay-up log.
- (2) Ships manned during lay-up are to comply with the requirements regarding fire safety. The requirements may be limited to engine room areas and any high risk area in use, assuming ships are laid up in ballast condition and that the cargo area is clean and gas free.
- (3) Upon satisfactory completion of the survey, the classification certificate is to be endorsed.

5.2.9.4 Reactivation surveys

- (1) The owner is to inform CCS of termination of the lay-up period and apply for the following surveys prior to reactivation of the ship:

- ① an occasional survey, the scope of which depends on the duration of the lay-up period and the surveys carried out during the lay-up period;
- ② all other surveys after construction that are being held in abeyance according to 5.2.9.1(3), taking into account the requirements of 5.2.9.1(4).

(2) Where the date of reactivation is beyond the original due date of the special survey which is held in abeyance according to 5.2.9.1(3), and where surveys have been carried out according to 5.2.9.1(4), a complete special survey is to be carried out prior to the reactivation. Those items which have been surveyed in compliance with the special classification survey requirements within 15 months preceding the reactivation may be credited.

(3) Scope of reactivation surveys: the survey is to be carried out in accordance with the relevant requirements of CCS Guidelines on Lay-up of Ships.

(4) Upon completion of the survey, the classification certificate is to be re-issued.”

Section 4 HULL AND EQUIPMENT SURVEYS

In paragraph 5.4.1.1, the words “and liquefied gas carriers” are added after the words “chemical tankers”, the word “and” before the words “chemical tankers” is replaced by comma “,”; the words “and 16” are added after the word “8”, and the word “and” before the word “8” is replaced by comma “,”.

The following sentence is added at the end of item ② of subparagraph 5.4.2.2(1):

“confirm that the towing and mooring equipment is properly marked with any restriction associated with its safe operation for ships constructed after 1 January 2007;”

In subparagraph 5.4.2.2(2), new items ⑫, ⑬ are added as follows:

- “⑫ examining, when applicable, that spurling pipes and cable lockers are provided with means to minimize water ingress;
- ⑬ examining, when applicable, the garbage chutes;”.

In subparagraph 5.4.2.2(2), the existing ⑫, ⑬, ⑭ are renumbered as ⑭, ⑮, ⑯.

In items ①, ④ of subparagraph 5.4.3.2(3), the words “spaces used for salt water ballast” are replaced by the words “ballast tanks”, and the words “or semi-hard” are added after the word “soft”.

In subparagraphs 5.4.4.2(3) and (4), the words “tanks used for water ballast” are replaced by “ballast tanks”, the words “water ballast double bottom tanks” are replaced by “double bottom ballast tanks”, and the words “or semi-hard” are added after the word “soft”.

Section 5 ADDITIONAL REQUIREMENTS FOR HULL AND EQUIPMENT SURVEYS OF GENERAL DRY CARGO SHIPS

In sub-items ②, ③ of subparagraph 5.5.3.2(1), the words “water ballast tanks” are replaced by “ballast tanks”, and the words “or semi-hard” are added after the word “soft”.

In subparagraph 5.5.4.2, the words “tanks used for water ballast” in (1) are replaced by “ballast tanks” and the words “water ballast double bottom tanks” in (2) are replaced by “double bottom ballast tanks”, and the words “or semi-hard” are added after the word “soft” in both (1) and (2).

**Section 6 ADDITIONAL REQUIREMENTS FOR HULL AND
EQUIPMENT SURVEYS OF OIL TANKERS**

In item ② of subparagraph 5.6.3.2(2) and item ② of subparagraph 5.6.4.2(2), the words “or semi-hard” are added after the word “soft”.

**Section 7 ADDITIONAL REQUIREMENTS FOR HULL AND
EQUIPMENT SURVEYS OF BULK CARRIERS**

In sub-item ①c of paragraph 5.7.3.2 and subparagraphs 5.7.4.2(1) and (2), the words “or semi-hard” are added after the word “soft”.

**Section 8 ADDITIONAL REQUIREMENTS FOR HULL AND
EQUIPMENT SURVEYS OF CHEMICAL TANKERS**

In subparagraph 5.8.3.2(1), the words “tanks used for water ballast” are replaced by the words “ballast tanks”.

In item ② of subparagraph 5.8.3.2(2) and item ② of subparagraph 5.8.4.2(1), the words “or semi-hard” are added after the word “soft”.

In subparagraph 5.8.4.3(1), the last sentence is deleted; a new sentence “The survey of stainless steel tanks may be carried out as an overall survey supplemented by close-up survey as deemed necessary by the Surveyor.” is added at the end of subparagraph 5.8.4.3(2).

The existing Table 5.8.4.3(2) is replaced by the following:

“Minimum requirements for close-up surveys at special survey of chemical tankers

Table 5.8.4.3(2)

| Special Survey No.1 age ≤ 5 | Special Survey No.2 5 < age ≤ 10 | Special Survey No.3 10 < age ≤ 15 | Special Survey No.4 and Subsequent: age > 15 |
|---|--|--|---|
| <p>A) One web frame - in a ballast wing tank (for S.H.) or ballast double hull tank (for D.H.) (see Note 1)</p> <p>B) One deck transverse - in a cargo tank or on deck</p> <p>D/C) One transverse bulkhead (lower part for S.H. - complete for D.H.) - in a ballast tank</p> <p>D) One transverse bulkhead - in a cargo wing tank</p> <p>D) One transverse bulkhead - in a cargo centre tank (see Note 2)</p> | <p>A) All web frames - in a ballast wing tank or ballast double hull tank (see Note 1)</p> <p>B) One deck transverse - in each remaining ballast tank or on deck (for S.H.)</p> <p>B) The knuckle area and the upper part (3 m approx) of one web frame in each remaining ballast tank (for D.H.)</p> <p>B) One deck transverse - in a cargo wing tank or on deck (for S.H.)</p> <p>B) One deck transverse - in two cargo centre tanks or on deck (for S.H.) and one deck transverse in two cargo tanks (for D.H.)</p> <p>C) Both transverse bulkhead - in a ballast wing tank (for S.H.)</p> <p>C) One transverse bulkhead in each ballast tank (for D.H.) (see Note 1)</p> <p>D) One transverse bulkhead - in each remaining ballast tank (for S.H.)</p> <p>D) One transverse bulkhead - in a cargo wing tank</p> <p>D) One transverse bulkhead - in two cargo centre tanks (see Note 2)</p> | <p>A) All web frames - in all ballast tanks</p> <p>A) All web frames - in a cargo wing tank</p> <p>A) One web frame - in each remaining cargo tank</p> <p>C) All transverse bulkheads - in all cargo and ballast tanks</p> | <p>1. As special survey No.3</p> <p>2. Additional transverse areas as deemed necessary by CCS</p> |

Notes:

- (1) Double hull tank - including double bottom and side tank even though these tanks are separate.
- (2) Where no centre cargo tanks are fitted (as in the case of centre longitudinal bulkhead), transverse bulkheads in wing tanks are to be surveyed.
- A) Complete transverse web frame ring including adjacent structural members.
- B) Deck transverse including adjacent deck structural members.
- C) Transverse bulkhead complete - including girder system and adjacent structural members.
- D) Transverse bulkhead lower part - including girder system and adjacent structural members.”

In subparagraphs 5.8.4.4(1) and (4), the words “Table 5.6.4.4(1)” are replaced by the words “Table 5.8.4.4(1)”; the existing Table 5.8.4.4(1) is replaced by the following:

**“Minimum requirements for thickness measurements at special survey of chemical tankers
Table 5.8.4.4(1)**

| Special Survey No.1 age ≤ 5 | Special Survey No.2 5 < age ≤ 10 | Special Survey No.3 10 < age ≤ 15 | Special Survey No.4 and Subsequent: age > 15 |
|--|--|--|--|
| 1. Suspect areas | 1. Suspect areas | 1. Suspect areas | 1. Suspect areas |
| 2. One section of deck plating for the full beam of the ship within the cargo area (in way of a ballast tank, if any, or a cargo tank used primarily for water ballast) | 2. Within the cargo area: a) Each deck plate b) One transverse section | 2. Within the cargo area: a) Each deck plate b) Two transverse sections ⁽¹⁾ c) All wind and water strakes | 2. Within the cargo area: a) Each deck plate b) Three transverse sections ⁽¹⁾ c) Each bottom plate |
| | 3. Selected wind and water strakes outside the cargo area | 3. Selected wind and water strakes outside the cargo area | 3. All wind and water strakes, full length |
| 4. Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to Table 5.8.4.3(2) of this Section | 4. Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to Table 5.8.4.3(2) of this Section | 4. Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to Table 5.8.4.3(2) of this Section | 4. Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to Table 5.8.4.3(2) of this Section |

Note:

(1) At least one section is to include a ballast tank within 0.5L amidships.”

In subparagraph 5.8.4.4(2), the words “Table 5.8.4.4(1) and Table 5.6.4.4(2)①b~d” are replaced by the words “Table 5.8.4.4(2)a~d”:

**“Requirements for extent of thickness measurements at those areas of substantial corrosion
(Special survey of chemical tankers within the cargo area length)
Bottom, inner bottom and hopper structure**

Table 5.8.4.4(2)a

| Structural member | Extent of measurement | Pattern of measurement |
|--|---|--|
| 1. Bottom, inner bottom and hopper structure plating | Minimum of three bays across tank, including aft bay Measurements around and under all suction bell mouths | 5-point pattern for each panel between longitudinals and floors |
| 2. Bottom, inner bottom and hopper structure longitudinals | Minimum of three longitudinals in each bay where bottom plating measured | Three measurements in line across the flange and three measurements on vertical web |
| 3. Bottom girders, including the watertight ones | At fore and aft watertight floors and in centre of tanks | Vertical line of single measurements on girder plating with one measurement between each panel stiffener, or a minimum of three measurements. Two measurements across face flat where fitted |
| 4. Bottom floors, including the watertight ones | Three floors in bays where bottom plating measured, with measurements at both ends and middle | 5-point pattern over two square metre area |
| 5. Hopper structure web frame ring | Three floors in bays where bottom plating measured | 5-point pattern over one square metre of plating. Single measurements on flange |
| 6. Hopper structure transverse watertight bulkhead or swash bulkhead | - lower 1/3 of bulkhead | - 5-point pattern over one square metre of plating |
| | - upper 2/3 of bulkhead | - 5-point pattern over two square metre of plating |
| | - stiffeners (minimum of three) | - For web, 5-point pattern over span (two measurements across web at each end and one at centre of span). For flange, single measurements at each end and centre of span |
| 7. Panel stiffening | Where applicable | Single measurements |

**Requirements for extent of thickness measurements at those areas of substantial corrosion
(Special survey of chemical tankers within the cargo area length)**

Deck structure

Table 5.8.4.4(2)b

| Structural member | Extent of measurement | Pattern of measurement |
|--|--|--|
| 1. Deck plating | Two transverse bands across tank | Minimum of three measurements per plate per band |
| 2. Deck longitudinals | Every third longitudinal in each of two bands with a minimum of one longitudinal | Three measurements in line vertically on webs and two measurements on flange (if fitted) |
| 3. Deck girders and brackets | At fore and aft transverse bulkhead, bracket toes and in centre of tanks | Vertical line of single measurements on web plating with one measurement between each panel stiffener, or a minimum of three measurements. Two measurements across flange. 5-point pattern on girder/bulkhead brackets |
| 4. Deck transverse webs | Minimum of two webs, with measurements at both ends and middle of span | 5-point pattern over one square metre area. Single measurements on flange |
| 5. Vertical web and transverse bulkhead in wing ballast tank for double hull design (two metres from deck) | Minimum of two webs, and both transverse bulkheads | 5-point pattern over one square metre area |
| 6. Panel stiffening | Where applicable | Single measurements |

**Requirements for extent of thickness measurements at those areas of substantial corrosion
(Special survey of chemical tankers within the cargo area length)**

Side shell and longitudinal bulkheads

Table 5.8.4.4(2)c

| Structural member | Extent of measurement | Pattern of measurement |
|--|--|---|
| 1. Side shell and longitudinal bulkhead plating: - Deckhead and bottom strakes, and strakes in way of horizontal girders - All other strakes | - Plating between each pair of longitudinals in a minimum of three bays (along the tank) - Plating between every third pair of longitudinals in same three bays | Single measurement |
| 2. Side shell and longitudinal bulkhead longitudinals on: - Deckhead and bottom strakes - All other strakes | - Each longitudinal in same three bays - Every third longitudinal in same three bays | 3 measurements across web and 1 measurement on flange |
| 3. Longitudinals - brackets | Minimum of three at top, middle and bottom of tank in same three bays | 5-point pattern over area of bracket |
| 4. Vertical web and transverse bulkheads of double side tanks (excluding deck area): - Strakes in way of horizontal girders - Other strakes | - Minimum of two webs and both transverse bulkheads - Minimum of two webs and both transverse bulkheads | - 5-point pattern over approx. two square metre area - Two measurements between each pair of vertical stiffeners |
| 5. Web frames and cross ties for other tanks than double side tanks | Three webs with minimum of three locations on each web, including in way of cross tie connections and lower end bracket | 5-point pattern over approximately two square metre area of webs, plus single measurements on flanges of web frame and cross ties |
| 6. Horizontal girders | Plating on each girder in a minimum of three bays | Two measurements between each pair of longitudinal girder stiffeners |
| 7. Panel stiffening | Where applicable | Single measurements |

**Requirements for extent of thickness measurements at those areas of substantial corrosion
(Special survey of chemical tankers within the cargo area length)
Transverse watertight and swash bulkheads**

Table 5.8.4.4(2)d

| Structural member | Extent of measurement | Pattern of measurement |
|--|--|--|
| 1. Upper and lower stool, where fitted | - Transverse band within 25 mm of welded connection to inner bottom/ deck plating - Transverse band within 25 mm of welded connection to shelf plate | 5-point pattern between stiffeners over one metre length |
| 2. Deckhead and bottom strakes, and strakes in way of horizontal stringers | Plating between pair of stiffeners at three locations: approximately 1/4, 1/2 and 3/4 width of tank | 5-point pattern between stiffeners over one metre length |
| 3. All other strakes | Plating between pair of stiffeners at middle location | Single measurement |
| 4. Strakes in corrugated bulkheads | Plating for each change of scantling at centre of panel and at flange of fabricated connection | 5-point pattern over about one square metre of plating |
| 5. Stiffeners | Minimum of three typical stiffeners | For web, 5-point pattern over span between bracket connections (two measurements across web at each bracket connection and one at centre of span). For flange, single measurements at each bracket toe and at centre of span |
| 6. Brackets | Minimum of three at top, middle and bottom of tank | 5-point pattern over area of bracket |
| 7. Horizontal stringers | All stringers with measurements at both ends and middle | 5-point pattern over one square metre area, plus single measurements near bracket toes and on flanges |
| 8. Deep webs and girders | Measurements at toe of bracket and at centre of span | For web, 5 point pattern over about 1 square metre. 3 measurements across face flat. |

Appendix 1 CORROSION AND WASTAGE CONTROL OF HULL STRUCTURE

In Table 2.2, the words “hatch covers, non-continuous hatch coamings, sea chests” are added after the words “brackets of members” in column “Other plating and members”.

Appendix 11 ESP SURVEY REPORTING PRINCIPLES

In the first sentence, the words “As a principle, for oil tankers and bulk carriers subject to ESP...” are replaced by the words “As a principle, for ships complying with ESP of Appendix 2, Chapter 2 of this PART...”.

In the note to paragraph 2.3, the words “and 8” are added after the word “7”, and the word “and” before the word “7” is replaced by comma “,”.

In paragraph 2.6, the words “, including crude oil washing (COW) piping for oil tankers, ” are added after the words “on deck”.

The title of Report 1 “EXECUTIVE HULL SUMMARY FOR OIL TANKER” is replaced by “EXECUTIVE HULL SUMMARY FOR OIL TANKER/CHEMICAL TANKER”.

Appendix 11A SURVEY PROGRAMME

The table in subparagraph 10(2) is replaced by the following:

| Area or location | Applicable ship type | | | Original as-built thickness (mm) | Minimum thickness (mm) | Substantial corrosion thickness (mm) |
|--|----------------------|---|---|----------------------------------|------------------------|--------------------------------------|
| | B | O | C | | | |
| Deck | X | X | X | | | |
| Plating | X | X | X | | | |
| Longitudinals | X | X | X | | | |
| Longitudinal girders | X | X | X | | | |
| Cross deck plating | X | | | | | |
| Cross deck stiffeners | X | | | | | |
| Bottom | X | X | X | | | |
| Plating | X | X | X | | | |
| Longitudinals | X | X | X | | | |
| Longitudinal girders | X | X | X | | | |
| Ship side | | X | X | | | |
| Plating | | X | X | | | |
| Longitudinals | | X | X | | | |
| Longitudinal girders | | X | X | | | |
| Inner bottom | X | X | X | | | |
| Plating | X | X | X | | | |
| Longitudinals | X | X | X | | | |
| Longitudinal girders | X | X | X | | | |
| Floors | X | | | | | |
| Ship side in way of topside tanks | X | | | | | |
| Plating | X | | | | | |
| Longitudinals | X | | | | | |
| Ship side in way of hopper side tanks | X | | | | | |
| Plating | X | | | | | |
| Longitudinals | X | | | | | |
| Ship side in way of tanks | Xp | | | | | |
| Plating | X | | | | | |
| Longitudinals | X | | | | | |
| Longitudinal stringers | X | | | | | |
| Ship side in way of cargo holds | X | | | | | |
| Plating | X | | | | | |
| Side frames webs | X | | | | | |
| Side frames flanges | X | | | | | |
| Upper brackets webs | X | | | | | |
| Upper brackets flanges | X | | | | | |

| Area or location | Applicable ship type | | | Original as-built thickness (mm) | Minimum thickness (mm) | Substantial corrosion thickness (mm) |
|---|----------------------|---|---|----------------------------------|------------------------|--------------------------------------|
| | B | O | C | | | |
| Lower brackets webs | X | | | | | |
| Lower brackets flanges | X | | | | | |
| Longitudinal bulkhead | X _p | X | X | | | |
| Plating | X | X | X | | | |
| Longitudinals | X _p | X | X | | | |
| Longitudinal girders | X _p | X | X | | | |
| Transverse bulkheads | X | X | X | | | |
| Plating | X | X | X | | | |
| Stiffeners | X _p | X | X | | | |
| Upper stool plating | X | | | | | |
| Upper stool stiffeners | X | | | | | |
| Lower stool plating | X | | | | | |
| Lower stool stiffeners | X | | | | | |
| Transverse web frames in topside tanks | X | | | | | |
| Plating | X | | | | | |
| Flanges | X | | | | | |
| Stiffeners | X | | | | | |
| Transverse web frames in hopper tanks | X | | | | | |
| Plating | X | | | | | |
| Flanges | X | | | | | |
| Stiffeners | X | | | | | |
| Hatch Covers | X | | | | | |
| Plating | X | | | | | |
| Stiffeners | X | | | | | |
| Hatch Coamings | X | | | | | |
| Plating | X | | | | | |
| Stiffeners | X | | | | | |
| Transverse web frames, floors and stringers and (for chemical tankers) diaphragms | | X | X | | | |
| Plating | | X | X | | | |
| Flanges | | X | X | | | |
| Stiffeners | | X | X | | | |
| Cross ties | | X | | | | |
| Flanges | | X | | | | |
| Webs | | X | | | | |

* The wastage allowance tables are to be attached to the survey programme.

X — Applicable; X_p — If applicable; B — Bulk carriers; O — Oil tankers; C — Chemical tankers.”

The existing Appendix 11B is replaced by the following:

“Appendix 11B SURVEY PLANNING QUESTIONNAIRE
(Bulk carriers/ Oil tankers/ Chemical tankers)

1 The following information will enable the owner in co-operation with CCS to develop a survey programme complying with the requirements of this Chapter. It is essential that the owner provides, when completing the present questionnaire, up-to-date information. The present questionnaire, when completed, is to provide all information and material required by this Chapter.

Particulars

Ship's name:

IMO number:

Flag State:

Port of registry:

Owner:

Classification Society:

Class ID:

Gross tonnage:

Deadweight (metric tonnes):

Date of build:

Information on access provision for close-up surveys and thickness measurement:

2 The owner is to indicate, in the table below, the means of access to the structures subject to close-up survey and thickness measurement.

| Hold/Tank No. | Structure | ① C (Cargo)/ B (Ballast) | Temporary staging | Rafts | Ladders | Direct access | Other means (please specify) |
|---|----------------------------------|-----------------------------|----------------------|-------|---------|------------------|------------------------------------|
| F.P. (Oil tankers / Bulk carriers / Chemical tankers) | Fore Peak | | | | | | |
| A.P. (Oil tankers / Bulk carriers / Chemical tankers) | Aft Peak | | | | | | |
| Cargo holds (Bulk carriers) | Hatch side coamings | | | | | | |
| | Topside sloping plate | | | | | | |
| | Upper stool plating | | | | | | |
| | Cross deck | | | | | | |
| | Side shell, frames & brackets | | | | | | |
| | Transverse bulkhead | | | | | | |
| | Hopper tank plating | | | | | | |
| | Lower stool | | | | | | |
| Wing tanks (Oil tankers / Chemical tankers) | Tank top | | | | | | |
| | Under deck | | | | | | |
| | Side shell | | | | | | |
| | Bottom transverse | | | | | | |
| | Longitudinal | | | | | | |
| | Transverse | | | | | | |

| Hold/Tank No. | Structure | ① C (Cargo)/ B (Ballast) | Temporary staging | Rafts | Ladders | Direct access | Other means (please specify) |
|--|--|-----------------------------|----------------------|-------|---------|------------------|------------------------------------|
| Centre tanks (Oil tankers / Chemical tankers) | Under deck | | | | | | |
| | Bottom transverse | | | | | | |
| | Transverse | | | | | | |
| Topside tanks (Bulk carriers) | Underdeck structure | | | | | | |
| | Side shell & structure | | | | | | |
| | Sloping plate & structure | | | | | | |
| | Webs & bulkheads | | | | | | |
| Double side skin tanks (Double skin bulk carriers) | Side shell & structure | | | | | | |
| | Inner skin & structure | | | | | | |
| | Webs & bulkheads | | | | | | |
| Hopper tanks (Bulk carriers) | Hopper sloping plate & structure | | | | | | |
| | Side shell & structure | | | | | | |
| | Bottom structure | | | | | | |
| | Webs & bulkheads | | | | | | |
| | Double bottom structure (Bulk carriers) | | | | | | |
| | Upper stool internal structure (Bulk carriers) | | | | | | |
| | Lower stool internal structure (Bulk carriers) | | | | | | |
| Wing tanks of ore carriers | Underdeck & structure | | | | | | |
| | Side shell & structure | | | | | | |
| | Side shell vertical web & structure | | | | | | |
| | Longitudinal bulkhead & structure | | | | | | |
| | Longitudinal bulkhead web & structure | | | | | | |
| | Bottom plating & structure | | | | | | |
| | Cross ties/stringers | | | | | | |

| |
|-------------------|
| History of cargo② |
| |
| |

① Applicable to oil tankers.

② For bulk carriers, history of bulk cargoes of a corrosive nature (e.g. high sulphur content);

For oil tankers, history of cargo with H₂S content or heated cargo for the last 3 years together with indication as to whether cargo was heated and, where available, Material Safety Data Sheets (MSDS)*;

For chemical tankers, history of heated cargo for the last 3 years together with indication as to whether cargo was heated.

* Refer to resolution MSC.150(77) on Recommendation for material safety data sheets for MARPOL Annex I cargoes and marine fuel oils.

Owner's inspections

3 Using a format similar to that of the table below (which is given as an example), the owner is to provide details of the results of their inspections for the last 3 years on all cargo and ballast tanks and void spaces within the cargo area in accordance with the requirements of this Chapter.

| Tank/Hold No. | Corrosion protection (1) | Coating extent (2) | Coating condition (3) | Structural deterioration (4) | Hold and tank history (5) |
|---|-----------------------------|-----------------------|--------------------------|---------------------------------|------------------------------|
| Cargo holds (Bulk carriers) | | | | | |
| Cargo centre tanks (Oil tankers / Chemical tankers) | | | | | |
| Cargo wing tanks (Oil tankers / Chemical tankers) | | | | | |
| Slop (Oil tankers) | | | | | |
| Topside tanks (Bulk carriers) | | | | | |
| Hopper tanks (Bulk carriers) | | | | | |
| Double side skin tanks (Bulk carriers) | | | | | |
| Double bottom tanks (Bulk carriers) | | | | | |
| Upper stools (Bulk carriers) | | | | | |
| Lower stools (Bulk carriers) | | | | | |
| Wing tanks (ore carriers) | | | | | |
| Ballast tanks (Oil tankers / Chemical tankers) | | | | | |
| Fore peak (Oil tankers / Bulk carriers / Chemical tankers) | | | | | |
| Aft peak (Oil tankers / Bulk carriers / Chemical tankers) | | | | | |
| Miscellaneous other spaces (Oil tankers / Bulk carriers / Chemical tankers) | | | | | |

Note: Indicate tanks which are used for cargo/ballast.

- 1) HC = hard coating; SC = soft coating; SH = semi-hard coating; NP = no protection
- 2) U = upper part; M = middle part; L = lower part; C = complete
- 3) G = good; F = fair; P = poor; RC = recoated (during the last 3 years)
- 4) N = no findings recorded; Y = findings recorded, (Description of findings is to be attached to the questionnaire)
- 5) DR = damage & repair; L = leakages; CV = conversion (Description is to be attached to this questionnaire)

| |
|--|
| Name of owner's representative: Signature: Date: |
|--|

Reports of Port State Control inspections

| |
|---|
| List the reports of Port State Control inspections containing hull structural related deficiencies and relevant information on rectification of the deficiencies: |
| |
| |
| |
| |
| |
| |

Safety Management System

| |
|---|
| List non-conformities related to hull maintenance, including the associated corrective actions: |
| |
| |
| |
| |
| |
| |

Name and address of the approved thickness measurement company:

| |
|--|
| |
| |
| |

Appendix 12 GUIDELINES FOR TECHNICAL ASSESSMENT IN CONJUNCTION WITH PLANNING FOR ENHANCED SURVEYS AND OWNERS INSPECTION REPORT

In paragraph 1.1, the words “and chemical tankers” are added after the words “bulk carriers”, and the word “and” before the words “bulk carriers” is replaced by comma “,”.

In paragraph 1.2.2, the words “and 8” are added after the word “7”, and the word “and” before the word “7” is replaced by comma “,”.

In paragraph 1.3.2.1, the words “...reference is to be made to TSCF’s Guidance Manual for the Inspection and Condition Assessment of Tanker Structures (Ref.2)...” are replaced by the words “...reference is to be made to the two TSCF’s publications mentioned in Ref.2 and Ref.3...”; the words “...which contains a catalogue of typical damages and proposed repair methods for various structural details on oil tankers...” are replaced by the words “...which contains a catalogue of typical damages and proposed repair methods for various tanker structural details...”; a new sentence “In particular, Chapter 3 of Ref.2 deals with various aspects specific to double hull tankers, such as stress concentration locations, misalignment during construction, corrosion trends, fatigue considerations and areas requiring special attention, which are to be considered in working out the survey planning.” is added after the sentence “Reference is made to examples in Figures 1.3.2.1(1) ~ (3).”

In paragraph 1.3.2.2, the words “Table 3.1” is deleted from the words “— Planning of risk of corrosion (referring to Ref.3, Table 3.1);” The following sentences “Special attention is to be given to the areas where the double hull tanker is particularly exposed to corrosion. To do this end, the specific aspects addressing corrosion in double hull tankers indicated in 3.4 (Corrosion trends) of Ref.2 are to be taken into account.” are added at the end of the sentence.

In paragraph 1.3.2.3, the words “thickness measurement (sections)” are replaced by the words “thickness measurement (areas and sections)”.

In Figure 1.3.2.1(1), the words “oil tanker” are replaced by the word “tanker”.

Appendix 13 RECOMMENDED PROCEDURES FOR THICKNESS MEASUREMENTS OF OIL TANKERS, BULK CARRIERS AND ETC.

In paragraph 13.1, the title “Recommended Procedures for Thickness Measurements of Oil Tankers, Ore/Oil Ships and etc.” are replaced by “Recommended Procedures for Thickness Measurements of Oil Tankers, Ore/Oil Ships and etc.^①”

Appendix 16 GUIDELINES FOR SURVEY OF PLANNED MAINTENANCE SCHEME (PMS) FOR MACHINERY

The existing paragraph 2.5.3 is replaced by the following:

“2.5.3 For the ship which is assigned the class notation PMS for the first time, a class memorandum is to be given to remind the owner that “Implementation Survey should be carried out by next Annual Audit. ”

The existing Appendix 21 is deleted.



① The Recommended Procedures for Thickness Measurements are also applicable to chemical tankers.

CHAPTER 6 SURVEYS RELATED TO CLASS NOTATIONS

Section 2 SURVEYS RELATED TO CLASS NOTATIONS FOR SPECIAL DUTIES

The existing paragraph 6.2.3 is replaced by the following:

“6.2.3 Oil recovery ships

6.2.3.1 General requirements

(1) This paragraph applies to oil recovery ships having one of the following class notations:

- ① Oil Recovery Ship with Cargo Tank;
- ② Oil Recovery Ship without Cargo Tank;
- ③ Oil Recovery Ship not suitable for products with a flashpoint of 60°C and less.

(2) The following documents are to be available on board:

- ① operating manual;
- ② overhaul records for gas detection and alarm system.

6.2.3.2 Initial classification

(1) Submission of plans and documents

- ① For any newbuilding, the classification survey of which is intended, the plans and documents specified in Chapter 3 of PART EIGHT are to be submitted to CCS for approval.
- ② For any oil recovery ship constructed not under the supervision of CCS, the initial classification of which is intended, the plans and documents listed in Chapter 3 of PART EIGHT are to be submitted in addition to those required by Section 14, Chapter 5 of this PART.

(2) Survey

- ① Upon completion of construction of the ship, operation test and simulated operation of the oil recovery equipment are to be carried out.
- ② Operation test of the oil recovery equipment is to be carried out during the initial classification of existing ships.

6.2.3.3 Annual surveys

(1) Checking ballast systems and bilge systems etc., in the transfer system for recovered oil and hazardous area; confirming that they are in effective condition.

(2) Checking the venting system of recovered oil tanks and other ventilation systems in the hazardous area; confirming that they are in effective condition.

(3) Confirming that air lock (if fitted) is in effective condition.

(4) Confirming that the gas detection and alarm system and the portable gas detection equipment are in effective condition.

(5) Confirming that no potential sources of ignition are present in or near the recovered oil transfer pump room and that access ladders are in good condition.

(6) Examination of the bulkheads of recovered oil transfer pump rooms for signs of leakage or fractures, and in particular, the sealing arrangements of all penetrations in these bulkheads.

- (7) Confirming that installed pressure gauges on recovered oil transfer piping and level indicator systems of recovered oil tanks are operational.
- (8) Examination, so far as practicable, of pumps in the recovered oil transfer pump room for excessive gland seal leakage, verification of proper operation of electrical and mechanical remote operating and shutdown devices.
- (9) Examination of the fixed fire-fighting system for the recovered oil transfer pump room, and confirming, as far as practicable and when appropriate, the operation of the remote means for closing the various openings.
- (10) Overall survey of recovered oil tanks. Where the tank is adjacent to the engine room, the bulkhead is to be subjected to a close-up survey to confirm that there are no signs of leakage or fractures.

6.2.3.4 Intermediate surveys

- (1) The items specified for annual surveys.
- (2) Effectiveness test as required by the Surveyor if deemed necessary.
- (3) Where a tank adjacent to the engine room is intended for the storage of recovered oil, the tank is subject to pressure test.
- (4) For weather decks, an examination as far as applicable of recovered oil transfer, bunker, ballast, steam and vent piping systems is to be carried out. If upon examination there is any doubt as to the condition of the piping, the piping may be required to be pressure tested, thickness measured or both.

6.2.3.5 Special surveys

- (1) The special survey is to cover the items specified for intermediate surveys.
- (2) Ballast systems and bilge systems etc., in the transfer system for recovered oil and hazardous area are to be examined and operationally tested to working pressure to ensure that tightness and condition remain satisfactory. Special attention is to be given to any ballast piping in oil recovery tanks and recovered oil transfer piping in ballast tanks and void spaces.”

A new subparagraph 6.2.6 is added as follows:

“6.2.6 DP notation

6.2.6.1 General requirements

- (1) This paragraph applies to ships which have been assigned one of the following class notations related to dynamic positioning systems:
 - ① DP – 1;
 - ② DP – 2;
 - ③ DP – 3.

6.2.6.2 Initial classification

- (1) For a ship intended for the notation DP, the plans and documents required by 11.1.4 of Chapter 11, PART EIGHT of the Rules are to be submitted for approval.
- (2) The survey of the ship during construction is to include examinations and tests of the following items:

- ① The control system of DP system and relevant reference system are to be subjected to type approval in accordance with Chapter 3 of this PART to demonstrate that they are in compliance with the requirements of Chapter 11, PART EIGHT of the Rules, suit the environmental conditions at sea and be issued a Marine Products Certificate, including the following systems:
 - a. dynamic positioning control system (including computer system);
 - b. an independent joystick system with automatic heading control;
 - c. positioning reference system.
- ② Checking Marine Products Certificates of relevant equipment;
- ③ Confirming that the equipment and arrangement of DP system is in compliance with the approved plans and Chapter 11, PART EIGHT of the Rules;
- ④ All sensors, peripheral equipment and reference systems are to be tested before the test of the whole DP system. Alarm system and logical conversion are to be calibrated in accordance with the failure of analogue sensors;
- ⑤ The following tests are to be carried out to the thruster:
 - a. function test to control and alarm system of each thruster;
 - b. test of signal exchanges between each thruster and DP system computer;
 - c. test of different control methods of the thruster;
- ⑥ Test is to be carried out to the capacity of the UPS batteries;
- ⑦ Test is to be carried out to all functions of the independent joystick system.
- ⑧ The following tests are to be carried out to the whole set of DP system:
 - a. test to system functions in all operational modes;
 - b. test to conversion method, back-up system and alarm system;
 - c. positioning is to be performed on all possible combinations of position reference systems (PRSs), and on each PRS as a single system. Selecting and de-selecting of PRSs are also to be tested;
 - d. test to manual override function under normal operation and failure conditions;
 - e. continuous site test for at least 6 to 8 hours to the whole set of automatic system and any failure occurred is to be recorded and analyzed;
 - f. the whole DP system is to be tested for at least 2 hours under specified environmental conditions. Weather conditions are to be such as to make the average thruster load level reach 50% or higher. Where the environmental conditions can not satisfy such requirement, the test may be carried out as a special test later on an appropriate occasion.
- ⑨ For steering gears included under DP-control, a test is to be carried out to verify that maximum design temperature of actuator and all other steering gear components is not exceeded when the rudder is continuously put over from border to border within the limits set by the DP-control system, until temperature is stabilized.
- ⑩ For class notations DP-2 and DP-3, FMEA test is to be carried out in accordance with approved FMEA test procedures. The FMEA test is to be based on the simulation of failures and is to be performed under as realistic conditions as practicable.

6.2.6.3 Annual surveys

- (1) The apparatus such as generator and thruster system related to DP system is to be surveyed in accordance with the requirements of the main class.
- (2) It is to be confirmed that the DP system has been normally maintained in good working order.

6.2.6.4 Special surveys

- (1) The following tests are to be carried out to the thruster:
 - ① function test to control and alarm system of each thruster;
 - ② test of signal exchanges between each thruster and DP system computer;
 - ③ test of different control methods of the thruster.

- (2) Test is to be carried out to all functions of the independent joystick system:
- ① tests to conversion method, back-up system and alarm system with all operation modes and in various simulated failure conditions;
 - ② test to manual override function under normal operation and failure conditions;
 - ③ continuous site test for at least 6 to 8 hours to the whole set of automatic system and any failure occurred is to be recorded and analyzed;
 - ④ the whole DP system is to be tested for at least 2 hours under specified environmental conditions. Weather conditions are to be such as to make the average thruster load level reach 50% or higher. Where the environmental conditions can not satisfy such requirement, the test may be carried out as a special test later on an appropriate occasion.
- (3) The following tests are to be carried out to the whole set of DP system:
- a. test to system functions in all operational modes;
 - b. test to conversion method, back-up system and alarm system;
 - c. positioning is to be performed on all possible combinations of position reference systems (PRSs), and on each PRS as a single system. Selecting and de-selecting of PRSs are also to be tested;
 - d. test to manual override function under normal operation and failure conditions;
 - e. continuous site test for at least 6 to 8 hours to the whole set of automatic system and any failure occurred is to be recorded and analyzed.

6.2.6.5 Survey to alteration of DP system

(1) Where a major alteration is made to the hardware or software of the DP system (i.e. adding a position reference system, installing more or different thruster(s) or adding a different control method, changes in power system, structural changes etc.), the owner or the entrusted shipyard is to advise CCS in a timely manner. CCS will consider the need for a re-survey or test.”

Section 4 SURVEYS RELATED TO CLASS NOTATIONS FOR MACHINERY

The existing paragraph 6.4.1 is deleted, and the existing paragraph 6.4.2 is renumbered as 6.4.1.

PART TWO HULL

CHAPTER 1 GENERAL

Section 2 HULL STRUCTURAL MEMBERS

The existing paragraph 1.2.6.2 is replaced by the following:

“The ends of secondary members are generally to be bracketed, see Figure 1.2.6.2. Where secondary members pass through primary members, secondary members are to be connected to the webs of primary members by welding.”

Section 4 WELD DESIGN FOR HULL STRUCTURES

A new paragraph 1.4.1.11 is added as follows:

“1.4.1.11 When arranging side joints of shell plating, the arrangement of longitudinal members such as deck plating, longitudinals and inner bottom margin plates are to be taken into account, avoiding coincidence of the side joints and fillet welds of longitudinal members or their intersection to an excessively small angle. The butt welds of end joint of the shell are to avoid the toes of internal longitudinal members and the fillet welding of transverse members as far as practicable.”

Section 6 CORROSION CONTROL FOR HULL STRUCTURES

The existing paragraph 1.6.1.2 is replaced by the following:

“1.6.1.2 All seawater ballast spaces having boundaries formed by the hull plating are to be applied with epoxy-based or equivalent coating system. For ships engaged on international voyages, protective coatings in dedicated seawater ballast tanks of all type of ships of not less than 500 gross tonnage and double-side skin spaces arranged in bulk carriers of 150 m in length and upwards are to comply with the requirements for coating systems of relevant specific spaces in CCS Guidelines for Anticorrosion Inspection of Hull Structure.

1.6.1.3 Except for those as specified in 1.6.1.2, the other spaces such as bilges in double bottom ships, spaces below solid floors of single bottom ships and cofferdams are to be applied with suitable protective coating, according to the service of the spaces.”

The existing paragraphs 1.6.1.3 to 1.6.1.5 are renumbered as 1.6.1.4 to 1.6.1.6 accordingly.

Section 8 SHIPS NAVIGATING IN RESTRICTED SERVICE

The existing paragraph 1.8.4.3 is replaced by the following:

“1.8.4.3 The rule scantlings in the following conditions are not to be reduced in accordance with the requirements in 1.8.4.1: the rule minimum thickness, scantlings of structural members for which ice strengthening and strengthening of bottom forward are required, and bulkhead, structural members of deep tanks and cargo tanks, inner bottom plating and framing for loading heavy cargoes, cargo deck framing, vehicle decks, pillars, stems, stern frames, propeller shaft brackets, rudders etc.”

Section 9 INTACT STABILITY

The existing paragraph 1.9.4.1 is replaced by the following:

“The intact stability of ships is to comply with the relevant requirements of IMO resolution MSC.267(85) — International Code on Intact Stability, 2008 (2008 IS Code).”

Section 12 STRUCTURAL ARRANGEMENT

In subparagraph 1.12.5.6(1), the words “margin line” are replaced by the words “bulkhead deck”.

The existing subparagraph 1.12.6.3(1) is replaced by the following:

“1.12.6.3(1) Side scuttles to the following spaces are to be fitted with hinged inside deadlights:

- ① spaces below freeboard deck;
- ② spaces within the first tier of enclosed superstructures; and
- ③ first tier deckhouses on the freeboard deck protecting openings leading below or considered buoyant in stability calculations.

Deadlights are to be capable of being closed and secured watertight if fitted below the freeboard deck and weathertight if fitted above.”

In subparagraphs 1.12.7.3(3) and (4), the reference to “1.12.7.4” is replaced by “1.12.7.4(6)”.

The existing paragraph 1.12.11 is replaced by the following:

“1.12.11 Arrangement of passenger ships above the bulkhead deck”.

In paragraph 1.12.11.4, the words “margin line” are replaced by the words “bulkhead deck”, the words “coaling ports” are replaced by the words “fuelling ports”, and the words “load line” are replaced by the word “draught”.

In paragraph 1.12.14.1, the word “2005” is replaced by the word “2006” and the words “...and within spaces in” are replaced by the words “...and within spaces in, and forward of,”.

A new paragraph 1.12.15.1 is added as follows:

“1.12.15.1 The following 1.12.15.2 ~ 1.12.15.4 apply to oil tankers of 500 gross tonnage and over and bulk carriers, referred to in paragraph 1.12.14.1, of 20000 gross tonnage and over.”

The existing paragraphs 1.12.15.1 to 1.12.15.4 are renumbered as 1.12.15.2 to 1.12.15.5 accordingly.

In paragraph 1.12.16.3, the words “smaller dimensions for the openings may be accepted” are replaced by the words “CCS accepts smaller dimensions for the openings approved by the Administration of the flag State”.

Section 13 MARKING OF OPERATING DRAFT OF WORKING SHIPS

The existing paragraph 1.13.2.1 is replaced by the following:

“1.13.2.1 For working ships intended for assignment of operating draught, the maximum operating draught is to be assigned in accordance with this Chapter, based on the minimum summer freeboard corresponding to type B freeboard as specified in the amendments to the protocol of 1988 relating to the International Convention on Load Lines, 1966 (IMO resolution MSC.143(77)).”

CHAPTER 2 HULL STRUCTURES

Section 2 LONGITUDINAL STRENGTH

In the formulae of subparagraph 2.2.7.5(2), “ h ” is replaced by “ h_w ” and “ b_w ” is replaced by “ b_f ”.

Section 7 SIDE FRAMING

In paragraph 2.7.2.8, the words “...actual span of frames, in m.” are replaced by the words “...span of frames, in m, being the vertical distance measured from the upper edge of floor to the side stringer (perforated flat), or distance between side stringers (perforated flats) or from the side stringer (perforated flat) to the lowest deck.”

Section 14 STEMS, STERN FRAMES, BULBOUS BOW, PROPELLER SHAFT BRACKETS AND RUDDER HORNS

In paragraph 2.14.6.2, the words “... of each strut and shaft bossing...” are replaced by the words “...of each strut and shaft bossing of herringbone propeller shaft bracket...”

CCS

CHAPTER 3 EQUIPMENT AND OUTFITS

Section 1 RUDDERS

In paragraph 3.1.4.6, the sentences “For semi-spade rudders as shown in Figure 3.1.4.6, the subjected forces are to be determined by direct calculation with the calculating mode as shown in Figure 3.1.4.6. In calculation, load is to be determined by the following formulae:” are replaced by “For semi-spade rudders as shown in Figure 3.1.4.6, the subjected forces are to be determined by direct calculation with the calculating mode as shown in Figure 3.1.4.6. In the Figure, e is the distance from the centreline of rudder stock to the centroid of section in way of $\frac{l_h}{2}$ rudder horn. In calculation, load is to be determined by the following formulae:”.

A new paragraph 3.1.8.7 is added as follows:

“3.1.8.7 For the cone connection with keys of rudder stock and tiller, see the requirements of 3.1.8.1 to 3.1.8.6 above.”

A new paragraph 3.1.11.6 is added as follows:

“3.1.11.6 For hydraulic cone connection of pintles and gudgeons, the thrust length is to be determined according to 3.1.9.2(1), where p is replaced by the thrust oil pressure of pintles P_{req} , to be calculated from the following formula:

$$P_{req} = 0.4 \frac{PD_c}{D_m^2 l} \quad \text{N/mm}^2$$

where: P — supporting force of pintle bearing, in N, to be calculated according to 3.1.4.6;

D_c — diameter of pintles, in mm, to be determined according to Figure 3.1.8.5;

D_m — mean diameter of cone, in mm, $D_m = (D_c + D_u)/2$, see for D_m , D_c , D_u in Figure 3.1.8.5;

l — length of cone, in mm, see Figure 3.1.8.5.”

Section 2 ANCHORING AND MOORING EQUIPMENT

The existing paragraph 3.2.2.1 is replaced by the following:

“3.2.2.1 The mass of individual bower anchors may vary within -3% to +7% of the mass given in Table 3.2.1.1(2) of this Section, provided that the total mass of the bower anchors is not to be less than that would have been required for anchors of equal mass.”

Section 7 SUPPORT STRUCTURE FOR DECK EQUIPMENT

The existing paragraph 3.7.2.4 is replaced by the following:

“3.7.2.4 The strength of securing of windlasses on fore deck is to be checked in accordance with the requirements of 3.2.5.”

CHAPTER 4 STRENGTHENING FOR NAVIGATION IN ICE

Section 1 GENERAL PROVISIONS

The existing paragraph 4.1.1.10 is replaced by the following:

“4.1.1.10 This paragraph and relevant technical requirements apply to ships with ice class notations other than class B.

- (1) The method for determining the hull scantlings is based on certain assumptions concerning the nature of the ice load on the structure. These assumptions are from full scale observations made in the northern Baltic.
- (2) It has thus been observed that the local ice pressure on small areas can reach rather high values. This pressure may be well in excess of the normal uniaxial crushing strength of sea ice. The explanation is that the stress field in fact is multiaxial.
- (3) Further, it has been observed that the ice pressure on a frame can be higher than on the shell plating at midspacing between frames. The explanation for this is the different flexural stiffness of frames and shell plating. The load distribution is assumed to be as shown in Figure 4.1.1.10.

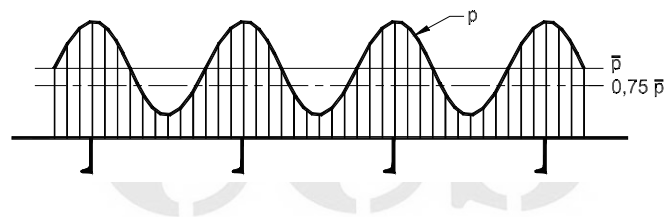


Figure 4.1.1.10 Ice load distribution on a ship's side

- (4) For the formulae and values given in this section for the determination of the hull scantlings more sophisticated methods may be substituted subject to approval by the administration or CCS.
- (5) If scantlings derived from these regulations are less than those required by other chapters and sections of the rules for an unstrengthened ship, the latter is to be used.

Note: The frame spacing and spans defined in this Chapter are normally assumed to be measured in a vertical plane parallel to the centreline of the ship. However, if the ship's side deviates more than 20° from this plane, the frame distances and spans are to be measured along the side of the ship.”

The existing paragraph 4.1.1.11 is deleted.

In paragraph 4.1.2.3, the sentence “The lower ice waterline (LIWL) is to be the lowest waterline at which the ship is intended to operate in ice.” is replaced by “The lower ice waterline (LIWL) is to be the lowest waterline at which the ship is intended to operate in ice. The waterline may be a broken line.”

Section 5 ICE STRENGTHENING CLASS B

The existing “4.5.2 Ice framing” is replaced by “4.5.2 Ice framing and longitudinals”.

A new paragraph 4.5.2.3 is added as follows:

“4.5.2.3 If longitudinal framing is fitted within the region from the stem to 0.075 L of the ship, the arrangement and scantling of longitudinals within the region are to comply with the following requirements:

- (1) Continuous intermediate longitudinals are to be fitted within the region, and the vertical extent is to be the same as that of intermediate frames as specified in 4.5.2.1 of this Chapter;
- (2) The distance between intermediate longitudinals and adjacent longitudinals within the region is not to be greater than 0.5 m;
- (3) The section modulus of longitudinals and intermediate longitudinals within the region is to comply with applicable requirements of 2.7.5 of Chapter 2, but the spacing of longitudinals s is to be taken as 1.5 times the distance between intermediate longitudinals and adjacent longitudinals during calculation.”

A new paragraph 4.5.2.4 is added as follows:

“4.5.2.4 Tripping brackets are to be fitted in accordance with 4.3.4.2(1) in way of inclined frames being fitted to the ice shell plating.”



CHAPTER 5 DOUBLE HULL OIL TANKERS

Section 5 DOUBLE SKIN CONSTRUCTION

The existing paragraph 5.5.2.3 is replaced by the following:

“5.5.2.3 Transverse framing or vertical webs in wing ballast tanks are to be provided in line with double bottom transverses and the spacing of transverse framing or vertical webs is not to be greater than $0.006L+3.2$ m. Transverse framing or vertical webs, deck transverses of cargo tanks, vertical girders of longitudinal bulkheads, cross ties between inner skin and longitudinal bulkheads or between longitudinal bulkheads (if provided, see Figure 5.1.5.2(2) of Section 1 of this Chapter) and double bottom transverses form transverse strength frame ring.”

In paragraph 5.5.6.3, the sentence “Non-watertight transverse webs supporting longitudinals of ship side and inner shell are to be provided at the same frame of bottom transverse in double skin.” is replaced by “Non-watertight transverse webs in double skin supporting longitudinals of ship side and inner shell are to be provided in line with double bottom transverse.”

Section 10 CORRUGATED LONGITUDINAL OILTIGHT BULKHEADS IN CARGO TANK REGION

In paragraph 5.10.3.3, the sentences “The width of bottom flat portion is not to be less than the depth of bottom transverses. The width of top flat portion is not to be less than the depth of web beam. They are all not to be less than $0.1D$.” are replaced by “Both the width of bottom and top flat portion are not to be less than $0.1D$ for ships of more than 150 m in length.”

CHAPTER 7 CONTAINER SHIPS

Appendix 1 CONTAINER SECURING ARRANGEMENTS

In paragraph 4.6.2, the formula is replaced by the following:

$$Q_k(C_{sk} + kC_c) + (kQ_i + kQ_j)C_c + \delta_k = C_c[(H_{k+1} + H_{k+2} + H_{k+3} + H_{k+4})k + \sum_{r=1}^k H_r(r - \frac{1}{2})]$$

$$Q_j(C_{sj} + jC_c) + jQ_iC_c + \delta_j = C_c[(H_{j+1} + H_{j+2})j + \sum_{r=1}^j H_r(r - \frac{1}{2})]$$

$$Q_i(C_{si} + iC_c) + \delta_i = C_c[H_{i+1}i + \sum_{r=1}^i H_r(r - \frac{1}{2})]$$

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CHAPTER 10 TUGS

Section 5 TOWING ARRANGEMENTS AND SUPPORTING STRUCTURE

In paragraph 10.5.1.1, the words “towing winches” are replaced by the words “the position of fixed towing guide point”.

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PART THREE MACHINERY INSTALLATIONS

CHAPTER 2 PUMPING AND PIPING SYSTEMS

Section 8 ARRANGEMENT

In the existing paragraph 2.8.9.1(2), the sentence “The thickness of the distance piece is to comply with the requirements in Table 5.3.4.2 of this PART.” is replaced by “The wall thickness of the distance piece is to comply with the requirements in Table 5.3.4.2 of this PART, or may be same as that of the shell plating in way of its penetration into the distance piece.”

In the existing paragraph 2.8.9.5, the sentence “Wall thickness of pipes between inner bulkhead and shell plate of wing tank is to meet the requirements of Table 5.3.4.2 of this PART.” is replaced by “The wall thickness of pipes between inner bulkhead and shell plate of wing tank is to comply with the requirements in Table 5.3.4.2 of this PART, or may be same as that of the shell plating in way of its penetration into the pipes.”

Appendix 1 PRODUCTION AND APPLICATION OF PLASTIC PIPES ON SHIPS

The following new text is added to the end of 1.5.4:

“Alternatively, for pipes and fittings not employing hand lay-up techniques, the hydrostatic pressure test may be carried out in accordance with the hydrostatic testing requirements stipulated in the recognised national or international standard accepted by CCS to which the pipe or fittings are manufactured, provided that there is an effective quality system in place.”

A new paragraph 1.5.7 is added as follows:

“1.5.7 Depending upon the intended application, CCS may require the pressure testing of each pipe and/or fitting.”

CHAPTER 3 SHIP'S PIPING AND VENTILATING SYSTEMS

Section 4 BILGE PUMPS AND BILGE PIPING

In the existing Table 3.4.1.1, the words “Service criteria number” are replaced by “Bilge pump numeral”.

A new paragraph 3.4.1.5 is added as follows:

“3.4.1.5 For passenger ships, the bilge pump numeral C is to be calculated as follows:

$$\text{when } P_1 \text{ is greater than } P: C = \frac{72(M + 2P_1)}{V + P_1 - P}$$

$$\text{in other cases: } C = \frac{72(M + 2P)}{V}$$

where: M — the volume of the machinery space, in m^3 , as defined in SOLAS regulation II-1/2, that is below the bulkhead deck; with the addition thereto of the volume of any permanent oil fuel bunkers which may be situated above the inner bottom and forward of, or abaft, the machinery space;

V — the whole volume of the ship below the bulkhead deck, in m^3 ;

P — the whole volume of the passenger and crew spaces below the bulkhead deck, in m^3 , which are provided for the accommodation and use of passengers and crew, excluding baggage, store, provision and mail rooms;

$$P_1 = KN$$

where: N — the number of passengers for which the ship is to be certified; and

$$K = 0.056L$$

where: L — the length of the ship, in m , as defined in SOLAS regulation II-1/2.

However, where the value of KN is greater than the sum of P and the whole volume of the actual passenger spaces above the bulkhead deck, the figure to be taken as P_1 is that sum or two-thirds KN , whichever is the greater.”

Section 5 ADDITIONAL REQUIREMENTS FOR BILGE DRAINAGE FOR PASSENGER SHIPS

In the existing paragraph 3.5.1.2, the words “criterion numeral” are replaced by “bilge pump numeral”.

Section 6 ADDITIONAL REQUIREMENTS FOR BILGE DRAINAGE

A footnote “①” is added at the end of the existing paragraph 3.6.2:

“① Refer to MSC.1/Circ.1320: Guidelines for the Drainage of Fire-fighting Water from Closed Vehicle and Ro-Ro Spaces and Special Category Spaces of Passenger and Cargo Ships.”

A new paragraph 3.6.2.2 is added as follows:

“3.6.2.2 On all ships, for closed vehicles and ro-ro spaces and special category spaces, where fixed pressure water-spraying systems are fitted, means are to be provided to prevent the blockage of drainage arrangements.”

Section 11 VENTILATION

In the existing paragraph 3.11.1.1, the words “Machinery spaces of category A” are replaced by “Machinery spaces of category A and other machinery spaces essential for propulsion of the ship”.

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CHAPTER 5 PIPING SYSTEM FOR OIL TANKERS

Section 1 GENERAL PROVISIONS

In the existing paragraph 5.1.1.1, the words “Section 6 of this Chapter” are replaced by “Section 8 of this Chapter”.

Section 4 CARGO OIL HEATING

New paragraphs 5.4.3.2, 5.4.3.3 and 5.4.3.4 are added as follows:

“5.4.3.2 The heating oil supply and return lines are not to penetrate the cargo tank plating, other than at the top of the tank.

5.4.3.3 Isolating shut-off valves are to be provided at the inlet and outlet connections to the heating oil circuit(s) of each tank.

5.4.3.4 Spectacle flanges or spool pipes are to be provided in the heating oil supply and return pipes to the cargo heating system, at a suitable position within the cargo area, so that the lines can be blanked off in circumstances where the cargo does not require to be heated or where the heating coils have been removed from the tanks.”

Section 8 REQUIREMENTS FOR OIL TANKERS INTENDED FOR CARRIAGE OF CARGO OIL HAVING A FLASH POINT EXCEEDING 60°C

In the existing paragraph 5.8.1.1, the words “5.3.2.1, 5.3.2.2” are replaced by “5.3.1.5”.

The existing paragraph 5.8.1.2 is deleted.

CHAPTER 9 DIESEL ENGINES

Appendix 2 GUIDELINES FOR ELECTRONICALLY CONTROLLED DIESEL ENGINES

In the existing paragraph 2.3.1, the words “electronic control system” are replaced by “fuel oil, lubricating oil, hydraulic, starting air, cooling water, and control and safety systems of the electronically controlled diesel engine”.

Appendix 6 PROGRAM FOR TRIALS OF I.C. ENGINES TO ASSESS OPERATIONAL CAPABILITY

The existing paragraph 2.1.1(5) is replaced by the following:

“(5) In reverse direction of propeller rotation at a minimum engine speed of $n = 0.7 n_0$: 10 min;”.

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CHAPTER 10 TRANSMISSION GEARING

Appendix 1 APPRAISAL OF GEAR STRENGTH

4 Alignment

The existing paragraph 4.2 is replaced by the following:

“4.2 Alignment calculation including gear force

4.2.1 The force of bearing in operation condition

When the gearbox is in static condition, only vertical static counterforce goes with the supporting bearing. Considering the influence of gearbox expansion in thermal state, the vertical static counterforce also goes with the supporting bearing. But when in operation condition, due to the influence of the gear force, not only supporting force changes, but the acting direction changes.

4.2.2 Calculation for dynamic resultants

Take the X-axis as along the gear shaft centerline, and the positive direction is from aft to fore wheel bearings. The Y-axis is perpendicular to the X-axis, with the upward direction as positive direction. The direction of Z-axis is determined by the right-hand rule.

Take the angle between the Y-axis and the line connecting gear engaged point and driven gear center as ψ , with the clockwise direction as positive direction.

θ_f and θ_a are angles between the Z-axis and the dynamic resultants on fore and aft bearings, with the counter-clockwise direction as positive direction.

L_1 is the distance between gear centerline and aft bearing; L_2 is the distance between gear centerline and fore bearing.

Take the upward direction (Y direction) as positive for counterforce on bearings; take the right direction (Z direction) as positive for counterforce on bearings while observed from aft to left bearings.

Figure 1 shows the various forces that the final pinion with double gear ratio acts on wheel.

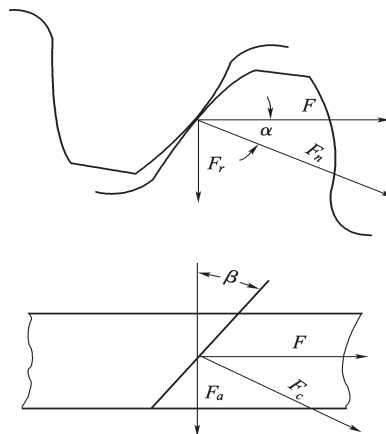


Figure 1 Forces acting on pinion

For spur gear and single helical gear, the dynamic resultants acting on bearings and acting directions are calculated in accordance with the following formulae:

(1) Counterforce which gear tangential force acts on fore and aft bearings

Tangential force F_t acting on wheel is:

$$F_t = 2T_1/d_1 \quad \text{kN} \quad (1)$$

where: T_1 — transmission torque acting on pinion, in N•m:

$$T_1 = 9550P u_2/n_e \quad (2)$$

where: P — propelling power transmitted by the reduction gear of the gearbox, in kW;

n_e — rated speed of the main engine, in r/min;

u_2 — gear ratio;

d_1 — working diameter of pinion, in mm.

The component of tangential force F_t acting on wheel in the Z direction, F_{tz} , is:

$$F_{tz} = F_t \cos\psi = 2T_1 \cos\psi/d_1 \quad \text{kN} \quad (3)$$

The component of tangential force F_t acting on wheel in the Y direction, F_{ty} , is:

$$F_{ty} = F_t \sin\psi = 2T_1 \sin\psi/d_1 \quad \text{kN} \quad (4)$$

The counterforce which gear tangential force acts on fore bearing in the Z direction, F_{tzf} , is:

$$F_{tzf} = \pm 2T_1 L_1 \cos\psi / ((L_1 + L_2)d_1) \quad \text{kN} \quad (5)$$

The counterforce which gear tangential force acts on aft bearing in the Z direction, F_{tza} , is:

$$F_{tza} = \pm 2T_1 L_2 \cos\psi / ((L_1 + L_2)d_1) \quad \text{kN} \quad (6)$$

The counterforce which gear tangential force acts on fore bearing in the Y direction, F_{tyf} , is:

$$F_{tyf} = \pm 2T_1 L_1 \sin\psi / ((L_1 + L_2)d_1) \quad \text{kN} \quad (7)$$

The counterforce which gear tangential force acts on aft bearing in the Y direction, F_{tya} , is:

$$F_{tya} = \pm 2T_1 L_2 \sin\psi / ((L_1 + L_2)d_1) \quad \text{kN} \quad (8)$$

Observed from aft to fore bearings, when the driven wheel rotates counter-clockwise, formulae (5) and (6) take positive, formulae (7) and (8) take negative; when it rotates clockwise, formulae (5) and (6) take negative, formulae (7) and (8) take positive.

(2) Counterforce which gear radial force F_r acts on fore and aft bearings

Radial force F_r is:

$$F_r = F_t \tan\alpha_n / \cos\beta \quad \text{kN} \quad (9)$$

where: α_n — normal engaged angle, in $^\circ$.

β — helix angle at spur helical gear, in $^\circ$.

The component of radial force F_r in the Z direction, F_{rz} , is:

$$F_{rz} = F_r \sin \psi = F_t \operatorname{tg} \alpha_n \sin \psi / \cos \beta \quad \text{kN} \quad (10)$$

The component of radial force F_r in the Y direction, F_{ry} , is:

$$F_{ry} = F_r \cos \psi = F_t \operatorname{tg} \alpha_n \cos \psi / \cos \beta \quad \text{kN} \quad (11)$$

The counterforce which gear radial force acts on fore bearing in the Z direction, F_{rzf} , is:

$$F_{rzf} = F_t L_1 \operatorname{tg} \alpha_n \sin \psi / ((L_1 + L_2) \cos \beta) \quad \text{kN} \quad (12)$$

The counterforce which gear radial force acts on aft bearing in the Z direction, F_{rza} , is:

$$F_{rza} = F_t L_2 \operatorname{tg} \alpha_n \sin \psi / ((L_1 + L_2) \cos \beta) \quad \text{kN} \quad (13)$$

The counterforce which gear radial force acts on fore bearing in the Y direction, F_{ryf} , is:

$$F_{ryf} = F_t L_1 \operatorname{tg} \alpha_n \cos \psi / ((L_1 + L_2) \cos \beta) \quad \text{kN} \quad (14)$$

The counterforce which gear radial force acts on aft bearing in the Y direction, F_{rya} , is:

$$F_{rya} = F_t L_2 \operatorname{tg} \alpha_n \cos \psi / ((L_1 + L_2) \cos \beta) \quad \text{kN} \quad (15)$$

(3) Counterforce which gear axial force F_a acts on fore and aft bearings

Axial force F_a is:

$$F_a = F_t \operatorname{tg} \beta \quad \text{kN} \quad (16)$$

The counterforce which gear axial force acts on fore bearing in the Z direction, F_{azf} , is:

$$F_{azf} = \pm F_t d_1 \operatorname{tg} \beta \sin \psi / (2(L_1 + L_2)) \quad \text{kN} \quad (17)$$

The counterforce which gear axial force acts on fore bearing in the Y direction, F_{ayf} , is:

$$F_{ayf} = \pm F_t d_1 \operatorname{tg} \beta \cos \psi / (2(L_1 + L_2)) \quad \text{kN} \quad (18)$$

For formulae (17) and (18), if, observed from aft to fore bearings, the wheel rotates counter-clockwise and is right-hand teeth, F_{azf} and F_{ayf} are positive; if the wheel rotates counter-clockwise and is left-hand teeth, F_{azf} and F_{ayf} are negative; if the wheel rotates clockwise and is right-hand teeth, F_{azf} and F_{ayf} are negative; if the wheel rotates clockwise and is left-hand teeth, F_{azf} and F_{ayf} are positive.

F_{aza} , the counterforce which gear axial force acts on aft bearing in the Z direction, and F_{azf} are equal in magnitude and opposite in direction; F_{aya} , the counterforce which gear axial force acts on aft bearing in the Y direction, and F_{ayf} are equal in magnitude and opposite in direction.

(4) Counterforce which gear weight acts on fore and aft bearings

The counterforce which gear weight acts on fore bearing, R_{ff} , is:

$$R_{ff} = 0.0098 G_1 L_1 / (L_1 + L_2) \quad \text{kN} \quad (19)$$

The counterforce which gear weight acts on aft bearing, R_{af} , is:

$$R_{a1} = 0.0098G_1L_2/(L_1 + L_2) \quad \text{kN} \quad (20)$$

where: G_1 — gear weight, in kg.

(5) Counterforce which flange output shaft acts on fore and aft bearings

Case 1: if the center of gravity of flange output shaft is between the fore and aft bearings, then:

the counterforce which flange output shaft acts on fore bearing, R_{f2} , is:

$$R_{f2} = 0.0098G_2L_3/(L_3 + L_4) \quad \text{kN} \quad (21)$$

the counterforce which flange output shaft acts on aft bearing, R_{a2} , is:

$$R_{a2} = 0.0098G_2L_4/(L_3 + L_4) \quad \text{kN} \quad (22)$$

where, for formulae (21) and (22),

G_2 — weight of flange output shaft, in kg;

L_3 — distance between the gravity center of flange output shaft and the aft bearing, in mm;

L_4 — distance between the gravity center of flange output shaft and the fore bearing, in mm.

Case 2: if the center of gravity of flange output shaft is on the left of (behind) the aft bearing, then:

the counterforce which flange output shaft acts on fore bearing, R_{f2} , is:

$$R_{f2} = -0.0098G_2L_3/(L_4 - L_3) \quad \text{kN} \quad (23)$$

the counterforce which flange output shaft acts on aft bearing, R_{a2} , is:

$$R_{a2} = 0.0098G_2L_4/(L_4 - L_3) \quad \text{kN} \quad (24)$$

Dynamic resultants F_f, F_a acting on fore and aft bearings and acting direction θ_f, θ_a is:

$$F_f = \left[(F_{tzf} + F_{rzf} + F_{azf})^2 + (F_{tyf} + F_{ryf} + F_{ayf} + R_{f1} + R_{f2})^2 \right]^{1/2} \quad \text{kN} \quad (25)$$

$$\theta_f = \text{tg}^{-1} \left[(F_{tyf} + F_{ryf} + F_{ayf} + R_{f1} + R_{f2}) / (F_{tzf} + F_{rzf} + F_{azf}) \right] \quad (^\circ) \quad (26)$$

$$F_a = \left[(F_{tza} + F_{rza} + F_{aza})^2 + (F_{tya} + F_{rya} + F_{aya} + R_{a1} + R_{a2})^2 \right]^{1/2} \quad \text{kN} \quad (27)$$

$$\theta_a = \text{tg}^{-1} \left[(F_{tya} + F_{rya} + F_{aya} + R_{a1} + R_{a2}) / (F_{tza} + F_{rza} + F_{aza}) \right] \quad (^\circ) \quad (28)$$

where: F_{tzf}, F_{tza} — counterforce which gear tangential force acts on fore and aft bearings in the Z direction, in kN, see formulae (5) and (6);

F_{tyf}, F_{tya} — counterforce which gear tangential force acts on fore and aft bearings in the Y direction, in kN, see formulae (7) and (8);

F_{rzf}, F_{rza} — counterforce which gear radial force acts on fore and aft bearings in the Z direction, in kN, see formulae (12) and (13);

F_{ryf}, F_{rya} — counterforce which gear radial force acts on fore and aft bearings in the Y direction, in kN, see formulae (14) and (15);

F_{azf}, F_{aza} — counterforce which gear axial force acts on fore and aft bearings in the Z direction, in kN, see formula (17);

F_{ayf}, F_{aya} — counterforce which gear axial force acts on fore and aft bearings in the Y direction, in kN, see formula (18);

- R_{f1}, R_{a1} — counterforce which gear weight acts on fore and aft bearings, in kN, see formulae (19) and (20);
 R_{f2}, R_{a2} — counterforce which flange output shaft acts on fore and aft bearings, in kN, see formulae (21), (22), (23) and (24);
 F_f, F_a — dynamic resultants on fore and aft bearings, in kN;
 θ_f, θ_a — acting angle of dynamic resultants on fore and aft bearings, ($^\circ$).

Obviously, due to the influence of gear force, under operation condition, dynamic resultants of fore and aft bearings of wheels and its acting direction are different from force of alignment calculation for shafting thermal state and its direction.

If the pinion is right above the wheel, then:

Dynamic resultants F_f, F_a acting on fore and aft bearings and acting direction θ_f, θ_a is:

$$F_f = \left[(F_{tzf})^2 + (F_{ryf} + F_{ayf} + R_{f1} + R_{f2})^2 \right]^{1/2} \quad \text{kN} \quad (29)$$

$$\theta_f = \text{tg}^{-1} \left[(F_{ryf} + F_{ayf} + R_{f1} + R_{f2}) / F_{tzf} \right] \quad (^\circ) \quad (30)$$

$$F_a = \left[(F_{tza})^2 + (F_{rya} + F_{aya} + R_{a1} + R_{a2})^2 \right]^{1/2} \quad \text{kN} \quad (31)$$

$$\theta_a = \text{tg}^{-1} \left[(F_{rya} + F_{aya} + R_{a1} + R_{a2}) / F_{tza} \right] \quad (^\circ) \quad (32)$$

where: $F_{tzf} = \pm 2T_1 L_1 / ((L_1 + L_2)d_1)$ kN (33)

$$F_{tza} = \pm 2T_1 L_2 / ((L_1 + L_2)d_1)$$
 kN (34)

$$F_{ryf} = F_t L_1 \text{tg} \alpha_n / ((L_1 + L_2) \cos \beta)$$
 kN (35)

$$F_{rya} = F_t L_2 \text{tg} \alpha_n / ((L_1 + L_2) \cos \beta)$$
 kN (36)

$$F_{ayf} = -F_{ayf} = \pm F_t d_1 \text{tg} \beta \cos \psi / (2(L_1 + L_2))$$
 kN (37)

Figure 2 shows the counterforce on fore and aft wheel bearings when the pinion is right above the wheel.

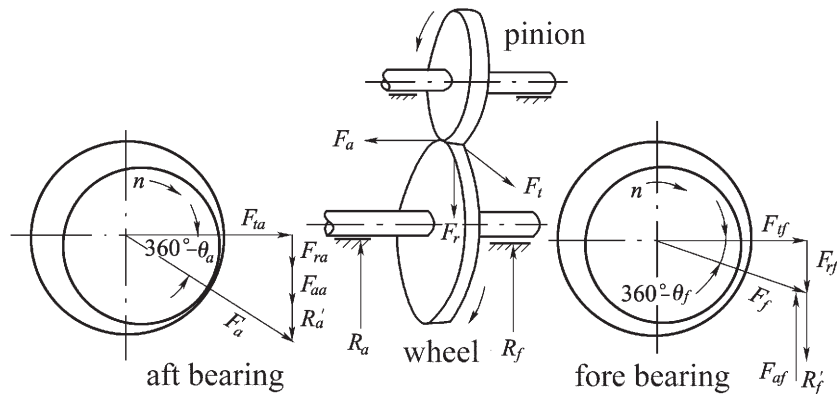


Figure 2 Counterforce on the wheel bearings

The following are added at the end of the existing paragraph 4.4.1:

“Angle between the Y-axis and the line connecting gear engaged point and driven gear center ψ

Distance between gear centerline and fore bearing L_1

Distance between gear centerline and aft bearing L_2 ”.

CHAPTER 11 SHAFTING AND PROPELLERS

Section 3 SHAFT TRANSMISSION UNITS

In the existing paragraph 11.3.6.13, the words “the working pressure” are replaced by “the design pressure” and the words “but need not exceed the design pressure plus 7 MPa” are added at the end of the paragraph.

Section 4 PROPELLERS

Definition of parameter α_1 is added to the end of the existing paragraph 11.4.5.2 as follows:

“ α_1 — coefficient of linear expansion of propeller shaft material”.

The following are added at the end of the existing paragraph 11.4.5.3:

“Maximum pull-up length at 35°C:

$$S_{\max} = \frac{P_{\max}}{P_{35}} S_{35} - \frac{35(\alpha_2 - \alpha_1)d_1}{K} \text{ mm}”$$

CCS

CHAPTER 13 STEERING GEAR AND WINDLASSES

Section 1 STEERING GEAR

In the existing subparagraph 13.1.12.4(1), the sentence “If the vessel cannot be tested at the deepest draught, alternative trial methods are to be submitted.” is replaced by “If the vessel cannot be tested at the deepest draught, alternative trial methods may be submitted subject to agreement of the flag State Administration.”

CCS

PART FOUR ELECTRICAL INSTALLATIONS

CHAPTER 1 GENERAL

Section 1 GENERAL PROVISIONS

A new subparagraph 1.1.3.1(25) is added as follows:

“(25) All electrical equipment located in hazardous areas together with the following associated information are to be indicated in their arrangement plan:

- ① type of protection, explosion group and temperature class;
- ② degree of protection;
- ③ hazardous classification of the area where the electrical equipment is installed (if hazardous area classification is not indicated in the plan).”

Section 3 DESIGN, CONSTRUCTION AND INSTALLATION

A new phrase is added after the words “IP44” in 1.3.2.3 as follows:

“, except where evidence of suitability is submitted to and approved by CCS”.

In the existing paragraph 1.3.2.4, the words “e.g. position of inlet ventilation openings, filters, baffles, etc. to prevent or restrict the ingress of water mist/spray into the equipment” are replaced by “e.g. position of inlet ventilation openings, cooling airflow for the equipment is to be assured”.

In the existing Figure 1.3.2.3, the words “Evidence of Suitability” and “IP44” are deleted.

In the existing Table 1.3.4.4, the lines relating to “Special fixed earthing conductor” are replaced by the following:

| Types of earthing conductor | Cross sectional area of associated current carrying conductor S (mm ²) | Minimum cross sectional area of copper earthing conductor Q (mm ²) |
|----------------------------------|--|--|
| Special fixed earthing conductor | $S \leq 2.5$ | $Q = S$, but at least 1.5 |
| | $2.5 < S \leq 120$ | $Q = S/2$, but at least 4 |
| | $S > 120$ | $Q = 70$ |

CHAPTER 2 ELECTRICAL INSTALLATIONS IN SHIPS

Section 1 MAIN SOURCE OF ELECTRICAL POWER

In the existing paragraph 2.1.3.1, the words “if they ... of this Section” in the first sentence are replaced by “if they constitute the necessary parts of lighting system and main electric power source system as required in 2.1.1.1 of this Section”.

Section 4 POWER SUPPLY AND DISTRIBUTION

A new paragraph 2.4.12 is added as follows:

“2.4.12 Power supply to safety, control and alarm systems of prime movers

2.4.12.1 The prime movers referred to in this paragraph mean diesel engines, gas turbines and steam turbines, etc. that drive the electric generators which comprise the main source of electric power.

2.4.12.2 The safety, control and alarm systems of prime movers are to be supplied by two independent power sources, which and associated wiring are to be such that the requirements of 2.1.1.1(2) of this Chapter can be met in case of single failure.”

A new paragraph 2.4.13 is added as follows:

“2.4.13 Power supply to electronic control system of diesel engines

2.4.13.1 The power supply to electronic control systems of diesel engines is to comply with the requirements of 2.2.4 of Appendix 2 to Chapter 9 of PART THREE.”

Section 5 PROTECTION

In the existing paragraph 2.5.9.1, the following words are added after “switch and fuses”:
“, except for transitional emergency lighting feeders only fuses may be used”.

Section 7 LIGHTING AND NAVIGATION LIGHTS

The existing paragraph 2.7.3.4 is replaced by the following:

“2.7.3.4 No local switch is to be installed in the transitional emergency lighting feeders.”

Section 9 SAFETY SYSTEMS FOR SHIPS AND PERSONS ONBOARD

In the existing paragraph 2.9.1.1, the words “cargo ships of 300 gross tonnage and above” are replaced by “cargo ships of 500 gross tonnage and above”.

In the existing paragraph 2.9.2.1, the words “cargo ships of 300 gross tonnage and above” are replaced by “cargo ships of 500 gross tonnage and above”.

The first sentence in 2.9.3.1 is replaced by the following:

“In any ro-ro spaces and other protected spaces where personnel normally work or have access, automatic audible and visual alarms are to be provided for discharge of fire extinguishing medium.”

In the existing paragraph 2.9.9, the words “of 80 m or above in length” are deleted.

In the existing paragraph 2.9.9.1, the first sentence is replaced by the following:

“For sliding watertight doors provided to ensure the watertight integrity of internal openings which are used while at sea, their operation, control and indicators are to comply with the following requirements:”

Section 16 ADDITIONAL REQUIREMENTS FOR OIL TANKERS

Paragraph 2.16.7.5 is deleted and the existing paragraph 2.16.7.6 is renumbered as 2.16.7.5.

CCS

CHAPTER 3 CONSTRUCTION AND TESTING OF ELECTRICAL EQUIPMENT

Section 3 SWITCHGEAR ASSEMBLIES

The existing subparagraph 3.3.2.1(6) is replaced by the following:

“(6) Where the total capacity of the main generating sets exceeds 100 kVA, a separate cubicle is to be provided for each generator, and the cubicles are to be separated from each other by partitions of steel or flame-retardant material.”

Section 5 CABLES

In the existing paragraph 3.5.5.4, the words “including asbestos,” are deleted.

In the existing paragraph 3.5.6.9 the word “asbestos,” is deleted.

CCS

PART SIX FIRE PROTECTION, DETECTION AND EXTINCTION

CHAPTER 1 GENERAL

Section 1 GENERAL PROVISIONS

The existing paragraph 1.1.5.4 is replaced by the following:

“1.1.5.4 Tankers carrying products having a flash point exceeding 60°C (closed-cup test) are to be dealt with as cargo ships of equivalent tonnage, in addition to complying with the following requirements:

- (1) Isolation valves used for the fire mains of water fire-extinguishing systems are to be fitted in the fire main at the poop front in a protected position and on the tank deck at intervals of not more than 40 m to preserve the integrity of the fire main system in case of fire or explosion.
- (2) Four fire-fighter's outfits are to be provided.
- (3) In lieu of the fixed fire-extinguishing system for tanks, they are to be fitted with a fixed deck foam system complying with requirements.”

The existing paragraph 1.1.7.3 is replaced by the following:

“1.1.7.3 In addition to complying with the requirements of this PART, the electrical equipment and electronic devices in fire detection systems and other detection and alarm systems used for periodically unattended machinery spaces are to be in compliance with the relevant requirements of PART SEVEN of the Rules.”

The existing paragraph 1.1.7.5 is deleted.

CHAPTER 3 FIRE SAFETY MEASURES

Section 3 PROTECTION OF CARGO PUMP ROOMS

The existing paragraph 3.3.1.4(1) is replaced by the following:

“(1) Where a system for sequential sampling is used for sampling of pump rooms including exhaust ducts, the time between two samplings of a same position is to be reasonably short.”

CCS

PART SEVEN AUTOMATION AND REMOTE CONTROL

CHAPTER 3 REQUIREMENTS FOR CLASS NOTATION AUT-0 OF PERIODICALLY UNATTENDED MACHINERY SPACES

Section 5 AUXILIARY MACHINERY

The existing paragraph 3.5.2.2 is deleted.

The existing paragraph 3.5.2.3 is renumbered as 3.5.2.2.

Section 10 AUTOMATIC CONTROL AND MONITORING ITEMS

Table 3.10.1.1 is supplemented as follows, covering 2:

| Item | CCS | | Mode of protective control action | Mode of alarm at BCS | Remarks |
|--|--|-------------|-----------------------------------|----------------------|--|
| | Display | Limit alarm | | | |
| 1 | 2 | 3 | 4 | 5 | 6 |
| 2 Auxiliary diesel engines [▲] | | | | | |
| Power supply for control-safety-alarm systems (electrical, pneumatic and hydraulic pressure) | Electrical, pneumatic and hydraulic pressure | Loss | — | S | Indication of voltage may be replaced by indicating lamp |

**CHAPTER 4 REQUIREMENTS FOR MACHINERY NOTATIONS OF
CONSTANTLY ATTENDED MACHINERY SPACES**

Section 2 REQUIREMENTS FOR AUTOMATION OF SHIPS WITH CLASS NOTATION MCC

Table 4.2.6.1 is supplemented as follows, covering 2:

| Item | CCS | | Mode of protective control action | Remarks |
|--|--|-------------|-----------------------------------|--|
| | Display | Limit alarm | | |
| 1 | 2 | 3 | 4 | 5 |
| 2 Auxiliary diesel engines [▲] | | | | |
| Power supply for control-safety-alarm systems (electrical, pneumatic and hydraulic pressure) | Electrical, pneumatic and hydraulic pressure | Loss | — | Indication of voltage may be replaced by indicating lamp |

CCS

PART EIGHT ADDITIONAL REQUIREMENTS

The full text of Chapter 3 is replaced by the following:

“CHAPTER 3 ADDITIONAL REQUIREMENTS FOR OIL RECOVERY SHIPS

Section 1 GENERAL PROVISIONS

3.1.1 General requirements

3.1.1.1 The requirements of Sections 1 to 5 of this Chapter apply to steel ships equipped for the recovery of oil floating on the sea with a flash point not exceeding 60°C (closed-cup test) and a Reid vapour pressure below atmospheric pressure, as required for the class notations in paragraphs 3.1.2.1 and 3.1.2.2.

The requirements of Section 6 of this Chapter apply to steel ships equipped for the recovery of oil floating on the sea with a flash point exceeding 60°C (closed-cup test) and a Reid vapour pressure below atmospheric pressure, as required for the class notation in paragraph 3.1.2.3.

3.1.1.2 The ship is to be capable of the following operations at a safe distance from the source of oil spill:

- ① recovery of floating oil from the surface of the sea;
- ② handling, storage and transportation of the recovered oil.

3.1.1.3 The other auxiliary ships associated with operations of oil recovery ships may be dealt with by referring to this Chapter.

3.1.2 Class notations

3.1.2.1 Oil recovery ships equipped with means for the recovery and discharge of oil as well as with tanks for storing the recovered oil and complying with the requirements of Sections 1 to 5 of this Chapter will be assigned the class notation Oil Recovery Ship with Cargo Tank.

3.1.2.2 Oil recovery ships without tanks for storing the recovered oil equipped with means for the recovery, but not for discharge of oil and complying with the requirements of Sections 1 to 5 of this Chapter will be assigned the class notation Oil Recovery Ship without Cargo Tank.

3.1.2.3 Oil recovery ships equipped with means for the recovery of oil and complying with the requirements of Section 6 of this Chapter will be assigned the class notation Oil Recovery Ship not suitable for products with a flash point of 60°C and less.

3.1.3 Definitions

3.1.3.1 *Oil recovery ship* means a steel ship specially or also engaged in the recovery of oil floating on the sea.

3.1.3.2 *Gas-hazardous zone* means an area in which flammable or explosive gas or vapor is liable to accumulate to a dangerous concentration. The gas-hazardous zones may be divided into the following categories:

(1) *Hazardous zone of Category 0* means an area in which the mixture of flammable or explosive gas or vapor with air exists continuously or for long time.

(2) *Hazardous zone of Category 1* means an area in which the mixture of flammable or explosive gas or vapor with air may occur during normal operation.

3.1.3.3 *Source of oil spill* means the source from which the oil floating on the sea originates, e.g. from an oil tanker, a submarine oil pipeline or an offshore drilling unit.

3.1.4 Division of gas-hazardous zones and safe areas

3.1.4.1 The following areas or spaces of oil recovery ships are to be regarded as gas-hazardous zones:

(1) Hazardous zones of Category 0:

- ① recovered oil tanks;
- ② the interiors of piping systems and containers of the containment system for recovered oil.

(2) Hazardous zones of Category 1:

- ① cofferdams or other spaces adjacent to any recovered oil tank except for 3.2.2.6;
- ② enclosed or semi-enclosed spaces in which pipe flanges, valves, hoses, pumps and other equipment for handling of recovered oil are located;
- ③ spaces including semi-enclosed spaces on open deck within a 3 m radius of the separator, the hoses and valves used for oil recovery, the openings of recovered oil tanks and the openings of spaces within the hazardous zones of Category 1 such as pump rooms or cofferdams;
- ④ space on open deck above recovered oil tanks, extending 3 m respectively fore and aft of this area to a height of 2.4 m;
- ⑤ any enclosed space outside a recovered oil tank, through which recovered oil piping passes or in which such piping terminates, may be excluded, provided that ventilation is fitted as specified in 3.2.5.4 of Section 2;
- ⑥ enclosed or semi-enclosed spaces which can be entered directly from hazardous zones of Category 1 (without air lock) or which have openings into hazardous zones of Category 1 may be excluded, provided that ventilation is fitted as specified in 3.2.5.4 of Section 2.

3.1.4.2 The areas outside the above-mentioned gas-dangerous zones are safe areas.

3.1.5 Plans and documents

3.1.5.1 The relevant plans and documents as specified in the relevant chapters of the Rules and in addition, the following ones are to be submitted for approval:

- (1) General arrangement of equipment for oil recovery operations;
- (2) Details of access doors (including air locks) and openings used in normal recovery operations and not fitted with gastight sealing;
- (3) Details of access doors and openings closed gastight in oil recovery operations;
- (4) Details of arrangement and capacity of recovered oil tanks;
- (5) Division of gas-hazardous zones;
- (6) Drawing of power system of the equipment used for oil recovery operations;
- (7) Details of arrangement of piping, pumping and handling systems for recovered oil;

- (8) Arrangement of venting system of recovered oil tank;
- (9) Arrangement of electrical equipment in gas-hazardous zones;
- (10) Operating manual (see Section 5 of this Chapter);
- (11) Other plans and documents as deemed necessary.

Section 2 CONSTRUCTION AND FIRE SAFETY

3.2.1 Hull structures

3.2.1.1 The structures of oil recovery ships are to comply with the relevant requirements of Chapter 2, PART TWO of the Rules.

3.2.1.2 For integral recovered oil tanks, the thickness of the plane oiltight bulkhead plating is to comply with the requirements of 3.2.1.3 and 3.2.1.4, and other structural members of bulkhead are to comply with the relevant requirements of Chapters 5 and 6, PART TWO of the Rules.

3.2.1.3 The thickness t of the plane oiltight bulkhead plating of integral recovered oil tanks is not to be less than that obtained from the following formula:

$$t = 3.75s\sqrt{h} + 2.5 \text{ mm}$$

where: s — spacing of stiffeners, in m;

h — vertical distance, in m, from lower edge of the plate in a strake to the tank top, but not less than $0.4D$.

3.2.1.4 The thickness t of the plane oiltight bulkhead plating of integral recovered oil tanks is also to comply with the following requirements:

(1) Where vertical stiffeners are fitted on the bulkhead:

$$t \geq s/86 \text{ mm, for the upper } 3/4 \text{ of the bulkhead}$$

$$t \geq s/74 \text{ mm, for the lower } 1/4 \text{ of the bulkhead.}$$

(2) Where horizontal stiffeners are fitted on the bulkhead:

$$t \geq s/98 \text{ mm, for the upper } 3/4 \text{ of the bulkhead}$$

$$t \geq s/84 \text{ mm, for the lower } 1/4 \text{ of the bulkhead}$$

where: s — spacing of stiffeners, in mm.

3.2.2 Arrangement of recovered oil tanks

3.2.2.1 Any tanks, which are also intended for other purposes and will not be utilized during oil recovery operations, are to be arranged so that recovered oil cannot be transferred to them inadvertently.

3.2.2.2 Tanks intended for the storage of recovered oil are to be located forward or aft of the accommodation and machinery spaces.

3.2.2.3 Except where permitted by 3.2.2.6, tanks intended for the storage of recovered oil are to be separated from accommodation and machinery spaces by cofferdams. Oil fuel tanks, settling tanks, tanks for ballast water or anti-pollution liquid, closed spaces where oil recovery handling equipment is stored and pump rooms may be considered as a cofferdam.

3.2.2.4 Cofferdams are to be at least one frame spacing in length (600 mm minimum) and are to cover the whole area of the boundary under consideration.

3.2.2.5 The height of tanks for recovered oil is not to be less than 1.5 m. Internal obstructions in the tanks are to be avoided to ensure a full flow of recovered oil. Adequate drainage openings are to be provided to ensure free flow of residues to assist in cleaning and gas freeing on completion of recovery operations. Any coating in the walls of tanks for recovered oil is to be of an oil and dispersion resistant type.

3.2.2.6 Where cofferdams are impractical to arrange, any tank adjacent to the engine room or pipe tunnel may be accepted for storage of recovered oil, provided that bulkheads of the tank are:

- (1) accessible for inspection;
- (2) carried continuously through abutting plate panels, except that full penetration welding may be used at the top of the tank.

3.2.2.7 All openings (sounding pipes, hatches for the deployment of portable pumps and hoses) to tanks for recovered oil are to be located on open deck to prevent accumulation of oil vapour.

3.2.2.8 Tanks for recovered oil are to have suitable access from open deck for cleaning and gas-freeing, or small dedicated hatches for cleaning.

3.2.2.9 Tanks for recovered oil are in general to be provided with wash bulkheads in one of the following cases:

- (1) $0.5B$ (B being breadth of the ship) is exceeded; or
- (2) $0.1L$ (L being length of the ship) or 10 m is exceeded, whichever is the greater.

3.2.3 Access and other openings

3.2.3.1 In general, no access door or any other opening is to be permitted between safe spaces (such as accommodation, service and machinery spaces, control stations and navigation bridge) and gas-hazardous zones. Access doors may be accepted between such spaces and gas-hazardous zones of Category 1, provided that the following conditions are met:

- (1) an air lock is to consist of two steel doors substantially gastight which should be spaced not less than 1.5 m apart (watertight doors may be considered as gastight doors);
- (2) safe spaces are under positive pressure mechanical ventilation in relation to the gas-hazardous zones;
- (3) the doors are to be self-closing and without any holding back arrangements;
- (4) signs are provided to warn that the doors are to be kept closed during oil recovery operations.

3.2.3.2 Access, ventilation openings (inlets and outlets) and other openings to safe spaces such as accommodation, service and machinery spaces, control stations and navigation bridge, which are in frequent use during oil recovery operations and not fitted with weathertight closing appliances, are to be located outside gas-dangerous zones. Where these openings are located inside gas-hazardous zones, they are to be fitted with air locks, and the height of their doorsills is to comply with the relevant provisions for load lines.

3.2.3.3 Oil handling spaces on deck are to be provided with a coaming around all pumps, transfer flanges and other connections. Each coaming is to have a height sufficient to prevent recovered oil from entering accommodation, machinery, control and service spaces or passing overboard. The coaming is to have a height of at least 150 mm. Where drains are provided for the coaming, closing devices for these drains are to be permanently attached.

3.2.4 Fire protection and extinction

3.2.4.1 For vessels with tanks for recovered oil forward of superstructures, exterior boundaries of superstructures and deckhouses enclosing accommodation, including any overhanging decks which support such accommodation, are to be insulated to A-60 standard for all parts which face deck areas where there are arrangements for collection, handling and transfer of recovered oil as well as tanks for recovered oil and for 3 m aft or forward thereof. The requirement is also applicable for access doors in such boundaries.

3.2.4.2 The requirement in paragraph 3.2.4.1 above is also applicable for vessels with tanks aft of superstructures, provided that exterior boundaries of superstructures and deckhouses enclosing accommodation, including any overhanging decks which support such accommodation, are situated within 10 m of the nearest tank for recovered oil.

3.2.4.3 Portholes or windows in the exterior boundaries which are required to be insulated to A-60 standard, as referred to in 3.2.4.1 of this Section, are to be of fixed (non-opening) type and are to be insulated to A-60 standard, except for those in the navigation bridge.

3.2.4.4 As an alternative to compliance with 3.2.4.1 and 3.2.4.2, a fixed water spraying system may be used to protect all boundaries, portholes or windows which may, in this case, be insulated to A-0 standard. The system is to be capable of delivering water at a rate of 10 L/ min·m² at least and is to be readily available.

3.2.4.5 Working deck areas used for oil recovery operations, where there are arrangements for the collection, handling and transfer of recovered oil, are to be provided with the following fire-extinguishing equipment:

(1) two dry powder fire-extinguishers, each at least 50 kg capacity. The fire-extinguishers are to be located near the working deck and are to be fitted with discharge hoses having a length sufficient to reach the arrangements for the collection, handling and transfer of recovered oil;

(2) a large fire-extinguishing foam installation fitted with at least one portable foam applicator. The foam installation is to be so arranged that it is capable of applying foam to any part of the working deck. The capacity of any applicator is to be not less than 400 L/min of foam solution and the applicator throw in still air conditions is to be not less than 15 m. Sufficient foam concentrate is to be provided for at least 0.4 L/m² of the working deck area with a minimum quantity of 200 L. The foam expansion ratio is generally not to exceed 12 to 1.

3.2.4.6 Each recovery oil pump-room is to be provided with a fixed fire-extinguishing system suitable for machinery spaces of category A. The system controls are to be operated from a readily accessible position outside the pump-room. Where a carbon dioxide system is used, the quantity of carbon dioxide is to be sufficient to give a minimum volume of free gas equal to 45% of the gross volume of the tanks for recovered oil. A notice is to be exhibited at the controls stating that, due to the electrostatic ignition hazard, the system is to be used only for fire extinguishing and not for inerting purposes.

3.2.4.7 Oil recovery ships are to carry at least four fire-fighter's outfits.

3.2.5 Mechanical ventilation

3.2.5.1 The design, type and structure of mechanical ventilation systems may be dealt with in accordance with the relevant requirements for oil tankers.

3.2.5.2 Spaces with access to hazardous zones of Category 1 are to be kept under positive pressure mechanical ventilation during oil recovery operations, with the air intake located inside a safe area.

3.2.5.3 Spaces in hazardous zones of Categories 0 and 1 that are not frequently used during oil recovery operations are not to be ventilated, provided that the equipment therein is provided with the required explosion protection. For safety reasons, spaces in hazardous zones of Categories 0 and 1 that must be accessible at all times are to be equipped with a ventilation system of the extraction type, ensuring at least 8 air changes per hour.

3.2.5.4 Hazardous zones of Category 1 as specified in 3.1.4.1(2)⑤, ⑥ of Section 1 of this Chapter may be accepted as safe areas, provided that the following special ventilation requirements are complied with and positive pressure mechanical ventilation is maintained:

- (1) the ventilation airflow is to be at least 20 air changes per hour;
- (2) the arrangement of ventilation inlet and outlet openings in a space is to be such that the entire space is efficiently ventilated, taking special consideration to locations where gas may be released or may accumulate;
- (3) the air intake is to be located in a safe area.

3.2.5.5 For the spaces required to be under positive pressure ventilation, audible and visual alarms are to be initiated at the navigation bridge or other suitable positions in case of loss of positive pressure ventilation.

3.2.6 Gas detection and alarm system

3.2.6.1 For the purpose of explosion protection, the ship is to be equipped with a permanently installed gas detection system, which will actuate an audible and visual alarm at the navigation bridge, open deck or other suitable positions when a concentration of hydrocarbon gas or similar products equal to 30 % of the lower explosion limit (LEL) is exceeded.

Detection points may be arranged according to specific circumstances, generally close to ventilation air intakes, in air locks and on the main deck (at least one at the fore end and one at the aft end of the ship).

3.2.6.2 In addition to the above gas detection system, at least one portable instrument is to be available on board for gas detection.

Section 3 MACHINERY INSTALLATIONS

3.3.1 General requirements

3.3.1.1 All machinery equipment used in gas-hazardous zones during oil recovery operations is to be suitable for operation in gas contaminated atmosphere.

3.3.1.2 The exhaust lines of diesel engines, the flue ducts of boilers and the vents of diesel engine crankcases are to be led to a position outside the gas-hazardous zones as described in 3.1.4 of Section 1.

3.3.1.3 The exhaust lines of diesel engines and the flue ducts of boilers are to be provided with effective spark arresters.

3.3.2 Transfer system for recovered oil

3.3.2.1 A fixed transfer system for recovered oil is to be provided. The transfer system is to be arranged such that simultaneous filling and discharge will be possible. Unless provided otherwise, the transfer system for recovered oil is to be independent of all other piping systems onboard.

3.3.2.2 For coupling of portable skimming equipment, one or maximum two filling connections with branch pipes to all recovered oil tanks are to be arranged on deck.

3.3.2.3 Where recovered oil transfer pumps are driven by shafting which passes through a pump room bulkhead or deck, gastight glands are to be fitted to the shaft at the pump room plating. The glands are to be capable of being lubricated from outside the pump room and are to be so designed as to prevent overheating. The seal parts of the glands are to be of materials that will not initiate sparks. Where a bellows piece is incorporated in the design, it is to be hydraulically tested to 0.34 MPa before being fitted.

3.3.2.4 All recovered oil transfer pumps which are capable of developing a pressure exceeding the design pressure of the system are to be provided with relief valves. Each relief valve is to be so arranged as to discharge back to the suction side of the pump, and to effectively limit the pump discharge pressure to the design pressure of the system.

3.3.2.5 One pressure gauge for each recovered oil transfer pump is to be located at the pump discharge and, where the pumps are capable of being operated from outside the pump room, an additional gauge is to be provided which is to be visible from the operating station.

3.3.2.6 Piping systems related to oil recovered are to be arranged as follows:

- (1) piping systems related to oil recovered are not to pass through machinery and accommodation spaces;
- (2) piping systems related to oil recovered are not to pass through drinking water tanks, boiler water tanks or other tanks. Where it is unavoidable for piping systems to pass through other tanks, the portions of pipelines within tanks are to be all-welded extra thick pipes without valves, flanges, fittings or slip joints (see for wall thickness requirements in Table 5.3.4.2 of Chapter 5, PART THREE of the Rules).

3.3.3 Venting arrangements of tanks for recovered oil

3.3.3.1 Every tank for recovered oil is to be fitted with a vent pipe or other equivalent venting arrangement. The vent pipes are to be sized for 125% of the maximum loading rate to prevent the pressure in any recovered oil tank from exceeding the design pressure; however, the diameter of each vent pipe is to be not less than 60 mm. Venting outlets are to be led to open deck. Gas from the outlets is to be discharged directly upwards.

3.3.3.2 The outlets are to have a minimum height of 2.4 m above deck and be located at a minimum horizontal distance of 5 m away from openings to accommodation and other gas-safe spaces, ventilation intakes for accommodation spaces and engine room and non-certified safe electrical equipment.

3.3.3.3 The end of vent pipes is to be fitted with a corrosion resistant flameproof wire gauze capable of being easily renewed.

3.3.3.4 Vent pipes are also to comply with the applicable requirements of Chapter 3, PART THREE of the Rules.

3.3.3.5 For multi-purpose oil recovery ships, portable vent pipes intended for use during oil recovery operations only, may be accepted.

3.3.4 Other systems related to recovered oil

3.3.4.1 Tanks for recovered oil are to be fitted with suitable means for determining the level within the tanks. Sounding pipes, if fitted for this purpose, are to terminate in the open air above freeboard deck. The internal diameter of sounding pipes is not to be less than 50 mm.

3.3.4.2 Provisions are to be made to guard against liquid rising in recovered oil tanks to a height which would exceed the design head of the tanks. This may be accomplished by high-level alarms or overflow control systems or other equivalent means, together with independent gauging devices and tank filling procedures. The high level alarm is to be capable of giving an audible and visual alarm at the recovered oil control station.

3.3.4.3 The heating systems and other steam pipelines fitted to recovered oil tanks are to comply with the relevant requirements of Chapter 5, PART THREE of the Rules.

3.3.4.4 Bilge drainage of the recovered oil transfer pump room and the cofferdam within the gas-hazardous zones is to be effected by powered pumps or bilge ejector suction independent of the bilge drainage system of safe spaces. The pump room bilge is to be drained into the tanks for recovered oil.

For oil recovery ships of not more than 500 gross tons, the pump room bilge may be drained by a hand pump having at least a 50 mm bore suction.

3.3.4.5 The ballast piping system serving gas-hazardous zones is to be independent of that serving safe spaces. The ballast pump is to be located in the recovered oil pump room or other suitable gas-hazardous space.

3.3.5 Machinery equipment and systems in gas-hazardous zones

3.3.5.1 The oil recovery equipment and hoses are to be electrically bonded into the ship's hull. The cross-sectional area of the metallic bonding strap is to be not less than 10 mm².

3.3.5.2 Hoses are to be electrically well conductive.

3.3.5.3 No sparks are allowed during operation of the oil recovery equipment.

3.3.5.4 Surface temperature of the equipment is not to exceed 200°C.

Section 4 ELECTRICAL INSTALLATIONS

3.4.1 General requirements

3.4.1.1 Unless specified otherwise in this Section, electrical equipment, cables and distribution systems are to comply with the relevant requirements of Section 16, Chapter 2 of PART FOUR of the Rules.

3.4.1.2 The equipment used for oil recovery operation and deck areas used for storing hoses are to have adequate lighting.

3.4.1.3 The power distribution systems of oil recovery ships having the notation Oil Recovery Ship without Cargo Tank are to comply with Section 4, Chapter 2 of PART FOUR of the Rules.

3.4.2 Electrical equipment in gas-hazardous zones

3.4.2.1 The use of electrical appliances in gas-hazardous zones as specified in 3.1.4 of Section 1 is to be restricted to operationally essential equipment and is to comply with Table 3.4.2.1.

Electrical equipment permitted in gas-hazardous zones Table 3.4.2.1

| Category of hazardous zones | Type of electrical equipment | Cable |
|-----------------------------|---|---|
| 0 | Intrinsically safe Ex" ia" | Cables associated with intrinsically safe equipment in such zones |
| 1 | Intrinsically safe Ex" ia", Ex" ib" | Cables associated with the equipment in such zones; Through runs of cables |
| | Flameproof Ex" d" | |
| | Increased safety Ex" e" | |
| | Pressurized enclosure Ex" p" | |
| | Powder filled Ex" q" Encapsulated Ex" m" | |

3.4.2.2 The explosion-proof electrical equipment listed in Table 3.4.2.1 is to meet at least the following requirements:

Temperature class T3;
Equipment group IIA.

3.4.2.3 All equipment not complying with 3.4.2.1 of this Section and located in the gas-hazardous zones as specified in 3.1.4 of Section 1 are to be disconnected during oil recovery operation. The switches for such disconnection are to be safeguarded against unintentional re-connection and appropriately marked to that effect.

3.4.2.4 The flexible cables without armor or metal braid may be applied in zones of Category 1, provided that the construction and installation of such cables are to comply with acceptable standards^①, as appropriate.

3.4.2.5 Portable oil recovery equipment and recovered oil pumps are to comply with the following requirements:

- (1) Portable oil recovery equipment and recovered oil pumps are to be supplied from a permanently installed distribution box or socket outlet.
- (2) Socket outlets for power circuits are to be interlocked in such a way that the plug can be neither inserted nor withdrawn when the socket contacts are live.
- (3) The socket outlet as the separate final sub-circuit is to be provided with a circuit breaker capable of overcurrent and short-circuit protection in each insulated phase. The supply to the socket-outlet is to be permanently installed.
- (4) Socket outlets are to be located at easily accessible places and in such a way that flexible cables are not carried through doors or portlights leading from working deck to machinery or accommodation spaces.

Section 5 OPERATING MANUAL

3.5.1 Operating manual

^① Refer to IEC publication 60079-14: Explosive atmospheres – Part 14: Electrical installations design, selection and erection.

3.5.1.1 The ship is to be provided with an approved operating manual. In general, the operating manual is to contain a description of the safety precautions needed when preparing for and carrying out oil recovery operations.

3.5.1.2 The operating manual for oil recovery ships is to include:

(1) Equipment and arrangement

- ① arrangement of recovered oil tanks;
- ② transfer system for recovered oil;
- ③ gas-measuring instrument;
- ④ other associated units of equipment.

(2) Preparations for operation

- ① checking all equipment on board to determine compliance with 3.3.1.1 of Section 3 and 3.4.2.1 of Section 4;
- ② mounting and fastening of non-permanent equipment;
- ③ blanking off particular pipes;
- ④ assembling air pipes;
- ⑤ disconnecting power supply to those electrical installations not complying with 3.4.2.1 of Section 4;
- ⑥ closing openings between safe areas and gas-hazardous zones;
- ⑦ starting up additional ventilation equipment;
- ⑧ changeover to low suction for cooling water pumps;
- ⑨ displaying signs to the effect that open flame, non-certified explosion-proof electrical equipment, etc. are prohibited.

(3) Oil recovery operation

- ① guidance on safe distance from an oil spill source and relevant notes;
- ② gas measurements during operation (on open deck and in spaces where gas may accumulate). If gas is traced on open deck, the ship is to move away immediately;
- ③ actions to be taken for cleaning, ventilation, emptying adjacent tanks, etc. if gas is traced in any enclosed space;
- ④ emergency measures to be taken in case of failure of positive pressure ventilation;
- ⑤ precautions against overfilling of recovered oil tanks;
- ⑥ discharging.

(4) Cleaning and gas-freeing of recovered oil tanks and pipes.

Section 6 OIL RECOVERY SHIPS CARRYING RECOVERED OIL HAVING A FLASH POINT EXCEEDING 60°C

3.6.1 General requirements

3.6.1.1 Ships engaged exclusively in the recovery of oil having a flash point exceeding 60°C are to comply with the relevant requirements of Sections 1 (excluding paragraph 3.1.4) and 5 of this Chapter, and the following additional requirements.

3.6.2 Construction and fire safety

3.6.2.1 Ships engaged exclusively in the recovery of oil having a flash point exceeding 60°C are to comply with the requirements of Chapter 2, PART TWO of the Rules.

3.6.2.2 The fire safety of ships engaged exclusively in the recovery of oil having a flash point exceeding 60°C are to comply with the relevant requirements for cargo ships and the following additional requirements:

- (1) In working deck areas, fire-extinguishing equipment required in 3.2.4.5 of this Chapter is to be provided in lieu of the fixed fire-extinguishing system required for cargo spaces of cargo ships.
- (2) All openings of tanks for recovered oil are to be located in accordance with the requirements of 3.2.2.7 of this Chapter.
- (3) Spill coamings and drains are to be provided in accordance with the requirements of 3.2.3.3 of this Chapter.
- (4) Fire-fighter's outfits are to be provided in accordance with the requirements of 3.2.4.7 of this Chapter.
- (5) At least one portable instrument is to be available on board for gas detection.

3.6.3 Machinery installations

3.6.3.1 For ships engaged exclusively in the recovery of oil having a flash point exceeding 60°C, paragraphs 3.3.2.1, 3.3.2.2, 3.3.2.4, 3.3.2.5, 3.3.2.6, 3.3.4.1, 3.3.4.2 and 3.3.4.3 of this Chapter are applicable. However, subparagraph 3.3.2.6(1) may be replaced by the following:

- (1) piping systems related to oil recovered are not to pass through machinery and accommodation spaces as far as practicable; where this is unavoidable, the arrangement of such piping systems within machinery spaces is to comply with the requirements for fuel oil piping systems.

3.6.3.2 The venting arrangements of tanks for recovered oil are to comply with the requirements of 3.3.3 of this Chapter, or the requirements for fuel oil tanks in Chapter 3, PART THREE of the Rules.

3.6.4 Electrical installations

3.6.4.1 The additional requirements for electrical installations of ships engaged exclusively in the recovery of oil having a flash point exceeding 60°C are to be in compliance with 2.16.7 of Section 16, Chapter 2, PART FOUR of the Rules.”

CHAPTER 10 ADDITIONAL REQUIREMENTS FOR PETROLEUM ASPHALT CARRIERS

Section 2 CONSTRUCTION AND ARRANGEMENT OF SHIP

A new paragraph 10.2.5.2 is added as follows:

“10.2.5.2 For spaces of heat-insulating layers (heat-insulating spaces) of asphalt carriers fitted with integral tanks, provision is to be made to prevent over- or under-pressure caused by temperature variations.”

CCS

The full text of Chapter 11 is replaced by the following:

“CHAPTER 11 DYNAMIC POSITIONING SYSTEMS

Section 1 GENERAL PROVISIONS

11.1.1 General requirements

11.1.1.1 This Chapter applies to dynamic positioning systems installed on board ships or mobile offshore units (hereinafter referred to as vessels). The components and systems covered by this Chapter are also to comply with the relevant requirements for main class.

11.1.1.2 The vessels provided with dynamic positioning systems in accordance with this Chapter may be assigned an appropriate class notation.

11.1.1.3 A vessel with a dynamic positioning system, for which no class notation is requested, may be designed and equipped by reference to the applicable requirements of this Chapter.

11.1.1.4 For the equipment or system not complying with the requirements for the class notations, CCS may issue upon request a Declaration of Compliance showing general or partial compliance of the vessel/system with this Chapter. CCS will not monitor or follow up the condition of the vessel thereafter.

11.1.1.5 CCS will give appropriate consideration to novel designs and special functions of dynamically positioned vessels or relevant equipment. If such designs and functions comply with the intention of this Chapter, they are to be accepted.

11.1.1.6 This Chapter is based on the assumption that operation and maintenance of the dynamic positioning system is carried out by qualified crew.

11.1.1.7 Special consideration will be given where the dynamic positioning system is also used for purposes other than position keeping, e.g. track following.

11.1.2 Class notations

11.1.2.1 Upon request of the owner and in accordance with different redundancy degrees of the dynamic positioning systems, the following class notations will be assigned:

DP-1: Vessels with dynamic positioning systems can automatically keep their position and heading within specified environmental conditions. In addition, an independent joystick system is to be provided.

DP-2: Vessels with dynamic positioning systems can automatically keep their position and heading in case of a single failure (excluding loss of a cabin or cabins) within specified environmental conditions and operating limits.

DP-3: Vessels with dynamic positioning systems can automatically keep their position and heading in case of a single failure (including total loss of a cabin caused by fire or flooding) within specified environmental conditions and operating limits.

11.1.2.2 The classification of the dynamic positioning system is to cover the following sub-systems and their back-up systems:

- (1) dynamic system;
- (2) thruster system;
- (3) measuring system;

- (4) dynamic positioning control system (including controller, operator panel and remote thruster system);
- (5) independent joystick system.

11.1.3 Definitions

11.1.3.1 For the purpose of this Chapter, the following definitions apply:

(1) *Dynamic positioning* means the provision of a hydrodynamic system with automatic and/or manual control capable of maintaining the heading and position of the ship during operation within specified operating limits and environmental conditions.

(2) *Specified operating limits* are those for specified allowable position deviations from a set point.

(3) *Specified environmental conditions* are the specified wind speed, sea current and wave height under which the vessel is designed to carry out its intended operations. Ice load may not be considered.

(4) *Dynamically positioned vessel* is a vessel which automatically maintains its position (fixed location or predetermined track) and heading exclusively by means of thruster force.

(5) *Dynamic positioning system* means the complete installation necessary for dynamically positioning a vessel, comprising the following sub-systems:

- ① power system;
- ② thruster system;
- ③ DP control system and measuring system; and
- ④ independent joystick system.

(6) *Power system* means all components and systems necessary to supply the DP system with power, comprising the following components or systems:

- ① prime movers with necessary auxiliary systems including piping;
- ② generators;
- ③ switchboards;
- ④ uninterruptible power supplies (UPSs) and batteries;
- ⑤ distribution system including cabling and cable routing; and
- ⑥ for DP-2 and DP-3 notations: power management system.

(7) *Thruster system* means the thrusters and their controls used for dynamic positioning, including:

- ① thrusters with drive units and necessary auxiliary systems including piping;
- ② main propellers and rudders if these are under the control of the DP-system;
- ③ thruster control electronics;
- ④ manual thruster controls; and
- ⑤ associated cabling and cable routing.

(8) *DP control system* means all control components and systems, hardware and software necessary to dynamically position the vessel. The DP control system consists of the following:

- ① computer system and controller;
- ② sensor system;
- ③ display system (operator panels)/autopilot;
- ④ position reference system; and
- ⑤ associated cabling and cable routing.

(9) *Computer system* means a system consisting of one or more computers, including software, peripherals and interfaces, and a computer network with its protocols.

(10) *Position reference system* means the system to measure the ship's position and heading.

(11) *Position keeping* means maintaining a desired position within the normal operating limits of the control system and the environmental conditions.

(12) *Controller* means all concentrated control hardware and software necessary to supply DP of the vessel. The controller is generally to be composed of one or more computers.

(13) *Reliability* means the ability of a system or component to perform its required function without failure during a specified time interval.

(14) *Redundancy* means the ability of a component or system to maintain or restore its function when a single failure has occurred. Redundancy can be achieved, for instance, by installation of multiple components, systems or alternative means of performing a function.

(15) *Single failure* means a failure in a component causing one or both of the following effects:

- ① function loss of a component or system;
- ② deterioration of functional capability to such an extent that the safety of the vessel, personnel, or environment is significantly reduced.

(16) *Joystick* is a device for readily setting of vectorial thrust output including turning moment.

(17) *Operational mode* is the manner of control under which the DP-system may be operated, e. g.:

- ① automatic mode (automatic position and heading control);
- ② independent joystick mode (manual position control with selectable automatic or manual heading control);
- ③ manual mode (individual control of pitch and speed, azimuth, start and stop of each thruster).

11.1.4 Plans and documents

11.1.4.1 For dynamically positioned vessels, the following plans and documents are to be submitted for approval in addition to those required for main class:

(1) Technical description of DP system, including the following:

- ① performance of measuring systems and controllers, type and controlling manner of thrusters and thruster arrangement;
- ② for class notations DP-2 and DP-3, the description of principles of on-line "consequence analysis" is to be submitted.

(2) Analysis of position holding performance of the vessel, including diagrams (or description) of ultimate status of environment (wind speed, current and wave). For class notations DP-2 and DP-3, description of the principle of the ability of maintaining position after the greatest single failure.

- (3) Block diagram(s) of sensor(s) and position reference system(s).
- (4) Function diagram(s) of the controlling system(s).
- (5) Single line arrangement and description of cables between equipment units (power, control and indication).
- (6) Calculations of maximum general power load required for DP. For class notations DP-2 and DP-3, power consumption after the greatest single failure is to be indicated.
- (7) For class notations DP-2 and DP-3, failure mode and effect analysis (FMEA) reports (including redundancy test procedure).
- (8) Arrangement of control station.
- (9) List of indication and alarm items of control console.
- (10) Programs for mooring tests and sea trials (to be reviewed by the attending Surveyor).
- (11) For DP-3, fire and flooding separation arrangement and cable routing layout drawing.

11.1.4.2 The following plans and documents are to be submitted for reference:

- (1) Operation manual for positioning system, including:
 - ① equipment description;
 - ② maintenance description;
 - ③ emergency description.
- (2) For class notations DP-2 and DP-3, description of power management system.

11.1.5 Failure mode and effect analysis (FMEA)

11.1.5.1 The purpose of FMEA is to give a description of the different failure modes of the equipment related to functions of the DP system. Special attention is to be paid to the analysis of systems of which a certain piece of equipment may have a number of failure modes and thus induce a number of different effects on the dynamic positioning system.

11.1.5.2 The failure mode and effect analysis is to be carried out to the whole DP system. Such analysis is to include, so far as possible, details of all main components of the system, generally covering but not restricted to the following:

- (1) Description of all main components of the system and functional block diagram showing interactions between them.
- (2) All major failure modes.
- (3) The main cause that can be anticipated of each failure mode.
- (4) The transient effect of each failure on the vessel's position.
- (5) The method of detecting failures.
- (6) The effects of failures on the ability of the system.

(7) The analysis to probable common failure mode.

11.1.5.3 When preparing the FMEA report, a description of the effects of each failure mode alone on other items within the system and on the whole DP system is to be made.

11.1.5.4 The independence of all technical functions is to be taken into account and when redundancy is considered unnecessary or impossible for some components of the system, further consideration is to be given to the reliability and mechanical protection of these components. Where the reliability of these components is sufficient or the effects of failures are minor, they may be arranged accordingly.

11.1.5.5 The test of system redundancy is to be tested under each failure mode. The redundancy test program is to be based on the simulation of failure modes, and the tests are to be carried out in the realistic condition as far as practicable. Details of the redundancy test program are to be submitted for examination.

11.1.5.6 FMEA(s) and redundancy test program(s) is(are) to be kept on board. The FMEA(s) and redundancy test program(s) is (are) at all times to be updated to cover alterations to the DP system hardware or software, according to the actual condition.

Section 2 SYSTEM ARRANGEMENT

11.2.1 General requirements

11.2.1.1 This Section specifies the requirements for system arrangement of a general type and unless expressly stated otherwise, these requirements apply to all vessels with DP class notations. Specific requirements for each sub-system will be specified below.

11.2.1.2 In accordance with different class notations, the design of DP arrangement is to meet the requirements of Table 11.2.1.2.

Arrangement of DP system

Table 11.2.1.2

| Class notation | | DP-1 | DP-2 | DP-3 | |
|-------------------------|---|----------------------------|-----------|--------------------------------------|----------------------------------|
| Power system | Generator & prime mover | Non-redundant ^① | Redundant | Redundant, separate compartments | |
| | Main switchboard | 1 ^① | 1 | 2, separate compartments | |
| | Power management system | No | Yes | Yes | |
| Thrusters | Thruster arrangement | Non-redundant | Redundant | Redundant, separate compartments | |
| Control | Automatic control, number of computer systems | 1 | 2 | 3 (one in alternate control station) | |
| | Independent joystick system | 1 | 1 | 1 | |
| | Single handle for each thruster | Yes | Yes | Yes | |
| Sensors | Position reference systems | 2 | 3 | 2 + 1 | one in alternate control station |
| | Vertical reference systems | 1 | 2 | 2 + 1 | |
| | Gyro | 1 | 2 | 2 + | |
| | Wind speed & direction | 1 | 2 | 2 | |
| UPS | | 1 | 2 | 2 + 1, separate compartments | |
| Back-up control station | | No | No | Yes | |
| Printer | | Required | Required | Required | |

^① When this is part of the vessel's normal electrical power system (i.e. not only the DP system), then PART FOUR of the Rules applies.

11.2.1.3 Redundancy of components will normally be necessary as follows:

- (1) for class notation DP-2, redundancy of all active components;
- (2) for class notation DP-3, redundancy of all components (including piping and cable routing) and physical A-60 separation of the components.

11.2.1.4 Redundant components and systems are to be immediately available (i.e. hot standby required) and with such capacity that the DP operation can be continued. The transfer to the redundant component or system is to be automatic as far as practicable, and operator intervention is to be kept to a minimum. The transfer is to be smooth and within acceptable limitations of the operation.

11.2.1.5 Under special environmental conditions for operation, such as near an offshore unit, the DP system is to be so designed that it has remote control of the length and tension of individual chains where positional mooring equipment is used to assist in main dynamic positioning. In accordance with the operation conditions, the consequence of chain fracture or thruster failure is to be analyzed.

11.2.2 Dynamic positioning control station

11.2.2.1 The DP control station for DP operating and controlling is to be fitted on dynamically positioned vessels. The relevant indicators, alarms, control panel and communication system are to be fitted at the control station.

11.2.2.2 The DP control station is to be located such as to suit main operational activities of the vessel and so arranged that the operator has a good view of the vessel's exterior limits and surrounding areas and is aware of any activity relevant to the DP operation.

11.2.2.3 For class notation DP-3, a back-up DP control station with back-up computer(s) is to be fitted. The separation between the back-up control station and the main control station is to meet the requirement of A-60 Class. In an emergency, the operator is to be able to easily move from the main DP control station to the back-up DP control station. Just as the main control station, the back-up control station is to provide a good view of the vessel's exterior limits and surrounding areas.

11.2.2.4 Consideration is to be given to the environmental conditions of the DP control station. If the normal DP operation can be kept only upon necessary measures, redundancy of these measures is required for class notations DP-2 and DP-3.

11.2.3 Arrangement of control system

11.2.3.1 The control system is to include both automatic and manual control modes. The automatic control mode is to include control of position and heading. set points for control of position and heading are to be independently selectable. The manual control mode is to include control of pitch/speed and azimuth of each thruster by individual controllers, and an integrated remote thruster control by use of joystick.

11.2.3.2 For class notation DP-1, an automatic DP control system and one independent back-up joystick system with automatic heading control are to be fitted.

11.2.3.3 For class notation DP-2, two independent automatic DP control systems and one joystick system with automatic heading control are to be fitted. Should one automatic system fail, control is to be automatically transferred to the other. In case of failure of both automatic control systems, concentrated manual control may be performed.

11.2.3.4 For class notation DP-3, three independent automatic DP control systems and one joystick system with automatic heading control are to be fitted. The two automatic control systems located at the dynamic positioning control station are to be arranged such that, should one fail, control is automatically transferred to the other. The third automatic control system is to be located in the emergency back-up control station and transfer of control to it is to be initiated manually. In case of failure of both main automatic control systems, concentrated manual control may be performed.

11.2.3.5 The back-up control system is to be selected by the switch located at the back-up control station. Where a switch with the same function is also fitted at the main control station, it may be used to select the back-up control system provided that the damaged main control station does not interfere with the back-up control station.

11.2.3.6 Where two or more DP control systems are operated simultaneously, means are to be provided for self-monitoring and comparison between systems so as to initiate an alarm when any significant difference is detected in orders for thrusters or position or heading. Such technique is not to endanger the independence of each system or cause any risk to the common failure mode.

11.2.3.7 A single manual controller is to be fitted for each thruster at both main and back-up control stations.

11.2.4 Arrangement of control panels

11.2.4.1 The information sources like displays, indicators, etc. are to provide information in a readily usable form. The operator is to be provided with immediate information of the effect of his actions. Generally, feedback signals or other confirmations of actions carried out are to be displayed, not only the initial command.

11.2.4.2 Easy switch-over between operational modes are to be provided. Active mode is to be positively indicated. Positive indications of the operational status of the different sub-systems are to be given.

11.2.4.3 Indicators and controls are to be arranged in logical groups, and to be coordinated with the geometry of the vessel when this is relevant.

11.2.4.4 If control of a sub-system can be carried out from alternate control stations, positive indication of the station in charge is to be provided.

11.2.4.5 Precautions are to be taken to avoid inadvertent operation of controls if this may result in a critical situation. Such precautions may be proper location of handles etc, recessed or covered switches, or logic requirements to operations.

11.2.4.6 Interlocks are to be arranged, if erroneous sequence of operation may lead to a critical situation or damage of equipment.

11.2.4.7 Controls and indicators placed in the navigation bridge are to be sufficiently illuminated. Lights for such purpose are to be provided with dimming facilities.

11.2.5 Arrangement of cables and piping systems

11.2.5.1 For class notation DP-2, piping systems for fuel, lubrication, hydraulic oil, cooling water and pneumatic control as well as cables, which are essential to the DP system, are to be located with due regard to fire hazards and mechanical damage.

11.2.5.2 For class notation DP-3, cables for redundant equipment or systems are not to be routed together with those for the main systems through the same compartments. Where this is unavoidable, such cables may run together in ducts of A-60 class provided that this applies only to cables arranged in spaces without high fire risk. Cable connection boxes are not allowed in such ducts.

11.2.5.3 For class notation DP-3, redundant piping systems (for fuel, lubrication, hydraulic oil, cooling water and pneumatic control) are also to comply with the requirements of 11.2.5.2, so far as practicable

11.2.5.4 For class notations DP-2 and DP-3, the systems, which are not directly part of the DP system, but which in the event of failure could cause failure of the DP system (e.g., common fire suppression systems, engine ventilation systems, shut-down systems, etc), are also to comply with the relevant requirements of this Chapter.

Section 3 THRUSTER SYSTEM

11.3.1 General requirements

11.3.1.1 The thrusters mentioned in this Section are pipe tunnel thrusters, azimuth thrusters, thrusters for fixed or variable pitch blades, driven by electric motors, diesel engines, or hydraulically. Other types of thrusters will be specially considered in each case.

11.3.1.2 Unless expressly provided otherwise in this Section, the design and manufacture of the thruster system including prime mover, gearbox, shafting and propeller are to comply with the applicable requirements of PART THREE of the Rules.

11.3.1.3 Thrusters used in dynamic positioning are to meet the requirements for long-time operations.

11.3.1.4 The control and monitoring of thrusters are to meet the requirements of Section 5 of this Chapter.

11.3.2 Thruster arrangement

11.3.2.1 The location of thrusters is to be arranged to minimize interference with other thrusters and hull.

11.3.2.2 Thruster intakes are to be located at sufficient depth to reduce the possibility of ingesting floating debris and vortex formation.

11.3.2.3 The number and capacity of thrusters are to meet the following requirements:

(1) In the specified environmental conditions, the thruster system is to provide adequate thrust in longitudinal and lateral directions and yawing moment for heading control.

(2) For class notations DP-2 and DP-3, where the arrangement of thrusters is provided with redundancy, there are to be adequate thrust in longitudinal and lateral directions and yawing moment for heading control after failure of any one of the thrusters.

11.3.2.4 If necessary, the values of the thruster forces used in the consequence analysis are to be corrected for interference between thrusters and other effects which will reduce the effective force.

11.3.2.5 When the main steering system is included under DP control, the steering gear is to be designed for continuous operation.

11.3.2.6 A failure of the thruster system, including pitch, azimuth or speed control, is not to make the thruster rotation and/or other uncontrolled operation of pitch and speed.

Section 4 POWER SYSTEM

11.4.1 General requirements

11.4.1.1 Unless expressly provided otherwise in this Chapter, the power system is to comply with the applicable requirements for electrical installations in PART FOUR of the Rules.

11.4.2 Number and capacity of generators

11.4.2.1 When starting thruster motors, especially when one generator is out of service, transient voltage drop caused in the main bus-bar system during starting periods is not to be in excess of 15% of the rated voltage.

11.4.2.2 If the total capacity of installed thrusters exceeds that of the associated generators, interlocks or thrust limitations are to be arranged to prevent overloading the power plant.

11.4.2.3 The high reactive load demands which may occur in DP thruster operation are to be considered when selecting number and type of generators.

11.4.2.4 For class notations DP-2 and DP-3, the number of generators is to comply with the requirements for redundancy after a single failure.

11.4.3 Power management system

11.4.3.1 For vessels with class notations DP-2 and DP-3, at least one automatic power management system is to be arranged to perform load-dependent starting and stop of generators. This system is to block starting of large consumers when there is not adequate running generator capacity, and to start up back-up generators as required, and hence to permit requested loads start to proceed. The power management system is to have adequate redundancy or reliability.

11.4.3.2 An alarm is to be initiated when the total electrical load exceeds a preset percentage of the running generator(s) capacity. This alarm is to be adjustable between 50% and 100% of the running capacity and is to be set with regard to the number of generators in service and the effect of the loss of any one generator.

11.4.3.3 For electrically driven thruster systems, provision is to be made for the automatic starting, synchronizing and load sharing of a non-running generator before the load reaches the alarm level required by 11.4.3.2.

11.4.3.4 Sudden overload caused by the stopping of one or more generators is not to create a blackout. Reduction in thruster load, i.e. pitch or speed reductions, are to be introduced to enable standby generators to come online. If this function is taken care of by the DP computer system, the function is to be coordinated with the power management system.

11.4.3.5 A failure in the power management system is not to cause alteration to the online power generation, and is to initiate an alarm in the DP control station.

11.4.3.6 It is to be possible to operate the switchboards manually, with the power management system disconnected.

11.4.3.7 An FMEA of the power management system is to be carried out.

11.4.4 Main switchboard arrangement

11.4.4.1 For class notations DP-2 and DP-3, the main switchboard is to be so arranged that no single failure will give a total blackout. A single failure in this case is defined as any system or component breakdown of technical nature. For vessels with class notation DP-3, single failures also include the failures caused by flooding and fire incidents. The immediate consequence of this is that physical separation of redundant components/systems must be used to limit the effects of flooding and fire incidents.

11.4.4.2 When considering single failures of switchboards, the possibility of direct short circuit of the main bus-bar has to be considered.

11.4.4.3 A main bus-bar system is to consist of at least two sections (or parts). Where a circuit breaker is capable of breaking the maximum short circuit current in the system, the sections may be connected with the breaker. This breaker is to be appropriately protected and is to comply with the requirements for selectivity.

11.4.4.4 For class notation DP-2, the bus-bar sections may be so arranged in one switchboard that adequate capacity is available to supply the essential ship service loads and the critical operational loads in case of loss of any section due to any reason and that the vessel's position can be kept within specified environmental conditions and operating limits.

Adequate capacity of generators and their primer movers is to be available to supply essential loads after any single failure of the essential systems such as cooling water and fuel oil systems, and the vessel's position can be kept within specified environmental conditions and operating limits.

11.4.4.5 For vessels with class notation DP-3, each switchboard is to be isolated from the other(s) by A-60 partitions. Where switchboards are to be connected in operation, there is to be a bus-tie breaker on each side of this partition and such breakers are to provide appropriate protection. If the switchboards are located below the operational waterline, the division is also to be watertight.

11.4.4.6 For class notation DP-3, generators and distribution systems are to be suitably sized and located in at least two compartments so that adequate capacity will be available to keep the vessel's position within specified operating limits after total loss of any one of the compartments due to fire or flooding, and that non-running consumers can be started without voltage drop. Adequate capacity of generators and their primer movers is to be available to supply essential loads after any single failure of the essential systems such as cooling water and fuel oil systems or total loss of any one of the compartments, and the vessel's position can be kept within specified environmental conditions and operating limits.

11.4.4.7 For vessels with class notation DP-2 or DP-3, it is to be possible to operate with separate bus-bar sections. Protection against blackout due to overloading of thrusters is to be provided in separate bus-bar sections.

11.4.4.8 Bus-bar sections may be connected together during starting of large motors in order to meet requirements for voltage drop.

11.4.4.9 The online power reserve, i.e. the difference between online generator capacity and consumed power at any time is to be continuously displayed at the DP control station. For split-bus power arrangements, indications are to be provided for individual bus-bar sections. The reserve power indicators may be omitted in systems where thruster operation will not overload the power plant.

Section 5 CONTROLLER AND MEASURING SYSTEM

11.5.1 General requirements

11.5.1.1 Unless expressly provided otherwise in this Chapter, controllers and measuring systems are to comply with the applicable requirements for automatic control and remote control in PART SEVEN of the Rules.

11.5.2 Composition of the controller and measuring system

11.5.2.1 The controller and measuring system comprise the following equipment:

- (1) computer system;
- (2) manual thruster controls;
- (3) thruster joystick controls;
- (4) automatic thruster controls;
- (5) position reference systems;
- (6) sensor systems;
- (7) displays and alarms;
- (8) communication.

11.5.3 Computer system

11.5.3.1 For class notation DP-1, the computer of the DP control system need not be redundant.

11.5.3.2 For class notation DP-2, the DP control system is to consist of at least two independent computer systems. Common facilities, such as self-checking routines, data transfer arrangements and interfaces, are not to cause the failure of both/all systems.

11.5.3.3 For class notation DP-3, the DP control system is to consist of at least two independent computer systems with self-checking and alignment facilities. Common facilities, such as self-checking routines, data transfer arrangements and plant interfaces, are not to cause the failure of both/all systems. In addition, one back-up computer control system is to be arranged. An alarm is to be initiated if any computer fails or is not ready to take control.

11.5.3.4 For class notations DP-2 and DP-3, the DP control is to include a software function, known as “consequent analysis”, which continuously verifies that the vessel will remain in position even if the worst case failure occurs. This analysis is to verify that the thrusters remaining in operation after the worst case failure can generate the same resultant thruster force and moment as required before the failure. The consequence analysis is to generate an alarm if the occurrence of a worst case failure would lead to a loss of position due to insufficient thrust for the prevailing environmental conditions. For operations which will take a long time to safely terminate, the consequence analysis is to include a function which simulates the thrust and power remaining after the worst case failure, based on manual input of weather trend.

11.5.3.5 For class notations DP-2 and DP-3, redundant computer systems are to be arranged with automatic transfer of control after a detected failure in one of the computer systems. The automatic transfer of control from one computer system to another is to be smooth and within the acceptable limitations of the operation.

11.5.3.6 For class notation DP-3, the back-up DP control system is to be located in a room, separated by A-60 class divisions from the main DP control system. During DP operation, this back-up control system is to be continuously updated by input from the sensors, position reference systems, thruster feedback, etc., and to be ready to take over control.

11.5.3.7 An uninterruptable power supply (UPS) is to be provided for each DP computer system to ensure that any power failure will not affect more than one computer. UPS battery capacity is to provide a minimum of 30 minutes operation following a mains supply failure.

11.5.4 Manual thruster control

11.5.4.1 Individual and separate manual operation of thrusters for start, stop, azimuth and pitch/speed control is to be arranged in the DP control station (star/stop of high voltage motors may be excluded).

11.5.4.2 Running/stop, pitch/speed, and azimuth for each thruster is to be continuously displayed at the DP manual control stand.

11.5.4.3 It is to be possible to control thrusters manually at all times, also in case of any failure of automatic and joystick control systems.

11.5.4.4 It is to be possible to stop thrusters individually from the DP control station by independent emergency means. This emergency stop is to be arranged with separate cables for each thruster.

11.5.4.5 For class notations DP-2 and DP-3, an alarm is to be initiated upon loop failure, i.e. broken connections or short-circuit, in the emergency stop system.

11.5.5 Independent joystick control

11.5.5.1 The independent joystick control system is an integrated control system consisting of thrusters and rudders (if applicable). The joystick is to enable the control of longitudinal and transverse thruster forces, turning moments, and all combinations of these thruster force components.

11.5.5.2 The independent joystick control system may exclude those thrusters or rudders which are not necessary for achieving an adequate thrust force level in all directions.

11.5.5.3 The independent joystick control system is to include selectable automatic heading control.

11.5.5.4 Any failure in the independent joystick control system is to initiate an alarm.

11.5.5.5 Any failure causing operator loss of control of the thrusters in the independent joystick control system is to set the thrust commands to zero. If the failure affects only a limited number of thrusters, the command to these affected thrusters is to be automatically set to zero, while keeping the other unaffected thrusters in joystick control.

11.5.6 Automatic DP control

11.5.6.1 The automatic thruster control is to consist of a computer system, comprising one and more computers with processing units, input/output devices, and memories.

11.5.6.2 For class notation DP-1, the following requirements are to be complied with:

(1) The computer system for automatic thruster control is to produce commands for pitch/speed and azimuth for all thrusters. The commands are to be transmitted to the individual thruster control units via the circuits for selection of command source.

(2) The computer system is to perform self-check routines that are to bring the computer system to a stop when critical failure conditions are detected.

(3) When stopped, either by automatic or manual means, the computer system is to set speed/pitch commands to zero.

11.5.6.3 For class notation DP-2, the following requirements are to be complied with:

- (1) Computer systems are to comply with the requirements for class notation DP-1 in 11.5.6.2.
- (2) The computer system for automatic thruster control is to be capable of controlling thrusters after the occurrence of any single failure within the computer system or its associated equipment. This may be achieved by two or more parallel computer systems, one of which is to be selected as the on-line system and the other system or systems are to be in hot standby condition. The changeover from one system to another is to be possible by manual and/or automatic means. In case of automatic changeover upon failure detection, the system that was online is to remain unavailable after repair until manually reselected as the online (or standby) system.
- (3) The computer systems are to perform self-check routines for detection of failure.
- (4) If any failure of a standby system, or any of the sensors or position reference systems selected for this system is detected, an alarm is to be initiated.
- (5) There is to be an identification of the online control system at the operator panel.

11.5.6.4 For class notation DP-3, the following requirements are to be complied with:

- (1) Computer systems are to comply with the requirements for class notation DP-2 in 11.5.6.3.
- (2) There is to be an automatic back-up system, and the control station where the back-up system is located is to be separated by A-60 class division from the control station where the main system is located.
- (3) If three independent computer systems are chosen for the main system, one of these computers may serve as the back-up, provided that the necessary independence as required for the back-up is achieved.
- (4) There is to be at least one position reference system and one compass connected to the back-up system, independent of the condition of the main system.
- (5) The back-up system is to be activated by the operator, either at the main DP control station or at the back-up station. The nature of the switching is to be such that no single failure will render the back-up inoperable together with the main system.

11.5.7 Thruster control mode selection

11.5.7.1 The thruster control mode is to be selectable by a simple device located in the DP control station. The control mode selector may consist of a single selector switch, or individual selectors for each thruster.

11.5.7.2 The control mode selector is to be so arranged that it is always possible to select manual controls after any single failure in the DP control mode.

11.5.7.3 For class notations DP-2 and DP-3, the mode selector is to be such that no single failure will deselect all thrusters from the automatic control mode.

11.5.7.4 The mode selector may consist of a single switch also for class notation DP-3 even if this may be damaged by a fire or other hazards, provided that the back-up computer system is still selectable.

11.5.8 Position reference systems

11.5.8.1 In general, a DP system is to include at least two independent position reference systems. For class notations DP-2 and DP-3, at least three position reference systems are to be installed and simultaneously available to the DP system during operation. When two or more position reference systems are required, they are to be based on different principles. For class notation DP-1, two position reference systems based on the same principle are allowed.

11.5.8.2 Position reference systems are to be selected with due consideration to operational requirements, and with regard both to the restrictions caused by the manner of deployment and expected performance for the operating conditions. The system is to allow for smoothing and mutual adjustment of the inputs originating from various position reference systems and transfer between reference systems is to be bumpless. Indication of the reference system in operation is to be given to the operator.

11.5.8.3 Position reference systems are to provide data with adequate accuracy for the intended DP operations. When the vessel deviates from the intended course or from the operating area determined by the operator, audible and visual alarms are to be activated. Position reference systems are to be monitored and if the signals provided are incorrect or significantly degraded, alarms are to be given.

11.5.8.4 For class notation DP-3, one of the position reference systems is to be connected to the back-up control station and separated by A-60 class divisions from other position reference systems.

11.5.8.5 When an acoustic reference system is used, a hydrophone is to be chosen to minimize the influence of mechanical and acoustic disturbance on transmission channels.

11.5.8.6 When a taut wire system is used, materials used for wire rope, tensioning and auxiliary equipment are to be appropriate for marine service.

11.5.8.7 When the signals from the position reference system are changed by the movement of the vessel (rolling, pitching), the position is to be automatically corrected.

11.5.8.8 Position reference systems are to comply with the relevant main class rules for electrical, mechanical, and hydraulic components and subsystems.

11.5.8.9 Position reference systems are to be monitored for electrical and mechanical functions, i.e. power, pressure, temperature.

11.5.8.10 Position reference systems are to provide new position data with a refresh rate and accuracy suitable for the intended DP-operations.

11.5.8.11 The power supply to position reference systems is to be from UPSs (except for class notation DP-1). For class notations DP-2 and DP-3, the arrangement of power supply is to be in accordance with the overall redundancy requirement.

11.5.9 Sensor systems

11.5.9.1 Sensors are to be provided in accordance with the requirements of Table 11.2.1.2 of this Chapter.

11.5.9.2 Sensors are to be as far as possible monitored for failures (e.g. connecting wire break, overheating, power loss).

11.5.9.3 Inputs from sensors are to be monitored in order to detect possible faults, especially in respect to temporal evolution of the signal. As regards the analogue sensors, an alarm is to be initiated in the event of connecting line wire break, short circuit and low insulation. When failure of a sensor is detected, an alarm is to be initiated even if the sensor is in a standby or offline use at the time of failure.

11.5.9.4 Any failure of automatic changeover between sensors is to activate visual and audible alarms at the control station.

11.5.9.5 Sensors used for the same purpose and connected to redundant systems are to be arranged independently so that failure of one will not affect the others.

11.5.9.6 For class notation DP-3, one of each type of sensors is to be connected directly to the back-up control system and separated by an A-60 class division from the other sensors.

11.5.9.7 When more than one sensor for a specified function is required, then each is to be independent with respect to power, signal transmission, and interfaces. For class notations DP-2 and DP-3, the arrangement of power supply is to be in accordance with the overall redundancy requirement.

11.5.9.8 The monitoring of sensors is to include alarms for electrical and mechanical functions, i.e. power, pressure, temperature as relevant.

11.5.10 Display and alarm

11.5.10.1 The DP control station is to display information from the power system, thruster system and DP control system so as to ensure normal operation of these systems. The information needed for safe operation of DP system is to be available at any time.

11.5.10.2 The display system, especially that located at the DP control station, is to be based on ergonomic principles. The DP control system is to provide means for easy selection of the control mode, such as manual control, computer control of thrusters. The active mode is to be clearly displayed. The display system is to comply with the following principles:

- (1) separation of redundant devices to reduce the possibility of common mode failure occurrence;
- (2) ease of access for maintenance purposes;
- (3) protection against adverse effects from environment and electromagnetic disturbances.

11.5.10.3 For vessels with class notations DP-2 and DP-3, operator controls are to be so designed that no single inadvertent action on the operator's panel will lead to a critical condition.

11.5.10.4 Failures of the DP system and the equipment controlled by it are to initiate audible and visual alarms. The occurrence and status of these failures are to be permanently recorded.

11.5.10.5 The DP system is to prevent failures from being transferred from one system to another. Redundant components are to be so arranged that a failure of one component will be isolated and the standby component activated.

11.5.10.6 Where it is practicable, each DP control station is to be fitted with alarms and display/status indication as specified in Table 11.5.10.6.

11.5.10.7 Where alarms and displays required in 11.5.10.6 are impracticable or unnecessary or equivalent arrangements are available, they may be reduced as appropriate, subject to agreement by CCS.

11.5.10.8 If the alarms at the DP control station are slave signals of other alarm systems, there is to be a local acknowledgement and silencing device. The silence device is not to cause inhibiting of new alarms.

11.5.10.9 Displays are to be independent of thruster control systems.

Alarm and display of control station

Table 11.5.10.6

| System | Monitored parameters | Alarm | Display |
|---|---|-------|---------|
| Thruster power system | Engine lubricating oil pressure – low | × | |
| | Engine coolant temperature – high | × | |
| | CPP hydraulic oil pressure – low and high | × | |
| | CPP hydraulic oil temperature – high | × | |
| | CPP pitch | | × |
| | Thruster RPM | | × |
| | Thruster force direction | | × |
| | Thruster motor/SCR coolant leakage | × | |
| | Thruster motor SCR temperature | | × |
| | Thruster motor short circuit (internal short) | | × |
| | Thruster motor exciter power available | | × |
| | Thruster motor supply power available | | × |
| | Thruster motor overload | × | |
| | Thruster motor high temperature | × | |
| Power distribution system | Status of automatically controlled circuit breakers | | × |
| | Bus bar voltage | | × |
| | Bus bar frequency | | × |
| | Power factors | | × |
| | Bus bar current and power levels | | × |
| | High power consumers – current levels | | × |
| | Back-up power availability | | × |
| System performance | Exceeding operating limits | × | |
| | Control system failure | × | |
| | Position sensor failure | × | |
| | Vessel's target point and present position and heading | | × |
| | Wind speed and direction | | × |
| | Selected reference systems | | × |
| Specific requirements for class notations DP-2 & DP-3 | Thruster location (pictorial) | | × |
| | Percentage or thruster force | | × |
| | Alarm provided by consequence analysis, regarding available standby thrusters | × | × |
| | Position information from position reference systems connected | | × |

11.5.11 Arrangement of data communication links

11.5.11.1 When two or more thrusters and their manual controls are using the same data communication link, this link is to be arranged with redundancy in technical design.

11.5.11.2 When the automatic DP control system uses a data communication link, this link is to be separate from the communication link(s) for manual control.

11.5.11.3 For class notations DP-2 and DP-3, the data communication link is to be arranged with redundancy in technical design.

11.5.11.4 The independent joystick system may share the redundant data communication link with the manual control, but not with the automatic DP control system.

11.5.12 Internal communication system

11.5.12.1 Two way communication is to be provided between the DP control station and the following locations:

- (1) navigation bridge;
- (2) main engine control room;
- (3) related operation control stations.

11.5.12.2 The power supply of the communication system is to be independent of the main power of the vessel.

11.5.13 Uninterruptible power supplies (UPSs)

11.5.13.1 The controllers and measuring systems are to be supplied from UPSs. The arrangement and number of UPSs are to be in accordance with Table 11.2.1.2 of this Chapter. For class notation DP-1, at least one UPS is to be fitted. For class notations DP-2 and DP-3, the number of UPSs is to be determined according to FMEA. Unless otherwise justified, 2 UPSs are to be provided for DP-2; for DP-3, 3 UPSs are to be provided, one of which is to be located in a separate compartment separated by A-60 class division from other UPSs.

11.5.13.2 The battery capacity of each UPS is to maintain the DP operation of at least 30 min.

11.5.13.3 The power supply for the independent joystick system is to be independent of the DP control system UPSs.

11.5.13.4 For class notation DP-2, the input power supply to the redundant UPS is to be derived from different sides of the main switchboard. For class notation DP-3, the input power supply to the redundant UPS for the main DP control system is to be derived from different sides of the main switchboard.

Section 6 ENVIRONMENTAL CONDITIONS

11.6.1 General requirements

11.6.1.1 For vessels engaged in unrestricted service, a set of standard North Sea Environmental Conditions is to be used.

11.6.1.2 For vessels engaged in restricted service, a long-term distribution of environmental conditions prevailing where the vessel is in operation is to be considered.

11.6.1.3 For the determination of the performance capability rating of the DP system, such rating in the following three conditions is to be calculated:

- (1) with all thrusters operating;
- (2) with one single failure;
- (3) with most critical single failure.

11.6.1.4 Environmental forces (wind, wave drift and current loads) and thrust are to be evaluated through tunnel and tank model tests or other recognized methods.”

CHAPTER 12 IN-WATER SURVEY ARRANGEMENTS OF SHIPS

Section 3 STRUCTURAL DESIGN PRINCIPLES

The existing paragraph 12.3.2 is replaced by the following:

“12.3.2 Rudder arrangements

12.3.2.1 Rudder arrangements are to be such that rudder pintle clearances can be checked while the ship is afloat.”

The existing paragraph 12.3.3 is replaced by the following:

“12.3.3 Oil sealing glands of propeller shafts or tube shafts

12.3.3.1 The oil sealing glands of propeller shafts or tube shafts is to be such that clearances between propeller shafts or tube shafts and bearings can be checked while the ship is afloat.”

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