TÜRK LOYDU

TL-PR

TL-Procedural Requirements

July 2019

These procedural requirements are prepared by embedding related IACS Procedural Requirements. In order to have consistency, the numbering of the procedural requirements are kept as the same with related IACS Procedural Requirements.

Unless otherwise specified, these Rules apply according to the implementation dates as defined in each procedural requirement. See Rule Change Summary on TL website for revision details.

This latest edition incorporates all rule changes.

"General Terms and Conditions" of the respective latest edition will be applicable (see Rules for Classification and Surveys).

If there is a difference between the rules in English and in Turkish, the rule in English is to be considered as valid. This publication is available in print and electronic pdf version. Once downloaded, this document will become UNCONTROLLED. Please check the website below for the valid version.

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TL- PR 1A Procedure for Transfer of Class

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1. This Procedural Requirement applies to requests for transfer of class received on or after 1 July 2016.

PR1A
Procedure for Transfer of Class

Application

This Procedure contains procedures and requirements pertaining to transfer of class from one Society (i.e. losing Society) to another Society (i.e. gaining Society) and is applicable, unless stated otherwise, to vessels of over 100 GT of whatever type, self propelled or not, restricted or unrestricted service, except for "inland waterway" vessels.

The obligations of this Procedure apply to TL which are subject to verification of compliance with QSCS.

Definitions

‘At vessel’s delivery’ means that the new construction survey process is completed, the first Certificate of Class is delivered and the vessel has not departed from the yard.

‘First Certificate of Class’ means either Interim Certificate of Class or Full Term Certificate of Class or another Certificate serving the same purpose.

‘Gaining Society’ means a Classification Society which accepts a vessel for its classification only after all overdue surveys; overdue recommendations or overdue conditions of class previously issued against the vessel have been completed by or as specified by the losing Society.

‘Interim Certificate of Class’, or Interim Class Certificate, is the certificate issued immediately upon completion of the survey of the vessel to enable it to trade while the report of the classification surveys is processed by the gaining Society pursuant to issuing its full term Class Certificate.

‘Losing Society’ means the Classification Society from which class is being transferred. In the case of vessels classed by more than one Society, ‘losing Society’ means all Classification Societies from which class is being transferred.

‘Outstanding’ means still to be dealt with.

‘Overdue’ means overdue on the date the losing Society receives the request by the gaining Society for its current classification survey status.

‘Recommendations’ and ‘Conditions of Class’ are to be read throughout this Procedural Requirement as being different terms used by Societies for the same thing, i.e. requirements to the effect that specific measures, repairs, surveys etc. are to be carried out within a specific time limit in order to retain class.

Section A - Procedural Requirements

A.1 Obligations and reporting of the gaining Society

A.1.1 Whenever a Society is requested by an Owner to accept an existing vessel into class, the gaining Society is to immediately notify the Owner in writing that:

.1 the relevant surveys specified TL- PR1A/B.2.1 are required to be satisfactorily completed for entry into class;

.2 for vessels less than 15 years of age(Note 1), an Interim Certificate of Class can be issued only after the gaining Society has completed: (i) all overdue surveys and (ii) all overdue recommendations / conditions of class previously issued against the vessel as specified to the Owner by the losing Society;

.3 for vessels 15 years of age and over, an Interim Certificate of Class can be issued only after the losing Society has completed: (i) all overdue surveys and (ii) all overdue recommendations / conditions of class previously issued against the vessel.

.4 any outstanding recommendations / conditions of class are to be dealt with by their due dates;

.5 the principles given in items .1, .2 and .3 above apply to any additional recommendations / conditions of class issued against the vessel arising from surveys which were not included in the initial survey status provided to the gaining Society by the losing Society because the surveys were carried out in close proximity to the request for transfer of class. Such additional recommendations / conditions of class if received after the issuance of the Interim Certificate of Class by the gaining Society and which are overdue are to be dealt with at the first port of call by the relevant Society depending on the age of the vessel;

.6 copies of the plans listed in Section C are to be provided to the gaining Society as a prerequisite to obtaining a full term Class Certificate.

If the Owner is unable to provide all of the required plans, the gaining Society is to request that the Owner authorise the losing Society to transfer copies of such of these plans as it may possess directly to the gaining Society upon request from the gaining Society, with the advice that the losing Society will invoice the gaining Society and the gaining Society may, in turn, charge the associated costs to the Owner.

A.1.2 Prior to issuing an Interim Certificate of Class the gaining Society is to obtain:

.1 from the Owner, a written request for transfer of class, containing an authorisation for the gaining Society to obtain the current classification status from the losing Society; and

.2 the current classification survey status from the Headquarters of the losing Society or one of its designated control or management centres.

(Note 1) To be calculated from the date of delivery to the “Date Request for Class was Received” in Form G Part A – Survey Status Request.

A.1.3 Within two (2) working days of receipt of a written request from the Owner for transfer of class at a Society's Headquarters or one of its designated control or management centres, the gaining Society is to notify the losing Society of the requested transfer of class using the Form G in Annex 1 with Part A completed and attaching the Owner's authorisation for release of the survey status. If the gaining Society does not receive the classification survey status from the losing Society within three (3) working days from request, the gaining Society may utilise the losing Society's survey status information provided by the Owner and, after complying with the other relevant requirements of this Procedural Requirement, may issue an Interim Certificate of Class. In such cases, a statement is to be included in or with the Interim Certificate of Class reminding the Owner that the conditions of A.1.1 are still applicable.

A.1.4 The gaining Society is not to issue an Interim Certificate of Class, or other documents enabling the vessel to trade:

1. Until all overdue surveys and all overdue recommendations / conditions of class previously issued against the subject vessel as specified to the Owner by the losing Society, have been completed and rectified by:

   a) the gaining Society, for vessels less than 15 years of age;

   b) the losing Society, for vessels 15 years of age and above; and

2. Until all relevant surveys specified in TL- PR1A/B.2.1 have been satisfactorily completed; when facilities are not available in the first port of survey, an Interim Certificate of Class may be issued to allow the vessel to undertake a direct voyage to a port where facilities are available to complete surveys required in TL- PR1A/B.2.1 In such cases:

   The surveys specified in TL- PR1A/B.2.1 are to be carried out to the maximum extent practicable at the first port of survey, but in no case less than the scope of annual hull survey and machinery surveys as required in B.2.1.2;

3. before giving the opportunity to the Flag Administration to provide any further instructions within three (3) working days.(Note 2)

A.1.5 The validity of the Interim Certificate of Class and the subsequent Class Certificate is subject to any outstanding recommendations / conditions of class previously issued against the vessel being completed by the due date and as specified by the losing Society. Any outstanding recommendations / conditions of class with their due dates are to be clearly stated on the:

.1 Interim Certificate of Class or an attachment to the Interim Certificate of Class, and/or class survey record available on board; and

.2 survey status when the full term Class Certificate is issued.

(Note 2) In compliance with the requirements of Art. 10.5 of the Regulation (EC) No 391/2009 as amended.

A.1.6 The gaining Society is, within one (1) month from issuing its Interim Certificate of Class, to advise the losing Society of the date of issuing this certificate and confirm the date, location and action taken to satisfy each overdue survey and overdue recommendation / condition of class, if any, issued against the subject vessel as specified to the Owner by the losing Society. The report Form G in Annex 1, with Parts A and B duly completed is to be used.

A.1.7 Any additional information regarding outstanding surveys or recommendations / conditions of class received from the losing Society in accordance with A.2.3 is to be dealt with in accordance with A.1.4 and A.1.5, as applicable, and reported to the losing Society with Form G in Annex 1 with Part B-1 duly completed within one (1) month from the completion of the survey. If this additional information is received after the Interim Certificate of Class has been issued, any surveys or recommendations / conditions of class which are overdue are to be dealt with at the first port of call:

.1 by the gaining Society in vessels less than 15 years of age; or

.2 by the losing Society in vessels 15 years of age or over.

If this is not accomplished, the Interim Certificate of Class is to be withdrawn immediately unless the Owner agrees to proceed directly, without further trading, to a suitable port where any overdue surveys or overdue recommendations / conditions of class are to be carried out by the relevant Society based on the age of the vessel.

A.1.8 Prior to final entry into class the gaining Society's obligation is:

.1 to carry out and document the review, of class survey records, of the losing Society, by an authorised person considering the items specified in Annex 3;

.2 to advise the losing Society in writing of the anticipated date of final entry into class and that Form G with Parts A, B and B-1 (when applicable) duly completed has been sent(Note 3).

A.1.9 The gaining Society may, if deemed necessary, carry out the review of class survey records of other Societies, which had previously classed the vessel.

A.1.10 Within one (1) month of the date of final entry into class, the gaining Society is to dispatch Form G in Annex 1, with Parts A, B, B-1 (when applicable) and C duly completed, to the losing Society. In cases where the losing Society has reported recommendations / conditions of class on the vessel, the gaining Society is to provide to the losing Society, together with Form G, an itemised list of actions taken with the date and location and actions to be taken, to satisfy each recommendation / condition of class. The gaining Society is to confirm in writing the date of final entry into class to the flag State within one (1) month of the date of final entry into class.

A.1.11 The reporting by gaining Society to losing Society required in A.1.6, A.1.7 and A.1.10 is to be done in accordance with the Harmonisation of Reporting in Annex 2.

(Note 3) In compliance with the requirements of Art. 10.6 of the Regulation (EC) No 391/2009 as amended.

A.2 Obligations and reporting of the losing Society

A.2.1 If an Owner advises the losing Society of an intention to transfer class, the losing Society is to immediately confirm to the Owner any overdue surveys and outstanding recommendations / conditions of class, together with any outstanding fees.

A.2.2 The losing Society:

.1 within two (2) working days of receipt of a written request at its Headquarters or one of its designated control or management centres, is to notify the gaining Society the latest class details in its possession including a full list of overdue surveys and recommendations / conditions of class - with the respective due dates - issued against the subject vessel. For vessels under Enhanced Survey Programme, the following documentation is also to be provided:

(i) the most recent Condition Evaluation Report/Executive Hull Summary Reports;

(ii) any available Survey Planning Document for the forthcoming special or intermediate survey, regardless of whether the gaining Society intends to credit or not class entry surveys as periodical surveys for maintenance of classification.

In cases where the class status is received in a language not readily understood by the gaining Society or contains vague or unclear descriptions, the losing Society is to provide additional detailed information in English language on request of the gaining Society. The losing Society is obliged to advise the gaining Society of the possibility of further recommendations / conditions of class arising from surveys which the losing Society knows have been carried out but for which reports have not yet been received. The report Form L in Annex 1 with Part A completed is to be used by the losing Society to report on the class status. Details may be amplified, if necessary, in accompanying documents.

.2 is obliged to make available, within one (1) month of the receipt of the request referred to in .1 above, all class survey records including thickness measurement reports from the last special survey and in addition, any subsequent thickness measurements including areas with substantial corrosion, to the gaining society for record review and relevant reporting, to the extent this information is in the possession of the losing Society, to enable the gaining Society to retain the Vessel's Records as outlined in Annex 3, in accordance with A.1.8.

.3 alternatively to .2 above, upon request is obliged to provide, within one (1) month of the receipt of the request referred to in .1, a copy of all the class survey records including thickness measurement reports from the last special survey and in addition, any subsequent thickness measurements including areas with substantial corrosion, to the gaining Society, to enable the gaining Society to retain the Vessel's Records as outlined in Annex 3, in accordance with A.1.8. These survey records will be transferred electronically if electronic files are available.

.4 is also to submit, within one (1) month of the receipt of the request referred to in .1 above, any Vessel's Records regarding class items (see Annex 3) available from prior transfers of class performed after 1 July 2001.

A.2.3 The losing Society has one (1) month from issuance of its survey status to the gaining Society as per A.2.2 to forward to the gaining Society:

.1 the additional information on outstanding surveys and/or recommendations / conditions of class arising from surveys performed proximate to the date of Owner's written request for transfer of class which were not included in said status, by dispatching Form L in Annex 1 with Part A-1 duly completed;

A.2.3bis The losing Society is to forward to the gaining Society:

.1 the standard structural diminution allowances which were applying to the vessel, by dispatching Form L in Annex 1 with Parts A and A-1 (when applicable) duly completed, within five working days from the receipt of the request for transfer of class from gaining Society;

.2 the TL- R-S19/31 assessment reports (when applicable) within twelve working days from the receipt of the request for transfer of class from gaining Society.

A.2.3ter For CSR vessels, the Owner is to submit to the Gaining Society plans showing, for each structural element, both as-built and renewal thicknesses and any thickness for "voluntary addition". (refer to C.1.2)

A.2.4 To ensure mutual exchange of information on vessels transferring class and on the survey status of such vessels, the losing Society is, on completion of a withdrawal of class, to dispatch Form L in Annex 1, with Parts A, A-1 (when applicable) and B duly completed, to the TOC database and to the gaining Society.

A.2.5 Should the losing Society, upon receiving information from the gaining Society pursuant to the disposition of the transfer of class, have clear grounds for believing that the gaining Society did not fulfil its obligations as specified in A.1, the losing Society is to notify the gaining Society of its concerns and attempt to resolve any differences.

A.2.6 Societies who had classed the vessel prior to the losing Society have the same obligations as the losing Society which are given in A.2.2.2 or A.2.2.3, if so requested by the gaining Society, in accordance with A.1.9.

A.3 Transfer of class at vessel's delivery

A.3.1 The procedural requirements for transfer of class at vessel's delivery are applicable when the Society which has carried out the new construction technical review and surveys (i.e. Losing Society) has issued its first Certificate of Class.

Obligations and reporting of the Gaining Society

A.3.2 Whenever a Society is requested by an Owner to accept a vessel into class at its delivery, that Society, i.e. the gaining Society, is to immediately notify the Owner in writing that:

.1 any outstanding recommendations / conditions of class are to be dealt with by their due dates;

.2 copies of the plans listed in Section C are to be provided to the gaining Society as a prerequisite to obtaining a Full Term Certificate of Class.

If the Owner is unable to provide all of the required plans, the gaining Society is to request that the Owner authorise the losing Society to transfer copies of such of these plans as it may possess directly to the gaining Society upon request from the gaining Society, with the advice

that the losing Society will invoice the gaining Society and the gaining Society may, in turn, charge the associated costs to the Owner.

A.3.3 Prior to issuing an Interim Certificate of Class on the date of the vessel's delivery, the gaining Society is to obtain:

.1 from the Owner, a written request for transfer of class at vessel's delivery, containing an authorisation for the gaining Society to obtain a copy of the first Certificate of Class, from the losing Society; and

.2 the first Certificate of Class from the Headquarters of the losing Society or one of its designated control or management centres or from the attending Surveyor at the yard of the builder including any outstanding recommendations / conditions of class and information normally contained in the classification status.

A.3.4 After receipt of a written request from the Owner for transfer of class at a Society's Headquarters or one of its designated control or management centres, the gaining Society is to notify the losing Society of the requested transfer of class using the Form G in Annex 1 with Part A completed and attaching the Owner's authorisation for release of the first Certificate of Class, including the list of any recommendations / conditions of class - with the respective due dates - issued against the subject vessel and information normally contained in the classification status.

If the gaining Society does not receive the above documents from the losing Society on the date of the vessel's delivery, the gaining Society may utilise the losing Society's said documents provided by the Owner and, after complying with the other relevant requirements of this Procedural Requirement, may issue an Interim Certificate of Class on the date of the vessel's delivery. In such cases, a statement is to be included in or with the Interim Certificate of Class issued by the Gaining Society reminding the Owner that the conditions of A.3.2 are still applicable.

A.3.5 The Gaining Society is not to issue an Interim Certificate of Class, or other documents enabling the vessel to trade:

.1 until all relevant surveys specified in TL- PR1A/B.2.1 have been satisfactorily completed; and

.2 before giving the opportunity to the Flag Administration to provide any further instruction within three (3) working days(Note 4).

(Note 4) In compliance with the requirements of Art. 10.5 of the Regulation (EC) No 391/2009 as amended.

A.3.6 The validity of the Interim Certificate of Class and the subsequent full term Certificate of Class issued by the Gaining Society is subject to any outstanding recommendations / conditions of class previously issued against the vessel being completed by the due date and as specified by the losing Society. Any outstanding recommendations / conditions of class with their due dates and information normally contained in the classification status are to be clearly stated on the:

.1 First Certificate of Class or an attachment to the First Certificate of Class and/or class survey record available onboard.

.2 Survey status when the full term Certificate of Class is issued.

A.3.7 The gaining Society is, within one (1) month from issuing its Interim Certificate of Class, to advise the losing Society of the date of issuing this certificate. The report Form G in Annex 1, with Parts A and B duly completed is to be used.

A.3.8 Within one (1) month of the date of final entry into class, the gaining Society is to dispatch Form G in Annex 1, with Parts A, B, and C duly completed to the losing Society. In cases where the losing Society has reported recommendations / conditions of class on the vessel, the gaining Society is to provide to the losing Society, together with Form G, an itemised list of actions taken with the date and location and actions to be taken, to satisfy each recommendation / condition of class.

A.3.9 The reporting by gaining Society to losing Society required in A.3.8 is to be done in accordance with the Harmonisation of Reporting in Annex 2.

Obligations and reporting of the losing Society

A.3.10 Upon receipt of a written request at its Headquarters or one of its designated control or management centres and on the date of the vessel's delivery, the losing Society is to submit to the gaining Society its first Certificate of Class, including the list of any recommendations / conditions of class - with the respective due dates - issued against the subject vessel and the list of any information normally contained in the classification status. The report Form L in Annex 1 with Part A completed is to be used by the losing Society. Details may be amplified, if necessary, in accompanying documents.

A.3.11 The losing Society has one (1) month from issuance of its first Certificate of Class to the gaining Society to forward to the gaining Society:

.1 the structural diminution allowances which were applying to the vessel, by dispatching Form L in Annex 1 with Parts A and A-1 duly completed.

A.3.12 To ensure mutual exchange of information on vessels transferring class, the losing Society is, on completion of a withdrawal of class, to dispatch Form L in Annex 1, with Parts A, A-1 and B duly completed, to the TOC database and to the gaining Society.

A.3.13 Should the losing Society, upon receiving information from the gaining Society pursuant to the disposition of the transfer of class, have clear grounds for believing that the gaining Society did not fulfil its obligations, the losing Society is to notify the gaining Society of its concerns and attempt to resolve any differences.

A.4 Other requirements

A.4.1 The obligations of the gaining and losing Societies continue to apply when a vessel's class is suspended and for six (6) months following withdrawal of a vessel's class, irrespective of class status in the meantime.

A.4.2 As the ship may be laid up, the gaining Society is to check the classification status from the previous Society in order to verify if TL- PR1A is applicable.

Section B - Technical Requirements

For transfer of class from one Society to another, the following minimum technical requirements are to be applied.

B.1 Plans and information

B.1.1 The gaining Society is to request copies of plans showing the main scantlings and arrangements of the actual vessels and machinery, together with any proposals for alterations being dealt with, from the Owner. Receipt of plans listed in Section C, or equivalent, alternative technical data in lieu of specific plans or items, is to be identified to the Owner as a prerequisite to issuance of a full term Class Certificate by the gaining Society. However, having made a good faith effort to obtain the information, if it proves not practicable to acquire certain plans as listed in Section C, or equivalent, alternative technical data, the gaining Society may issue the full term Class Certificate provided that its classification records document that the vessel is being accepted into class on the basis of a recorded internal review of the circumstances prevailing with respect to availability of plans.

B.2 Class Entry Surveys[(Note 1)]

B.2.1 Notwithstanding the records indicating that all surveys are up-to-date, a class entry survey is to be held by the gaining Society, the minimum extent of which is to be based on the age of the vessel and the losing Society's class status as follows:

.1 Hull Class Entry Survey:

i) for vessels of age less than 5 years the survey is to take the form of an Annual Survey;

ii) for vessels between 5 and 10 years of age the survey is to include an Annual Survey and inspection of a representative number of ballast spaces;

iii) for vessels of 10 years of age and above but less than 20 years of age, the survey is to include an Annual Survey and inspection of a representative number of ballast spaces and cargo spaces. For gas carriers, in lieu of internal inspection of cargo spaces, the following applies:

- Inspection of representative spaces surrounding cargo tanks, including external inspection of the tank and its supporting systems as far as possible;

- Review of cargo log books and operational records to verify the correct functioning of the cargo containment system.

(Note 1) Class entry surveys may be, but are not required to be, credited as periodical surveys for maintenance of classification. Recommendations and/or conditions of class due for compliance at a specified periodical survey for maintenance of classification need not be carried out/complied with at a class entry survey unless the class entry survey is credited as the specified periodical survey for maintenance of classification or the recommendation / condition of classification is overdue.

iv) for vessels subject to TL- R Z10.1, Z10.2, Z10.3, Z10.4 or Z10.5 which are 15 years of age and above but less than 20 years of age, the survey is to have the scope of a Special Survey or an Intermediate Survey, whichever is due next;

v) for all vessels, which are 20 years of age and above, the survey is to have the scope of a Special Survey(Note 2);

vi) in lieu of the requirements in items i) through v), the following apply for site specific purpose-built Floating Production and/or Storage Vessels:

- for vessels of age less than 5 years, the survey is to have the scope of an Annual Survey;

- for vessels of age between 5 and 10 years, the survey is to include an Annual Survey and inspection of twenty percent of ballast spaces;

- for vessels of age between 10 and 20 years, the survey is to include an Annual Survey and inspection of twenty percent of ballast spaces and twenty percent of cargo spaces.

- for vessels over 20 years of age, the survey is to have the scope of a Special Survey.

vii) for site specific Floating Production and/or Storage Vessels which have been converted from other vessels, the survey is to take the form of an Annual Survey and also include inspection of twenty percent of ballast spaces and twenty percent of cargo spaces until 20 years have elapsed since conversion. After 20 years the survey is to have the scope of a Special Survey.

viii) in the context of applying items iv) and v) above, if a dry-docking of the vessel is not due at the time of transfer, consideration can be given to carrying out an underwater examination in lieu of dry-docking.

ix) in the context of applying items iv) and v), as applicable, the anchors and anchor chain cables ranging and gauging for vessels over 15 years of age is not required to be carried out as part of the class entry survey unless the class entry survey is being credited as a periodical survey for maintenance of class. If the class entry survey is to be credited as a periodical survey for maintenance of class, consideration may be given by the gaining society to the acceptance of the anchors and anchor chain cables ranging and gauging carried out by the losing society provided they were carried out within the applicable survey window of the periodical survey in question.

x) in the context of applying items i) to viii) above, as applicable,

- if the class entry survey is to be credited as a periodical survey for maintenance of class consideration may be given by the gaining society to the acceptance of thickness measurements taken by the losing society provided they were carried out within the applicable survey window of the periodical survey in question.

(Note 2) The requirement of item v) is also applicable to the vessels having their hull under continuous survey.

- if the class entry survey is not to be credited as a periodical survey for maintenance of class, consideration may be given by the gaining society to the acceptance of thickness measurements taken by the losing society provided they were carried out within 15 months prior to completion of class entry survey when it is in the scope of a Special Survey, within 18 months prior to completion of class entry survey when it is in the scope of an Intermediate Survey.

  In both cases, the thickness measurements are to be reviewed by the gaining society for compliance with the applicable survey requirements, and confirmatory gauging are to be taken to the satisfaction of the gaining society.

xi) In the context of applying iii) to viii) above, as applicable, tank testing for vessels over 15 years of age is not required to be carried out as part of the class entry survey unless the class entry survey is being credited as a periodical survey for maintenance of class. If the class entry survey is to be credited as a periodical survey for maintenance of class, consideration may be given by the gaining society to the acceptance of the tank testing carried out by the losing society provided they were carried out within the applicable survey window of the periodical survey in question.

xii) In the context of applying i) to viii) above, as applicable, compliance with TL Requirements that require compliance at the forthcoming due periodical surveys (such as TL- R S26 and S27) are not required to be carried out/completed as part of the class entry survey unless the class entry survey is credited as a periodical survey for maintenance of class.

.2 Machinery Class Entry Survey, a general examination of all essential machinery is to be held and is to include:

i) examination under working conditions of oil fuel burning equipment of boiler, economisers and steam/steam generators. The adjustment of safety valves of this equipment is to be verified by checking the records on the vessel;

ii) all pressure vessels;

iii) insulation resistance, generator circuit breakers, preference tripping relays and generator prime mover governors are to be tested and paralleling and load sharing to be proved;

iv) in all cases, navigating lights and indicators are to be examined and their working and alternative sources of power verified;

v) bilge pumps, emergency fire pumps and remote control for oil valves, oil fuel pumps, lubricating oil pumps and forced draught fans are to be examined under working conditions;

vi) recirculating and ice clearing arrangements, if any;

vii) the main and all auxiliary machinery necessary for operation of the vessel at sea together with essential controls and steering gear is to be tested under working conditions. Alternative means of steering are to be tested. A short sea trial is to be held at the Surveyors discretion if the vessel has been laid up for a long period;

viii) initial start arrangements are to be verified;

ix) in the case of oil tankers, the cargo oil system and electrical installation in way of hazardous spaces are to be checked for compliance with the gaining Society's Rule requirements. Where intrinsically safe equipment is installed, the Surveyors are to satisfy themselves that a recognised authority has approved such equipment. The safety devices, alarms and essential instruments of the inert gas system are to be verified and the plant generally examined to ensure that it does not constitute a hazard to the vessel.

Note: For the transfer of class or adding class at ship's delivery, items iii) and ix) may be verified by reviewing the ship's record.

Section C - Plans to be submitted by the Owner to the Gaining Society

C.1 Plans to be submitted

C.1.1 Main Plans

- General Arrangement
- Capacity Plan
- Hydrostatic Curves
- Loading Manual, where required.
- Damage Stability calculation, where required.

C.1.2 Steel plans

- Midship Section
- Scantling Plan
- Decks
- Shell Expansion
- Transverse Bulkheads
- Rudder and Rudder Stock
- Hatch Covers
- For CSR vessels, plans showing, for each structural element, both as-built and renewal thicknesses and any thickness for “voluntary addition”.

C.1.3 Machinery plans

- Machinery Arrangement
- Intermediate, Thrust- and Screw Shafts
- Propeller
- Main Engines, Propulsion Gears and Clutch Systems (or Manufacturer make, model and rating information)
- For Steam Turbine Vessels, Main Boilers, Superheaters and Economisers (or Manufacturer make, model and rating information) and Steam Piping
- Bilge and Ballast Piping Diagram
- Wiring Diagram
- Steering Gear Systems Piping and Arrangements and Steering Gear Manufacturer make and model information

C.2 Torsional vibration calculations

C.2.1 For vessels less than two (2) years old, torsional vibration calculations are to be submitted.

C.3 Additional requirements for vessels with ice class notation

C.3.1 Plans for flexible couplings and/or torque limiting shafting devices in the propulsion line shafting (or manufacturer make, model and rating information) are to be submitted.

C.4 Additional plans required for oil tankers

C.4.1 Pumping arrangement at the forward and after ends and drainage of cofferdams and pump rooms are to be submitted.

C.5 Additional plans required for unattended machinery space notation

C.5.1 The following additional plans are to be submitted:

- Instrument and Alarm List
- Fire Alarm System
- List of Automatic Safety Functions (e.g. slowdowns, shutdowns, etc.)
- Function Testing Plan.

C.6 Additional Documents required for approval of Alternative Design and Arrangements

C.6.1 Document(s) of Approval of Alternative Design and Arrangements are to be submitted, if any.

Notes:

(1) Additional information may be necessary according to Flag State requirements.

(2) Alternative technical data may be accepted by the gaining Society in lieu of specific items of the listed documentation not being available at the time of the transfer.

TL- PR 1B Procedure for Adding, Maintaining or Withdrawing Double or Dual Class

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Notes:

1. This Procedural Requirement applies when adding, maintaining or withdrawing double or dual class on or after 1 July 2014.

PR1B
Procedure for Adding, Maintaining and Withdrawing Double or Dual Class

Application

This Procedure contains procedures and requirements pertaining to adding, maintaining or withdrawing a double or dual class and is applicable, unless stated otherwise, to vessels of over 100 GT of whatever type, self propelled or not, restricted or unrestricted service, except for "inland waterway" vessels.

The obligations of this Procedure apply to TL which are subject to verification of compliance with QSCS.

Definitions

‘Double class vessel’ is a vessel which is classed by two Societies and where each Society works as if it is the only Society classing the vessel, and does all surveys in accordance with its own requirements and schedule.

‘Dual class vessel’ is a vessel which is classed by two Societies between which there is a written agreement regarding sharing of work.

‘First Society’ is a Society classing a vessel which, under request of the Owner, enters a double or dual class arrangement with another Society.

‘Interim Certificate of Class’, or Interim Class Certificate, is the certificate issued immediately upon completion of the survey of the vessel to enable it to trade while the report of the classification surveys is processed by the gaining Society pursuant to issuing its full term Class Certificate.

‘Outstanding’ means still to be dealt with.

‘Overdue’ means overdue on the date the first or losing Society receives the request by the second or remaining Society for its current classification survey status.

‘Recommendations’ and ‘Conditions of Class’ are to be read throughout this Procedural Requirement as being different terms used by Societies for the same thing i.e. requirements to the effect that specific measures, repairs, surveys etc. are to be carried out within a specific time limit in order to retain class.

‘Remaining Society’ is a Society which keeps an existing vessel in class, when the class by the other Society involved in the double or dual class arrangement is suspended or withdrawn.

‘Second Society’ is a Society which is requested by an Owner to accept an existing vessel already classed by another Society into its class under double or dual class arrangement.

‘Withdrawing Society’ is a Society which withdraws its class to an existing vessel in class under double or dual class arrangement.(Note 1)

(Note 1) In this Procedure, Form G and L in Annex 1, Annex 2 and Annex 3, the withdrawing Society is sometimes referred to simply as the “losing”, when the context is obvious.

Section A - Adding class of a Second Society to a vessel classed by First Society

A.1 Obligations of the second Society

A.1.1 Whenever a Society (i.e. second Society) is requested by an Owner to accept an existing vessel already classed by another Society (i.e. first Society) into its class under double or dual class arrangement, the second Society is to immediately notify the Owner in writing that:

.1 the second Society only accepts a vessel that is free from any overdue surveys or recommendations / conditions of class;

.2 the Owner is to inform first Society of his request to second Society;

.3 the Owner is to authorise first Society to submit to second Society its current classification status and documents as listed in Annex 3 for information and use by second Society in conducting its class entry surveys;

.4 when the Owner decides to leave the double or dual class arrangement and prior to withdrawing from the class of one of two Societies the Owner is to inform the Societies of his intended actions;

.5 when the Owner is advised that one of the Societies involved in double or dual class arrangement suspends or withdraws class the Owner is to inform the remaining Society of the action taken by the other Society without delay;

.6 copies of the plans listed in Section C of TL- PR1A are to be provided to second Society as a prerequisite to obtaining a full term Class Certificate. If the Owner is unable to provide all of the required plans, the second Society is to request that the Owner authorise the first Society to transfer copies of such of these plans as it may possess directly to the second Society upon request from the second Society, with the advice that the first Society will invoice the second Society and the second Society may, in turn, charge the associated costs to the Owner.

A.1.2 Within two (2) working days of receipt of a written request from the Owner for entry into second Society's class at a Society's Headquarters or one of its designated control or management centres, the second Society is to notify the first Society of the requested entry into class using Form G in Annex 1 with its Part A duly completed and attaching the Owner's authorisation for release of survey status.

A.1.3 Prior to issuing an Interim Certificate of Class the second Society is to:

.1 obtain from the Owner, a written application for entry into second Society's class, containing an authorisation for second Society to obtain the current classification status from the first Society;

.2 obtain the current classification survey status from the Headquarters of the first Society or one of its designated control or management centres;

.3 for double class: carry out its class entry survey in accordance with the requirements of Section B of PR1A taking account of the recommendations / conditions of class in the status provided by the first Society;

.4 for dual class: carry out an initial survey having the scope of an annual survey as a minimum.

A.1.4 The second Society is, within one month from issuing its Interim Certificate of Class, to advise the first Society of the date of issuing this certificate. The report Form G in Annex 1, with Parts A and B duly completed is to be used.

Any additional information regarding outstanding surveys or recommendations / conditions of class received from the first Society in accordance with A.2.2 is to be taken into account in accordance with A.1.3.3, as applicable, and reported to the first Society with Form G in Annex 1 with Part B-1 duly completed within one (1) month from the completion of the survey.

A.1.5 Prior to final entry into the second Society's class, the second Society is obligated to:

.1 carry out and document the review of class survey records, of the first Society, by an authorised person considering the items specified in Annex 3;

.2 obtain plans and information in accordance with the requirements of Section B of PR1A.

A.1.6 To ensure mutual exchange of information on vessels adding class and on the survey status of such vessels, the second Society is, on completion of final entry into class, to dispatch Form G in Annex 1, with Parts A, B, B-1 (when applicable) and C duly completed to the TOC database and to the first Society.

A.2 Obligations of the first Society

A.2.1 The first Society:

.1 within two (2) working days of receipt of a written request at its Headquarters or one of its designated control or management centres is to notify the second Society the current classification status including a full list of surveys and recommendations / conditions of class. The most recent condition evaluation report/executive hull summary reports and survey planning document for the commenced Special Survey for vessels under Enhanced Survey Programme are also to be provided. In cases where the class status is received in a language not readily understood by the second Society or contains vague or unclear descriptions the first Society is to provide additional detailed information in English language on request of the second Society. The first Society is obliged to advise the second Society of the possibility of further recommendations / conditions of class arising from surveys, which the first Society knows have been carried out but for which reports have not yet been received. The report Form L in Annex 1 with Part A completed is to be used by the first Society to report on the class status; details may be amplified, if necessary, in accompanying documents;

.2 is obliged to make available, within one (1) month of receipt of request referred to in .1, all class survey records to the second Society for record review and relevant reporting, to the extent this information is in possession of the first Society, to enable the second Society to retain the Vessels Records outlined in Annex 3, in accordance with A.1.5.1 of this Procedure;

.3 alternatively to .2 above, upon request is obliged to provide, within one (1) month of receipt of the request referred to in .1, a copy of all the class survey records to the second Society, to enable the second Society to retain the Vessels Records outlined in Annex 3, in accordance with A.1.5.1 of this Procedure. These survey records will be transferred electronically if electronic files are available;

.4 is also to submit, within one month of receipt of the request referred to in .1 above, any Vessel's Records regarding class items (see Annex 3) available during the present class and from prior transfers of class performed after 1 July 2001.

A.2.2 The first Society has one month from issuance of its classification status to the second Society as per A.2.1 to forward to the second Society:

.1 the additional information on outstanding surveys and/or recommendations / conditions of class arising from surveys performed proximate to the date of Owner's written request for adding class which were not included in said status, by dispatching Form L in Annex 1 with Part A-1 duly completed; and

.2 the structural diminution allowances which were applying to the vessel, by dispatching Form L in Annex 1 with Parts A and A-1 (when applicable) duly completed.

Section B

B.1 Adding class of a Second Society to a vessel classed by First Society at vessel's delivery

B.1.1 The procedural requirements for adding class at vessel's delivery are applicable when the Society which has carried out the new construction technical review and surveys (i.e. First Society) has issued its first Certificate of Class.

Obligations and reporting of the second Society

B.1.2 Whenever a Society (i.e. Second Society) is requested by an Owner to accept a vessel already classed by another Society (i.e. first Society) into its class under double or dual class arrangement at vessel's delivery, the second Society is to immediately notify the Owner in writing that:

.1 the Owner is to inform first Society of his request to second Society;

.2 the Owner is to authorise first Society to submit to second Society its Certificate of Class;

.3 when the Owner decides to leave the double or dual class arrangement and prior to withdrawing from the class of one of two Societies the Owner is to inform the Societies of his intended actions;

.4 when the Owner is advised that one of the Societies involved in double or dual class arrangement suspends or withdraws class the Owner is to inform the remaining Society of the action taken by the other Society without delay;

.5 copies of the plans listed in Section C of TL- PR1A are to be provided to second Society as a prerequisite to obtaining a full term Certificate of Class. If the Owner is unable to provide all of the required plans, the second Society is to request that the Owner authorise the first Society to transfer copies of such of these plans as it may possess directly to the second Society upon request from the second Society, with the advice that the first Society will invoice the second Society and the second Society may, in turn, charge the associated costs to the Owner.

B.1.3 After receipt of a written request from the Owner for entry into second Society's class at a Society's Headquarters or one of its designated control or management centres, the second Society is to notify the first Society of the requested entry into class using Form G in Annex 1 with its Part A duly completed and attaching the Owner's authorisation for release of the first Certificate of Class, including the list of any recommendations / conditions of class – with the respective due dates - issued against the subject vessel and the list of any information normally contained in the classification status.

B.1.4 Prior to issuing an Interim Certificate of Class on the date of the vessel's delivery, the second Society is to:

.1 obtain from the Owner, a written request for entry into second Society's class at vessel's delivery, containing an authorisation for second Society to obtain a copy of the first Certificate of Class, from the first Society;

.2 obtain the first Certificate of Class from the Headquarters of the first Society or one of its designated control or management centres or from the attending Surveyor at the

yard of the builders, including any outstanding recommendations / conditions of class and information normally contained in the classification status.

.3 carry out and satisfactorily complete all relevant surveys specified in TL- PR1A/B.2.1.

B.1.5 The second Society is, within one month from issuing its Interim Certificate of Class, to advise the first Society of the date of issuing this certificate. The report Form G in Annex 1, with Parts A and B duly completed is to be used.

B.1.6 Prior to final entry into the second Society's class, the second Society is obligated to:

.1 obtain plans and information in accordance with the requirements of Section B of PR1A.

B.1.7 To ensure mutual exchange of information on vessels adding class and on the survey status of such vessels, the second Society is, on completion of final entry into class, to dispatch Form G in Annex 1, with Parts A, B and C duly completed to the TOC database and to the first Society.

Obligations and reporting of first Society

B1.8 Upon receipt of a written request at its Headquarters or one of its designated control or management centres and on the date of the vessel's delivery, the first Society is to notify the second Society its first Certificate of Class, including the list of any recommendations / conditions of class - with respective due dates - issued against the subject vessel and the list of any information normally contained in the classification status. The report Form L in Annex 1 with Part A completed is to be used by the first Society; details may be amplified, if necessary, in accompanying documents;

B.1.9 The first Society has one month from issuance of its Certificate of Class to the second Society to forward to the second Society:

.1 the structural diminution allowances which were applying to the vessel, by dispatching Form L in Annex 1 with Parts A and A-1 duly completed.

Section C - Maintaining Class in a Double or Dual Class Arrangement

C.1 Double class

C.1.1 Each Society acts independently while the vessel is in double class.

C.2 Dual class

C.2.1 Each Society acts also on behalf of the other Society, while the vessel is in dual class, in accordance with the agreement adopted by the two Societies.

Section D - Withdrawing Class of a Society from a Double Class Arrangement

D.1 Obligations of the remaining Society maintaining its class

D.1.1 Whenever a Society (i.e. the remaining Society) being in a double class arrangement with another Society receives a written request from an Owner pertaining to his intention to withdraw from class of the other Society (i.e. withdrawing Society), or information that her class has been withdrawn by the other Society, the remaining Society is to immediately notify the Owner in writing that:

.1 the validity of the remaining Society's Class Certificate is subject:

i) for vessels less than 15 years of age[(Note 2)], to completion by the remaining Society of all overdue recommendations / conditions of class of the withdrawing Society at the first port of call at which surveys can be carried out and to completion by the remaining Society of all outstanding recommendations / conditions of class of the withdrawing Society by the due date;

ii) for vessels of 15 years of age and over, to completion by the withdrawing Society of all overdue recommendations / conditions of class and to completion by the remaining Society of all outstanding recommendations / conditions of class of the withdrawing Society by the due date;

.2 the Owner is to authorise remaining Society to request from withdrawing Society its current classification status;

.3 principles given in item .1 above apply to any additional recommendations / conditions of class issued against the vessel, which were not included in the initial survey status provided to the remaining Society by the withdrawing Society because they have arisen from the surveys carried out in close proximity to the request for withdrawal from class. Such additional recommendations / conditions of class, if received after the issuance of the Interim Certificate of Class by the remaining Society and which are overdue, are to be dealt with at the first port of call at which surveys can be carried out by the relevant Society, depending on the age of the vessel.

D.1.2 The remaining Society is to obtain from the Owner a written confirmation of intention to withdraw from the other Society's class, containing an authorisation for remaining Society to obtain the current classification status from the Headquarters of the withdrawing Society or one of its designated control or management centres.

D.1.3 Within two (2) working days of receipt of a written confirmation of intention from the Owner to withdraw from the other Society's class at the remaining Society's Headquarters or at one of its designated control or management centres, the remaining Society is to request the withdrawing Society, on the basis of Owner's authorisation, to release the survey status using Form G in Annex 1 with its Part A duly completed and attaching the Owner's authorisation for release of survey status. However, if the remaining Society does not receive the classification survey status from the withdrawing Society within three (3) working days from the request, the remaining Society may utilise the withdrawing Society' survey status

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(Note 2) To be calculated from the date of delivery to either the date of notification by the Owner of his intention to withdraw from class or the date of advice by the withdrawing Society to the Remaining Society (date of Form L) that class has been withdrawn, not at the request of the Owner.

information provided by the Owner and, after complying with the other relevant requirements of this Procedural Requirement, may confirm the validity of its Class Certificate.

D.1.4 The remaining Society is to suspend the validity of its Class Certificate or other documents enabling the vessel to trade, if any overdue recommendations / conditions of class previously issued against the subject vessel by the withdrawing Society have not been satisfactorily completed by the relevant Society, depending on the age of the vessel, at the first port of call where surveys can be carried out.

When repair facilities are not available in the first port of survey, a direct voyage to a repair port may be accepted to complete surveys for overdue recommendations / conditions of class. In that case, the remaining Society is to inform the owner and withdrawing Society of the decision taken, e.g. direct voyage conditions agreed and port of repairs.

D.1.5 The validity of remaining Society's Class Certificate is subject to any outstanding recommendations / conditions of class previously issued against the vessel by the withdrawing Society being completed by the due date and as specified by the withdrawing Society. Any outstanding recommendations / conditions of class with their due dates are to be clearly stated on the:

.1 class survey record if available on board; and

.2 survey status.

D.1.6 Within one (1) month from the completion of the survey, the remaining Society is to advise the withdrawing Society of the actions taken with dates and locations to satisfy each overdue recommendation / condition of class, if any, issued against the subject vessel as specified to the Owner by the withdrawing Society. The report Form G in Annex 1, with Parts A and B duly completed is to be used. A list of dates, locations and actions taken to satisfy each overdue recommendation/overdue condition of class as specified to the Owner by the withdrawing Society is to be attached to the copy sent to the withdrawing Society.

Where no overdue items are provided by the withdrawing Society, this form with Parts A and B, duly completed, is to be sent to the withdrawing Society and to the TOC database within one (1) month from the date of sending Form L Part A.

D.1.7 Any additional information regarding outstanding recommendations / conditions of class received from the withdrawing Society in accordance with D.2.3 is to be dealt with in accordance with D.1.4 and D.1.5, as applicable, and reported to the withdrawing Society with Form G in Annex 1 with Part B-1 duly completed within one (1) month from the completion of the survey. When this additional information is received any recommendations / conditions of class which are overdue are to be dealt with at the first port of call at which surveys can be carried out by the relevant Society, depending on the age of the vessel. If this is not accomplished, the Class Certificate is to be suspended immediately unless the Owner agrees to proceed directly, without further trading, to a suitable port where any overdue recommendations / conditions of class are to be dealt with for completion.

D.1.8 The remaining Society is, within one (1) month of completion of a transfer of vessel into single class, to dispatch Form G in Annex 1, with its Parts A, B, B-1 (when applicable) and C duly completed, to the TOC database and to the withdrawing Society. In cases where the withdrawing Society has reported recommendations / conditions of class on the vessel, the due dates of which are yet to come, the remaining Society is to provide to the withdrawing Society, together with the Form G, an itemised list of the actions taken with dates and locations and actions to be taken, to satisfy each recommendation / condition of class.

D.1.9 The reporting by remaining Society to withdrawing Society required in D.1.8 is to be done in accordance with the Harmonisation of Reporting in Annex 2.

D.1.10 The remaining Society is to carry out and document the review of class survey records of the withdrawing Society during the period of double class arrangement, by an authorised person considering the items specified in Annex 3.

D.2 Obligations of the withdrawing Society

D.2.1 If an Owner advises a Society in writing of an intention to withdraw from its class or class is withdrawn by the withdrawing Society, the withdrawing Society is to immediately confirm to the Owner any overdue surveys and outstanding recommendations / conditions of class, together with any outstanding fees. The remaining Society is to be informed of the actual or intended withdrawal of class using Form L in Annex 1, completed as applicable.

D.2.2 The withdrawing Society:

.1 within two (2) working days of receipt of a written request from the remaining Society at its Headquarters or one of its designated control or management centres, is to notify the remaining Society the latest class details in its possession including a full list of overdue surveys and recommendations / conditions of class - with the respective due dates - issued against the subject vessel. The most recent Condition Evaluation / Executive Hull Summary Reports and Survey Planning Document for the commenced Special Survey for vessels under Enhanced Survey Programme, if any during the period of double class arrangement, are also to be provided. In cases where the class status is received in a language not readily understood by the remaining Society or contains vague or unclear descriptions, the withdrawing Society is to provide additional detailed information in English language on request of the remaining Society. The withdrawing Society is obliged to advise the remaining Society of the possibility of further recommendations / conditions of class arising from surveys, which the withdrawing Society knows have been carried out but for which reports have not yet been received. The report Form L in Annex 1 with Part A completed is to be used by the withdrawing Society to report on the class status. Details may be amplified, if necessary, in accompanying documents;

.2 is obliged to make available, within one month of receipt of the request referred to in 2.1, all class survey records to the remaining Society for record review and relevant reporting during the period of double class arrangement to the extent this information is in the possession of the withdrawing Society to enable the gaining Society to retain the Vessel's Records as outlined in Annex 3, in accordance with D.1.10;

.3 alternatively to .2 above, the withdrawing Society is obliged to provide, within one month of receipt of the request referred to in .1, a copy of all class survey records to the remaining Society upon request.

D.2.3 The withdrawing Society has one (1) month from issuance of its survey status to the remaining Society per paragraph D.2.2.2 to forward to the remaining Society the additional information on outstanding surveys and/or recommendations / conditions of class arising from surveys performed proximate to the date of Owner's written request to withdraw from class which were not included in said status to the Owner, by dispatching Form L in Annex 1 with Part A-1 duly completed.

D.2.4 For vessels of 15 years of age and over, the withdrawing Society is, within one (1) month from completion of any overdue recommendations / conditions of class imposed by the withdrawing Society, to confirm to the remaining Society the date, location and action taken to

satisfy each item. The report Form L in Annex 1, Part A duly completed, is to be used. The reporting by the withdrawing Society to the remaining Society is to be done in accordance with the Harmonisation of Reporting in Annex 2.

D.2.5 To ensure mutual exchange of information on vessels transferring class and on the survey status of such vessels, the withdrawing Society is, on completion of a withdrawal of class, to dispatch Form L in Annex 1, with its Parts A, A-1 (when applicable) and B duly completed, to the TOC database and to the remaining Society.

D.2.6 Should the withdrawing Society, upon receiving information from the remaining Society pursuant to the disposition of the withdraw of class, have clear grounds for believing that the remaining Society did not fulfil its obligations as specified in D.1, the withdrawing Society is to notify the remaining Society of its concerns and attempt to resolve any differences.

Section E - Withdrawing Class of a Society from a Dual Class Arrangement

E.1 In the case of dual classed vessels, the withdrawing Society - according to agreement between the two Societies - is to inform the remaining Society that the class has been withdrawn using the first part and Part B of Form L.

Section F - Other Requirements

F.1 The obligations of the withdrawing and remaining Societies continue to apply when a vessel's class is suspended and for six (6) months following withdrawal of a vessel's class.

TL- PR 1C Procedure for Suspension and Reinstatement or Withdrawal of Class in Case of Surveys, Conditions of Class or Recommendations Going Overdue

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Notes:

1. This Procedural Requirement applies from 1 January 2017.

PR1C
Procedure for Suspension and Reinstatement or Withdrawal of Class in Case of Surveys, Conditions of Class or Recommendations Going Overdue

Application

This Procedure contains procedures and requirements pertaining to suspension and reinstatement or withdrawal of class and is applicable, unless stated otherwise, to vessels of over 100 GT of whatever type, self propelled or not, restricted or unrestricted service, except for "inland waterway" vessels.

The obligations of this Procedure apply to TL which are subject to verification of compliance with QSCS.

Definitions

‘Disclassed’ means class has been suspended or withdrawn.

‘Dual class vessel’ means a vessel which is classed by two Societies between which there is a written agreement regarding sharing of work.

‘Recommendations’ and ‘Conditions of Class’ are to be read throughout this Procedural Requirement as being different terms used by Societies for the same thing, i.e. requirements to the effect that specific measures, repairs, surveys etc. are to be carried out within a specific time limit in order to retain class.

‘Exceptional circumstances’ means unavailability of dry-docking facilities; unavailability of repair facilities; unavailability of essential materials, equipment or spare parts; or delays incurred by action taken to avoid severe weather conditions.

‘Force Majeure’ means damage to the ship; unforeseen inability of TL to attend the vessel due to the governmental restrictions on right of access or movement of personnel; unforeseeable delays in port or inability to discharge cargo due to unusually lengthy periods of severe weather, strikes or civil strife; acts of war; or other force majeure.

Section A - Procedure for Suspension and Reinstatement or Withdrawal of Class

A.1 Suspension and reinstatement of class in the case of overdue surveys

A.1.1 Owners are to be notified that the 5-year Class Certificate expires, and classification is automatically suspended, from the certificate expiry date in the event that the Special (Renewal) Survey has not been completed or is not under attendance for completion prior to resuming trading, by the due date, or by the expiry date of any extension granted in A.1.1.1.

Classification will be reinstated upon satisfactory completion of the surveys due. The surveys to be carried out are to be based upon the survey requirements at the original date due and not on the age of the vessel when the survey is carried out. Such surveys are to be credited from the date originally due. However, the vessel is disclassed from the date of suspension until the date class is reinstated.

A.1.1.1 Under “exceptional circumstances”, TL may grant an extension not exceeding three (3) months to allow for completion of the Special Survey provided that the vessel is attended and the attending Surveyor(s)[1] so recommend(s) after the following has been carried out:

a) annual survey;

b) re-examination of Recommendations / Conditions of Class;

c) progression of the Special Survey as far as practicable;

d) in the case where dry docking is due prior to the end of the class extension, an underwater examination is to be carried out by an approved diving company. An underwater examination by an approved company may be dispensed with in the case of extension of dry-docking survey not exceeding 36 months interval provided the ship is without outstanding Recommendation / Condition of Class regarding underwater parts.

A.1.1.2 In the case that the Class Certificate will expire when the vessel is expected to be at sea, an extension to allow for completion of the Special Survey may be granted provided there is documented agreement to such an extension prior to the expiry date of the certificate, and provided that positive arrangements have been made for attendance of the Surveyor at the first port of call, and provided that TL is satisfied that there is technical justification for such an extension. Such an extension is to be granted only until arrival at the first port of call after the expiry date of the certificate. However, if owing to “exceptional circumstances” the special survey cannot be completed at the first port of call, A1.1.1 may be followed, but the total period of extension shall in no case be longer than three months after the original due date of the special survey.

A.1.2 Annual Surveys: Owners are to be notified that the Class Certificate becomes invalid, and classification is automatically suspended, if the Annual Survey has not been completed within three (3) months of the due date of the annual survey, unless the vessel is under attendance for completion of the Annual Survey.

Classification will be reinstated upon satisfactory completion of the surveys due. Such surveys are to be credited from the date originally due. However, the vessel is to be disclassed from the date of suspension until the date class is reinstated.

[1] See TL- PR 20 ‘Procedural Requirement for certain ESP surveys’

A.1.3 Intermediate Surveys: Owners are to be notified that the Class Certificate becomes invalid, and classification is automatically suspended, if the Intermediate Survey has not been completed within three (3) months of the due date of the third annual survey in each periodic survey cycle, unless the vessel is under attendance for completion of the Intermediate Survey.

Classification will be reinstated upon satisfactory completion of the surveys due. Such surveys are to be credited from the date originally due. However, the vessel is to be disclassed from the date of suspension until the date class is reinstated.

A.1.4 Continuous Survey Item(s): Continuous survey item(s) due or overdue at time of annual survey is to be dealt with. The vessel's class will be subject to a suspension procedure if the item(s) is not surveyed, or postponed by agreement.

A.1.5 Vessels laid-up in accordance with TL's Rules prior to surveys becoming overdue need not be suspended when surveys addressed above become overdue.

However, vessels which are laid-up after being suspended as a result of surveys going overdue, remain suspended until the overdue surveys are completed.

A.1.6 When a vessel is intended for a demolition voyage with any periodical survey overdue, the vessel's class suspension may be held in abeyance and consideration may be given to allow the vessel to proceed on a single direct ballast voyage from the lay up or final discharge port to the demolition yard. In such cases a short term Class Certificate with conditions for the voyage noted may be issued provided the attending surveyor finds the vessel in satisfactory condition to proceed for the intended voyage.

A.1.7 Force Majeure: If, due to circumstances reasonably beyond the owner's or the Society's control as defined above, the vessel is not in a port where the overdue surveys can be completed at the expiry of the periods allowed above, TL may allow the vessel to sail, in class, directly to an agreed discharge port, and if necessary, hence, in ballast, to an agreed port at which the survey will be completed, provided the Society:

a) exams the ship's records;

b) carries out the due and/or overdue surveys and examination of Recommendations / Conditions of Class at the first port of call when there is an unforeseen inability of the Society to attend the vessel in the present port, and

c) has satisfied itself that the vessel is in condition to sail for one trip to a discharge port and subsequent ballast voyage to a repair facility if necessary. (Where there is unforeseen inability of TL to attend the vessel in the present port, the master is to confirm that his ship is in condition to sail to the nearest port of call.)

The surveys to be carried out are to be based upon the survey requirements at the original date due and not on the age of the vessel when the survey is carried out. Such surveys are to be credited from the date originally due.

If class has already been automatically suspended in such cases, it may be reinstated subject to the conditions prescribed in this paragraph.

A.1.8 When a vessel is intended for a single voyage from laid-up position to repair yard with any periodical survey overdue, the vessel's class suspension may be held in abeyance and consideration may be given to allow the vessel to proceed on a single direct ballast voyage from the site of lay up to the repair yard, upon agreement with the Flag Administration,

provided TL finds the vessel in satisfactory condition after surveys, the extent of which are to be based on surveys overdue and duration of lay-up. A short term Class Certificate with conditions for the intended voyage may be issued. This is not applicable to vessels whose class was already suspended prior to being laid-up.

A.2 Suspension and reinstatement of class in the case of overdue recommendations / conditions of class

A.2.1 Each recommendation / condition of class will be assigned a due date for completion. Owners will be notified of these dates and that the vessel's class will be subject to a suspension procedure if the item is not dealt with, or postponed by agreement, by the due date.

A.2.2 Classification will be reinstated upon verification that the overdue recommendation / condition of class has been satisfactorily dealt with. However, the vessel is to be disclassed from the date of suspension until the date class is reinstated.

A.3 Suspension and reinstatement of class of dual classed vessels

A.3.1 When a vessel is dual classed and in the event that one of the Societies involved takes action to suspend the class of the vessel for technical reasons, the Society concerned will advise the other Society of the reasons for such action and the full circumstances within five (5) working days.

A.3.2 The other Society will, upon receipt of this advice, also suspend the class of the vessel, unless it can otherwise document that such suspension is incorrect.

A.3.3 When TL decides to reinstate class, it is to inform the other Society.

A.4 Withdrawal of class

A.4.1 When class of a vessel has been suspended for a period of six (6) months due to overdue surveys and/or recommendations / conditions of class, the class is to be withdrawn. A longer suspension period may be granted when the vessel is not trading as in cases of lay-up, awaiting disposition in case of a casualty or attendance for reinstatement.

Section B - Notification and Reporting

B.1 Notification to Owners and Flag States

B.1.1 TL is to confirm in writing the suspension of class and reinstating of the vessel's class to the Owner and to the Flag State.

B.1.2 TL is to confirm in writing the withdrawal of class to the Owner and to the Flag State.

B.1.3 For vessels to which SOLAS applies, the letters according to B.1.1 and B.1.2 are to state that certain statutory certificates are implicitly invalidated by the suspension / withdrawal of class.

Notes:

(1) The Class Certificate is to include as a minimum:
- an expiry date based on the five year Special Survey (Renewal Survey);
- an endorsement section to record the completion of Annual [and Intermediate] Surveys;
- a statement to indicate that the Class Certificate becomes invalid and classification is automatically suspended, if:

  i) the Annual Survey has not been completed within three (3) months of the due date of the annual survey; or

  ii) the Intermediate Survey has not been completed within three (3) months of the due date of the third annual survey in each periodic survey cycle,

  unless the vessel is under attendance for completion of the relevant survey; or alternatively, a reference to the class suspension requirement contained in TL's Rules.

(2) At the discretion of TL, the following types of vessels may be exempted from compliance with this Procedural Requirement provided TL has procedures for the suspension and withdrawal of their class:
- Mobile Offshore Drilling Units;
- Mobile Offshore Units;
- Floating Production and/or Storage Vessels;
- Military vessels or commercial vessels owned or chartered by Governments, which are utilised in support of military operations or service; or
- Vessels in lay-up;
- Fishing vessels.

TL- PR 1ANNEX Annexes to PR1A, PR1B and PR1C

TABLE OF CONTENTS

Notes:

1. This Annex applies to the requests for transfer of class, or requests for adding class, or requests from an Owner pertaining to his intention to withdraw from class from another Society, or advice by the withdrawing Society that class has been withdrawn, received on or after 1 January 2014.

Annex 1 - Reporting Forms G and L

Form G

Form G is to be created and updated on the on-line TOC database maintained by the IACS Permanent Secretariat. The Form is then to be faxed or e-mailed to the other Society in accordance with the Notes below.

Form G is to be used:

I) by the gaining Society for reporting transfer of class from another Society (refer to A.1 and A.3 of TL- PR1A) using the following Notes:

1. This form with Part A, duly completed, is to be sent to the losing Society within two (2) working days of receipt of a written request for transfer of class by the gaining Society at its Headquarters or one of its designated control or management centres.

   In the case of transfer of class at vessel's delivery, the two (2) working days do not apply.

2. This form with Parts A and B, duly completed, is to be sent to the losing Society within one (1) month of the date of issuing an Interim Certificate of Class to a vessel which is transferring from another Society.

   When not required to have been dealt with by the losing Society, a list of dates, locations and actions taken to satisfy each overdue survey and overdue recommendation / overdue condition of class as specified to the Owner by the losing Society is to be attached to the copy sent to the losing Society.

3. This form with Parts A, B and B-1 duly completed, is to be sent to the losing Society within one (1) month from the completion of the survey to confirm that additional overdue surveys and overdue recommendations / conditions of class have been dealt with.

   A list of dates, locations and actions taken to satisfy each additional overdue survey and additional overdue recommendation / condition of class as specified to the Owner by the losing or first or withdrawing Society is to be attached.

4. The gaining Society is, within one (1) month of the date of final entry into class, to dispatch this form, with Parts A, B, B-1 (when applicable) and C duly completed to the losing Society.

   In cases where the losing Society has reported recommendations / conditions of class on the vessel a list of actions taken with dates and locations and actions to be taken to satisfy each recommendation / condition of class within the due dates as specified to the owner by the losing Society is to be attached to the copy sent to the losing Society.

II) by the second Society for reporting addition of class to a vessel already classed by another Society (refer to A.1 and B.1 of TL- PR1B) using the following Notes:

1. This form with Part A, duly completed, is to be sent to the first Society within two (2) working days of receipt of a written request for addition of class by the second Society at its Headquarters or one of its designated control or management centres.

In the case of adding class at vessel's delivery, the two (2) working days do not apply.

2. This form with Parts A and B, duly completed, is to be sent to the first Society within one (1) month of the date of issuing an Interim Certificate of Class.

3. This form with Parts A, B and B-1 duly completed, is to be sent to the first Society within one (1) month from the completion of the survey to confirm that additional information regarding outstanding surveys or recommendations / conditions of class have been taken into account.

4. The second Society is, on completion of final entry into class, to dispatch this form, with Parts A, B, B-1 (when applicable) and C duly completed, to the first Society.

III) by the remaining Society for reporting maintenance of class when one class has been withdrawn from double class (refer to D.1 of TL- PR1B) using the following Notes:

1. This form with Part A duly completed, is to be sent to the withdrawing Society within two (2) working days of receipt of a written request for withdrawal of class by the remaining Society at its Headquarters or one of its designated control or management centres.

2. This form with Parts A and B, duly completed, is to be sent to the withdrawing Society within one (1) month from the completion of the survey to confirm that overdue recommendations / conditions of class have been dealt with. Where no overdue items are provided by the withdrawing Society, this form with Parts A and B, duly completed, is to be sent to the withdrawing Society within one (1) month from the date of sending Form L Part A.

   When not required to have been dealt with by the withdrawing Society, a list of dates, locations and actions taken to satisfy each overdue recommendation / overdue condition of class as specified to the Owner by the withdrawing Society is to be attached to the copy sent to the withdrawing Society.

3. This form with Parts A, B and B-1 duly completed, is to be sent to the withdrawing Society within one (1) month from the completion of the survey to confirm that additional overdue surveys and overdue recommendations / conditions of class have been dealt with.

   In cases where the withdrawing Society has reported recommendations / conditions of class on the vessel, a list of actions taken with dates and locations and actions to be taken to satisfy each recommendation / condition of class within the due dates as specified to the owner by the withdrawing Society is to be attached to the copy sent to the withdrawing Society.

4. On completion of a transfer of vessel into single class, this form, with Parts A, B, B-1 (when applicable) and C, duly completed is to be sent to the withdrawing Society to report the date of completion of transfer to single class from double class if not yet reported in case a) above.

IV) by Societies for reporting reassignment of class to a vessel which had its class previously withdrawn (refer to A.4 of TL- PR1A) using the following Note:

   This form, with Parts B and C duly filled in the fields relevant to a reassignment of class, is to be completed on the on-line TOC database maintained by the IACS Permanent Secretariat within one (1) month of final entry into class when class is

reassigned to a vessel class withdrawn previously due to a reason other than transfer of class amongst Societies.

Form G attached.

FORM G

(Tick all check boxes as appropriate)

- ☐ **GAINING SOCIETY'S TRANSFER OF CLASS**
- ☐ **REASSIGNMENT OF CLASS**
- ☐ **ADDING CLASS OF A SECOND SOCIETY TO A VESSEL CLASSED BY ANOTHER (FIRST) SOCIETY**
- ☐ **MAINTENANCE OF CLASS WITH THIS (REMAINING) SOCIETY WHEN WITHDRAWING FROM DOUBLE CLASS**

To:	Losing or first or withdrawing Society:	Fax No./e-mail address:
	TOC database	on-line database
From:	Gaining or second or remaining Society	Fax. No./e-mail address :

Gaining or second or remaining Society's Vessel Data				
Name of Vessel				ID No.
Vessel Type	☐	OT	Oil Tanker	Flag
	☐	CT	Chemical Tanker	
	☐	GT	Gas Tanker	
	☐	LC	Other Bulk Liquid Carrier	
	☐	BC	Bulk Carrier (all combinations OB, OBO, OO)	
	☐	GC	General Cargo Vessel (including Ro-Ro Cargo, Container, Reefer, HSC Cargo)	
	☐	PS	Passenger Vessel (including Passenger / General Cargo, Passenger / Ro-Ro, Passenger HSC)	
	☐	ZZ	Other Vessel Type	
Owner				

Part A - Survey Status Request (See Note 1)	
Name of Vessel (Prior to Transfer of Class or Adding Class or Withdrawing Class)	ID No. (losing or first or withdrawing Society's, if known)
Gross Tonnage	IMO No.

In accordance with TL- PR1A or PR1B, please provide details of the current survey status, including a full list of overdue surveys and recommendations / conditions of class with respective due dates for the vessel identified above.

In case of transfer of class or adding class at vessel's delivery, please provide details of the first Certificate of Class, including the list of any recommendations / conditions of class and the list of any information normally contained in the classification status.

Attached hereto is a copy of the Owner's authorization for release of the information requested to the gaining or second or remaining Society named on this form.

☐ We request the facility for record review in accordance with TL-PR1A, A.2.2.2 or TL- PR1B, D.2.2.2.

☐ We request a copy of the records in accordance with TL- PR1A, A.2.2.3 or TL- PR1B, D.2.2.3.

Date request for class was received	Date	DD	MM	YYYY	
Signature	Date	DD	MM	YYYY	

Part B - Report on Issue of Interim Certificate of Class or maintenance of Class (See Note 2)					
Date Survey Status, or first Certificate of Class in case of transfer of class or adding class at ship's delivery, received	DD MM YYYY				
Change of Owner	☐ Yes	☐ No	Change of Flag	☐ Yes	☐ No
Reason for Class Entry	☐	Transfer from another Society			
	☐	Reassignment of class to a vessel class withdrawn previously due to a reason other than transfer of class amongst Societies			
	☐	Adding class as double class			
	☐	Adding class as dual class			
Maintenance of Class	☐	(when withdrawing from double class)			

☐ Survey status not received within three working days of request

☐ For transfer of class or adding class at vessel's delivery, first Certificate of Class not received from losing / first Society on the day of vessel's delivery.

☐ A list of dates, locations and actions taken to satisfy each overdue survey and overdue recommendation / condition of class as specified to the Owner by the losing or withdrawing Society is attached

☐ No relevant items provided by the losing or withdrawing Society

Date of Issue of Interim Certificate of Class	Date	DD MM YYYY
Signature	Date	DD MM YYYY

Part B-1 - Report on Additional Information received by the losing or first or withdrawing Society (See Note 3) (to be completed only if Part A-1 of Form L is received)	
☐ A list of dates, locations and actions taken to satisfy each additional overdue survey and additional overdue outstanding recommendation / condition of class as specified to the Owner by the losing or first or withdrawing Society is attached ☐ No relevant items provided by the losing or first or withdrawing Society	
Signature	Date DD MM YYYY

Part C - Report on Final Entry into Class or Completion of Transfer to Single Class (See Note 4)	
Date of Final Entry into Class or Completion of Transfer to Single Class from Double Class	DD MM YYYY
☐ A list of dates, locations and actions which have been or will be taken to satisfy each recommendation / condition of class within the due dates as specified to the Owner by the losing or first Society is attached ☐ No relevant items provided by the losing or first Society	
Signature	Date DD MM YYYY

Form L

Form L is to be created and updated on the on-line TOC database maintained by the IACS Permanent Secretariat. The Form is then to be faxed or e-mailed to the other Society in accordance with the Notes below.

Form L is to be used:

I) **by the losing Society for reporting withdrawal of class due to a transfer of class to another Society** (refer to A.2, A.3 and A.4 of TL- PR1A);

II) **by the first Society in connection with adding the class of a second society to a vessel already classed by the first Society** (refer to A.2 and B.1 of TL- PR1B); and

III) **by the withdrawing Society for advising the remaining Society when withdrawing from double or dual class** (refer to D.2 and E of TL- PR1B)

using the following Notes:

1. This form, with Part A duly completed, is to be sent by fax or e-mail to the gaining/second/remaining Society within two (2) working days of receipt of the gaining/second/remaining Society's Survey Status Request. A full list of overdue surveys and recommendations / conditions of class with the respective due dates for the vessel is to be attached to the copy sent to the gaining/second/remaining Society. Surveys and recommendations / conditions of class which have not been completed by their due date (including window period), when a ship is laid-up in accordance with the Society's rules prior to such due date (including window period), are not to be declared as overdue within the scope of the information to be included in Form L. In the case of transfer of class/adding class at vessel's delivery, the two (2) working days do not apply.

2. If the fourth box of Part A is ticked, this form, with Part A-1 duly completed, is to be sent to the gaining/second/remaining Society within one (1) month from issuance of the losing/first/withdrawing Society's survey status for advising additional survey status information which has not been provided in the previous reporting to the gaining/second/remaining Society.

   If the eighth box of Part A is ticked, this form, with Part A-1 duly completed, is to be sent to the gaining/second/remaining Society within five (5) working days from issuance of the losing/first/withdrawing Society's survey status for advising additional survey status information which has not been provided in the previous reporting to the gaining/second/remaining Society.

3. This form, with Parts A, A-1 (when applicable) and B duly completed, is to be sent to the gaining/remaining Society when class has been withdrawn from a vessel which has transferred to another Society or withdrawn from double class.

Form L attached.

FORM L

(Tick all check boxes as appropriate)

☐ **LOSING SOCIETY'S TRANSFER OF CLASS**
☐ **ADDING CLASS OF A SECOND SOCIETY TO A VESSEL CLASSED BY THIS (FIRST) SOCIETY**
☐ **ADVICE TO THE REMAINING SOCIETY WHEN WITHDRAWING FROM DOUBLE OR DUAL CLASS**

To:	Gaining or second or remaining Society:	Fax No./e-mail address:
	TOC database	on-line database
From:	Losing or first or withdrawing Society:	Fax. No./e-mail address:

Vessel Data			
Name of Vessel			ID No.
Gross Tonnage			IMO No.
Flag			Year of build
Vessel Type	☐ OT	Oil Tanker	
	☐ CT	Chemical Tanker	
	☐ GT	Gas Tanker	
	☐ LC	Other Bulk Liquid Carrier	
	☐ BC	Bulk Carrier (all combinations OB, OBO, OO)	
	☐ GC	General Cargo Vessel (including Ro-Ro Cargo, Container, Reefer, HSC Cargo)	
	☐ PS	Passenger Vessel (including Passenger / General Cargo, Passenger / Ro-Ro, Passenger HSC)	
	☐ ZZ	Other Vessel Type	
Build Yard & No.			
Owner			
Equipment Number		Date of entry into the losing or first or withdrawing Society	DD MM YY
Society during Construction			

Record of Previous Transfer of Class, if available								
Society	Date Classed DD MM YY		Society	Date Classed DD MM YY		Society	Date Classed DD MM YY	

Status of compliance with TL- Rs S19/22/23/26/27/30/31, if applicable			
Information already included in the survey status			☐
	Applicable	Due date for compliance	Date initial compliance verified
TL-Rs S19/S22/S23	☐	DD MM YY	DD MM YY
TL- Rs S26	☐	DD MM YY	DD MM YY
TL- Rs S27	☐	DD MM YY	DD MM YY
TL- Rs S30	☐	DD MM YY	DD MM YY
TL- Rs S31	☐	DD MM YY	DD MM YY

FORM L

Part A – Survey Status Information (See Note 1)

Date Survey Status Request, or request for first Certificate of Class in case of transfer of class or adding class at ship's delivery, received DD MM YYYY

☐ A full list of overdue surveys / outstanding recommendations / conditions of class with the respective due dates for the vessel identified above is attached.

☐ In case of transfer of class or adding class at vessel's delivery, details of the first Certificate of Class, including the list of any recommendations / conditions of class and the list of any information normally contained in the classification status for the vessel identified above is attached.

☐ There is no overdue survey nor outstanding recommendation / condition of class.

☐ There is/are survey report(s) outstanding. (if this box is ticked, then Part A-1 is applicable)

☐ There is no survey report outstanding.

☐ Structural diminution allowances are attached.

☐ Structural diminution allowances: see document circulated by letter Ref. ……Date ……..

☐ Structural diminution allowances will be sent within five (5) working days. (if this box is ticked, then Part A-1 is applicable)

☐ Class is **not** suspended, nor withdrawn

☐ Class is suspended, with effect from (date) DD MM YYYY

Reason for suspension:

- ☐ a = Survey Overdue
- ☐ b = Non-compliance with Recommendations / Conditions or Class
- ☐ c = Other Safety Related
- ☐ d = Pending Disposition of Casualty
- ☐ e = Other Non-Safety Related

☐ Class was withdrawn, with effect from (date) DD MM YYYY

Reason for withdrawal:

- ☐ 0 = Transfer of class amongst Societies holding a QSCS certificate
- ☐ 1a= At the Owner's request due to the reasons other than identified in 1b, 1c or 2
- ☐ 1b= Scrapped/Sold for Scrap
- ☐ 1c= Casualty
- ☐ 2 = Transferred to a Society not holding a QSCS certificate
- ☐ 3a= Overdue Surveys
- ☐ 3b= Non-compliance with Recommendations / Condition of Class
- ☐ 3c= Safety Related other than identified in 3a or 3b
- ☐ 4 = Other Non-Safety Related or Unidentified

Signature:	Date: DD MM YYYY

Part A-1 – Additional Survey Status Information (See Note 2)	
☐ A list of additional overdue surveys and additional outstanding recommendations / conditions of class which were not included in Part A is attached. ☐ Structural diminution allowances are attached. ☐ No further information.	
Signature:	Date: DD MM YYYY

Part B – Report on Withdrawal of Class on Transfer to, or maintenance of class with another Society (See Note 3)	
Date Class Withdrawn	DD MM YYYY
Signature:	Date: DD MM YYYY

Annex 2 - Harmonisation of Reporting

ITEM	ACTION	LOCATION	DATE	GAINING SOCIETY'S REPORT REQUIREMENTS
Overdue Survey	Commenced	Port	Survey Date	List items credited and items remaining to be credited, if any. Explain why the entire survey was not completed at this port. List conditions for direct voyage to port where survey will be completed, including the need to discharge current cargo if applicable.
Overdue Survey	Continued	Port	Survey Date	In cases where surveys are continued at the port where the current cargo is discharged, list items credited and items remaining to be credited, if any. Explain why the entire survey was not completed at this port. List conditions for direct voyage to port where survey will be completed.
Overdue Survey	Completed	Port	Survey Date	List place and date where survey was completed.
Overdue recommendation / condition of class	Cleared	Port	Survey Date	Explain actions taken to complete overdue recommendation / condition of class as specified by the losing Society.
Overdue recommendation / condition of class	Commenced	Port	Survey Date	In cases where overdue recommendations / conditions of class are postponed or partly postponed at the port where the current cargo is discharged, list items credited and items remaining to be credited, if any. Explain why the overdue recommendation was not completed at this port. List conditions for discharge voyage to port where recommendation will be completed as specified by losing Society.
Overdue recommendation / condition of class	Cleared	Port	Survey Date	List date, place and actions take for completion of overdue recommendations / conditions of class.

Annex 3 - Items to be considered in the review of Vessel's Records

* 1. Damages

* 2. Major repairs / rectifications

* 3. Conversion of hull-dates

* 4. Major alterations of machinery installation-dates

5. Condition evaluation / hull summary report if applicable

* 6. History of recommendations / conditions of class

7. Thickness measurements from last Special Survey and subsequent thickness measurements, including areas with substantial corrosion

8. Report of last Special Survey and subsequent periodical reports

* 9. Information on coating condition of water ballast tanks (including non ESP vessels)

10. Restrictions / limitations in navigation area

11. Optional photos when available

* As retained by the losing Society

Annex 4 - List of Societies' Contact Points

Refer to the IACS Website:

www.iacs.org.uk, located under:

- Publications
- Procedural Requirements

and the Transfer of Class (TOC) Database.

TL- PR 3 Transparency of Classification and Statutory Information

1 Type of Information

The actual types of information are as follows:

Standing documentation
Ship related information
Newbuildings
Ships in Operation Class Services
Ships in Operation Statutory Services
Other information
SCF – Ship Construction File as indicated in SOLAS Ch.II-1/3-10, Paragraph 4.

2 The Receivers of Information

The receivers are:

Owners
Flag States
Port States
Insurance Companies

3 Release of Information

The Table 1 indicates release of information and is applicable to all types of ships with the exception of Tankers and Bulk Carriers subject to SOLAS Chapter II-1 Part A-1 Regulation 3-10 (Goal-based ship construction standards for bulk carriers and oil tankers).

The Table 2 indicates release of information and is applicable to Tankers and Bulk Carriers subject to SOLAS Chapter II-1 Part A-1 Regulation 3-10 (Goal-based ship construction standards for bulk carriers and oil tankers).

The footnotes describe the conditions of release.

Note:

1. This Procedural Requirement applies from 1 July 2016.

Table 1

Information in Question	Information available to: Owners	Flag State	Port State	Insurance Company*	Ship Yards
1. TL's Standing Documents:					
Rules and Guidelines (Class and statutory requirements)	1	1	1	1	1
Instructions to Surveyors					
Quality Manual		1			
Register Book	1	1	1	1	1
	1	1	1	1	1
2. Ship Related Information:					
A. New buildings					
Approved Drawings	6	1			7
Formal Approval Letters	1				7
Certificates of Important Equipment	2				7
B. Ships in Operation:					
Class Services					
Date (month and year) of all Class Surveys	7	1	1	1	
Expiry Date of Class Certificate	7	7**	1	1	
Certificates/Reports	7	1	6	5	
Overdue Surveys	7	7**	1	1	
Text of Conditions of Class/ Recommendations	7	1	1	5	
Text of Overdue Conditions of Class/Recommendations	7	1	1	1	
Executive Hull Summary	7	3	3	3	
Statutory Services					
Due Dates of Statutory Surveys	7	7**	1	1	
Expiry Date of Statutory Certificates	7	7**	1	1	
Registered Statutory Rec.	7	7**	1	5***	
Overdue Statutory Rec.	7	7**	1	1***	
3. Other Information:					
Correspondence File with Yard and/or Owner	6	6		5&6	
Audit of Class Societies QA System	4	4	4	4	
Class Transfer Reporting	7	7	7	7	
Class Withdrawal Information	7	7	7	7	

* Insurance Company means P&I Clubs and Hull Underwriters.
** If stated in Agreement.
*** Unless prevented by the agreement with the flag State.

KEY:
1. Available upon request.
2. At delivery of the ship by Shipyard.
3. Available under visit on board.
4. Result of audit available on request.
5. When accepted by Owners - or through special clause in insurance contract.
6. When accepted by Owner (Master) or Shipyard as applicable.
7. Automatically available.

Table 2

Information in Question	Information available to:				
	Owners	**Flag State**	**Port State**	**Insurance Company***	**Ship Yards**
1. TL's Standing Documents:					
Rules and Guidelines (Class and statutory requirements)	1	1	1	1	1
Instructions to Surveyors Quality Manual		1			
Register Book	1	1	1	1	1
	1	1	1	1	1
2. Ship Related Information:					
A. New buildings					
Approved Drawings	1	1			7
Formal Approval Letters	1	1			7
Certificates of Important Equipment	2	1			7
SCF	2	8			7
Formal Review Letters in relation with SCF	2	2			7
B. Ships in Operation:					
Class Services					
Date (month and year) of all Class Surveys	7	1	1	1	
Expiry Date of Class Certificate	7	7**	1	1	
Certificates/Reports	7	1	6	5	
Overdue Surveys	7	7**	1	1	
Text of Conditions of Class/ Recommendations	7	1	1	5	
Text of Overdue Conditions of Class/Recommendations	7	1	1	1	
Executive Hull Summary	7	3	3	3	
Statutory Services					
Due Dates of Statutory Surveys	7	7**	1	1	
Expiry Date of Statutory Certificates	7	7**	1	1	
Registered Statutory Rec.	7	7**	1	5***	
Overdue Statutory Rec.	7	7**	1	1***	
3. Other Information:					
Correspondence File with Yard and/or Owner	1	1		5&6	
Updated modifications to SCF	7****	8			
Audit of Class Societies QA System	4	4	4	4	
Class Transfer Reporting	7	7	7	7	
Class Withdrawal Information	7	7	7	7	

* Insurance Company means P&I Clubs and Hull Underwriters.
** If stated in Agreement.
*** Unless prevented by the agreement with the flag State.
**** By Owner or Shipyard.

KEY:
1. Will be available upon request.
2. At delivery of the ship by Shipyard.
3. Available under visit on board.
4. Result of audit available on request.
5. When accepted by Owners - or through special clause in insurance contract.
6. When accepted by Owner (Master) or Shipyard as applicable.
7. Automatically available.
8. Available through Owner upon request.

TL- PR 5 Definition of Exclusive Surveyor and Non-Exclusive Surveyor and Procedure for Employment and Control of Non-Exclusive Surveyors

1. Exclusive Surveyor

An exclusive surveyor is a person solely employed by TL, who is duly qualified, trained and authorized to execute all duties and activities incumbent upon his employer, within his level of work responsibility. Such an exclusive surveyor is not permitted to undertake other employment.

An exclusive surveyor of TL may also be regarded as an exclusive surveyor to another Classification Society in those cases where the relevant Societies have agreed to share survey resources.

A secondment surveyor from an organization may be regarded as an exclusive surveyor to TL subject to the basis of a long term secondment contract from the organization to the Classification Society. The secondment surveyor must be duly qualified, trained, authorized and directly controlled by that Society for the performance of the duties and activities being delegated, in accordance with the relevant quality system requirements of the Classification Society. Such a secondment surveyor is only permitted to execute duties on behalf of that Classification Society.

2. Non-Exclusive Surveyor

A non-exclusive surveyor is a person who enters into an agreement with a Society to act on its behalf and who is also free to work on behalf of other organizations.

2.1 Employment

(i) The employment of non-exclusive surveyors should be limited to locations not easily served by exclusive surveyors. This should, however, not prevent the hiring of non-exclusive surveyors who, on a case-by-case basis, may be needed to assist during periods of high work loading at exclusive offices.

(ii) The suitability of the non-exclusive surveyor is to be determined before engagement, either:

(a) by a previously demonstrated capability to provide a proper service, or,

(b) by direct assessment by a suitably qualified senior exclusive surveyor.

Note:

This Procedural Requirement applies from 1 July 2009.

(iii) The qualifications of a non-exclusive surveyor should include:

(a) a degree or equivalent from an institution recognised within a relevant field of engineering or physical science, or
a qualification from a suitable marine or nautical institution and relevant seagoing experience as a certified ship officer,

(b) suitable work experience relevant to the processes he or she is authorised to perform.

(iv) In assessing suitability and qualifications, the following may also be taken into account:

(a) Experience from class-related work as stated in a CV or other document.

(b) Mandatory training given by TL in accordance with the documented Scheme.

(v) Proposals for the employment of non-exclusive surveyors together with a CV giving details of education and experience are to be forwarded to TL for consideration, including final approval by authorised senior staff.

(vi) Records are to be kept of the justification for engagement.

(vii) Non-exclusive surveyors are to fulfill the qualification and training requirements of the quality system procedures and process instructions relevant to the tasks that each is authorised to perform.

(viii) The non-exclusive surveyor is to be engaged by means of a contract giving conditions of service, general instructions, and the scope of surveys which may be undertaken.

(ix) Depending on the extent of their employment, non-exclusive surveyors are to be supplied with copies of:

(a) the society's Register of Ships,

(b) a set of the society's Rules and Regulations for the Classification of Ships,

(c) codes, standards and/or specifications related to the processes they are authorised to perform,

(d) advice in writing detailing the service required on a job-by-job basis by a controlling exclusive office,

(e) quality system procedures and process instructions (controlled copies) relevant to the tasks non-exclusive surveyor is authorised to perform.

2.2 Control

(i) Effective controls are to be maintained over the non-exclusive surveyor by the controlling office by means of:

(a) examination of survey reports, and

(b) activity monitoring in accordance with Procedural Requirement 6

(ii) Surveys by non-exclusive surveyors may be subject to a subsequent confirmatory survey being carried out by an exclusive surveyor.

(iii) A comprehensive list of non-exclusive surveyors is to be maintained centrally, while a list of verification dates is to be maintained by the controlling exclusive office.

TL- PR 19 Procedural Requirement for Thickness Measurements

1. Thickness Measurements required in the context of hull structural classification surveys, if not carried out by TL itself shall be witnessed by a surveyor. The attendance of the surveyor shall be recorded.

2. This requires the surveyor to be on board, while the gaugings are taken, to the extent necessary to control the process (see Footnote).

2.1 Survey meeting

Prior to commencement of the Intermediate or Special survey, as required by TL- R Z7, R Z7.1, R Z7.2, R Z10s or R Z15, a meeting is to be held between the attending surveyor(s), the master of the ship or mobile offshore unit or an appropriately qualified representative appointed by the master or Company, the owner's representative(s) in attendance and the thickness measurement firm's representative(s) so as to ensure the safe and efficient execution of the surveys and thickness measurements to be carried out onboard.

Communication with the thickness measurement operator(s) and owner's representative(s) is to be agreed during the meeting, with respect to the following:

- reporting of thickness measurements on regular basis to the attending surveyor

- prompt notification to the surveyor in case of following findings:
  - excessive and/or extensive corrosion or pitting/grooving of any significance
  - structural defects like buckling, fractures and deformed structures
  - detached and/or holed structure
  - corrosion of welds.

When thickness measurements are taken in association with Intermediate or Special Survey, a documented record indicating where and when the meeting took place and who attended (the name of the surveyor(s), the master of the ship or mobile offshore unit or an appropriately qualified representative appointed by the master or Company, the owner's representative(s) and the representative(s) of the thickness measurement firm(s)) is to be maintained.

Footnote:

It is confirmed that this also applies to thickness measurements taken during voyages.

Notes:

1. This Procedural Requirement applies from 1 January 2018.

2.2 Monitoring of the thickness measurement process onboard

The surveyor is to decide final extent and location of thickness measurements after overall survey of representative spaces onboard.

In case the owner prefers to commence the thickness measurements prior to the overall survey then the surveyor is to advise that the planned extent and locations of thickness measurements are subject to confirmation during the overall survey.
Based on findings, the surveyor may require that additional thickness measurements have to be taken.

The surveyor is to direct the gauging operation by selecting locations such that readings taken represent, on average, the condition of the structure for that area.

Thickness measurements taken mainly to evaluate the extent of corrosion, which may affect the hull girder strength, are to be carried out in a systematic manner of all longitudinal structural members that are required to be gauged by the relevant TL- R(s).

Where thickness measurements indicate substantial corrosion or wastage in excess of allowable diminution, the surveyor is to direct locations for additional thickness measurements in order to delineate areas of substantial corrosion and to identify structural members for repairs/renewals.

Thickness measurements of structures in areas where close-up surveys are required shall be carried out simultaneously with close-up surveys.

2.3 Review and verification

Upon completion of the thickness measurements, the surveyor is to confirm that no further gaugings are needed, or specify additional gaugings.

If, where special consideration is allowed by TL- R(s), the extent of thickness measurements is reduced, the surveyor’s special consideration is to be reported.

In case thickness measurements are partly carried out, the extent of remaining thickness measurements is to be reported for the use of the next surveyor.

TL- PR 20 Procedural Requirement for certain ESP Surveys

The objective of this PR is to improve the quality of surveys. This PR applies to surveys of hull structures and piping systems in way of cargo holds and/or cargo tanks, cofferdams, cargo pump rooms, pipe tunnels, void spaces, within the cargo length area and all ballast tanks. In the case of Bulk Carriers, selected fuel oil tanks within the cargo length area might be part of the areas to be surveyed according to the applicable provisions of the TL- R Z10.2 or TL- R Z10.5.
Taking into consideration, the size of vessels and scope of surveys for vessels noted below, it is more effective to have more than one surveyor examine the required spaces, holds or tanks and to provide mutual support and consultation during the surveys in recommending repairs and actions required for conditions of Class / Recommendations.

1. On ships 20,000 tonnes DWT and above, subject to ESP, starting with special survey No.3, at special and intermediate hull classification surveys, the survey of hull structure and piping systems to which this PR applies is to be carried out by at least two exclusive surveyors. On bulk carriers 100,000 dwt and above of single side skin construction at the intermediate hull classification survey between 10 and 15 years of age, the survey of hull structure and piping systems to which this PR applies is to be performed by at least two exclusive surveyors.

2. This requires that at least two exclusive surveyors attend on board at the same time to perform the required survey[1)]. Where compatible with relevant laws and regulations, on dual class vessels, the requirement for two surveyors may be fulfilled by having one surveyor attend from TL.

3. Though each attending surveyor is not required to perform all aspects of the required survey, they are required to consult with each other and to do joint overall and close-up surveys to the extent necessary to determine the condition of the vessel areas to which this PR applies. The extent of these surveys should be sufficient for the surveyors to agree on actions required to complete the survey with respect to renewals, repairs, and other recommendations or conditions of class. Each surveyor is required to co-sign the survey report or indicate their concurrence in an equivalent manner.

4. The following surveys may be witnessed by a single Surveyor:

   - Thickness measurements in accordance with TL- PR 19;
   - Tank testing in accordance with the applicable TL- R Z10;
   - Repairs carried out in association with Intermediate and Special Hull Classification Survey, the extent of which have been agreed upon by the required two surveyors during the course of the surveys.

Notes:
1. It is confirmed that this also applies to voyage surveys.
2. For definition of exclusive surveyors, refer to TL- PR 5.
3. This Procedural Requirement applies from 1 January 2017.

4. Surveyors used to fulfill this requirement are to be qualified in the survey processes involved.

5.. The onboard attendance of the surveyors is to be documented according to TL' procedures.

TL- PR 23 Procedure for Reporting Cancellation of Approval of a Thickness Measurement Firm

1. Introduction

1.1 Firms engaged in thickness measurements on ships are subject to approval by TL in accordance with TL- R Z17.

2. Notification of cancellation of approval for cause

2.1 When the approval of a TM Firm has been cancelled by TL for any of the following reasons:

a) service improperly carried out or the results improperly reported;

b) appropriate corrective action not taken for deficiencies found in the service operation system within the time agreed by TL;

c) the Society not being informed of alterations to the service operation system related to compliance with requirements for approval;

d) wilful acts or omissions by the TM Firm related to compliance with requirements for maintaining approval.

TL is to send an email to the other participating Societies within 5 working days of such cancellation.

Notes:

1. This Procedural Requirement applies from 1 November 2013.

2.2 The e-mail is to be in the form set out below.

Notice of Cancellation of Thickness Measurement (TM) Firm Approval

Dear Madam/Sir,

This is to inform you that the approval of the following TM Firm has been cancelled on the date shown below:

[TM Firm complete name as shown on Society's public website]
[TM Firm complete address: Street Address or Post Office Box; City, Province or State (where applicable), Country, Postal Code (if available)]

due to **[insert text of reason from 2.1, above]**.

Approval cancelled by **[Society]** on **[DD/MM/YYYY]**.

TL- PR 29 Definition of date of "contract for construction"

1. The date of "contract for construction" of a vessel is the date on which the contract to build the vessel is signed between the prospective owner and the shipbuilder. This date and the construction numbers (i.e. hull numbers) of all the vessels included in the contract are to be declared to TL by the party applying for the assignment of class to a newbuilding.

2. The date of "contract for construction" of a series of vessels, including specified optional vessels for which the option is ultimately exercised, is the date on which the contract to build the series is signed between the prospective owner and the shipbuilder.

   For the purpose of this Procedural Requirement, vessels built under a single contract for construction are considered a "series of vessels" if they are built to the same approved plans for classification purposes. However, vessels within a series may have design alterations from the original design provided:

   (1) such alterations do not affect matters related to classification, or

   (2) If the alterations are subject to classification requirements, these alterations are to comply with the classification requirements in effect on the date on which the alterations are contracted between the prospective owner and the shipbuilder or, in the absence of the alteration contract, comply with the classification requirements in effect on the date on which the alterations are submitted to TL for approval.

   The optional vessels will be considered part of the same series of vessels if the option is exercised not later than 1 year after the contract to build the series was signed.

3. If a contract for construction is later amended to include additional vessels or additional options, the date of "contract for construction" for such vessels is the date on which the amendment to the contract, is signed between the prospective owner and the shipbuilder. The amendment to the contract is to be considered as a "new contract" to which 1 and 2 above apply.

4. If a contract for construction is amended to change the ship type, the date of "contract for construction" of this modified vessel, or vessels, is the date on which revised contract or new contract is signed between the Owner, or Owners, and the shipbuilder.

Note:

This Procedural Requirement applies from 1 July 2009.

TL- PR 35 Procedure for Imposing and Clearing Recommendations/Conditions of Class

1. Purpose

The purpose of this Procedural Requirement is to set procedures for imposing, clearing and controlling Recommendations/Conditions of Class which TL is to follow.

2. Definition

“Recommendations” and “Conditions of Class” are to be read throughout this Procedural Requirement as being different terms used by Classification Societies for the same thing, i.e. requirements to the effect that specific measures, repairs, surveys are to be carried out within a specific time limit in order to retain Classification.

3. Procedures for Members to follow for imposing, clearing and controlling Recommendations/Conditions of Class

3.1 Recommendations/Conditions of Class shall be imposed for the following:

a. Repairs and/or renewals related to damages that affect Classification (e.g. grounding, structural damages, machinery damages, wastage over the allowable limits, etc.)

b. Supplementary survey requirements

c. Temporary repairs

3.2 For repairs not completed at the time of survey, a Recommendation/Condition of Class is to be imposed. In order to provide adequate information to the surveyor attending for survey of the repairs, the Recommendation/Condition of Class is to be sufficiently detailed with identification of items to be repaired. For identification of extensive repairs, reference may be given to the survey report.

3.3 Recommendations/Conditions of Class may require imposing limitations related to navigation and operation that are deemed necessary for continued operation under Classification (e.g. loss of anchor and/or chain, etc).

3.4 Recommendations/Conditions of Class shall be given in writing with a time limit for completion to the owner’s representatives/Ship’s Master, and are to be clearly stated on the Certificate of Class or an attachment to the Certificate of Class and/or class survey status or report.

3.5 Owners will be notified of these dates and that the vessel’s class will be subject to a suspension procedure if the item is not dealt with, or postponed, by the due date. (Ref. TL-PR1C, A2)

Note: This Procedural Requirement applies from 1 July 2009.

3.6 Clearance of Recommendations/Conditions of Class shall be supported by a survey report giving details of all associated repairs and/or renewals, or of the supplemental surveys carried out. Repairs carried out shall be reported with identification of:

- Compartment and location
- Structural member
- Repair method
- Repair extent
- NDT/Tests

3.7 Partially dealt with Recommendations/Conditions of Class shall be supported by a survey report giving details of repairs and/or renewals, or of that part of the supplemental surveys carried out and those parts remaining outstanding.

TL- PR 37

Procedural Requirement for Confined Space Safe Entry

Contents

Note:

1. This Procedural Requirement applies from 1 July 2019

1 Objective

This procedural requirement contains the minimum requirements that TL shall prescribe to help keep surveyors safe when conducting confined space entry.
TL is free to take measures beyond those required in this document, but shall as a minimum prescribe the requirements contained in this document and that they meet any relevant occupational safety and health legislative requirements in place at locations where work is conducted.

TL- G 72 can be referred to for further guidance on confined space safe entry practice.

2 Definitions

2.1 Confined Space

Confined Space means a space that has any of the following characteristics:

- Limited openings for entry and exit
- Unfavourable natural ventilation
- Not intended for continuous worker occupancy

It may include, but is not limited to: boilers, pressure vessels, cargo spaces (cargo holds, or cargo tanks), cargo space stairways, ballast tanks, double bottoms, double hull spaces, fuel oil tanks, lube oil tanks, sewage-tanks, pump-rooms, compressor rooms, cofferdams, void spaces, duct keels, inter-barrier spaces, engine crankcases, excavations and pits.

2.2 Confined Space Entry (CSE)

Confined Space Entry is the process of entering, working in and exiting a confined space.

2.3 Competent Person

Competent person means a person with sufficient theoretical knowledge and practical experience to make an informed assessment of the likelihood of oxygen deficient/enriched or a dangerous atmosphere being present or subsequently arising in the space. Competent person must be trained and qualified in the hazards of Confined Spaces and in use of atmospheric monitoring devices. The Competent Person role may be performed by a Marine Chemist.

2.4 Responsible Person

Responsible Person means a person authorised to permit entry to a confined space and having sufficient knowledge of the procedure to be followed and other activities that are being undertaken that could impact on the safety of those in a confined space.

2.5 Attendant

Attendant is a person who is suitably trained and responsible for maintaining a watch over those entering the confined space, for maintaining communications with those inside the space and for initiating the emergency procedures in the event of an incident occurring.

2.6 Marine Chemist

A Marine Chemist is a person holding a valid and suitably recognised qualification as a marine chemist or equivalent.

2.7 Adjacent Space

An adjacent space is any space bordering the confined space in any directions, including all points of contact, corners, diagonals, decks, tank tops and bulkheads.

2.8 Toxic Product

A Toxic Product means any chemical liquid, gas or solid material, which can give toxic vapour and which is assigned with suffix "T" in column "k" of table given in Chapter 17 of IBC Code, or assigned with suffix "T" or “F+T” in column "f" of table given in Chapter 19 of IGC Code, or classified as a Toxic Substance (Class/Division 6.1) within the part 2 of IMDG Code, or any other product which has a toxic symbol in the data sheet or is hazard classified as a toxic.

2.9 Surveyor

For the purpose of this Procedural Requirement a Surveyor is any person employed by TL conducting activities within a confined space on behalf of TL.

2.10 Permit to Enter/Permit to Work

A Permit to Enter or Permit to Work is a documented authorisation that has been signed and dated, including time of issue by the Responsible Person, which states that the space has been tested by a Competent Person and that the space is safe for entry; what precautions, equipment etc. are required and what works is to be done.

3 Requirements

The requirements are categorised in three groups.

3.1 Training

3.1.1 All surveyors who are expected to enter and work in confined spaces shall be trained in Occupational Safety and Health requirements for such activities. This training shall include:

3.1.1.1 Recognising a confined space

3.1.1.2 Role of the Competent Person, Responsible Person, Attendant and Marine Chemist

3.1.1.3 How to recognise the hazards and manage the risks associated with Confined Space Entries

3.1.1.4 Permit to Work (PTW) systems/control procedures at the workplace

3.1.1.5 Requirements for atmosphere testing and the interpretation of their results

3.1.1.6 Use of personal multi gas meters

3.1.1.7 Access, exit and safe working requirements

3.1.1.8 Emergency arrangements

3.1.2 Competency in the areas covered by the training identified in 3.1.1 shall be periodically assessed, either as part of activity monitoring or some other suitable means. The maximum period between these assessments of competency is 3 years. Appropriate refresher training shall be provided as determined necessary from the competency assessment. The delivery mechanism for this refresher training is for the individual societies to determine.

3.2 Confined Space Entry Procedures

Societies shall have documented procedures that cover the following points:

3.2.1 Include in their procedures the minimum requirements for Surveyors entry into a confined space, as follows:

3.2.1.1 Safe entry procedures (such as entry permit, “safe for workers” certificate, “safe for hot work” certificate, etc.) are in place, current and are being followed

3.2.1.2 The Responsible and Competent Persons are identified

3.2.1.3 The access and exit arrangements to and within the confined space are considered safe. Where available, multiple entry and exit ways shall be opened

3.2.1.4 Communications arrangements are adequate

3.2.1.5 The confined space is adequately clean to allow safe working

3.2.1.6 The confined space lighting is adequate for entry/exit and to allow safe working in a confined space

3.2.1.7 The atmosphere has been demonstrated as being safe (safe limits are: atmospheric oxygen the range of 20.6% to 22% by volume, combustible gases less than 5% of lower explosive limit, toxics within acceptable limits)

3.2.1.8 Adequate ventilation arrangements are in place and functioning

3.2.1.9 Isolation of the confined space, as applicable, from other tanks, cargo spaces, pipes, etc. and of machinery in the space, is confirmed

3.2.1.10 Extreme temperature effects are adequately considered

3.2.1.11 Electrical equipment in the confined space is suitable and in acceptable condition

3.2.1.12 A dedicated Attendant is provided by the vessel’s management or the management of the facility where the surveyor’s activities are carried out for the complete duration of the time spent working in the confined space and the Attendant has suitable means of initiating emergency response

3.2.1.13 Adequate emergency response arrangements are in place

3.2.2 No surveyor shall be the first to enter a confined space, and they shall be accompanied at all times where the size of the space permits.

3.2.3 Surveyors shall not enter the confined space if they are required to wear breathing apparatus.

3.2.4 Surveyor shall not enter the confined space if the surrounding noise can adversely impact effective communication.

3.2.5 Surveyor shall not enter the confined space if a toxic product is contained in an adjacent space, until the following is carried out:

3.2.5.1 A risk assessment is completed by the vessel's Management Company and the risk is mitigated.

3.2.5.2 All identified controls are confirmed in place prior to tank entry.

3.2.6 No surveyor shall be part of a rescue team.

3.2.7 Surveyors shall immediately leave a confined space, by the nearest safe exit, if any alarms sound, or any physical impairment or distress is experienced by the surveyor.

3.2.8 If any of minimum requirements addressed in 3.2.1 through 3.2.7 are not complied with or in any other situation where the surveyor has a valid concern over the safety of the confined space, he/she shall refuse to enter the confined space.

3.2.9 The points addressed in 3.2.1 through 3.2.8 above shall be considered as part of survey planning and reviewed as changes occur during any Confined Space Entry.

3.3 Equipment for Surveyors Entering a Confined Space

3.3.1 The following minimum set of Personal Protective Equipment shall be made available by the society to surveyors for conducting a Confined Space Entry:

3.3.1.1 Protective clothing

3.3.1.2 Safety shoes/boots

3.3.1.3 Hard hat

3.3.1.4 Work gloves

3.3.1.5 Protective glasses and/or goggles

3.3.1.6 Ear defenders and/or ear plugs

3.3.1.7 An individual multi gas meter, in good working order, serviced and calibrated as per the manufacturer's instructions

3.3.1.8 A flashlight, appropriate to the nature of the confined space to be entered, and in good working order

3.3.2 The surveyor must always use the necessary personal protective equipment according to the specific conditions and the survey being carried out.

TL-PR 38 Procedure for calculation and verification of the Energy Efficiency Design Index (EEDI)

Introduction

This procedure applies to all cases of Class Societies' involvement in conducting the survey and certification of EEDI in accordance with regulations 5, 6, 7, 8 and 9 of MARPOL Annex VI as a Verifier defined in the IMO *"2014 Guidelines on Survey and Certification of the Energy Efficiency Design Index (EEDI)"* as amended in MEPC.1/Circ.855.

1 Definitions

"Industry Guidelines" means the *"2015 Industry Guidelines for calculation and verification of the Energy Efficiency Design Index (EEDI)"* as submitted to MEPC 68 that may be revised in order to remain in line with the relevant IMO Guidelines.

"Verifying Society" is a Society which conducts the survey and verification of EEDI of a ship.

"Witnessing Society" is a Society which has witnessed the towing tank test of a ship of the same type as the ship whose EEDI is verified by the Verifying Society. "Ship of the same type" is defined in IMO *"2014 Guidelines on Survey and Certification of the Energy Efficiency Design Index (EEDI)"*.

"Witnessing protocol" is a document showing evidence of the witnessing and acceptance of the towing tank test by the Witnessing Society, with indication such as date, signature and possible remarks of the attending surveyor.

2 Scope of the Procedure

The scope of this procedure is defined in Part I of the Industry Guidelines.

3 Calculation of EEDI

The procedure to compute the EEDI is documented in Part II of the Industry Guidelines. For the purpose of this Procedural Requirement, calculation of the EEDI is to be performed in accordance with IMO *"2014 Guidelines on the method of calculation of the attained Energy Efficiency Design Index (EEDI) for new ships"* and Part II of the Industry Guidelines, as amended.

Note:

1. This Procedural Requirement applies from 1 July 2019.

4 Verification of EEDI

The procedure to verify the EEDI is documented in Part III of the Industry Guidelines, together with Appendixes 1, 3, 4 and 5. For the purpose of this Procedural Requirement, verification of the EEDI is to be performed in accordance with IMO *"2014 Guidelines on Survey and Certification of the Energy Efficiency Design Index (EEDI)"* and Part III of the Industry Guidelines, as amended.
A sample of document to be submitted to the Verifier including additional information for verification is provided in Appendix 2 of the Industry Guidelines.

5 Acceptance of towing tank tests witnessed by another Society

Further to the agreement of the submitter of the EEDI Technical File and the Shipowner, a Verifying Society may accept towing tank tests reports witnessed by another Society if the towing tank tested ship is of the same type as the ship of which the EEDI is verified.

Copies of the following documents are to be provided to the Verifying Society, with due consideration given to the protection of the Intellectual Property Rights (IPR) as indicated under paragraph 14 of the Industry Guidelines:

- Calculation of the reference speed of the verified ship explicitly making reference to the speed power curves of the tank tested ship model

- Witnessing protocol of the tank tested ship endorsed by the surveyor of the Witnessing Society

- Towing tank test report of the tank tested ship

On specific request of the Verifying Society, the following additional information is to be submitted:

- Ship lines and model particulars, loading and operating conditions of the tank tested ship as described in 4.2.7.2 of IMO *"2014 Guidelines on Survey and Certification of the Energy Efficiency Design Index (EEDI)"* as amended, showing that the verified ship and the tank tested ship are of the same type

If some of the relevant information is held by the original Witnessing Society, the submitter should authorize the Witnessing Society to make the information available to the Verifying Society.

6 New ship (as per MARPOL Annex VI Regulation 2) designed before the entry into force of the MARPOL Annex VI amendments introducing the EEDI

It is expected that the towing tank tests of a new ship performed before the entry into force of MARPOL Annex VI amendments introducing the EEDI have not been witnessed by a Verifier. In this case, towing tank test results provided by a tank test organization with quality control certified according to a recognized scheme or with experience acceptable to the Verifying Society may be accepted by the Verifying Society.

Attached:

2015 Industry Guidelines for calculation and verification of the Energy Efficiency Design Index (EEDI)

2015 INDUSTRY GUIDELINES FOR CALCULATION AND VERIFICATION OF THE ENERGY EFFICIENCY DESIGN INDEX (EEDI)

TABLE OF CONTENTS

Part I - Scope of the Industry Guidelines

1 Scope of the Guidelines

1.1 Objective

The objective of these Industry Guidelines for calculation and verification of the Energy Efficiency Design Index (EEDI), hereafter designated as “the Industry Guidelines”, is to provide details and examples of calculation of attained EEDI and to support the method and role of the verifier in charge of conducting the survey and certification of EEDI in compliance with the following IMO Resolutions:

- 2018 Guidelines on the method of calculation of the attained Energy Efficiency Design Index (EEDI) for new ships, Res. MEPC.308(73) adopted on 26 October 2018, as amended, referred to as the "IMO Calculation Guidelines" in the present document
- 2014 Guidelines on survey and certification of EEDI, Res. MEPC.254(67) adopted on 17 October 2014, as amended, referred to as the "IMO Verification Guidelines" in the present document
- 2013 interim Guidelines for determining minimum propulsion power to maintain the manoeuvrability of ships in adverse conditions, Res. MEPC.232(65) as amended
- 2013 Guidance on treatment of innovative energy efficiency technologies for calculation and verification of the attained EEDI, MEPC.1/Circ.815

In the event that the IMO Guidelines are amended, then pending amendment of these Industry Guidelines, calculation and verification of EEDI are to be implemented in compliance with the amended IMO Guidelines.

1.2 Application

These Guidelines apply to new ships as defined in regulation 2.23 of MARPOL Annex VI of 400 gross tonnage and above of the types defined in regulations 2.25 to 2.31, 2.33 to 2.35, 2.38 and 2.39, as follows:

- Bulk carrier
- Gas carrier
- LNG carrier (contracted on or after 1 September 2015)
- Cruise passenger ship having non-conventional propulsion (contracted on or after 1 September 2015)
- Tanker
- Container ship
- General cargo ship
- Ro-ro cargo ship (vehicle carrier) (contracted on or after 1 September 2015)
- Ro-ro cargo ship (contracted on or after 1 September 2015)
- Ro-ro passenger ship (contracted on or after 1 September 2015)
- Refrigerated cargo carrier
- Combination carrier

The calculation and verification of EEDI shall be performed for each:

1. new ship before ship delivery
2. new ship in service which has undergone a major conversion

3. new or existing ship which has undergone a major conversion that is so extensive that the ship is regarded by the Administration as a newly constructed ship

The Industry Guidelines shall not apply to ships which have non-conventional propulsion, such as diesel-electric propulsion, turbine propulsion or hybrid propulsion systems, with the exception of cruise passenger ships with diesel-electric propulsion and LNG carriers having diesel-electric or steam turbine propulsion systems.

The Industry Guidelines shall not apply to cargo ships having ice-breaking capability as defined in regulation 2.42 of MARPOL Annex VI As a consequence, the Industry Guidelines apply to cargo vessels with ice class up to and including Finnish-Swedish ice class 1A Super or equivalent unless they qualify as a ship with ice-breaking capability in which case they are exempt. The intermediate Polar Classes, namely PC4 and PC5, need to demonstrate ice-breaking capability through ice trials to qualify. In the initial stages, ice-breaking capability can be demonstrated based on ice tank tests.

Part II - Explanatory notes on calculation of EEDI

2 Introduction

The attained Energy Efficiency Design Index (EEDI) is a measure of a ship's energy efficiency determined as follows:

$$EEDI = \frac{CO_2\ emission}{Transport\ work}$$

The CO2 emission is computed from the fuel consumption taking into account the carbon content of the fuel. The fuel consumption is based on the power used for propulsion and auxiliary power measured at defined design conditions.

The transport work is estimated by multiplying the ship capacity as defined under 2.3 of the IMO Calculation Guidelines by the ship's reference speed at the corresponding draft. The reference speed is determined at 75% of the rated installed power in general and 83% of the rated installed propulsion power for LNG carriers having diesel electric or steam turbine propulsion systems.

3 EEDI formula

The EEDI is provided by the following formula:

$$\frac{(\prod_{i=1}^{n} f_j)\cdot(\sum_{i=1}^{nME} P_{ME(i)}\cdot C_{FME(i)}\cdot SFC_{ME(i)}) + P_{AE}\cdot C_{FAE}\cdot SFC_{AE} + \{(\prod_{i=1}^{n} f_j)\cdot\sum_{i=1}^{nPTI} P_{PTI(i)} - \sum_{i=1}^{neff} f_{eff(i)}\cdot P_{AEeff(i)}\}\cdot C_{FAE}\cdot SFC_{AE} - \sum_{i=1}^{neff} f_{eff(i)}\cdot P_{eff(i)}\cdot C_{FME}\cdot SFC_{ME})}{f_i\, f_c\, f_v\, Capacity\, f_w\, V_{ref}}$$

With the following notes:

The global fi factor may also be written:
$f_i = (\prod_{i=1}^{m} f_i)$

where each individual fi factor is explained under section 9 of this document.

If part of the normal maximum sea load is provided by shaft generators, the term $P_{AE}.C_{FAE}.SFC_{AE}$ may be replaced by:

$$(P_{AE} - 0.75 * \sum_{i=1}^{nPTO} P_{PTO(i)}).C_{FAE}.SFC_{AE} + 0.75 * \sum_{i=1}^{nPTO} P_{PTO(i)}.C_{FME(i)}.SFC_{ME(i)}$$

with the condition $0.75 * \sum_{i=1}^{nPTO} P_{PTO(i)} \leq P_{AE}$.

Where the total propulsion power is limited by verified technical means as indicated under section 6, the term $(\sum_{i=1}^{nME} P_{ME(i)}.C_{FME(i)}.SFC_{ME(i)} + \sum_{i=1}^{nPTI} P_{PTI(i)}.C_{FAE}.SFC_{AE})$ is to be replaced by 75 percent of the limited total propulsion power multiplied by the average weighted value of ($SFC_{ME}.C_{FME}$) and ($SFC_{AE}.C_{FAE}$).

Due to the uncertainties in the estimation of the different parameters, the accuracy of the calculation of the attained EEDI cannot be better than 1%.

Therefore, the values of attained and required EEDI have to be reported with no more than three significant figures (for instance, 2.23 or 10.3) and the checking of Regulation 20, chapter 4 of MARPOL Annex VI is to be verified in accordance with this accuracy.

4 Fuel consumption and Fuel Conversion Factor

4.1 General

The conversion factor CF and the specific fuel consumption, SFC, are determined from the results recorded in the parent engine NOx Technical File as defined in paragraph 1.3.15 of the NOx Technical Code 2008.

The fuel grade used during the test of the engine in the test bed measurement of SFC determines the value of the CF conversion factor according to the table under 2.1of the IMO Calculation Guidelines.

SFC is the corrected specific fuel consumption, measured in g/kWh, of the engines. The subscripts ME(i) and AE(i) refer to the main and auxiliary engine(s), respectively. SFC_{AE} is the power-weighted average among $SFC_{AE(i)}$ of the respective engines *i.*

For main engines certified to the E2 or E3 test cycles of the NOx Technical Code 2008, the engine Specific Fuel Consumption ($SFC_{ME(i)}$) is that recorded in the test report included in a NOx Technical File for the parent engine(s) at 75% of MCR power.

For engines certified to the D2 or C1 test cycles of the NOx Technical Code 2008, the engine Specific Fuel Consumption ($SFC_{AE(i)}$) is that recorded in the test report included in a NOx Technical File for the parent engine(s) at 50% of MCR power or torque rating.

The SFC is to be corrected to the value corresponding to the ISO standard reference conditions using the standard lower calorific value of the fuel oil (42,700kJ/kg), referring to ISO 15550:2002 and ISO 3046-1:2002.

For LNG driven engines for which SFC is measured in kJ/kWh, the SFC value is to be converted to g/kWh using the standard lower calorific value of the LNG (48,000 kJ/kg), referring to the 2006 IPCC Guidelines.

For those engines which do not have a test report included in a NOx Technical File because its power is below 130 kW, the SFC specified by the manufacturer is to be used.

At the design stage, in case of unavailability of test reports in the NOx Technical File, the SFC value given by the manufacturer with the addition of the guarantee tolerance is to be used.

4.2 Dual-fuel engines

Gas fuel may be used as primary fuel for one or more of the main and auxiliary engine(s) in accordance with paragraph 4.2.3 of the IMO Verification Guidelines.

For these dual-fuel engines, the C_F factor and the Specific Fuel Consumption for gas (LNG) and for pilot fuel should be combined at the relevant EEDI load point as described in 2.5.1 and Appendix 4 of the IMO Calculation Guidelines.

4.3 LNG carriers with steam turbine propulsion

The Specific Fuel Consumption of the steam turbine should be determined during the running tests of the main boilers and steam turbines on board under load during the sea trials. For preliminary estimate of EEDI, manufacturer’s certificate is to be used.

5 Capacity, power and speed

5.1 Capacity

The capacity of the ship is computed as a function of the gross tonnage for cruise passenger ships and of the deadweight for other types of ships as indicated under 2.3 of the IMO Calculation Guidelines.

For the computation of the deadweight according to 2.4 of the IMO Calculation Guidelines, the lightweight of the ship and the displacement at the summer load draught are to be based on the results of the inclining test or lightweight check provided in the final stability booklet. At the design stage, the deadweight may be taken in the provisional documentation.

5.2 Power

The installed power for EEDI determination is taking into account the propulsion power and in general a fixed part of the auxiliary power, measured at the output of the crankshaft of main or auxiliary engine.

The power P_{ME} is defined as 75% MCR of all main engines in general.

For LNG carriers having diesel electric propulsion system, the power P_{ME} is 83% of the rated output of the electrical propulsion motor(s) divided by the electrical chain efficiency from the output of the auxiliary engines to the output of the propulsion motor(s).

For LNG carriers having steam turbine propulsion system, the power P_{ME} is 83% of the rated installed power of steam turbines.

The total propulsion power is conventionally taken as follows:

$$\sum_{i=1}^{nME} P_{ME(i)} + \sum_{i=1}^{nPTI} (P_{PTI(i)} \cdot \eta_{PTI(i)}) \cdot \eta_{\overline{Gen}}$$

In this formula:

- The value of PME(i) may be limited by verified technical means (see 6 below)
- The total propulsion power may be limited by verified technical means. In particular an electronic engine control system may limit the total propulsion power, whatever the number of engines in function (see 6 below)

The auxiliary power can be nominally defined as a specified proportion of main engine power aiming to cover normal maximum sea load for propulsion and accommodation[1]. The nominal values are 2.5% of main engine power plus 250 kW for installed main engine power equal to or above 10 MW. 5% of main engine power will be accounted if less than 10 MW main engine power is installed. Alternatively, as explained below, the value for auxiliary power can be taken from the electric power table (EPT) of the ship.

[1] by paragraphs 2.5.6.1 to 2.5.6.3 of the IMO Calculation Guidelines.

In addition, if shaft motors are installed, then in principle 75% of the shaft motor power is accounted for in the EEDI calculation. Detailed explanation about this is given in section 6.

For Passenger ships, Ro-Ro Passenger Ships and Cruise Passenger Ships, the P_{AE} value should be estimated by the electric power (excluding propulsion) in conditions when the ship is engaged in a voyage at reference speed (V_{ref}), as given in the electric power table (EPT), divided by the average efficiency of the generator(s) weighted by power.

As an option for other vessel types, if the difference between P_{AE} value calculated by paragraphs 2.2.5.6.1 to 2.2.5.6.5 of Res.MEPC.308(73) and P_{AE} based on EPT, leads to a variation of the computed EEDI value exceeding 1%, the value for auxiliary power could be taken from the EPT.

5.3 Speed V_{ref}

The speed V_{ref} is the ship speed, measured in knots, verified during sea trials and corrected to be given in the following ideal conditions:

- in deep water of 15°C
- assuming the weather is calm with no wind, no current and no waves
- in the loading condition corresponding to the Capacity
- at the total propulsion power defined in 5.2 taking into account shaft generators and shaft motors

6 Shaft generator and shaft motor

6.1 Introduction and background

As for 2.5.2 and 2.5.3 of IMO Calculation Guidelines, content of this section applies to ships other than LNG carriers having diesel-electric propulsion system. For LNG carriers with diesel-electric propulsion, the factor 0.75 between the propulsion power and the rated power is to be replaced by 0.83.

Ships need electrical power for the operation of engine auxiliary systems, other systems, crew accommodation and for any cargo purposes. This electrical power can be generated by diesel-generator sets (gen-sets), shaft generators, waste heat recovery systems driving a generator and possibly by new innovative technologies, e.g. solar panels.

Diesel-generator sets and shaft generators are the most common systems. While diesel-generator sets use a diesel engine powering a generator, a shaft generator is driven by the main engine. It is considered that due to the better efficiency of the main engine and efficiency of the shaft generator less CO_2 is emitted compared to gen-set operation.

The EEDI formula expresses the propulsion power of a vessel as 75% of the main engine power P_{ME}. It is also termed shaft power P_S, which corresponds to the ship's speed V_{ref} in the EEDI formula.

P_{AE} - the auxiliary power - is also included in the EEDI formula. However, this power demand is largely dependent on loading and trading patterns and it must also incorporate safety aspects, for example, the provision of a spare generator set. As noted in section 5, the auxiliary power can generally be taken into account as a fixed proportion of the main engine power (i.e. nominally 2.5% plus 250kW) [2].

[2] c.f.: precise instruction in IMO Calculation Guidelines.

The use of shaft generators is a well proven and often applied technology, particularly for high electrical power demands related to the payload e.g. reefer containers. Usually a ship design implements a main engine to reach the envisaged speed with some provision of sea margin. For the use of a shaft generator past practice and understanding was to install a bigger main engine to reach the same speed compared to the design without a shaft generator and to then have the excess power available from the main engine at any time for generation of electrical power. As a rule of thumb, one more cylinder was added to the main engine to cover this additional power demand.

The difficulty with this issue for calculation of the EEDI is that the excess power could be used to move the ship faster in the case where the shaft generator is not in use which would produce a distortion between ship designs which are otherwise the same.

The IMO Calculation Guidelines take these circumstances into account and offer options for the use of shaft generators. These options are described in detail, below.

Further, electric shaft motors operate similarly to shaft generators; sometimes a shaft generator can act as a shaft motor. The possible influence of shaft motors has also been taken into account in the IMO Calculation Guidelines and is also illustrated, below.

6.2 Main engine power without shaft generators

The main engines are solely used for the ship's propulsion. For the purpose of the EEDI, the main engine power is 75 % of the rated installed power MCR_{ME} for each main engine:

$$P_{ME(i)} = 0.75 \times MCR_{ME(i)}$$

6.3 Main engine power with shaft generators

Shaft generators produce electric power using power from the prime mover (main engine). Therefore the power used for the shaft generator is not available for the propulsion. Hence MCR_{ME} is the sum of the power needed for propulsion and the power needed for the shaft generator. Thus at least a part of the shaft generator's power should be deductible from the main engine power (P_{ME}).

The power driving the shaft generator is not only deducted in the calculation. As this power is not available for propulsion this yields a reduced reference speed. The speed is to be determined from the power curve obtained at the sea trial as explained in the schematic figure provided in paragraph 2.5 of the IMO Calculation Guidelines.

It has been defined that 75% of the main engine power is entered in the EEDI calculation. To induce no confusion in the calculation framework, it has therefore also been defined to take into account 75% of the shaft power take off.

For the calculation of the effect of shaft generators, two options are available.

6.3.1 Option 1

For this option, $P_{PTO(i)}$ is defined as 75% of the rated electrical output power MCR_{PTO} of each shaft generator. The maximum allowable deduction is limited by the auxiliary power P_{AE} as described in Paragraph 2.6 in the IMO Calculation Guidelines.

Then the main engine power P_{ME} is:

$$P_{PTO(i)} = 0.75 \times MCR_{PTO(i)}$$
$$\sum P_{ME(i)} = 0.75 \times \sum \left(MCR_{ME(i)} - P_{PTO(i)} \right) \; with \; 0.75 \times \sum P_{PTO(i)} \leq P_{AE}$$

This means, that only the maximum amount of shaft generator power that is equal to P_{AE} is deductible from the main engine power. In doing so, 75% of the shaft generator power must be greater than the auxiliary power calculated in accordance to Para. 2.5.6 of the IMO Calculation Guidelines.

Higher shaft generators output than P_{AE} will not be accounted for under option 1.

6.3.2 Option 2

The main engine power P_{ME} to be considered for the calculation of the EEDI is defined as 75% of the power to which the propulsion system is limited. This can be achieved by any verified technical means, e.g. by electronic engine controls.

$$P_{ME(i)} = 0.75 \times P_{Shaft,limit}$$

This option is to cover designs with the need for very high power requirements (e.g., pertaining to the cargo). With this option it is ensured that the higher main engine power cannot be used for a higher ship speed. This can be safeguarded by the use of verified technical devices limiting the power to the propulsor.

For example, consider a ship having a 15 MW main engine with a 3 MW shaft generator. The shaft limit is verified to 12 MW. The EEDI is then calculated with only 75% of 12 MW as main engine power as, in any case of operation, no more power than 12 MW can be delivered to the propulsor, irrespective of whether a shaft generator is in use or not.

It is to be noted that the guidelines do not stipulate any limits as to the value of the shaft limit in relation to main engine power or shaft generator power.

6.3.3 The use of specific fuel oil consumption and CF-factor

Shaft generators are driven by the main engine, therefore the specific fuel oil consumption of the main engine is allowed to be used to the full extent if 75% of the shaft generator power is equal to P_{AE}.

In the case shaft generator power is less than P_{AE} then 75% of the shaft generator power is calculated with the main engine's specific fuel oil consumption and the remaining part of the total P_{AE} power is calculated with SFC of the auxiliaries (SFC_{AE}).

The same applies to the conversion factor C_F, if different fuels are used in the EEDI calculation.

6.4 Total shaft power with shaft motors

In the case where shaft motor(s) are installed, the same guiding principles as explained for shaft generators, above, apply. But in contrast to shaft generators, motors do increase the total power to the propulsor and do increase ships' speed and therefore must be included in the total shaft power within the EEDI calculation. The total shaft power is thus main engine(s) power plus the additional shaft motor(s) power:

$$\sum P_{ME(i)} + \sum P_{PTI(i),Shaft}$$

Where:

$$\sum P_{PTI(i),Shaft} = \sum \left(0.75 \cdot P_{SM,\max(i)} \cdot \eta_{PTI(i)}\right)$$

and ΣP_{ME} may be 0(zero) if the ship is a diesel-electric cruise passenger ship.

Similar to the shaft generators, only 75% of the rated power consumption $P_{SM,max}$ (i.e. rated motor output divided by the motor efficiency) of each shaft motor divided by the weighted average efficiency of the generator(s) $\eta_{\overline{Gen}}$ is taken into account for EEDI calculation[3].

$$\sum P_{PTI(i)} = \frac{\sum \left(0.75 \cdot P_{SM,\max(i)}\right)}{\eta_{\overline{Gen}}}$$

Figure 1.1 provides the notations used for the power and efficiencies used in IMO Calculation Guidelines and the present document.

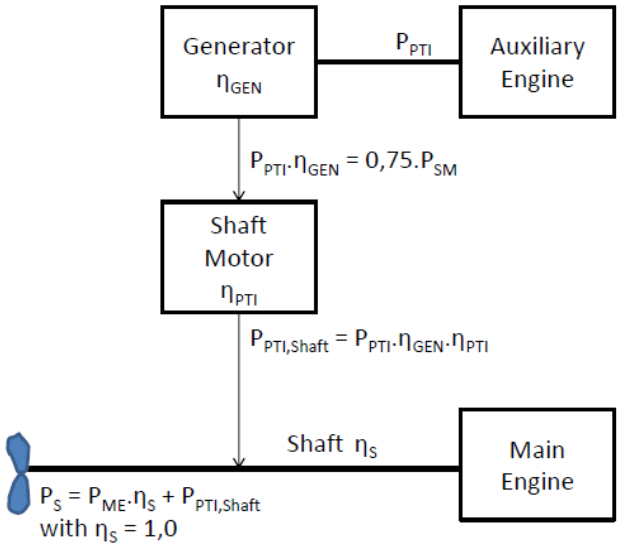

Figure 1.1: flow of power in a generic shaft motor installation

A power limitation similar to that described above for shaft generators can also be used for shaft motors. So if a verified technical measure is in place to limit the propulsion output, only 75% of limited power is to be used for EEDI calculation and also for that limited power V_{ref} is determined.

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3 The efficiency of shaft generators in the previous section has consciously not been taken into account in the denominator as inefficient generator(s) would increase the deductible power.

A diagram is inserted to highlight where the mechanical and electrical efficiencies or the related devices (PTI and Generator's) are located:

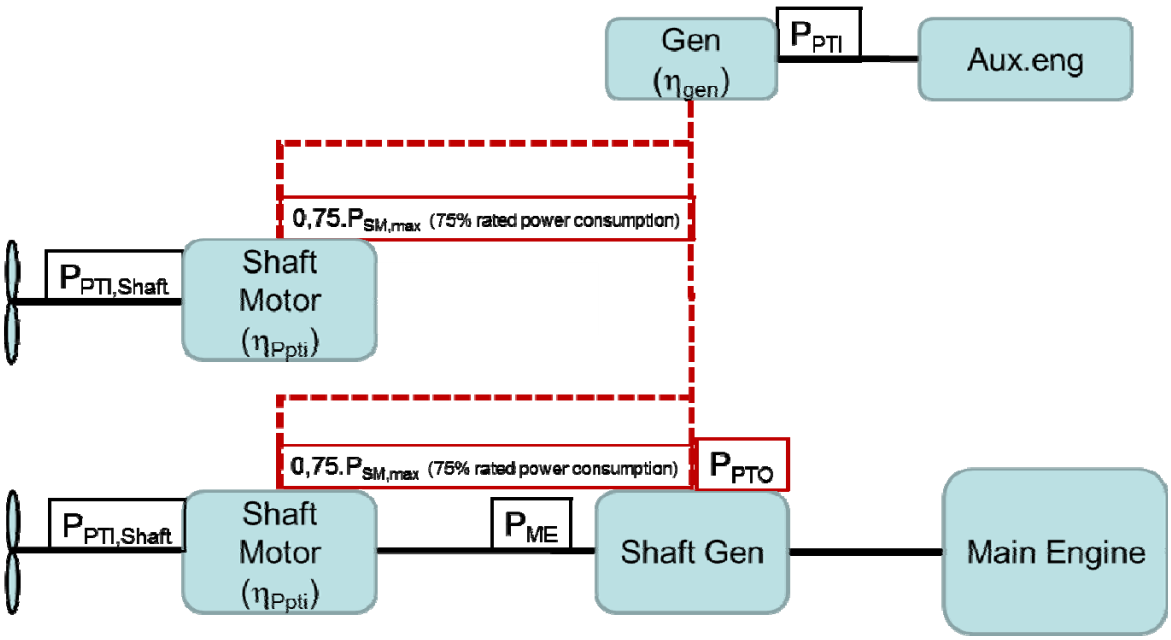


Figure 1.2: Typical arrangement of propulsion and electric power system

6.5 Calculation examples

For these calculation examples the ships' following main parameters are set as:

MCR_{ME} = 20,000 kW
Capacity = 20,000 DWT
$C_{F,ME}$ = 3.206
$C_{F,AE}$ = 3.206
SFC_{ME} = 190 g/kWh
SFC_{AE} = 215 g/kWh
v_{ref} = 20 kn (without shaft generator/motor)

6.5.1 One main engine, no shaft generator

$$MCR_{ME} = 20{,}000kW$$
$$P_{ME} = 0.75 \times MCR_{ME} = 0.75 \times 20{,}000kW = 15{,}000kW$$
$$P_{AE} = (0.025 \times 20{,}000) + 250kW = 750kW$$

$$EEDI = ((15{,}000 \times 3.206 \times 190) + (750 \times 3.206 \times 215))/(20 \times 20{,}000)$$
$$= 24.1\ g\,CO_2/t\,nm$$

6.5.2 One main engine, 0.75 x P_{PTO}<P_{AE}, option 1

$$MCR_{PTO} = 500kW$$
$$P_{PTO} = 500kW \times 0.75 = 375kW$$
$$MCR_{ME} = 20{,}000kW$$
$$P_{ME} = 0.75 \times (MCR_{ME} - P_{PTO}) = 0.75 \times (20{,}000kW - 375kW) = 14{,}719kW$$
$$P_{AE} = (0.025 \times MCR_{ME}) + 250kW = 750kW$$
$$v_{ref} = 19.89kn: \quad \text{The speed at } P_{ME} \text{ determined from the power curve}$$
$$EEDI = \left((P_{ME} \times C_{F,ME} \times SCF_{ME}) + (0.75 \times P_{PTO} \times C_{F,ME} \times SCF_{ME}) + ((P_{AE} - 0.75 \times P_{PTO}) \times C_{F,AE} \times SFC_{AE})\right) / (DWT \times v_{ref})$$
$$= 23.8 \ g\,CO_2 / t\,nm \quad \approx 1\%$$

6.5.3 One main engine, 0.75 x P_{PTO}=P_{AE}, option 1

$$MCR_{PTO} = 1{,}333kW$$
$$P_{PTO} = 1{,}333kW \times 0.75 = 1{,}000kW$$
$$MCR_{ME} = 20{,}000kW$$
$$P_{ME} = 0.75 \times (MCR_{ME} - P_{PTO}) = 0.75 \times (20{,}000kW - 1{,}000kW) = 14{,}250kW$$
$$P_{AE} = (0.025 \times MCR_{ME}) + 250kW = 750kW$$
$$v_{ref} = 19.71kn: \quad \text{The speed at } P_{ME} \text{ determined from the power curve}$$
$$EEDI = \left((P_{ME} \times C_{F,ME} \times SCF_{ME}) + (0.75 \times P_{PTO} \times C_{F,ME} \times SCF_{ME})\right) / (DWT \times v_{ref})$$
$$= 23.2 \ g\,CO_2 / t\,nm \quad \approx 4\%$$

6.5.4 One main engine with shaft generator, 0.75 x P_{PTO}> P_{AE}, option 1

$$MCR_{PTO} = 2{,}000kW$$
$$0.75 \times P_{PTO} = 0.75 \times 2{,}000kW \times 0.75 = 1{,}125kW > P_{AE} \Rightarrow P_{PTO} = P_{AE} / 0.75 = 1{,}000kW$$
$$MCR_{ME} = 20{,}000kW$$
$$P_{ME} = 0.75 \times (MCR_{ME} - P_{PTO}) = 0.75 \times (20{,}000kW - 1{,}000kW) = 14{,}250kW$$
$$P_{AE} = (0.025 \times MCR_{ME}) + 250kW = 750kW$$
$$v_{ref} = 19.71kn: \quad \text{The speed at } P_{ME} \text{ determined from the power curve}$$
$$EEDI = \left((P_{ME} \times C_{F,ME} \times SCF_{ME}) + (0.75 \times P_{PTO} \times C_{F,ME} \times SCF_{ME})\right) / (DWT \times v_{ref})$$
$$= 23.2 \ g\,CO_2 / t\,nm \quad \approx 4\%$$

6.5.5 One main engine with shaft generator, 0.75 x P_{PTO}> P_{AE}, option 2

$$MCR_{PTO} = 2{,}000kW$$
$$MCR_{ME} = 20{,}000kW$$
$$P_{Shaft,limit} = 18{,}000kW$$
$$P_{ME} = 0.75 \times (P_{Shaft,limit}) = 0.75 \times (18{,}000kW) = 13{,}500kW$$
$$P_{AE} = (0.025 \times MCR_{ME}) + 250kW = 750kW$$
$$v_{ref} = 19.41kn: \quad \text{The speed at } P_{ME} \text{ determined from the power curve}$$
$$EEDI = \left((P_{ME} \times C_{F,ME} \times SFC_{ME}) + (P_{AE} \times C_{F,ME} \times SFC_{ME})\right) / (DWT \times v_{ref})$$
$$= 22.4 \ g\,CO_2 / t\,nm \quad \approx 7\%$$

6.5.6 One main engine, one shaft motor

$$MCR_{ME} = 18{,}000kW$$
$$P_{ME} = 0.75 \times MCR_{ME} = 0.75 \times 18{,}000kW = 13{,}500kW$$
$$P_{AE} = \left\{0.025 \times \left(MCR_{ME} + \frac{P_{PTI}}{0.75}\right)\right\} + 250kW = \left\{0.025 \times \left(18{,}000 + \frac{1612.9}{0.75}\right)\right\} + 250kW = 754kW$$
$$P_{SM,max} = 2{,}000kW$$
$$P_{PTI} = 0.75 \times P_{SM,max} / \eta_{\overline{Gen}} = 1{,}612.9kW$$
$$\eta_{PTI} = 0.97$$
$$\eta_{\overline{Gen}} = 0.93$$
$$P_{Shaft} = P_{ME} + P_{PTI,Shaft} = P_{ME} + (P_{PTI} \cdot \eta_{PTI}) \cdot \eta_{\overline{Gen}} = 13{,}500kW + (1612.9 \cdot 0.97) \cdot 0.93 = 14{,}955kW$$
$$v_{ref} = 20kn$$

$$EEDI = \left(\left(P_{ME} \times C_{F,ME} \times SFC_{ME}\right) + \left(P_{AE} \times C_{F,AE} \times SFC_{AE}\right) + \left(P_{PTI} \times C_{F,AE} \times SFC_{AE}\right)\right) / \left(DWT \times v_{ref}\right)$$
$$= 24.6\ g\,CO_2 / t\,nm \quad \approx -2\%$$

7 Weather factor f_w

f_w is a non-dimensional coefficient indicating the decrease of speed in representative sea conditions of wave height, wave frequency and wind speed (e.g. Beaufort Scale 6), and is taken as 1.0 for the calculation of attained EEDI.

When a calculated f_w factor is used, the attained EEDI using calculated f_w shall be presented as "attained $EEDI_{weather}$" in order to clearly distinguish it from the attained EEDI under regulations 20 in MARPOL Annex VI.

Guidelines for the calculation of the coefficient f_w for the decrease of ship speed in respective sea conditions are provided in MEPC.1/Circ.796.

8 Correction factor for ship specific design elements f_j

Except in the cases listed below, the value of the f_j factor is 1.0.

For Finnish-Swedish ice class notations or equivalent notations of the Classification Societies, the f_j correction factor is indicated in 2.8.1 of the IMO Calculation Guidelines[4].

For shuttle tankers with propulsion redundancy defined as oil tankers between 80,000 and 160,000 deadweight equipped with dual-engines and twin-propellers and assigned the class notations covering dynamic positioning and propulsion redundancy, the f_j factor is 0.77.

The total shaft propulsion power of shuttle tankers with redundancy is usually not limited by verified technical means.

For ro-ro cargo and ro-ro passenger ships, the factor f_{jRoRo} is to be computed according to 2.8.3 of the IMO calculation Guidelines.

For general cargo ships, the factor f_j is to be computed according to 2.8.4 of the IMO Calculation Guidelines.

f_j factors for ice-class and for ship's type can be cumulated (multiplied) for ice-classed general cargo ships or ro-ro cargo or ro-ro passenger ships.

9 Capacity factor f_i

Except in the cases listed below, the value of the f_i factor is 1.0.

For Finnish-Swedish ice class notations or equivalent notations of the Classification Societies, the f_i correction factor is indicated in 2.11.1 of the IMO Calculation Guidelines.[4]

For a ship with voluntary structural enhancement, the f_{iVSE} factor is to be computed according to 2.11.2 of the IMO Calculation Guidelines.

For bulk carriers and oil tankers built in accordance with the Common Structural Rules and assigned the class notation CSR, the f_{iCSR} factor is to be computed according to 2.11.3 of the IMO Calculation Guidelines.

f_i capacity factors can be cumulated (multiplied), but the reference design for calculation of f_{iVSE} is to comply with the ice notation and/or Common Structural Rules as the case may be.

10 Cubic capacity correction factor f_c and cargo gears factor f_l

Except in the cases listed below, the value of the f_c and f_l factors is 1.0.

For chemical tankers as defined in regulation 1.16.1 of MARPOL Annex II, the f_c factor is to be computed according to 2.12.1 of the IMO Calculation Guidelines.

For gas carriers having direct diesel driven propulsion constructed or adapted and used for the carriage in bulk of liquefied natural gas, the f_c factor is to be computed according to 2.12.2 of the IMO Calculation Guidelines. This factor is not to be applied to LNG carriers defined in regulation 2.38 of MARPOL Annex VI.

For ro-ro passenger ships having a DWT/GT-ratio of less than 0.25, the cubic capacity correction factor f_{cRoPax} is to be computed according to 2.12.3 of the IMO Calculation Guidelines.

For general cargo ships only equipped with cranes, side loaders or ro-ro ramps, the f_l correction factor is to be computed according to 2.14 of the IMO Calculation Guidelines.

11 Innovative energy efficient technologies

Innovative energy efficient technologies are to be taken into account according to the 2013 Guidance on treatment of innovative energy efficiency technologies for calculation and verification of the attained EEDI, MEPC.1/Circ.815.

[4] Tables 1 and 2 in IMO Calculation Guidelines refer to Finnish/Swedish ice classed ships usually trading in the Baltic Sea. Justified alternative values for fi and fj factors may be accepted for ice-classed ships outside this scope of application (e.g. very large ships or POLAR CLASS)

12 Example of calculation

12.1 List of input parameters for calculation of EEDI

The input parameters used in the calculation of the EEDI are provided in Table 1.

The values of all these parameters are to be indicated in the EEDI Technical File and the documents listed in the "source" column are to be submitted to the verifier.

For electrical generator, the rated electrical output in kW is related to the rated apparent power output in kVA by the following relation: MCR_{PTO} (kW) = KVA_{PTO} * 0.8 where 0.8 is the conventional power factor.

Table 1: input parameters for calculation of EEDI

Symbol	Name	Usage	Source	Scope
	Service notation	Capacity, f_i, f_j and f_c factors		For the ship
	Class notations	fj for shuttle tanker, f_{iCSR}	Classification file	
	Ice notation	fi, fj for ice class		
Lpp	Length between perpendiculars (m)	fi, fj for ice class, f_{jRoRo}, f_j for general cargo ships		
B_S	Breadth (m)	f_{jRoRo}, f_j for general cargo ships		
d_S	Summer load line draught (m)	f_{jRoRo}, f_j for general cargo ships		
∇	Volumetric displacement	f_{jRoRo}, f_j for general cargo ships		
Δ	Displacement @ summer load draught (t)	deadweight, f_{iVSE}, f_{cRoPax}, f_l for general cargo ships	final stability file	
LWT	Ligthweight (t)	deadweight, f_{iVSE}, f_{iCSR}, f_{cRoPax} f_l for general cargo ships	Sheets of Submitter calculation for $lightweight_{referencedesign}$ lightweight check report	
GT	Gross tonnage	Capacity, f_{cRoPax}		
P_{AE}	Auxiliary engine power (kW)	EEDI	Note: Computed from engines & PTIs powers or electric power table	
V_{ref}	Reference speed (knot)	EEDI, f_{jRoRo}, f_j for general cargo ships	Sea trial report	
Cube	Total cubic capacity of the cargo tanks (m3)	f_c for chemical tankers and gas carriers	Tonnage file	
SWL	Safe working load of the crane (t)	f_l for general cargo ships		
Reach	Reach of the crane (m)	f_l for general cargo ships		

Symbol	Name	Usage	Source	Scope
MCR	Rated installed power (kW)	P_{ME}	EIAPP certificate or nameplate (if less than 130 kW)	Per engine (nME + nGEN)
MCR_{lim}	Limited rated output power after PTO in (kW)	P_{ME} with PTO option 2	Verification file	
MPP_{Motor}	Rated output of motor (kW)	P_{ME} for LNG carriers having diesel electric propulsion system	Certificate of the product	
η	Electrical efficiency	P_{ME} for LNG carriers having diesel electric propulsion system		
$MCR_{SteamTurbine}$	Rated installed power (kW)	P_{ME} for LNG carriers having steam turbine propulsion system	Certificate of the product	
	Fuel grade	C_F, SFC	NOX Technical File of the parent engine	
SFC	Corrected specific fuel consumption (g/kWh)	EEDI	NOx Technical File of the parent engine	
KVA_{PTO}	Rated electrical apparent output power (kVA)	P_{ME}	Nameplate of the shaft generator	Per shaft generator (nPTO)
$P_{PTI,Shaft}$	Mechanical output power (kW)	EEDI	Nameplate of the shaft motor	Per shaft motor (nPTI)
η_{PTI}	efficiency	power		
η_{GEN}	efficiency	power		Per generator (nGEN)
$P_{SHAFTlim}$	Limited shaft propulsion power (kW)	Limited power where means of limitation are fitted	Verification file	Per shaftline (nSHAFT)

12.2 Sample calculation of EEDI

A sample of document to be submitted to the verifier is provided in Appendix 2.

In addition, Appendix 6 contains a list of sample calculations of EEDI, as follows:

- Appendix 6.1: Cruise passenger ship with diesel-electric propulsion
- Appendix 6.2: LNG carrier with diesel-electric propulsion
- Appendix 6.3: Diesel-driven LNG carrier with re-liquefaction system
- Appendix 6.4: LNG carrier with steam turbine propulsion

Part III - Verification of EEDI

13 Verification process

Attained EEDI is to be computed in accordance with the IMO Calculation Guidelines and Part II of the present Industry Guidelines. Survey and certification of the EEDI are to be conducted on two stages:

1. preliminary verification at the design stage
2. final verification at the sea trial

The flow of the survey and certification process is presented in Figure 2.

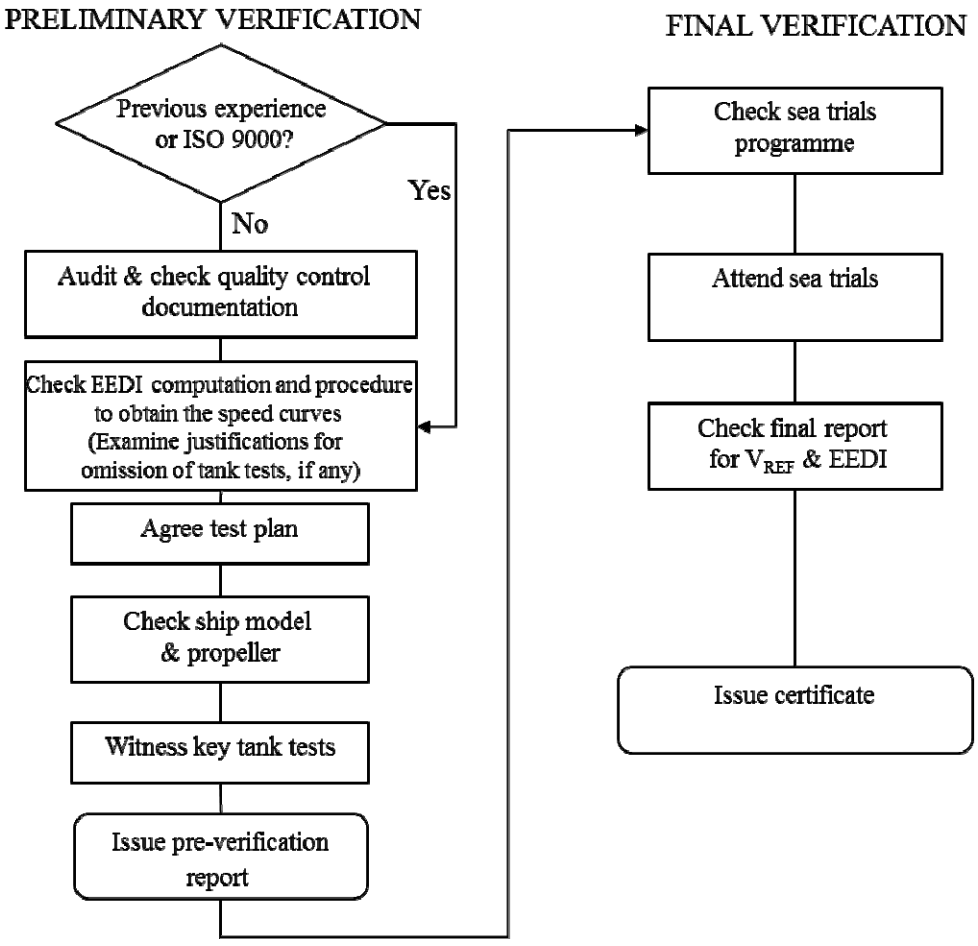


Figure 2: Flow of survey and certification process by verifier

14 Documents to be submitted

A sample of documents to be submitted to the verifier including additional information for verification is provided in Appendix 2.

The following information is to be submitted by the submitter to the verifier at the design stage:

Table 2: documents to be submitted at the design stage

EEDI Technical File	EEDI Technical File as defined in the IMO Verification Guidelines. See example of the EEDI Technical File in Appendix 1 of IMO Verification Guidelines.

NOx Technical File	Copy of the NOx Technical File and documented summary of the SFC correction for each type of main and auxiliary engine with copy of EIAPP certificate. Note: if the NOx Technical File has not been approved at the time of the preliminary verification, the SFC value with the addition of the guarantee tolerance is to be provided by Manufacturer. In this case, the NOx Technical File is to be submitted at the final verification stage.
Electric Power Table	If P_{AE} is significantly different from the values computed using the formula in 2.5.6.1 or 2.5.6.2 of the IMO Calculation Guidelines
Ship lines and model particulars	- Lines of ship - Report including the particulars of the ship model and propeller model
Verification file of power limitation technical arrangement	If the propulsion power is voluntarily limited by verified technical means
Power curves	Power-speed curves predicted at full scale in sea trial condition and EEDI condition
Description of the towing tank test facility and towing tank test organisation quality manual	If the verifier has no recent experience with the towing tank test facility and the towing tank test organization quality system is not ISO 9001 certified. - Quality management system of the towing tank test including process control, justifications concerning repeatability and quality management processes - Records of measuring equipment calibration as described in Appendix 3 - Standard model-ship extrapolation and correlation method (applied method and tests description)
Gas fuel oil general arrangement plan	If gas fuel is used as the primary fuel of the ship fitted with dual fuel engines. Gas fuel storage tanks (with capacities) and bunkering facilities are to be described.
Towing Tank Tests Plan	Plan explaining the different steps of the towing tank tests and the scheduled inspections allowing the verifier to check compliance with the items listed in Appendix 1 concerning tank tests
Towing Tank Tests Report	- Report of the results of the towing tank tests at sea trial and EEDI condition as required in Appendix 4 - Values of the experience-based parameters defined in the standard model-ship correlation method used by the towing tank test organization/shipyard - Reasons for exempting a towing tank test, only if applicable - Numerical calculations report and validation file of these calculations, only if calculations are used to derive power curves
Ship reference speed V_{ref}	Detailed calculation process of the ship speed, which is to include the estimation basis of experience-based parameters such as roughness coefficient, wake scaling coefficient

The following information is to be submitted by the submitter to the verifier at the final verification stage (and before the sea trials for the programme of sea trials):

Table 3: documents to be submitted at the final verification stage

Programme of sea trials	Description of the test procedure to be used for the speed trial, with number of speed points to be measured and indication of PTO/PTI to be in operation, if any.
Sea trials report	Report of sea trials with detailed computation of the corrections allowing determination of the reference speed V_{ref}
Final stability file	Final stability file including lightweight of the ship and displacement table based on the results of the inclining test or the lightweight check
Final power curves	Final power curve in the EEDI condition showing the speed adjustment methodology
Revised EEDI Technical File	Including identification of the parameters differing from the calculation performed at the initial verification stage
Ship lines	Lines of actual ship

In line with the IMO Verification Guidelines (4.1.2), it is recognized that the documents listed above may contain confidential information of submitters, which requires Intellectual Property Rights (IPR) protection. In the case where the submitter wants a non-disclosure agreement with the verifier, the additional information is to be provided to the verifier upon mutually agreed terms and conditions.

15 Preliminary verification at the design stage

15.1 Scope of the verifier work

For the preliminary verification of the EEDI at the design stage, the verifier:

- Review the EEDI Technical File, check that all the input parameters (see 12.1 above) are documented and justified and check that the possible omission of a towing tank test has been properly justified
- Check that the ITTC procedures and quality system are implemented by the organization conducting the towing tank tests. The verifier should possibly audit the quality management system of the towing tank if previous experience is insufficiently demonstrated
- Witness the towing tank tests according to a test plan initially agreed between the submitter and the verifier
- Check that the work done by the towing tank test organisation is consistent with the present Guidelines. In particular, the verifier will check that the power curves at full scale are determined in a consistent way between sea trials and EEDI loading conditions, applying the same calculation process of the power curves and considering justifiable differences of experience based parameters between the two conditions
- Issue a pre-verification report

15.2 Definitions

Experience-based parameters means parameters used in the determination of the scale effects coefficients of correlation between the towing tank model scale results and the full scale predictions of power curves.
This may include:

1. Hull roughness correction
2. Wake correction factor
3. Air resistance correction factor (due to superstructures and deck load)
4. Appendages correction factor (for appendages not present at model scale)

5. Propeller cavitation correction factor
6. Propeller open-water characteristics correction
7. C_P and C_N (see below)
8. ΔC_{FC} and Δw_C (see below)

Ship of the same type means a ship of which hull form (expressed in the lines such as sheer plan and body plan) excluding additional hull features such as fins and of which principal particulars are identical to that of the base ship.

Definition of survey methods directly involving the verifier: Review and Witness.
Review means the act of examining documents in order to determine identification and traceability and to confirm that requested information are present and that EEDI calculation process conforms to relevant requirements.

Witness means the attendance at scheduled key steps of the towing tank tests in accordance with the agreed Test Plan to the extent necessary to check compliance with the survey and certification requirements.

15.3 Towing tank tests and numerical calculations

There are two loading conditions to be taken into account for EEDI: EEDI loading condition and sea trial condition.

The speed power curves for these two loading conditions are to be based on towing tank test measurements. Towing tank test means model towing tests, model self-propulsion tests and model propeller open water tests.

Numerical calculations may be accepted as equivalent to model propeller open water tests.

A towing tank test for an individual ship may be omitted based on technical justifications such as availability of the results of towing tank tests for ships of the same type according to 4.2.5 of the IMO Verification Guidelines.

Numerical calculations may be submitted to justify derivation of speed power curves, where only one parent hull form have been verified with towing tank tests, in order to evaluate the effect of additional hull features such as fore bulb variations, fins and hydrodynamic energy saving devices.

These numerical tests may include CFD calculation of propulsive efficiency at reference speed V_{ref} as well as hull resistance variations and propeller open water efficiency.

In order to be accepted, these numerical tests are to be carried out in accordance with defined quality and technical standards (ITTC 7.5-03-01-04 at its latest revision or equivalent). The comparison of the CFD-computed values of the unmodified parent hull form with the results of the towing tank tests must be submitted for review.

15.4 Qualification of verifier personnel

Surveyors of the verifier are to confirm through review and witness as defined in 15.2 that the calculation of EEDI is performed according to the relevant requirements listed in 1.1. The surveyors are to be qualified to be able to carry out these tasks and procedures are to be in place to ensure that their activities are monitored.

15.5 Review of the towing tank test organisation quality system

The verifier is to familiarize with the towing tank test organization test facilities, measuring equipment, standard model-ship extrapolation and correlation method (applied method and tests description) and quality system for consideration of complying with the requirements of 15.6 prior to the test attendance when the verifier has no recent experience of the towing tank test facilities.

When in addition the towing tank test organization quality control system is not certified according to a recognized scheme (ISO 9001 or equivalent) the following additional information relative to the towing tank test organization is to be submitted to the verifier:

1. descriptions of the towing tank test facility; this includes the name of the facility, the particulars of towing tanks and towing equipment, and the records of calibration of each monitoring equipment as described in Appendix 3

2. quality manual containing at least the information listed in the ITTC Sample quality manual (2002 issue) Records of measuring equipment calibration as described in Appendix 3

15.6 Review and Witness

The verifier is to review the EEDI Technical File, using also the other documents listed in table 2 and submitted for information in order to verify the calculation of EEDI at design stage. This review activity is described in Appendix 1. Since detailed process of the towing tank tests depends on the practice of each submitter, sufficient information is to be included in the document submitted to the verifier to show that the principal scheme of the towing tank test process meets the requirements of the reference documents listed in Appendix 1 and Appendix 4.

Prior to the start of the towing tank tests, the submitter is to submit a test plan to the verifier. The verifier reviews the test plan and agrees with the submitter which scheduled inspections will be performed with the verifier surveyor in attendance in order to perform the verifications listed in Appendix 1 concerning the towing tank tests.

Following the indications of the agreed test plan, the submitter will notify the verifier for the agreed tests to be witnessed. The submitter will advise the verifier of any changes to the activities agreed in the Test Plan and provide the submitter with the towing tank test report and results of trial speed prediction.

15.7 Model-ship correlation

Model-ship correlation method followed by the towing tank test organization or shipyard is to be properly documented with reference to the 1978 ITTC Trial prediction method given in ITTC Recommended Procedure 7.5-02-03-1.4 rev.02 of 2011 or subsequent revision, mentioning the differences between the followed method and the 1978 ITTC trial prediction method and their global equivalence.

Considering the formula giving the total full scale resistance coefficient of the ship with bilge keels and other appendages:

$$C_{TS} = \frac{S_S + S_{BK}}{S_S}.[(1+k).C_{FS} + \Delta C_F + C_A] + C_R + C_{AAS} + C_{AppS}$$

The way of calculating the form factor k, the roughness allowance ΔC_F, the correlation allowance C_A, the air resistance coefficient C_{AAS} and the appendages coefficient C_{AppS} are to

be documented (if they are taken as 0, this has to be indicated also), as indicated in Appendix 4.

The correlation method used is to be based on thrust identity and the correlation factors is to be according to method 1 ($C_P - C_N$) or method 2 ($\Delta C_{FC} - \Delta w_C$) of the 1978 ITTC Trial prediction method. If the standard method used by the towing tank test organization doesn't fulfil these conditions, an additional analysis based on thrust identity is to be submitted to the verifier.

The verifier will check that the power-speed curves obtained for the EEDI condition and sea trial condition are obtained using the same calculation process and properly documented as requested in Appendix 4 "Witnessing of model test procedures". In particular, the verifier will compare the differences between experience based coefficients Cp and ΔC_{FC} between the EEDI condition (∇_{full}) and sea trial condition if different from EEDI condition (∇) with the indications given in Figures 3.1 and 3.2 extracted from a SAJ-ITTC study on a large number of oil tankers. If the difference is significantly higher than the values reported in the Figures, a proper justification of the values is to be submitted to the verifier.

NB: The trends in Figures 3.1 and 3.2 are based on limited data and may be revised in the future. The displayed trends depend on the method used to analyze the model tests behind the data including the form factor and other correlation factor relations. Other values may be accepted if based on sufficient number of data.

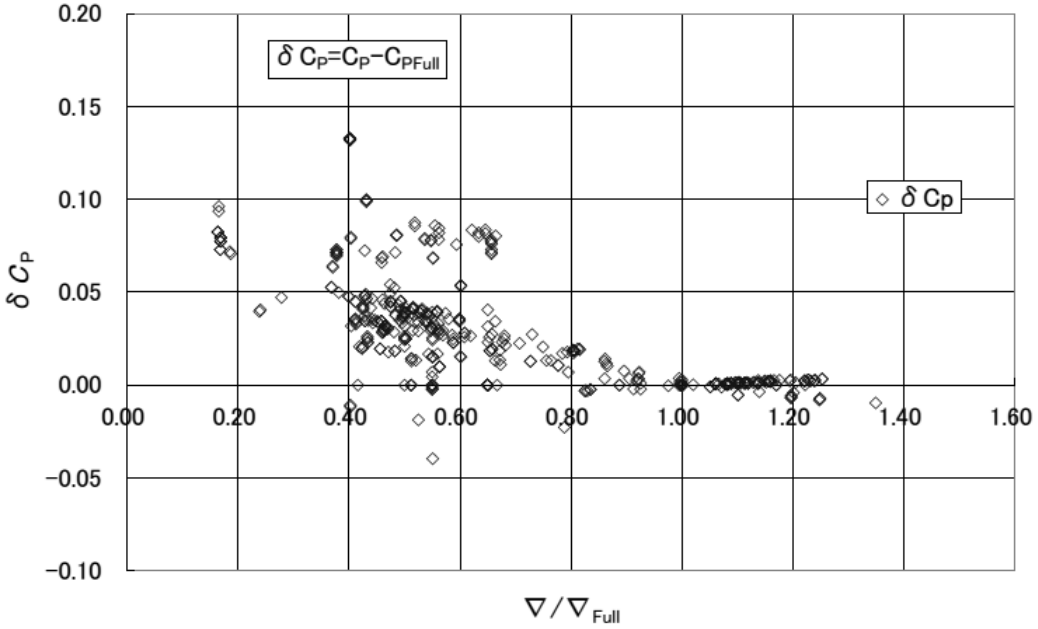


Figure 3.1: Variation of C_P- C_{PFull} as a function of the displacement ratio

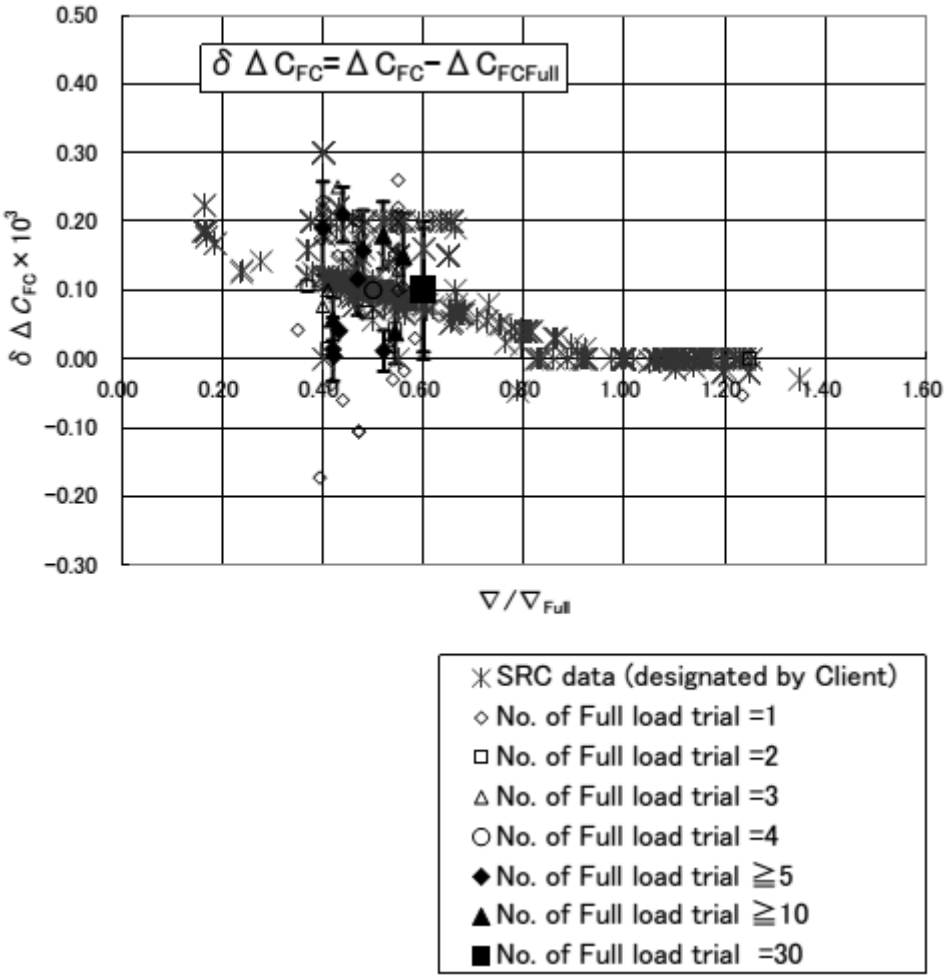


Figure 3.2: Variation of ΔC_{FC} as a function of the displacement ratio

15.8 Pre-verification report

The verifier issues the report on the "Preliminary Verification of EEDI" after it has verified the attained EEDI at the design stage in accordance with paragraphs 4.1 and 4.2 of the IMO Verification Guidelines.

A sample of the report on the “Preliminary Verification of EEDI” is provided in Appendix 5.

16 Final verification at sea trial

16.1 Sea trial procedure

For the verification of the EEDI at sea trial stage, the verifier shall:

- Examine the programme of the sea trial to check that the test procedure and in particular that the number of speed measurement points comply with the requirements of the IMO Verification Guidelines (see note below).
- Perform a survey to ascertain the machinery characteristics of some important electric load consumers and producers included in the EPT, if the power P_{AE} is directly computed from the EPT data’s.
- Attend the sea trial and notes the main parameters to be used for the final calculation of the EEDI, as given under 4.3.3 of the IMO Verification Guidelines

- Review the sea trial report provided by the submitter and check that the measured power and speed have been corrected accordingly (see note below).
- Check that the power curve estimated for EEDI condition further to sea trial is obtained by power adjustment.
- Review the revised EEDI Technical File.
- Issue or endorse the International Energy Efficiency Certificate.

Note: For application of the present Guidelines, sea conditions and ship speed should be measured in accordance with ITTC Recommended Procedure 7.5-04-01-01.1 Speed and Power Trials Part 1; 2014 or ISO 15016:2015.

Table 4 lists the data which are to be measured and recorded during sea trials:

Table 4: Measured data during sea trials

Symbol	Name	Measurement	Remark
	Time and duration of sea trial		
	Draft marks readings		
	Air and sea temperature		
	Main engine setting	Machinery log	
Ψ_0	Course direction (rad)	Compass	
V_G	Speed over ground (m/s)	GPS	
n	Propeller rpm (rpm)	Tachometer	
P_S	Power measured (kW)	Torsion meter or strain gauges (for torque measurement) or any alternative method that offer an equivalent level of precision and accuracy of power measurement	
V_{WR}	Relative wind velocity (m/s)	Wind indicator	
Ψ_{WR}	Relative wind direction (rad)	See above	
T_m	Mean wave period (seas and swell) (s)	Visual observation by multiple observers supplemented by hindcast data or wave measuring devices (wave buoy, wave radar, etc.)	
$H_{1/3}$	Significant wave height (seas and swell) (m)	See above	
χ	Incident angle of waves (seas and swell) (rad)	See above	
δ_R	Rudder angle (rad)	Rudder	
β	Drift angle (rad)	GPS	

Prior to the sea trial, the programme of the sea trials and , if available, additional documents listed in table 3 are to be submitted to the verifier in order for the verifier to check the procedure and to attend the sea trial and perform the verifications included in Appendix 1 concerning the sea trial.

The ship speed is to be measured at sea trial for at least three power settings of which range includes the total propulsion power defined in 5.2 according to the requirements of the IMO Verification Guidelines 4.3.6. This requirement applies individually to each ship, even if the ship is a sister ship of a parent vessel.

If it is physically impossible to meet the conditions in the ISO15016:2015 or ITTC Recommended Procedure 7.5-04-01-01, a practical treatment shall be allowed based on the documented mutual agreement among the owner, the verifier and the shipbuilder.

16.2 Estimation of the EEDI reference speed V_{Ref}

The adjustment procedure is applicable to the most complex case where sea trials cannot be conducted in EEDI loading condition. It is expected that this will be usually the case for cargo ships like bulk carriers for instance.

Ship speed should be measured in accordance with ISO 15016:2015 or ITTC Recommended Procedure 7.5-04-01-01.1, including the accuracy objectives under paragraph 1 of ITTC Recommended Procedure 7.5-04-01-01.2. In particular, if the shaft torque measurement device cannot be installed near the output flange of main engine, then the efficiency from the measured shaft power to brake horse power should be taken into account.

Using the speed-power curve obtained from the sea trials in the trial condition, the conversion of ship's speed from the trial condition to the EEDI condition shall be carried out by power adjustment as defined in Annex I of ISO 15016:2015.

The reference speed V_{ref} should be determined based on sea trials which have been carried out and evaluated in accordance with ISO 15016:2015 or equivalent (see note in 16.1).

Reference is made to paragraph 3 of Appendix 2 (Figure 3.1) where an example is provided.

16.3 Revision of EEDI Technical File

The EEDI Technical File is to be revised, as necessary, by taking into account the results of sea trials. Such revision is to include, as applicable, the adjusted power curve based on the results of sea trial (namely, modified ship speed under the condition as specified in paragraph 2.2 of the IMO Calculation Guidelines), the finally determined deadweight/gross tonnage and the recalculated attained EEDI and required EEDI based on these modifications.

The revised EEDI Technical File is to be submitted to the verifier for the confirmation that the revised attained EEDI is calculated in accordance with regulation 20 of MARPOL Annex VI and the IMO Calculation Guidelines.

17 Verification of the EEDI in case of major conversion

In this section, a major conversion is defined as in MARPOL Annex VI regulation 2.24 and interpretations in MEPC.1/Circ.795/Rev2, subject to the approval of the Administration.

For verification of the attained EEDI after a major conversion, no speed trials are necessary if the conversion or modifications don't involve a variation in reference speed.

In case of conversion, the verifier will review the modified EEDI Technical File. If the review leads to the conclusion that the modifications couldn't cause the ship to exceed the applicable required EEDI, the verifier will not request speed trials.

If such conclusion cannot be reached, like in the case of a lengthening of the ship, or increase of propulsion power of 10% or more, speed trials will be required.

If an Owner voluntarily requests re-certification of EEDI with IEE Certificate reissuance on the basis of an improvement to the ship efficiency, the verifier may request speed trials in order to validate the attained EEDI value improvement.

If speed trials are performed after conversion or modifications changing the attained EEDI value, tank tests verification is to be requested if the speed trials conditions differ from the

EEDI condition. In this case, numerical calculations performed in accordance with defined quality and technical standards (ITTC 7.5-03-01-04 at its latest revision or equivalent) replacing tank tests may be accepted by the verifier to quantify influence of the hull modifications.

In case of major conversion of a ship without prior EEDI, EEDI computation is not required, except if the Administration considers that due to the extensive character of the conversion, the ship is to be considered as a new one.

APPENDIX 1
Review and witness points

Ref.	Function	Survey method	Reference document	Documentation available to verifier	Remarks
01	EEDI Technical File	Review	IMO Verification Guidelines This document	Documents in table 2	
02	Limitation of power	Review	IMO Calculation Guidelines	Verification file of limitation technical means	Only If means of limitation are fitted
03	Electric Power Table	Review	Appendix 2 to IMO Calculation Guidelines Appendix 2 to IMO Verification Guidelines	EPT EPT-EEDI form	Only if PAE is significantly different from the values computed using the formula in 2.5.6.1 to 2.5.6.3 of the IMO Calculation Guidelines
04	Calibration of towing tank test measuring equipment	Review & witness	Appendix 3	Calibration reports	Check at random that measuring devices are well identified and that calibration reports are currently valid
05	Model tests – ship model	Review & witness	Appendix 4	Ship lines plan & offsets table Ship model report	Checks described in Appendix 4.1
06	Model tests – propeller model	Review & witness	Appendix 4	Propeller model report	Checks described in Appendix 4.2
07	Model tests – Resistance test, Propulsion test, Propeller open water test	Review & witness	Appendix 4	Towing tank tests report	Checks described in Appendix 4.3 Note: propeller open water test is not needed if a stock propeller is used. In this case, the open water characteristics of the stock propeller are to be annexed to the towing tank tests report.

Ref.	Function	Survey method	Reference document	Documentation available to verifier	Remarks
08	Model-ship extrapolation and correlation	Review	ITTC 7.5-02-03-01.4 1978 ITTC performance prediction method (rev.02 of 2011 or subsequent revision) Appendix 4 This document 15.7	Documents in table 2	Check that the ship-model correlation is based on thrust identity with correlation factor according to method 1 ($C_P - C_N$) or method 2 ($\Delta C_{FC} - \Delta w_C$) Check that the power-speed curves obtained for the EEDI condition and sea trial condition are obtained using the same calculation process with justified values of experience-based parameters
09	Numerical calculations replacing towing tank tests	Review	ITTC 7.5-03-01-04 (latest revision) or equivalent	Report of calculations	For justification of calculations replacing model tests refer to 15.3.
10	Electrical machinery survey prior to sea trials	Witness	Appendix 2 to IMO Verification Guidelines		Only if P_{AE} is computed from EPT
11	Programme of sea trials	Review	IMO Verification Guidelines	Programme of sea trials	Check minimum number of measurement points (3) Check the EEDI condition in EPT (if P_{AE} is computed from EPT)
12	Sea trials	Witness	ISO 15016:2015 or ITTC 7.5-04-01-01.1 (latest revision)		Check: • Propulsion power, particulars of the engines • Draught and trim • Sea conditions • Ship speed • Shaft power & rpm Check operation of means of limitations of engines or shaft power (if fitted) Check the power consumption of selected consumers included in sea trials condition EPT (if P_{AE} is computed from EPT)

Ref.	Function	Survey method	Reference document	Documentation available to verifier	Remarks
13	Sea trials – corrections calculation	Review	ISO 15016:2015 or ITTC Recommended Procedure 7.5-04-01-01.2	Sea trials report	Check that the displacement and trim of the ship in sea trial condition has been obtained with sufficient accuracy Check compliance with ISO 15016:2015 or ITTC Recommended Procedure 7.5-04-01-01.2
14	Sea trials – adjustment from trial condition to EEDI condition	Review	This document 16.2	Power curves after sea trial	Check that the power curve estimated for EEDI condition is obtained by power adjustment
15	EEDI Technical File – revised after sea trials	Review	IMO Verification Guidelines	Revised EEDI Technical File	Check that the file has been updated according to sea trials results

APPENDIX 2

Sample of document to be submitted to the verifier including additional information for verification

Caution
Protection of Intellectual Property Rights

This document contains confidential information (defined as additional information) of submitters. Additional information should be treated as strictly confidential by the verifier and failure to do so may lead to penalties. The verifier should note following requirements of IMO Verification Guidelines:
"*4.1.2 The information used in the verification process may contain confidential information of submitters, which requires Intellectual Property Rights (IPR) protection. In the case where the submitter want a non-disclosure agreement with the verifier, the additional information should be provided to the verifier upon mutually agreed terms and conditions.*"

Revision list

B	01/05/2014	Final stage: sections 1 to 16	XYZ	YYY	ZZZ
A	01/01/2013	Design stage: sections 1 to 13	XXX	YYY	ZZZ
REV.	**ISSUE DATE**	**DESCRIPTION**	**DRAWN**	**CHECKED**	**APPROVED**

1 General

This calculation of the Energy Efficiency Design Index (EEDI) is based on:

- Resolution MEPC.203(62) and MEPC.251(66) amendments to include regulations on energy efficiency in MARPOL Annex VI
- Resolution MEPC.308(73) 2018 Guidelines on the method of calculation of the attained Energy Efficiency Design Index (EEDI) for new ships

Calculations are being dealt with according to the Industry Guidelines on calculation and verification of EEDI, 2015 issue.

2 Data

2.1 Main parameters

Parameter	Value	Reference
Owner	OWNER	
Builder	YARD	
Hull No.	12346	
IMO No.	94111XX	
Ship's type	Bulk carrier	
Ship classification notations	I HULL, MACH, Bulk Carrier CSR BC-A (holds 2 and 4 may be empty) ESP GRAB[20] Unrestricted Navigation AUT-UMS, GREEN PASSPORT, INWATERSURVEY, MON-SHAFT	
HULL PARTICULARS		
Length overall	191.0 m	
Length between perpendiculars	185.0 m	
Breadth, moulded	32.25 m	
Depth, moulded	17.9 m	
Summer load line draught, moulded	12.70 m	
Deadweight at summer load line draught	55000 DWT	
Lightweight	11590 tons	
Owner's voluntary structural enhancements	No	
MAIN ENGINE		
Type & manufacturer	BUILDER 6SRT60ME	
Specified Maximum Continuous Rating (SMCR)	9200 kW x 105 rpm	
SFC at 75% SMCR	171 g/kWh	See paragraph 10.1
Number of set	1	
Fuel type	Diesel/Gas oil	
AUXILIARY ENGINES		

Parameter	Value	Reference
Type & manufacturer	BUILDER 5X28	
Specified Maximum Continuous Rating (SMCR)	650 kW x 700 rpm	
SFC at 50% SMCR	205 g/kWh	See paragraph 10.2
SFC at 75% SMCR (In case if P_{AE} significantly different from 2.5.6 of IMO EEDI Calculation Guidelines)	199 g/kWh	See paragraph 10.2
Number of set	3	
Fuel type	Diesel/Gas oil	
OVERVIEW OF PROPULSION SYSTEM AND ELECTRICITY SUPPLY SYSTEM		See section 4
SHAFT GENERATORS		
Type & manufacturer	None	
Rated electrical output power		
Number of set	0	
SHAFT MOTORS		
Type & manufacturer	None	
Rated power consumption		
Efficiency		
Number of set	0	
MAIN GENERATORS		
Type & manufacturer	BUILDER AC120	
Rated output	605 kWe	
Efficiency	0.93	
Number of set	3	
PROPULSION SHAFT		
Propeller diameter	5.9 m	
Propeller number of blades	4	
Voluntarily limited shaft propulsion power	No	
Number of set	1	
ENERGY SAVING EQUIPMENT		See section 9
Description of energy saving equipment	Propeller boss cap fins	
Power reduction or power output	None	

2.2 Preliminary verification of attained EEDI

Parameter	Value	Reference
TOWING TANK TEST ORGANIZATION		
Identification of organization	TEST corp.	See section 6.
ISO Certification or previous experience?	Previous experience	
TOWING TANK TESTS		
Exemption of towing tank tests	No	
Process and methodology of estimation of		See section 7

the power curves		
Ship model information		See subparagraph 7.2.1
Propeller model information		See subparagraph 7.2.2
EEDI & sea trial loading conditions	EEDI: mean draft: 12.7 m Trim 0 Sea trial (ballast): mean draft: 5.8 m Trim 2.6 m by stern	
Propeller open water diagram (model, ship)		See paragraph 7.4
Experience based parameters		See paragraph 7.3
Power curves at full scale		See section 3
Ship Reference speed	14.25 knots	
ELECTRIC POWER TABLE (as necessary, as defined in IMO EEDI Calculation Guidelines)	Significant difference from 2.5.6 of IMO EEDI Calculation Guidelines	See section 5
CALCULATION OF ATTAINED EEDI	5.06	See section 11
CALCULATION OF REQUIRED EEDI	5.27	See section 12
CALCULATION OF ATTAINED $EEDI_{weather}$	Not calculated	See section 13

2.3 Final verification of attained EEDI

Parameter	Value	Reference
SEA TRIAL LOADING CONDITION		
POWER CURVES		See section 3
Sea trial report with corrections		See section 15
Ship Reference speed	14.65 knots	
FINAL DEADWEIGHT		See section 14
Displacement	66171 tons	
Lightweight	11621 tons	
Deadweight	54550 DWT	
FINAL ATTAINED EEDI	4.96	See section 16

3 Power curves

The power curves estimated at the design stage and modified after the sea trials are given in Figure 3.1.

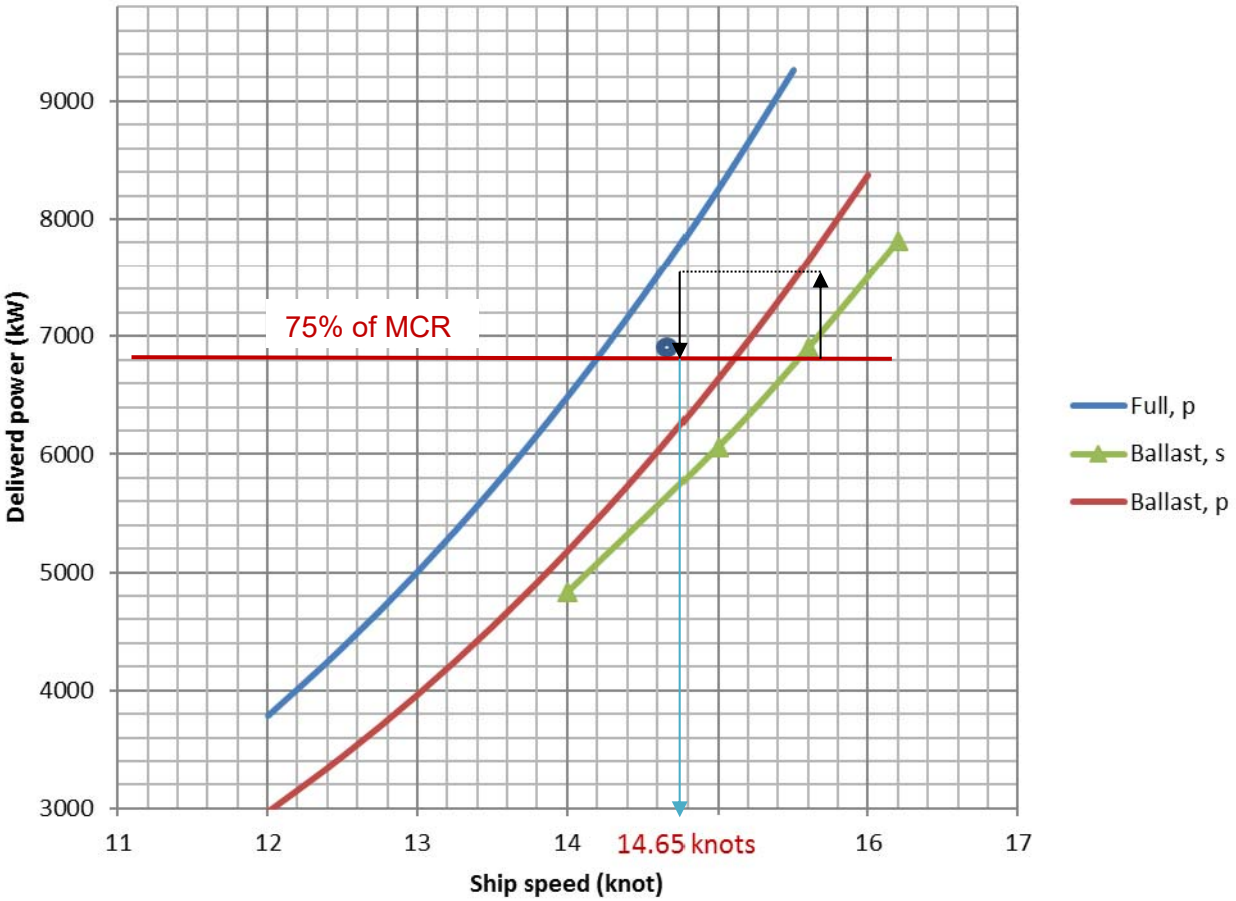


Figure 3.1: Power curves

4 Overview of propulsion system and electric power system

Figure 4.1 shows the connections within the propulsion and electric power supply systems.

The characteristics of the main engines, auxiliary engines, electrical generators and propulsion electrical motors are given in table 2.1.

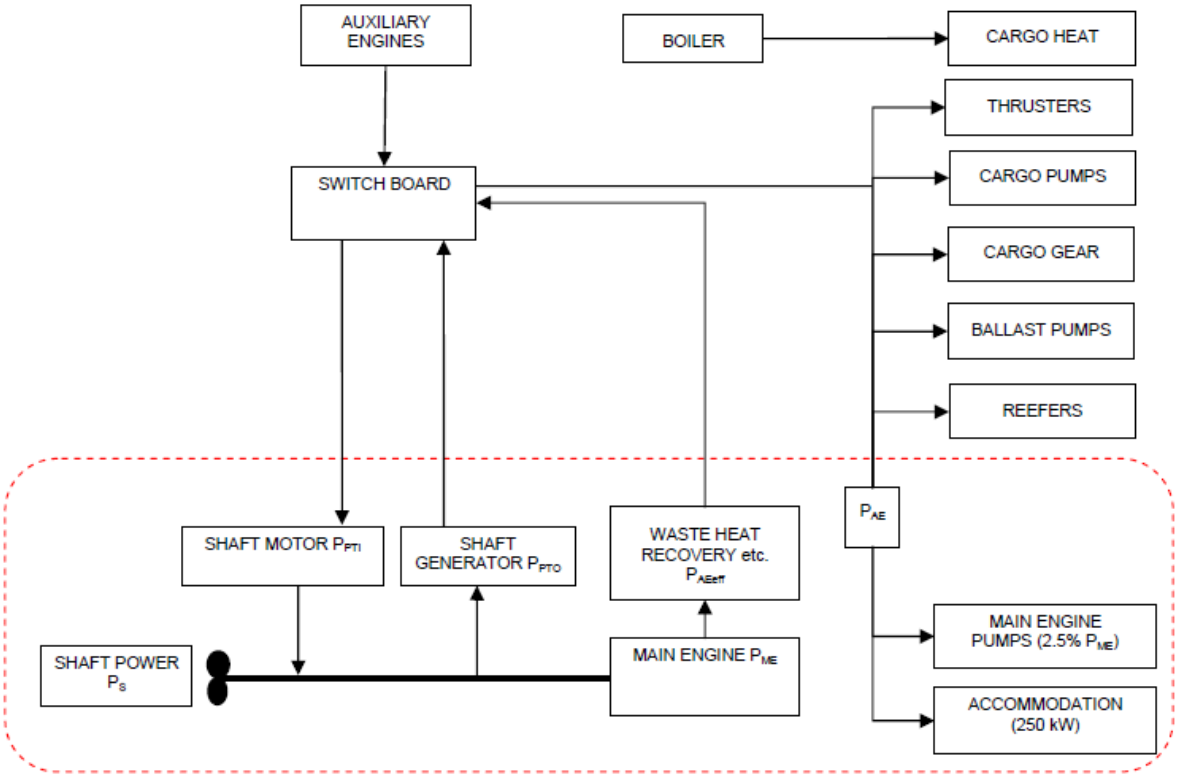


Figure 4.1 scheme of the propulsion and power generation systems

5 Electric power table

The electric power for the calculation of EEDI is provided in table 5.1.

Table 5.1: Electric power table for calculation of P_{AE}

Id	Group	Description	Mech. Power "Pm"	El. Motor output	Efficien. "e"	Rated el. Power "Pr"	load factor "kl"	duty factor "kd"	time factor "kt"	use factor "ku"	Necessary power "Pload"
1	A	STEERING GEAR	N.A.	N.A.	N.A.	45,0	0,9	1	0,3	0,27	12.2
2	A	HULL CATHODIC PROTECTION	N.A.	N.A.	N.A.	10	1	1	1	1,00	10,0
3	A	CRANE	N.A.	N.A.	N.A.	10,00	0,2	1	1	0,20	2,0
4	A	COMPASS	N.A.	N.A.	N.A.	0,5	1	1	1	1,00	0,5
5	A	RADAR NO.1	N.A.	N.A.	N.A.	1,3	1	0,5	1	0,50	0,7
6	A	RADAR NO.2	N.A.	N.A.	N.A.	1,3	1	0,5	1	0,50	0,7
7	A	NAVIGATION EQUIPMENT	N.A.	N.A.	N.A.	5,0	1	1	1	1,00	5,0
8	A	INTERNAL COMM. EQUIPMENT	N.A.	N.A.	N.A.	2,5	1	1	0,1	0,10	0,2
9	A	RADIO EQUIPMENT	N.A.	N.A.	N.A.	3,5	1	1	0,1	0,10	0,4
10	A	MOORING EQ.	N.A.	N.A.	N.A.	7,0	1	1	0,1	0,10	0,7
11	B	MAIN COOLING SEA WATER PUMP NO.1	28,0	30	0,925	30,3	0,9	0,66	1	0,59	18,0
12	B	MAIN COOLING SEA WATER PUMP NO.2	28,0	30	0,925	30,3	0,9	0,66	1	0,59	18,0
13	B	MAIN COOLING SEA WATER PUMP NO.3	28,0	30	0,925	30,3	0,9	0,66	1	0,59	18,0
14	B	LT COOLING FW PUMP NO.1	28,0	30	0,925	30,3	0,9	0,66	1	0,59	18,0
15	B	LT COOLING FW PUMP NO.2	28,0	30	0,925	30,3	0,9	0,66	1	0,59	18,0
16	B	LT COOLING FW PUMP NO.3	28,0	30	0,925	30,3	0,9	0,66	1	0,59	18,0

Id	Group	Description	Mech. Power "Pm"	El. Motor output	Efficien. "e"	Rated el. Power "Pr"	load factor "kl"	duty factor "kd"	time factor "kt"	use factor "ku"	Necessary power "Pload"
17	B	M/E COOLING WATER PUMP NO.1	13,0	15	0,9	14,4	1	0,5	1	0,50	7,2
18	B	M/E COOLING WATER PUMP NO.2	13,0	15	0,9	14,4	1	0,5	1	0,50	7,2
19	C	MAIN LUB. OIL PUMP NO.1	55,0	90	0,94	58,5	0,9	0,5	1	0,45	26,3
20	C	MAIN LUB. OIL PUMP NO.2	55,0	90	0,94	58,5	0,9	0,5	1	0,45	26,3
21	C	H.F.O. TRANSFER PUMP	6,0	7,5	0,88	6,8	1	1	0,1	0,10	0,7
22	C	D.O. TRANSFER PUMP	6,0	7,5	0,88	6,8	1	1	0,1	0,10	0,7
23	C	L.O. TRANSFER PUMP	1,4	2,5	0,8	1,8	1	1	0,1	0,10	0,2
24	C	TECHNICAL FRESH WATER PUMP NO.1	2,5	3,5	0,85	2,9	1	0,5	0,1	0,05	0,1
25	C	TECHNICAL FRESH WATER PUMP NO.2	2,5	3,5	0,85	2,9	1	0,5	0,1	0,05	0,1
26	C	E/R SUPPLY FAN NO.1	14,0	20	0,9	15,5	0,9	1	1	0,90	14,0
27	C	E/R SUPPLY FAN NO.2	14,0	20	0,9	15,5	0,9	1	1	0,90	14,0
28	C	E/R SUPPLY FAN NO.3	14,0	20	0,9	15,5	0,9	1	1	0,90	14,0
29	C	E/R SUPPLY FAN NO.4	14,0	20	0,9	15,5	0,9	1	1	0,90	14,0
30	C	PURIFIER ROOM EXH.VENTILATOR	2,5	3	0,82	3,0	0,9	1	1	0,90	2,7
31	C	PUMP HFO SUPPLY UNIT NO.1	2,1	3	0,8	2,6	0,9	0,5	1	0,45	1,2
32	C	PUMP HFO SUPPLY UNIT NO.2	2,1	3	0,8	2,6	0,9	0,5	1	0,45	1,2
33	C	CIRC. PUMP FOR HFO SUPPLY UNIT NO.1	2,8	3,5	0,84	3,3	0,9	0,5	1	0,45	1,5
34	C	CIRC. PUMP FOR HFO SUPPLY UNIT NO.2	2,8	3,5	0,84	3,3	0,9	0,5	1	0,45	1,5
35	C	H.F.O. SEPARATOR NO.1	N.A.	N.A.	N.A.	6,5	0,9	0,5	0,9	0,41	2,6
36	C	H.F.O. SEPARATOR NO.2	N.A.	N.A.	N.A.	6,5	0,9	0,5	0,9	0,41	2,6
37	C	MAIN AIR COMPRESSER NO.1	N.A.	N.A.	N.A.	43,0	1	0,5	0,1	0,05	2,2
38	C	MAIN AIR COMPRESSER NO.2	N.A.	N.A.	N.A.	43,0	1	0,5	0,1	0,05	2,2
39	C	SERVICE AIR COMPRESSER	N.A.	N.A.	N.A.	22,0	1	1	0,1	0,10	2,2
40	C	VENT. AIR SUPPLY	N.A.	N.A.	N.A.	1,0	1	1	0,5	0,50	0,1
41	C	BILGE WATER SEPARATOR	N.A.	N.A.	N.A.	1,5	1	1	0,1	0,10	0,2
42	C	M/E L.O. SEPARATOR	N.A.	N.A.	N.A.	6,5	0,9	1	0,2	0,18	1,2
43	C	G/E L.O. SEPARATOR	N.A.	N.A.	N.A.	6,5	0,9	1	0,2	0,18	1,2
44	D	HYDROPHORE PUMP NO.1	2,8	4	0,84	3,3	1	0,5	0,1	0,05	0,2
45	D	HYDROPHORE PUMP NO.2	2,8	4	0,84	3,3	1	0,5	0,1	0,05	0,2
46	D	HOT WATER CIRCULATING PUMP NO.1	0,5	1,0	0,8	0,8	1	0,5	0,2	0,10	0,1
47	D	HOT WATER CIRCULATING PUMP NO.2	0,5	1,0	0,8	0,8	1	0,5	0,2	0,10	0,1
48	E	E/R WORKSHOP WELDING SPACE EXH.	0,5	0,8	0,8	0,6	0,9	1	1	0,90	0,6
49	F	ECR COOLER UNIT	N.A.	N.A.	N.A.	4,2	1	1	0,5	0,50	2,1
50	F	FAN FOR AIR CONDITIONING PLANT	N.A.	N.A.	N.A.	8,0	0,9	1	0,5	0,45	3,6
51	F	COMP. AIR CONDITIONING PLANT NO.1	N.A.	N.A.	N.A.	10,0	0,9	1	0,5	0,45	4,5
52	F	COMP. AIR CONDITIONING PLANT NO.2	N.A.	N.A.	N.A.	10,0	0,9	1	0,5	0,45	4,5
53	F	COMP. AIR CONDITIONING PLANT NO.3	N.A.	N.A.	N.A.	10,0	0,9	1	0,5	0,45	4,5
54	F	COMP. AIR CONDITIONING PLANT NO.4	N.A.	N.A.	N.A.	10,0	0,9	1	0,5	0,45	4,5

Id	Group	Description	Mech. Power "Pm"	El. Motor output	Efficien. "e"	Rated el. Power "Pr"	load factor "kl"	duty factor "kd"	time factor "kt"	use factor "ku"	Necessary power "Pload"
55	G	FAN FOR GALLEY AIR COND. PLANT	N.A.	N.A.	N.A.	1,5	0,9	1	0,5	0,45	0,7
56	G	COMP. FOR GALLEY AIR COND. PLANT	N.A.	N.A.	N.A.	3,5	0,9	1	0,5	0,45	1,6
57	G	REF. COMPRESSOR NO.1	N.A.	N.A.	N.A.	4,0	1	0,5	0,1	0,05	0,2
58	G	REF. COMPRESSOR NO.2	N.A.	N.A.	N.A.	4,0	1	0,5	0,1	0,05	0,2
59	G	GALLEY EQUIPMENT	N.A.	N.A.	N.A.	80,0	0,5	1	0,1	0,05	4,0
60	H	VAC. COLLECTION SYSTEM	2,4	3,0	0,8	3,0	1	1	1	1,00	3,0
61	H	GALLEY EXH.	1,2	1,5	0,8	1,5	1	1	1	1,00	1,5
62	H	LAUNDRY EXH.	0,1	0,15	0,8	0,1	1	1	1	1,00	0,1
63	H	SEWAGE TREATMENT	N.A.	N.A.	N.A.	4,5	1	1	0,1	0,10	0,5
64	H	SEWAGE DISCHARGE	3	7,5	0,88	3,4	0,9	1	0,1	0,09	0,3
65	I	ACCOMMODATION LIGHTING	N.A.	N.A.	N.A.	16,0	1	1	0,5	0,5	8,0
66	I	E/R LIGHTING	N.A.	N.A.	N.A.	18,0	1	1	1	1,00	18,0
67	I	NAVIGATION LIGHTING	N.A.	N.A.	N.A.	0,9	1	0,5	1	0,50	0,4
68	I	BACK. NAV. LIGHTING	N.A.	N.A.	N.A.	0,9	1	0,5	1	0,50	0,4
								TOTAL POWER			**354,0**
P_{AE} = Total Power / (average efficiency of generators) = 354/0.93 = 381 kW											

6 Towing Tank test organization quality system

Towing tank tests will be performed in TEST corp.

The quality control system of the towing tank test organization TEST corp. has been documented previously (see report 100 for the ship hull No. 12345) and the quality manual and calibration records are available to the verifier.

The measuring equipment has not been modified since the issue of report 100 and is listed in table 6.1.

Table 6.1: List of measuring equipment

	Manufacturer	Model	Series	Lab. Id.	status
Propeller dynamometer	B&N	6001	300	125-2	Calibrated 01/01/2011
…					

7 Estimation process of power curves at design stage

7.1 Test procedure

The tests and their analysis are conducted by TEST corp. applying their standard correlation method (document is given in annex 1).

The method is based on thrust identity and references ITTC Recommended Procedure 7.5 - 02 - 03 -1.4 ITTC 1978 Trial Prediction Method (in its latest reviewed version of 2011), with prediction of the full scale rpm and delivered power by use of the C_P – C_N correction factors.

The results are based on a Resistance Test, a Propulsion Test and use the Open Water Characteristics of the model propeller used during the tests and the Propeller Open Water Characteristics of the final propeller given in 7.4.

Results of the resistance tests and propulsion tests of the ship model are given in the report of TEST corp. given in annex 2.

7.2 Speed prediction

The ship delivered power P_D and rate of revolutions n_S are determined from the following equations:

$$P_D = C_P . P_{DS}$$
$$n_T = C_N . n_S$$

Where C_N and C_P are experience-based factors and P_{DS} (resp. n_S) are the delivered power (resp. rpm) obtained from the analysis of the towing tank tests.

The ship total resistance coefficient C_{TS} is given by:

$$C_{TS} = \frac{S_S + S_{BK}}{S_S} . [(1+k) . C_{FS} + \Delta C_F] + C_R + C_{AAS} + C_{AppS}$$

Where:

S_S: ship hull wetted surface, here 9886 m^2

S_{BK}: wetted surface of bilge keels

k: form factor. Here 1+k = 1.38 over the speed range, determined according to ITTC standard procedure 7.5-02-02-01

C_{FS}: ship frictional resistance coefficient (computed according to ITTC 1957 formula)

ΔC_F: roughness allowance, computed according to Bowden-Davison formula. Here ΔC_F = 0.000339

C_R: residual resistance coefficient

C_{AAS}: air resistance coefficient

C_{AppS}: ship appendages (propeller boss cap fins) resistance coefficient, computed as provided in annex 2.

The air resistance coefficient is computed according to the following formula:

$$C_{AAS} = C_{DA} . \frac{\rho_A . A_{VS}}{\rho_S . S_S}$$

Where:

C_{DA} is the air drag coefficient, here 0.8

ρ_A and ρ_S are the air density and water density, respectively

A_{VS} is the projected wind area, here 820 m^2

$C_{AAS} = 7.9.10^{-5}$

The delivered power P_D results of the towing tank tests are summarized in table 7.1 for the EEDI condition (scantling draft) and in table 7.2 for the sea trial condition (light ballast draft).

Table 7.1: results of trial prediction in EEDI condition

Model reference: SX100 - model scale: 40					
Loading condition: EEDI loading condition (12.70 m draft)					
Resistance test: R001		Propulsion test: P001		Model propeller: Prop01	
Ship speed V (knot)	Wake factor w_{TM}-w_{TS}	Propeller thrust T_S (kN)	Propeller torque Q_S (kNm)	rpm on ship n_S	Delivered Power P_D (kW)
12	0.098	522	467	78	3781
12.5	0.093	578	514	82	4362

13	0.089	638	563	86	5004
13.5	0.081	701	615	90	5710
14	0.079	768	669	93	6486
14.5	0.086	838	727	97	7333
15	0.091	912	786	101	8257
15.5	0.099	990	849	105	9261
Experience-based factor C_P: 1.01					
Experience based factor C_N: 1.02					

Table 7.2: results of trial prediction in sea trial condition

Model reference: SX100 - model scale: 40					
Loading condition: Sea trial condition (5.80 m draft)					
Resistance test: R002		Propulsion test: POO2		Model propeller: Prop01	
Ship speed V (knot)	Wake factor w_{TM}-w_{TS}	Propeller thrust T_S (kN)	Propeller torque Q_S (kNm)	rpm on ship n_S	Delivered Power P_D (kW)
12	0,079	406	379	72	2974
12,5	0,081	451	418	76	3445
13	0,083	500	459	79	3968
13,5	0,085	551	503	83	4545
14	0,087	606	549	87	5181
14,5	0,088	664	597	90	5878
15	0,091	725	648	94	6641
15,5	0,089	790	701	98	7474
Experience-based factor C_P: 1.05					
Experience based factor C_N: 1.03					

The predicted results are represented on the speed curves given in Figure 3.1. The EEDI condition results are indexed (Full, p), the sea trial condition results (Ballast, p).

7.3 Ship and propeller models

The ship model is at scale λ = 40. The characteristics are given in table 7.3.

Table 7.3: characteristics of the ship model

Identification (model number or similar)	SX 100
Material of construction	Wood
Principal dimensions	
Length between perpendiculars (L_{PP})	4.625 m
Length of waterline (L_{WL})	4.700 m
Breadth (B)	0.806 m
Draught (T)	0.317 m
Design displacement (Δ) (kg, fresh water)	1008.7 kg
Wetted surface area	6.25 m^2
Details of turbulence stimulation	Sand strips
Details of appendages	rudder
Tolerances of manufacture	+/- 2.5 mm on length +/- 1 mm on breadth

The propeller model used during the tests is a stock model with the following characteristics:

Table 7.4: characteristics of the stock propeller used during the tests

Identification (model number or similar)	Prop01
Materials of construction	aluminium
Blade number	4
Principal dimensions	
Diameter	147.5 mm
Pitch-Diameter Ratio (*P/D*)	0.68
Expanded blade Area Ratio (A_E/A_0)	0.60
Thickness Ratio (*t/D*)	0.036
Hub/Boss Diameter (d_h)	25 mm
Tolerances of manufacture	Diameter (D): ± 0.10 mm Thickness (t): ± 0.10 mm Blade width (c): ± 0.20 mm Mean pitch at each radius (P/D): ……..± 0.5% of design value.

7.4 Open water characteristics of propeller

The open water characteristics of the stock model propeller are given in annex 2. The open water characteristics of the ship propeller are given in Figure 7.1.

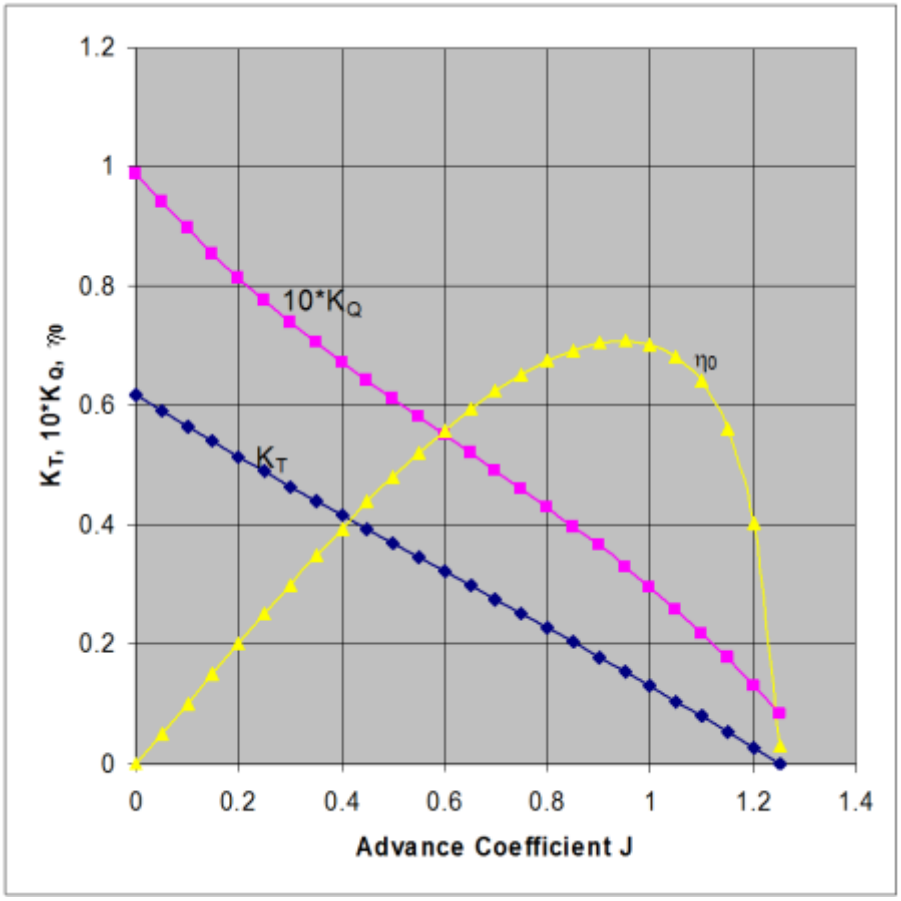


Figure 7.1: open water characteristics of ship propeller

8 Lines and offsets of the ship

The ships lines and offsets table are given in Annex 3.

9 Description of energy saving equipment

9.1 Energy saving equipment of which effects are expressed as $P_{AEeff(i)}$ and/or $P_{eff(i)}$ in the EEDI calculation formula

None here.

9.2 Other energy saving equipment

The propeller boss cap fins are described in annex 4.

10 Justification of SFC (documents attached to NO_x technical file of the parent engine)

10.1 Main engine

The shop test report for the parent main engine is provided in annex 5.1. The SFOC has been corrected to ISO conditions.

10.2 Auxiliary engine

The technical file of the EIAPP certificate of the auxiliary engines is provided in annex 5.2. The SFOC has been corrected to ISO conditions.

11 Calculation of attained EEDI at design stage

11.1 Input parameters and definitions

The EEDI quantities and intermediate calculations are listed in table 11.1:

Table 11.1: Parameters in attained EEDI calculation

EEDI quantity	Value	Remarks
C_{FME}	3.206	Marine Diesel oil is used for shop test of the main engine
P_{ME}	6900 kW	No shaft generator installed (P_{PTO} = 0) MCR is 9200 kW PME = 0.75x9200 = 6 900 kW
SFC_{ME}	171 g/kWh	According to parent engine shop test report in ISO conditions (see 10.1)
CF_{AE}	3.206	Marine diesel oil is used for shop test of the auxiliary engine
P_{PTI}	0	No shaft motor installed
P_{AE}	381 kW	MCR of the engine is 9200 kW, less than 10000kW $P_{AE} = 0.05.(\sum_{i=1}^{nME} MCR_{MEi} + \frac{\sum_{i=1}^{nPTI} P_{PTI(i)}}{0.75})$ P_{AE} = 0.05*9200 = 460 kW According to electric power table included in table 5.1, ∑Pload(i) = 354 kW The weighted average efficiency of generators = 0.93 (KWelec/kWmech) P_{AE} = ∑Pload(i) / 0.93 = 381 kW The difference (460 – 381) KW is expected to vary EEDI by slightly

		more than 1%, so 381 kW is considered.
SFC_{AE} (at 75% MCR)	199 g/kWh	According to technical file of EIAPP certificate in ISO conditions (see 10.2). According to 2.7.1 of IMO EEDI Calculation Guidelines the SFC_{AE} at 75% MCR should be used as P_{AE} is significantly different from 2.5.6 of IMO EEDI Calculation Guidelines.
P_{eff}	0	No mechanical energy efficient devices The propeller boss cap fins act by reducing ship resistance
P_{AEeff}	0	No auxiliary power reduction
f_{eff}		Not relevant here (see above)
f_j	1.0	The ship is a bulk carrier without ice notations. fj = 1.0
f_i	1.017	No ice notation f_{iICE} = 1.0 No voluntary structural enhancement for this ship f_{iVSE} = 1.0 The ship has the notation Bulk carrier CSR: $f_{iCSR} = 1 + 0.08*LWT_{CSR} / DWT_{CSR} = 1+0.08*11590/55000 = 1.017$ $fi = f_{iICE} \times f_{iVSE} \times f_{iCSR} = 1.017$
f_w	1.0	For attained EEDI calculation under regulation 20 and 21 of MARPOL Annex VI, f_w is 1.0
f_c	1.0	The ship is a bulk carrier f_c = 1.0
Capacity	55000	For a bulk carrier, Capacity is deadweight = 55 000 tons
V_{ref}	14.25 knots	At design stage, reference speed is obtained from the towing tank test report and delivered power in scantling draft (EEDI) condition is given in table 7.1 In table 7.1 $P_D = 1.0 \times P_{ME}$ = 6900 kW The reference speed is read on the speed curve corresponding to table 7.1 at intersection between curve *Full, p* and 6900 kW V_{ref} = 14.25 knots

11.2 Result

For this vessel, Attained EEDI is:

$$\frac{(\prod_{j=1}^{n} f_j)\cdot(\sum_{i=1}^{nMB} P_{MB(i)}\cdot C_{FME(i)}\cdot SFC_{ME(i)}) + P_{AE}\cdot C_{FAE}\cdot SFC_{AE} + \{(\prod_{j=1}^{n} f_j)\sum_{i=1}^{nPTI} P_{PTI(i)} - \sum_{i=1}^{nwht} f_{eff(i)}\cdot P_{AEeff(i)}\}\cdot C_{FAE}\cdot SFC_{AE} - \sum_{i=1}^{nwht} f_{eff(i)}\cdot P_{eff(i)}\cdot C_{FME}\cdot SFC_{ME})}{f_i\cdot f_c\cdot Capacity\cdot f_w\cdot V_{ref}}$$

Attained EEDI = (6900*3.206*171+381*3.206*199) / (1.017*55000*14.25) = 5.05 g/t.nm

12 Required EEDI

According to MARPOL Annex VI, Chapter 4, Regulation 21, the required EEDI is:
(1-x/100) x reference line value

The reference line value = $a*b^{-c}$ where a, b, c are given for a bulk carrier as:

a= 961.79 b = deadweight of the ship c = 0.477

So reference line value = 5.27 g/t.nm

In Phase 0 (between 1 Jan 2013 and 31 Dec 2014) above 20000 DWT, x = 0

So Required EEDI = 5.27 g/t.nm

Figure 12.1 provides the relative position of attained EEDI with reference to required value.

As a conclusion, for this vessel:

- attained EEDI = 5.05 g/t.nm
- required EEDI = 5.27 g/t.nm

- Regulation criteria is satisfied with 4.2% margin

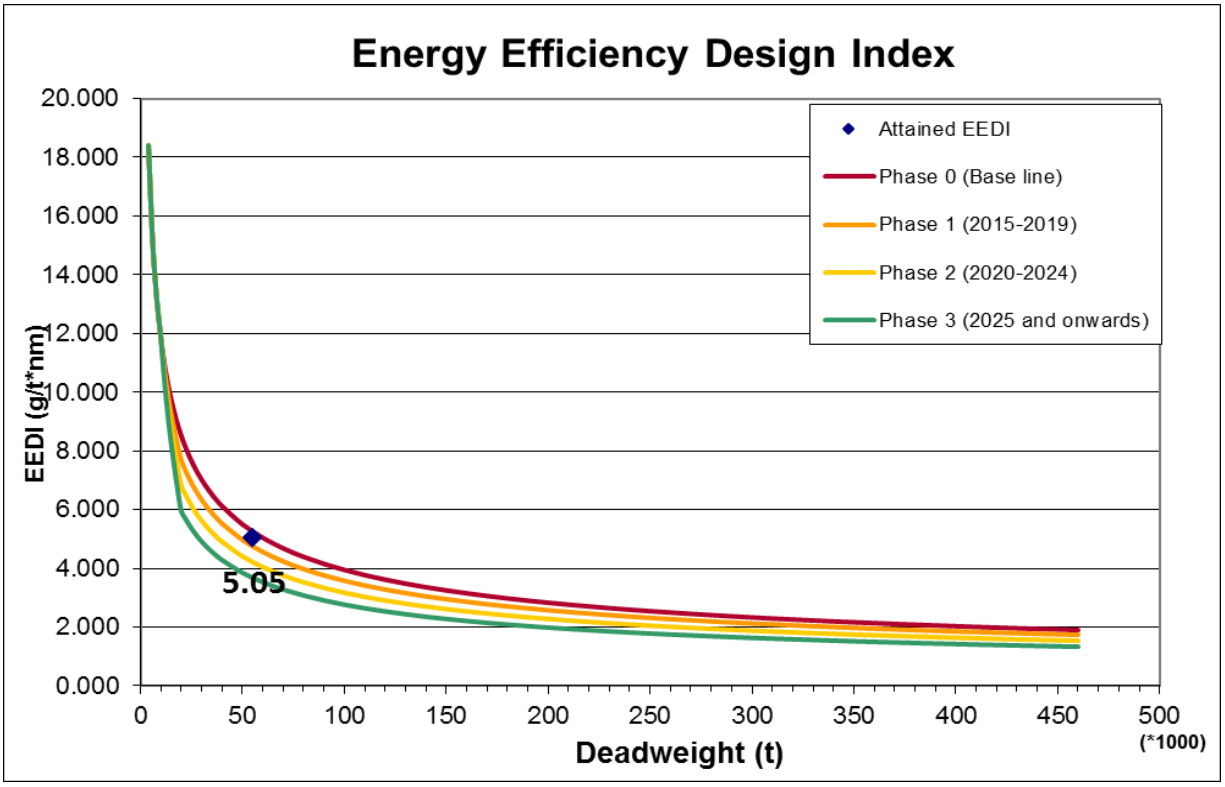


Figure 12.1: Required EEDI value

13 Calculation of attained $EEDI_{weather}$

Not calculated.

14 Lightweight check report

The lightweight check report is provided in annex 6. The final characteristics of the ship are:

Displacement	66171 tons
Lightweight	11621 tons
Deadweight	54550 DWT

15 Sea trial report with corrections

The sea trial report is provided in annex 7. The results of the sea trial after corrections by BSRA and ITTC standard methods are given on curve *Ballast,s* on Figure 3.1.

16 Calculation of attained EEDI at final stage

16.1 Recalculated values of parameters

The EEDI quantities and intermediate calculations are listed in table 16.1. Parameters which have not been modified from the preliminary verification stage are marked “no change”.

Table 16.1: Parameters in attained EEDI calculation (final stage)

EEDI quantity	Value	Remarks
C_{FME}	3.206	No change
P_{ME}	6900 kW	No change
SFC_{ME}	171 g/kWh	No change
CF_{AE}	3.206	No change
P_{PTI}	0	No change
P_{AE}	381 kW	The electric power table has been validated and endorsed (see the electric power table form in annex 8)
SFC_{AE} at 75% MCR	199 g/kWh	No change
P_{eff}	0	No change
P_{AEeff}	0	No change
f_{eff}		No change
f_j	1.0	No change
f_i	1.017	Deadweight and lightweight are computed from lightweight check: $f_{iCSR} = 1 + 0.08*LWT_{CSR} / DWT_{CSR} = 1+0.08*11621/54550 = 1.017$ $fi = f_{iICE} \times f_{iVSE} \times f_{iCSR} = 1.017$ (unchanged)
f_c	1.0	No change
Capacity	54550 DWT	Deadweight has been computed from the lightweight check. See 14.
V_{ref}	14.65 knots	The reference speed in EEDI condition has been adjusted according to the delivered power adjustment methodology defined in Industry Guidelines. The reference speed is read on the speed curves diagram in Figure 3.1 V_{ref} = 14.65 knots

16.2 Final result

Attained EEDI = (6900*3.206*171+381*3.206*199) / (1.017*54550*14.65) = 4.95 g/t.nm

Required EEDI in Phase 0: $961.79*54550^{-0.477}$ = 5.29 g/t.nm

Regulation criteria is satisfied with 6.4% margin

List of annexes to the Document

Annex 1	Standard model-ship extrapolation and correlation method
Annex 2	Towing tank tests report
Annex 3	Ship lines and offsets table
Annex 4	Description of energy saving equipment
Annex 5	5.1 NO_x Technical File of main engine(s)
	5.2 NO_x Technical File of auxiliary engines
Annex 6	Lightweight check report
Annex 7	Sea trials report
Annex 8	EPT-EEDI form

APPENDIX 3
Verifying the calibration of model test equipment

Quality Control System

The existence of a Quality Control System is not sufficient to guarantee the correctness of the test procedures; QS, including ISO 9000, only give documentary evidence what is to be and has been done. Quality Control Systems do not evaluate the procedures as such.

The Test institute should have a quality control system (QS). If the QS is not certified ISO 9000 a documentation of the QS should be shown. A Calibration Procedure is given in ITTC Recommended Procedures 7.6-01-01.

1. Measuring Equipment

An important aspect of the efficient operation of Quality System according to measuring equipment is a full identification of devices used for the tests.

Measuring equipment instruments shall have their individual records in which the following data shall be placed:

- name of equipment
- manufacturer
- model
- series
- laboratory identification number (optionally)
- status (verified, calibration, indication)

Moreover the information about the date of last and next calibration or verification shall be placed on this record. All the data shall be signed by authorised officer.

2. Measuring Standards

Measuring standards used in laboratory for calibration purposes shall be confirmed (verified) by Weights and Measures Office at appropriate intervals (defined by the Weights and Measures Office).

All measuring standards used in laboratory for the confirmation purposes shall be supported by certificates, reports or data sheets for the equipment confirming the source, uncertainty and conditions under which the results were obtained.

3. Calibration

The calibration methods may differ from institution to institution, depending on the particular measurement equipment. The calibration shall comprise the whole measuring chain (gauge, amplifier, data acquisition system etc.).

The laboratory shall ensure that the calibration tests are carried out using certified measuring standards having a known valid relationship to international or nationally recognised standards.

a) Calibration Report

“Calibration reports” shall include:

- identification of certificate for measuring standards
- description of environmental conditions
- calibration factor or calibration curve
- uncertainty of measurement
- minimum and maximum capacity" for which the error of measuring instrument is within specified (acceptable) limits.

b) Intervals of Confirmation

The measuring equipment (including measuring standards) shall be confirmed at appropriate (usually periodical) intervals, established on the basis of their stability, purpose and wear. The intervals shall be such that confirmation is carried out again prior to any probable change in the equipment accuracy, which is important for the equipment reliability. Depending on the results of preceding calibrations, the confirmation period may be shortened, if necessary, to ensure the continuous accuracy of the measuring equipment.

The laboratory shall have specific objective criteria for decisions concerning the choice of intervals of confirmation.

c) Non - Conforming Equipment

Any item of measuring equipment

- that has suffered damage,
- that has been overloaded or mishandled,
- that shows any malfunction,
- whose proper functioning is subject to doubt,
- that has exceeded its designated confirmation interval, or
- the integrity of whose seal has been violated, shall be removed from service by segregation, clear labelling or cancelling.

Such equipment shall not be returned to service until the reasons for its nonconformity have been eliminated and it is confirmed again.

If the results of calibration prior to any adjustment or repair were such as to indicate a risk of significant errors in any of the measurements made with the equipment before the calibration, the laboratory shall take the necessary corrective action.

4. Instrumentation

Especially the documentation on the calibration of the following Instrumentation should be shown.

a) Carriage Speed

The carriage speed is to be calibrated as a distance against time. Period between the calibrations is to be in accordance with the internal procedure of the towing tank test organisation.

b) Water Temperature

Measured by calibrated thermometer with certificate (accuracy 0.1°C).

c) Trim Measurement

Calibrated against a length standard. Period between the calibrations is to be in accordance with the internal procedure of the towing tank test organisation.

d) Resistance Test

Resistance Test is a force measurement. It is to be calibrated against a standard weight. Calibration normally before each test series.

e) Propulsion Test

During Self Propulsion Test torque, thrust and rate of revolutions are measured. Thrust and Torque are calibrated against a standard weight. Rate of revolution is normally measured by a pulse tachometer and an electronic counter which can be calibrated e.g. by an oscillograph.

Period between the calibrations is to be in accordance with the internal procedure of the towing tank test organisation.

f) Propeller Open Water Test

During Propeller Open Water Test torque, thrust and rate of revolutions are measured. Thrust and Torque are calibrated against a standard weight. Rate of revolution is normally measured by a pulse tachometer and an electronic counter which can be calibrated e.g. by an oscillograph.

Period between the calibrations is to be in accordance with the internal procedure of the towing tank test organisation.

Examples of documentation sheets are given in the Annexes 1 and 2:

ANNEX 1: SAMPLE OF MEASURING EQUIPMENT CARD

QM 4.10.5.1	**Measurement Equipment Card**	Laboratory Identification Number	

Equipment		Manufacturer		Model	
		Serial No.		Date of Purchase	
		Basic range			

		Status	
Work Instructions		Calibrated	☐
Calibration Instructions		Indication	☐
Verified at		Verified	☐

Date of Check	Certificate. No.	Period	Date of Next Check	Responsible	Department	Approval

ANNEX 2: SAMPLE OF CALIBRATION CERTIFICATE.

QM 4.10.6.2	**CALIBRATION CERTIFICATE for** PROPELLER	**NO.**	
		LIN	

Calibration Instructions		Calibrated by :	
Date of calibration		Checked by :	

Measurement combination

DYNAMOMETER LIN		Manufacturer		Model	
		Serial No		Date of purchased	
		Work instruction		Last calibration	
Cable					
AMPLIFIER LIN		Manufacturer		Model	
		Serial No		Date of purchased	
		Work instruction		Type of transducer	
		Excitation		Frequency of excit.	
	Thrust :	Amp. gain		Zero not load	
	Torque :	Amp. gain		Zero not load	
Cable					
A/C TRANSDUCER LIN		Manufacturer		Model	
		Serial No		Date of purchased	
		Work instruction		Certificate No	
MEASUREMENT STANDARDS		Mass		Certificate No	
		Length arm of force		Certificate No	
		Voltmeter		Certificate No	

QM 4.10.6.2	CALIBRATION RESULTS			
Environmental condition				
Place of test :				
Temperature :	initial		final	
Dampness :	initial		final	
Computation results of calibrations test				
Executed program	procedure	certificate NO.		
	Thrust	**Torque**		
Drift :				
Non Linearity errors :				
Hysteresis :				
Precision errors :				
Total uncertainty :				
Calibration factor :				
Calibration requests :				
Specified limits of	**Thrust**	**Torque**		
errors :				
Maximum capacity :				
Minimum capacity :				
Note : tests and computations results are included in report				

Prepared by : ..... Approved by : ..... Date : .....

APPENDIX 4
Review and witnessing of model test procedures

The Model Tests is to be witnessed by the verifier. Special attention is to be given to the following items:

1. Ship Model

Hydrodynamic Criteria

a) *Model Size*: The model should generally be as large as possible for the size of the towing tank taking into consideration wall, blockage and finite depth effects, as well as model mass and the maximum speed of the towing carriage (ITTC Recommended Procedure 7.5-02-02-01 Resistance Test).

b) *Reynolds Number*: The Reynolds Number is to be, if possible, above 2.5×10^5.

c) *Turbulence Stimulator*: In order to ensure turbulent flow, turbulence stimulators have to be applied.

Manufacture Accuracy

With regard to accuracy the ship model is to comply with the criteria given in ITTC Recommended Procedure 7.5-01-01-01, Ship Models.

The following points are to be checked:

a) *Main dimensions*: L_{PP}, *B.*

b) *Surface finish*: Model is to be smooth. Particular care is to be taken when finishing the model to ensure that geometric features such as knuckles, spray rails, and boundaries of transom sterns remain well-defined.

c) *Stations and Waterlines*: The spacing and numbering of displacement stations and waterlines are to be properly defined and accurately marked on the model.

d) *Displacement*: The model is to be run at the correct calculated displacement. The model weight is to be correct to within 0.2% of the correct calculated weight displacement. In case the marked draught is not met when the calculated displacement has been established the calculation of the displacement and the geometry of the model compared to the ship has to be revised. (Checking the Offsets).

Documentation in the report

Identification (model number or similar)
Materials of construction
Principal dimensions
Length between perpendiculars (L_{PP})
Length of waterline (L_{WL})
Breadth (B)
Draught (T)
For multihull vessels, longitudinal and transverse hull spacing
Design displacement (Δ) (kg, fresh water)

Hydrostatics, including water plane area and wetted surface area
Details of turbulence stimulation
Details of appendages
Tolerances of manufacture

2. Propeller Model

The Manufacturing Tolerances of Propellers for Propulsion Tests are given IN ITTC Recommended Procedures 7.5-01-01-01, Ship Models Chapter 3.1.2. Attention: Procedure 7.5 – 01-02-02 Propeller Model Accuracy is asking for higher standards which are applicable for cavitation tests and not required for self-propulsion tests.

Propeller Model Accuracy

Stock Propellers
During the “stock-propeller” testing phase, the geometrical particulars of the final design propeller are normally not known. Therefore, the stock propeller pitch (in case of CPP) is recommended to be adjusted to the anticipated propeller shaft power and design propeller revolutions. (ITTC Recommended Procedure 7.5-02-03-01.1 Propulsion/Bollard Pull Test).

Adjustable Pitch Propellers
Before the Tests the pitch adjustment is to be controlled.

Final Propellers
Propellers having diameter (D) typically from 150 mm to 300 mm is to be finished to the following tolerances:
Diameter (D) ± 0.10 mm
Thickness (t) ± 0.10 mm
Blade width (c) ± 0.20 mm
Mean pitch at each radius (P/D): ± 0.5% of de-sign value.
Special attention is to be paid to the shaping accuracy near the leading and trailing edges of the blade section and to the thickness distributions. The propeller will normally be completed to a polished finish.

Documentation in the report
Identification (model number or similar)
Materials of construction
Principal dimensions
Diameter
Pitch-Diameter Ratio (*P/D*)
Expanded blade Area Ratio (A_E/A_0)
Thickness Ratio (*t/D*)
Hub/Boss Diameter (d_h)
Tolerances of manufacture

3. Model Tests

a) Resistance Test

The Resistance Test is to be performed acc. to ITTC Recommended Procedure 7.5-02-02-01 Resistance Test.

Documentation in the report

Model Hull Specification:

- Identification (model number or similar)
- Loading condition
- Turbulence stimulation method
- Model scale
- Main dimensions and hydrostatics (see ITTC Recommended Procedure 7.5-01-01-01 Ship Models and chapter 2 of this paper).

Particulars of the towing tank, including length, breadth and water depth
Test date
Parametric data for the test:

- Water temperature
- Water density
- Kinematic viscosity of the water
- Form factor (even if (1+k) =1.0 is applicable, this is to be stated)
- ΔC_F or C_A

For each speed, the following measured and extrapolated data is to be given as a minimum:

- Model speed
- Resistance of the model
- Sinkage fore and aft, or sinkage and trim

b) Propulsion Test

The Propulsion Test is to be performed acc. to ITTC Recommended Procedure 7.5-02-03-01.1 Propulsion Test/Bollard Pull.

Documentation in the report
Model Hull Specification:

- Identification (model number or similar)
- Loading condition
- Turbulence stimulation method
- Model scale
- Main dimensions and hydrostatics *(*see ITTC Recommended Procedure 7.5-01-01-01 Ship Models and chapter 2 of this paper).

Model Propeller Specification:

- Identification (model number or similar)
- Model Scale
- Main dimensions and particulars (see ITTC Recommended Procedure 7.5-01-01-01 Ship Models and chapter 3 of this paper)

Particulars of the towing tank, including length, breadth and water depth
Test date
Parametric data for the test:

- Water temperature
- Water density
- Kinematic viscosity of the water
- Form factor (even if (1+k) = 1.0 is applicable, this is to be stated)
- ΔC_F or C_A
- Appendage drag scale effect correction factor (even if a factor for scale effect correction is not applied, this is to be stated).

For each speed the following measured data and extrapolated data is to be given as a minimum:

- Model speed
- External tow force
- Propeller thrust,
- Propeller torque

- Rate of revolutions.
- Sinkage fore and aft, or sinkage and trim
- The extrapolated values are also to contain the resulting delivered power $P_{D.}$

c) Propeller Open Water Test

In many cases the Propeller Open Water Characteristics of a stock propeller will be available and the Propeller Open Water Test need not be repeated for the particular project. A documentation of the Open Water Characteristics (Open Water Diagram) will suffice.

In case of a final propeller or where the Propeller Open Water Characteristics is not available the Propeller Open Water Test is to be performed acc. to ITTC Recommended Procedure 7.5-02-03-02.1 Open Water Test.

Documentation in the report
Model Propeller Specification:
- Identification (model number or similar)
- Model scale
- Main dimensions and particulars (see recommendations of ITTC Recommended Procedure 7.5-01-01-01 Ship Models and chapter 3 of this paper)
- Immersion of centreline of propeller shaft in the case of towing tank

Particulars of the towing tank or cavitation tunnel, including length, breadth and water depth or test section length, breadth and height.
Test date
Parametric data for the test:
- Water temperature
- Water density
- Kinematic viscosity of the water
- Reynolds Number (based on propeller blade chord at 0.7*R*)

For each speed the following data is to be given as a minimum:
- Speed
- Thrust of the propeller
- Torque of the propeller
- Rate of revolution
- Force of nozzle in the direction of the propeller shaft (in case of ducted propeller)

Propeller Open Water Diagram

4. Speed Trial Prediction

The principal steps of the Speed Trial Prediction Calculation are given in ITTC Recommended Procedure 7.5 - 02 - 03 -1.4 ITTC 1978 Trial Prediction Method (in its latest reviewed version of 2011). The main issue of a speed trial prediction is to get the loading of the propeller correct and also to assume the correct full scale wake. The right loading of the propeller can be achieved by increasing the friction deduction by the added resistance (e.g. wind resistance etc.) and run the self-propulsion test already at the right load or it can be achieved by calculation as given in Procedure 7.5-02-03-1.4.

A wake correction is always necessary for single screw ships. For twin screw ships it can be neglected unless the stern shape is of twin hull type or other special shape.

The following scheme indicates the main components of a speed trial prediction. It is to be based on a Resistance Test, a Propulsion Test and an Open Water Characteristics of the used model propeller during the tests and the Propeller Open Water Characteristics of the final propeller.

Documentation
Model Hull Specification:

- Identification (model number or similar)
- Loading condition
- Turbulence stimulation method
- Model scale
- Main dimensions and hydrostatics (see ITTC Recommended Procedure 7.5-01-01-01 Ship Models and chapter 2 of this paper).

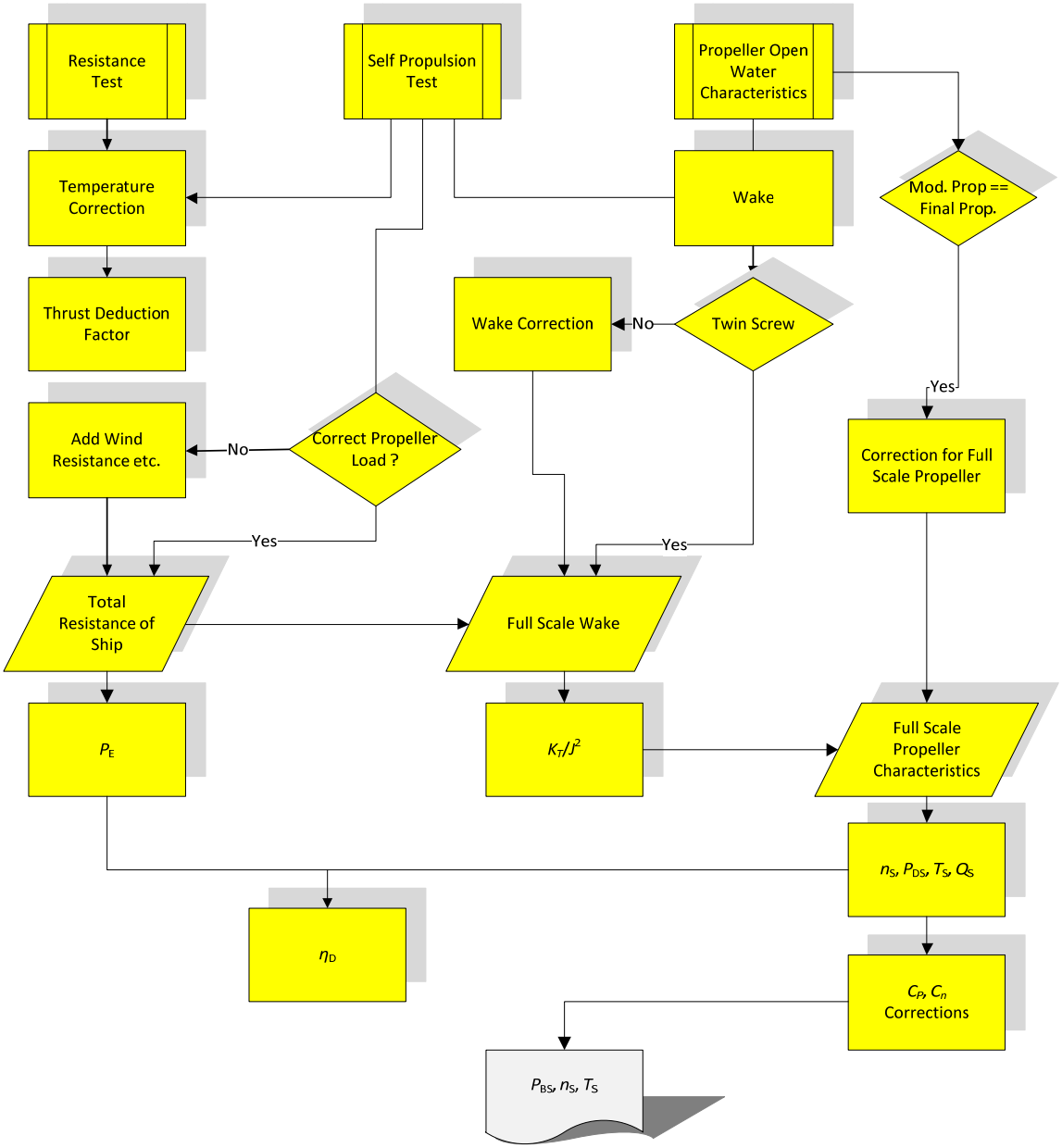
Model Propeller Specification:

- Main dimensions and particulars (see ITTC Recommended Procedure 7.5-01-01-01 Ship Models and chapter 3 of this paper)

Particulars of the towing tank, including length, breadth and water depth
Resistance Test Identification (Test No. or similar)
Propulsion Test Identification (Test No. or similar)
Open Water Characteristics of the model propeller
Open Water Characteristics of ship propeller
Ship Specification:

- Projected wind area
- Wind resistance coefficient
- Assumed BF
- C_P and C_n

Principle Scheme for Speed Trial Prediction

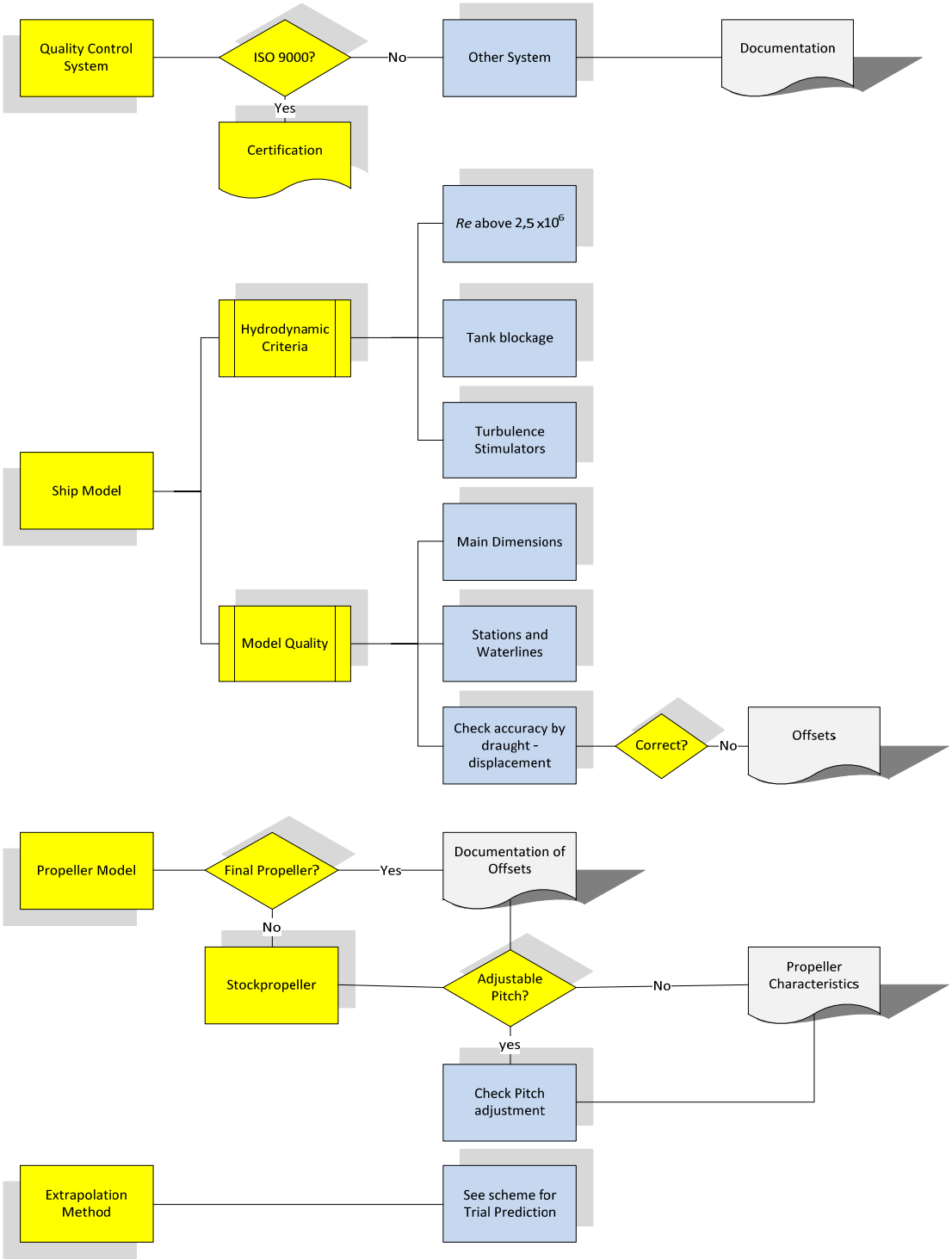


For each speed the following calculated data is to be given as a minimum:

- Ship speed
- Model wake coefficient
- Ship wake coefficient
- Propeller thrust on ship
- Propeller torque on ship
- Rate of revolutions on ship
- Predicted power on ship (delivered power on Propeller(s) P_D)
- Sinkage fore and aft, or sinkage and trim

Scheme for review and witnessing Model Tests

Checking of Model Testing Procedure



APPENDIX 5
Sample report "Preliminary Verification of EEDI"

ATTESTATION
PRELIMINARY VERIFICATION OF ENERGY EFFICIENCY DESIGN INDEX (EEDI)
by *VERIFIER*

Statement N° EEDI/2015/XXX

Ship particulars:

Ship Owner: _____

Shipyard: _____

Ship's Name: _____

IMO Number: _____

Hull number: _____

Building contract date: _____

Type of ship: _____

Port of registry: _____

Deadweight: _____

Summary results of EEDI

Reference speed	VV.V knots
Attained EEDI	X.XX g/t.nm
Required EEDI	Y.YY g/t.nm

Supporting documents

Title	**ID and/or remarks**
EEDI Technical File	RRRR dated 01/01/2015

This is to certify:

1 That the attained EEDI of the ship has been calculated according to the *2014 Guidelines on the method of calculation of the attained Energy Efficiency Design Index (EEDI) for new ships*, IMO resolution MEPC. 245(66).

2 That the preliminary verification of the EEDI shows that the ship complies with the applicable requirements in regulation 20 and regulation 21 of MARPOL Annex VI amended by resolutions MEPC.203(62) and MEPC. 251(66).

Completion date of preliminary verification of EEDI: xx/xx/xxxx

Issued at: _____ on: _____

Signature of the Verifier

APPENDIX 6
Sample calculations of EEDI

Content

Appendix 6.1
Sample calculation for diesel-electric cruise passenger ship

1. Preliminary calculation of attained EEDI at design stage

Attained EEDI for cruise passenger ship having diesel electric propulsion system is calculated as follows at design stage.
For a diesel-electric cruise passenger ship:
$P_{ME} = 0$, $P_{PTI} \neq 0$, $P_{PTO} = 0$

1) Input

The table below lists the input information needed at the design stage and verified at the final stage:

Symbol	Name	Value	Source
MPP	Rated output of electric propulsion motors	2 x 20000 kW	From EEDI technical file
η_{PTI}	Efficiency of transformer + converter + propulsion motor at 75% of rated motor output	0.945	From electric power table
η_{GEN}	Power-weighted average efficiency of generators	0.974	Calculation from individual generator efficiencies given in electric power table: 0.975*19000+0.972*14000/(14000+19000)
$HLOAD_{Max}$	Consumed electric power excluding propulsion in cruise most demanding conditions	15 779 kW	From electric power table for the most demanding cruise contractual conditions (here extreme summer conditions 28°C during 80% of the time)
SFC_{AE}	Power-weighted average of specific oil consumption among all engines at 75% of the MCR power	185 g/kWh	From NOx technical file
GT	Gross Tonnage	160000 ums	From EEDI technical file

MCR of auxiliary diesel engines 19,000 kW x 2 + 14,000 kW x 2
MPP 20,000 kW x 2
SFC_{AE} recorded in the test report annexed to the NOx technical file at 75% of MCR power and corrected to the ISO standard reference conditions.
185 g/kWh for both types of engines (19,000 kW and 14,000 kW)

2) Calculation of ΣP_{PTI}

The input is the rated output of the electric propulsion motors, MPP, which can be identified with the quantity noted $P_{PTI,Shaft}$ in 2.5.3 of the "2014 guidelines on the method of calculation of the attained energy efficiency design index (EEDI) for new ships".
The term P_{PTI} is then computed as follows:

$$\sum P_{PTI(i)} = \frac{\sum(0.75 \times MPP(i))}{\eta_{PTI} \times \eta_{Gen}}$$

$$\sum P_{PTI(i)} = \frac{2 \times 0.75 \times 20{,}000}{0.945 \times 0.974}$$

$$\sum P_{PTI(i)} = 32{,}593\ kW$$

Where η_{PTI} is the chain efficiency of the transformer, frequency converter and electric motor, as given by the manufacturer at 75% of the rated motor output and η_{Gen} is the weighted average efficiency of the generators.

3) Value of P_{AE}

P_{AE} is estimated by the consumed electric power, excluding propulsion, in most demanding (i.e. maximum electricity consumption) cruise conditions as given in the electric power table provided by the submitter, divided by the average efficiency of the generators.

The most demanding conditions maximise the design electrical load and correspond to contractual ambient conditions leading to the maximum consumption off heating ventilation and air conditioning systems, in accordance with Note 2 of the “2014 guidelines on the method of calculation of the attained energy efficiency design index (EEDI) for new ships”.

In this example, the most demanding condition corresponds to extreme summer conditions, where the external air temperature is 28°C during 80% of the time.

$$P_{AE} = \frac{\mathrm{HLOAD}_{\mathrm{Max}}}{\eta_{\mathrm{Gen}}} = \frac{15{,}779kW}{0.974} = 16{,}200\,\mathrm{kW}$$

4) V_{ref} at EEDI condition

V_{ref} is obtained by the preliminary speed-power curves as the model tank test results at EEDI condition at design stage. Suppose that V_{ref} of 22.5 kn is obtained at 75% of *MPP*, in this example calculation at design stage.

5) Calculation of the attained EEDI at design stage

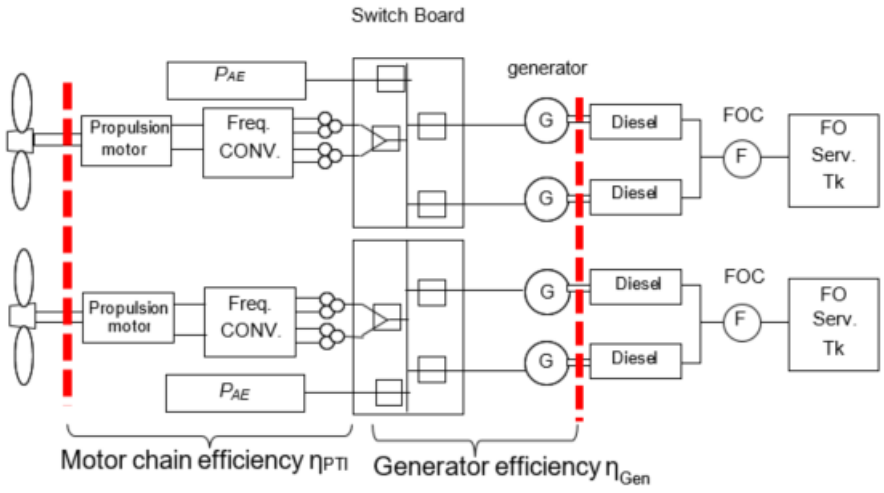
EEDI is calculated in accordance with paragraph 2 of the “2014 guidelines on the method of calculation of the attained energy efficiency design index (EEDI) for new ships”. The primary fuel is marine Gas Oil in this example.

$$EEDI = \frac{(P_{AE} + \sum_i P_{PTI}(i)) \cdot (C_{FAE} \cdot SFC_{AE})}{Capacity \cdot V_{ref}} = \frac{(16200 + 32593) \times 185 \times 3.206}{160{,}000(\mathrm{UMS}) \times 22.5(\mathrm{kn})} = 8.04$$

2. Final calculation of attained EEDI at sea trial

Attained EEDI at sea trial of cruise passenger ship having diesel electric propulsion system is calculated as follows.

1) Typical configuration and example of measurement points at sea trial



2) Specifications

Chain efficiency of the electric motor η_{PTI} and generator efficiency η_{Gen} can be confirmed during the sea trials at EEDI conditions (i.e. 75% of the rated motor output) taking into account the power factor cosφ of the electric consumers.

SFC_{AE} is computed form the NOx technical file if this file was not available at the preliminary stage.

Gross tonnage is confirmed at 160,000 ums.

Prior to sea trials, an on-board survey is performed to ensure that data read on the nameplates of the main electrical pieces of equipment comply with those recorded in the submitted electric power table.

3) V_{ref} at EEDI condition

V_{ref} is obtained by the speed-power curves as a result of the sea trial in accordance with paragraph 4.3.9 of the "2013 guidelines on survey and certification of the energy efficiency design index (EEDI)". Suppose that V_{ref} of 18.7kn is obtained at 75% of *MPP*, in this example calculation at sea trial.

During the sea trials, the shaft power transferred to the propellers $P_{PTI,Shaft}$ must be obtained. It could be measured by a torsiometer fitted on the propeller shaft, or obtained from the computation of the power consumption of the motor P_{SM} through the following relation:

$$P_{PTI,Shaft} = P_{SM} \times \eta_{PTI}$$

4) Calculation of the attained EEDI at sea trial

EEDI is calculated in accordance with paragraph 2 of the "2014 guidelines on the method of calculation of the attained energy efficiency design index (EEDI) for new ships". The primary fuel is marine Gas Oil in this example.

$$EEDI = \frac{(P_{AE} + \sum_i P_{PTI}(i)) \cdot (C_{FAE} \cdot SFC_{AE})}{Capacity \cdot V_{ref}}$$

$$= \frac{(16200 + 32593) \times 185 \times 3.206}{160{,}000(\text{UMS}) \times 22.7(\text{kn})} = 7.97$$

Appendix 6.2
Sample calculation for LNG carrier having diesel electric propulsion system

1. Preliminary calculation of attained EEDI at design stage

Attained EEDI for LNG carrier having diesel electric propulsion system at design stage is calculated as follows.

1) Specifications

MCR of main engines	10,000 (kW) x 3 + 6,400 (kW) x 1
MPP_{Motor}	24,000 (kW)
$SFC_{ME(i)\_electric,\ gas\ mode\ at\ 75\%\ of\ MCR}$	162.0 (g/kWh) (for 10,000 (kW)-Engines) (SFC with the addition of the guarantee tolerance) 162.6 (g/kWh) (for 6,400 (kW)-Engine) (Ditto)
$SFC_{ME(i)\_Pilotfuel}$	6.0 (g/kWh) (for 10,000 (kW)-Engines), 6.1 (g/kWh) (for 6,400 (kW)-Engine)
Deadweight	75,000 (ton)

2) $\eta_{electrical}$ at design stage

$\eta_{electrical}$ is set as 0.913 in accordance with paragraph 2.5.1 of the "2014 guidelines on the method of calculation of the attained energy efficiency design index (EEDI) for new ships".

3) Calculation of P_{ME}

P_{ME} is calculated in accordance with paragraph 2.5.1 of the "2014 guidelines on the method of calculation of the attained energy efficiency design index (EEDI) for new ships".

$$P_{ME} = 0.83 \times \frac{MPP_{Motor}}{\eta_{electrical}}$$

$$= 0.83 \times \frac{24{,}000}{0.913} = 21{,}818\,(\mathrm{kW})$$

4) Calculation of P_{AE}

P_{AE} is calculated in accordance with paragraph 2.5.6.1 and 2.5.6.3 of the "2014 guidelines on the method of calculation of the attained energy efficiency design index (EEDI) for new ships".

$$P_{AE} = \left(0.025 \times \left(\sum_{i=1}^{nME} MCR_{ME(i)} + \frac{\sum_{i=1}^{nPTI} P_{PTI(i)}}{0.75} \right) + 250 \right) \quad \text{and/or;}$$

$$+ CargoTankCapacity_{LNG} \times BOR \times COP_{reliquefy} \times R_{reliquefy} \quad (1) \quad \text{and/or;} \quad \text{(Not Applicable)}$$

$$+ 0.33 \times \sum_{i=1}^{nME} SFC_{ME(i),gasmode} \times \frac{P_{ME(i)}}{1000} \quad (2) \quad \text{and/or;} \quad \text{(Not Applicable)}$$

$$+ 0.02 \times \sum_{i=1}^{nME} P_{ME(i)} \quad (3)$$

$$= \left\{ (0.025 \times 24{,}000) + 250 \right\} + 0 + 0 + (0.02 \times 21{,}818)$$

$$= 1{,}286\,(\mathrm{kW})$$

Note:
*1: The value of MPP_{Motor} is used instead of MCR_{ME} in accordance with paragraph 2.5.6.3.3.

5) V_{ref} at EEDI condition

V_{ref} is obtained by the preliminary speed-power curves as the model tank test results at EEDI condition at design stage. Suppose that V_{ref} of 18.4kn is obtained at 83% of MPP_{Motor}, in this example calculation at design stage.

6) Calculation of the attained EEDI at design stage

EEDI is calculated in accordance with paragraph 2 of the "2014 guidelines on the method of calculation of the attained energy efficiency design index (EEDI) for new ships". The primary fuel is LNG in this example calculation. In this case, $SFC_{AE(i)\_electric,\ gas\ mode\ at\ 75\%\ of\ MCR}$ is equal to $SFC_{ME(i)\_electric,\ gas\ mode\ at\ 75\%\ of\ MCR}$, and $SFC_{AE(i)\_Pilotfuel}$ is equal to $SFC_{ME(i)\_Pilotfuel}$.

$$EEDI = \frac{P_{ME}\cdot\left(C_{FME\_Gas}\cdot SFC_{ME\_Gas} + C_{FME\_Pilotfuel}\cdot SFC_{ME\_Pilotfuel}\right) + P_{AE}\cdot\left(C_{FAE\_Gas}\cdot SFC_{AE\_Gas} + C_{FAE\_Pilotfuel}\cdot SFC_{AE\_Pilotfuel}\right)}{Capacity\cdot V_{ref}}$$

$$= \frac{21{,}818\times\left(2.750\times162.1+3.206\times6.0\right)+1{,}286\times\left(2.750\times162.1+3.206\times6.0\right)}{75{,}000\,(\mathrm{DWT})\times18.4(\mathrm{kn})} = 7.79$$

Note:
*1: The average weighed value of $SFC_{ME(i)\_electric,\ gas\ mode\ at\ 75\%\ of\ MCR}$ and $SFC_{AE(i)\_electric,\ gas\ mode\ at\ 75\%\ of\ MCR}$ is used;

$$\frac{162.0\times10{,}000(\mathrm{kW})\times3+162.6\times6{,}400(\mathrm{kW})}{10{,}000(\mathrm{kW})\times3+6{,}400(\mathrm{kW})} = 162.1(\mathrm{g/kWh})$$

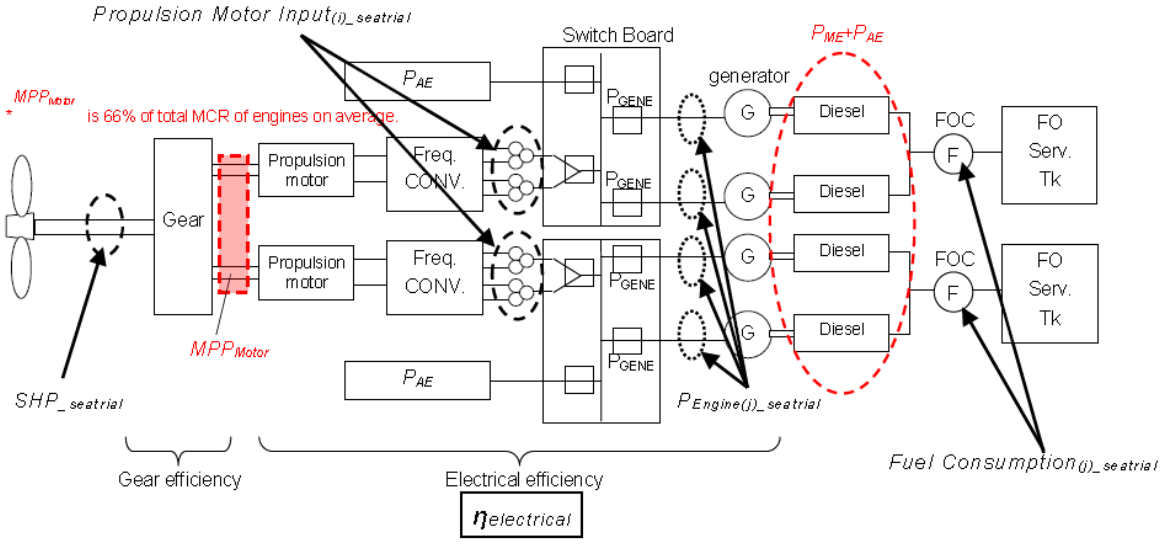
*2: The average weighed value of $SFC_{ME(i)\_Pilotfuel}$ and $SFC_{AE(i)\_Pilotfuel}$ is used;.

$$\frac{6.0\times10{,}000(\mathrm{kW})\times3+6.1\times6{,}400(\mathrm{kW})}{10{,}000(\mathrm{kW})\times3+6{,}400(\mathrm{kW})} = 6.0(\mathrm{g/kWh})$$

2. Final calculation of attained EEDI at sea trial

Attained EEDI for LNG carrier having diesel electric propulsion system at sea trial is calculated as follows.

1) Typical configuration and example of measurement points at sea trial



2) Specifications

MCR of main engines	10,000 (kW) x 3 + 6,400 (kW) x 1
MPP_{Motor}	24,000 (kW)
$SFC_{ME(i)\_electric,\ gas\ mode\ at\ 75\%\ of\ MCR}$	161.6 (g/kWh) (for 10,000 (kW)-Engines) (SFC of the test report in the NOx technical file) 162.2 (g/kWh) (for 6,400 (kW)-Engine) (Ditto)
$SFC_{ME(i)\_Pilotfuel}$	6.0 (g/kWh) (for 10,000 (kW)-Engines), 6.1 (g/kWh) (for 6,400 (kW)-Engine)
Deadweight	75,500 (ton)

3) $\eta_{electrical}$ at sea trial

$\eta_{electrical}$ is set as 0.913 in accordance with paragraph 2.5.1 of the "2014 guidelines on the method of calculation of the attained energy efficiency design index (EEDI) for new ships".

4) Calculation of P_{ME}

P_{ME} is calculated in accordance with paragraph 2.5.1 of the "2014 guidelines on the method of calculation of the attained energy efficiency design index (EEDI) for new ships".

$$P_{ME} = 0.83 \times \frac{MPP_{Motor}}{\eta_{electrical}}$$

$$= 0.83 \times \frac{24{,}000}{0.913} = 21{,}818\,(\mathrm{kW})$$

5) Calculation of P_{AE}

P_{AE} is calculated in accordance with paragraph 2.5.6.1 and 2.5.6.3 of the "2014 guidelines on the method of calculation of the attained energy efficiency design index (EEDI) for new ships".

$$P_{AE} = \left(0.025 \times \left(\sum_{i=1}^{nME} MCR_{ME(i)} + \frac{\sum_{i=1}^{nPTI} P_{PTI(i)}}{0.75} \right) + 250 \right. \quad \text{and/or;}$$

$$\left. + CargoTankCapacity_{LNG} \times BOR \times COP_{reliquefy} \times R_{reliquefy} \right) \quad \cdots(1) \quad \text{and/or;} \quad \text{(Not Applicable)}$$

$$+ 0.33 \times \sum_{i=1}^{nME} SFC_{ME(i),gasmode} \times \frac{P_{ME(i)}}{1000} \quad \cdots(2) \quad \text{and/or;} \quad \text{(Not Applicable)}$$

$$+ 0.02 \times \sum_{i=1}^{nME} P_{ME(i)} \quad \cdots(3)$$

$$= \{(0.025 \times 24{,}000) + 250\} + 0 + 0 + (0.02 \times 21{,}818)$$

$$= 1{,}286\,(\mathrm{kW})$$

Note:
*1: The value of MPP_{Motor} is used instead of MCR_{ME} in accordance with paragraph 2.5.6.3.3.

6) V_{ref} at EEDI condition

V_{ref} is obtained by the speed-power curves as a result of the sea trial in accordance with paragraph 4.3.9 of the "2013 guidelines on survey and certification of the energy efficiency design index (EEDI)". Suppose that V_{ref} of 18.5kn is obtained at 83% of MPP_{Motor}, in this example calculation at sea trial.

7) Calculation of the attained EEDI at sea trial

EEDI is calculated in accordance with paragraph 2 of the “2014 guidelines on the method of calculation of the attained energy efficiency design index (EEDI) for new ships”. The primary fuel is LNG in this example calculation. In this case, $SFC_{AE(i)\_electric,\ gas\ mode\ at\ 75\%\ of\ MCR}$ is equal to $SFC_{ME(i)\_electric,\ gas\ mode\ at\ 75\%\ of\ MCR}$, and $SFC_{AE(i)\_Pilotfuel}$ is equal to $SFC_{ME(i)\_Pilotfuel}$.

$$EEDI = \frac{P_{ME} \cdot \left(C_{FME\_Gas} \cdot SFC_{ME\_Gas} + C_{FME\_Pilotfuel} \cdot SFC_{ME\_Pilotfuel}\right) + P_{AE} \cdot \left(C_{FAE\_Gas} \cdot SFC_{AE\_Gas} + C_{FAE\_Pilotfuel} \cdot SFC_{AE\_Pilotfuel}\right)}{Capacity \cdot V_{ref}}$$

$$= \frac{21{,}818 \times \left(2.750 \times 161.7 + 3.206 \times 6.0\right) + 1{,}286 \times \left(2.750 \times 161.7 + 3.206 \times 6.0\right)}{75{,}500(\mathrm{DWT}) \times 18.5(\mathrm{kn})} = 7.67$$

Note:

*1: The average weighed value of $SFC_{ME(i)\_electric,\ gas\ mode\ at\ 75\%\ of\ MCR}$ and $SFC_{AE(i)\_electric,\ gas\ mode\ at\ 75\%\ of\ MCR}$ is used;.

$$\frac{161.6 \times 10{,}000(\mathrm{kW}) \times 3 + 162.2 \times 6{,}400(\mathrm{kW})}{10{,}000(\mathrm{kW}) \times 3 + 6{,}400(\mathrm{kW})} = 161.7(\mathrm{g/kWh})$$

*2: The average weighed value of $SFC_{ME(i)\_Pilotfuel}$ and $SFC_{AE(i)\_Pilotfuel}$ is used;.

$$\frac{6.0 \times 10{,}000(\mathrm{kW}) \times 3 + 6.1 \times 6{,}400(\mathrm{kW})}{10{,}000(\mathrm{kW}) \times 3 + 6{,}400(\mathrm{kW})} = 6.0(\mathrm{g/kWh})$$

Appendix 6.3
Sample calculation for LNG carrier having diesel driven with re-liquefaction system

1. Preliminary calculation of attained EEDI at design stage

Attained EEDI for LNG carrier having diesel driven with re-liquefaction system at design stage is calculated as follows.

1) Specifications

$MCR_{ME(i)}$	18,660 x 2 (kW) = 37,320 (kW)
$SFC_{ME(i)\_at\ 75\%\ of\ MCR}$	165.0 (g/kWh)
$SFC_{AE(i)\_at\ 50\%\ of\ MCR}$	198.0 (g/kWh)
$CargoTankCapacity_{LNG}$	211,900 (m3)
BOR	0.15 (%/day)
$COP_{cooling}$	0.166
$COP_{reliquefy}$	15.142

$$\left[COP_{reliquefy} = \frac{425\,(kg/m^3) \times 511\,(kJ/kg)}{24(h) \times 3600(\sec) \times COP_{cooling}} = 15.142 \right]$$

$R_{reliquefy}$	1
$Deadweight$	109,000 (ton)

2) Calculation of P_{ME}

P_{ME} is calculated in accordance with paragraph 2.5.1 of the "2014 guidelines on the method of calculation of the attained energy efficiency design index (EEDI) for new ships".

$$P_{ME(i)} = 0.75 \times MCR_{ME(i)}$$
$$= 0.75 \times (18{,}660 + 18{,}660) = 27{,}990(\mathrm{kW})$$

3) Calculation of P_{AE}

P_{AE} is calculated in accordance with paragraph 2.5.6.1 and 2.5.6.3 of the "2014 guidelines on the method of calculation of the attained energy efficiency design index (EEDI) for new ships".

P_{AE} = 0.025 x Σ $0.0_{ME(i)}$ + 250
+ $CargoTankCaipacity_{LNG}$ x BOR x $COP_{reliquefy}$ x $R_{reliquefy}$
= 0.025 x 37,320 +250
+ 211,900 x 0.15/100 x 15.142 x 1
= 5,996 (kW)

4) V_{ref} at EEDI condition

V_{ref} is obtained by the preliminary speed-power curves as the model tank test results at EEDI condition at design stage.

Suppose that V_{ref} of 19.7kn is obtained at 75% of $MCR_{ME(i)}$, in this example calculation at design stage.

5) Calculation of the attained EEDI on design stage

EEDI is calculated in accordance with paragraph 2 of the "2014 guidelines on the method of calculation of the attained energy efficiency design index (EEDI) for new ships".

$$EEDI = \frac{P_{ME} \cdot C_{FME} \cdot SFC_{ME} + P_{AE} \cdot C_{FAE} \cdot SFC_{AE}}{Capacity \cdot V_{ref}}$$
$$= \frac{27{,}990 \times 3.206 \times 165.0 + 5{,}996 \times 3.206 \times 198.0}{109{,}000(\mathrm{DWT}) \times 19.7(\mathrm{kn})} = 8.668$$

2. Final calculation of attained EEDI at sea trial

Attained EEDI for LNG carrier having diesel driven with re-liquefaction system at sea trial is calculated as follows.

1) Specifications

$MCR_{ME(i)}$	18,660 x 2 (kW) = 37,320 (kW)
$SFC_{ME(i)\_at\ 75\%\ of\ MCR}$	165.5 (g/kWh)
$SFC_{AE(i)\_at\ 50\%\ of\ MCR}$	198.5 (g/kWh)
$CargoTankCapacity_{LNG}$	211,900 (m^3)
BOR	0.15 (%/day)
$COP_{cooling}$	0.166
$COP_{reliquefy}$	15.142

$$COP_{reliquefy} = \frac{425\,(kg/m^3) \times 511\,(kJ/kg)}{24\,(h) \times 3600(\mathrm{sec}) \times COP_{cooling}} = 15.142$$

$R_{reliquefy}$	1
Deadweight	109,255 (ton)

$SFC_{ME(i)\_at\ 75\%\ of\ MCR}$ and $SFC_{AE(i)\_at\ 50\%\ of\ MCR}$ are in accordance with paragraph 2.7.1 of the "2014 guidelines on the method of calculation of the attained energy efficiency design index (EEDI) for new ships".

Deadweight is in accordance with paragraph 4.3.10 of the "2013 guidelines on survey and certification of the energy efficiency design index (EEDI)".

2) Measured values at sea trial

Relation between $SHP_{seatrial}$ and Ship's speed shall be measured and verified at sea trial.

3) Calculation of P_{ME}

P_{ME} is calculated in accordance with paragraph 2.5.1 of the "2014 guidelines on the method of calculation of the attained energy efficiency design index (EEDI) for new ships".

$$P_{ME(i)} = 0.75 \times MCR_{ME(i)}$$
$$= 0.75 \times (18{,}660 + 18{,}660) = 27{,}990(\mathrm{kW})$$

4) Calculation of P_{AE}

P_{AE} is calculated in accordance with paragraph 2.5.6.3 of the "2014 guidelines on the method of calculation of the attained energy efficiency design index (EEDI) for new ships".

P_{AE} = 0.025 x Σ $0.0_{ME(i)}$ + 250
+ $CargoTankCaipacity_{LNG}$ x *BOR* x $COP_{reliquefy}$ x $R_{reliquefy}$
= 0.025 x 37,320 +250
+ 211,900 x 0.15/100 x 15.142 x 1
= 5,996 (kW)

5) V_{ref} at EEDI condition

V_{ref} is obtained by the speed-power curves as a result of the sea trial in accordance with paragraph 4.3.9 of the"2013 guidelines on survey and certification of the energy efficiency design index (EEDI)".

Suppose that V_{ref} of 19.8kn is obtained at 75% of $MCR_{ME(i)}$, in this example calculation at sea trial.

6) Calculation of the attained EEDI at sea trial

EEDI is calculated in accordance with paragraph 2 of the "2014 guidelines on the method of calculation of the attained energy efficiency design index (EEDI) for new ships".

$$EEDI = \frac{P_{ME} \cdot C_{FME} \cdot SFC_{ME} + P_{AE} \cdot C_{FAE} \cdot SFC_{AE}}{Capacity \cdot V_{ref}}$$

$$= \frac{27{,}990 \times 3.206 \times 165.5 + 5{,}996 \times 3.206 \times 198.5}{109{,}255(\mathrm{DWT}) \times 19.8(\mathrm{kn})} = 8.629$$

Appendix 6.4
Sample calculation for LNG carrier having steam turbine propulsion system

1. Preliminary calculation of attained EEDI at design stage

Attained EEDI for LNG carrier having steam turbine propulsion system at design stage is calculated as follows.

1) Specifications

$MCR_{Steam\ turbine}$	25,000 (kW)
$SFC_{Steam\ turbine}$	241.0 (g/kWh)
Deadweight	75,000 (ton)

2) Calculation of P_{ME}

P_{ME} is calculated in accordance with paragraph 2.5.1 of the“2014 guidelines on the method of calculation of the attained energy efficiency design index (EEDI) for new ships”.

$$P_{ME} = 0.83 \times MCR_{SteamTurbine}$$
$$= 0.83 \times 25{,}000 = 20{,}750(\mathrm{kW})$$

3) Calculation of P_{AE}

P_{AE} is treated as 0(zero) because electric load ($P_{generator\_seatrial}$) is supposed to be included in $SFC_{SteamTurbine}$, in accordance with paragraph 2.5.6.3 and 2.7.2.1 of the “2014 guidelines on the method of calculation of the attained energy efficiency design index (EEDI) for new ships”.

P_{AE} = 0

4) V_{ref} at EEDI condition

V_{ref} is obtained by the preliminary speed-power curves as the model tank test results at EEDI condition at design stage.

Suppose that V_{ref} of 18.7kn is obtained at 83% of $MCR_{SteamTurbine}$, in this example calculation at design stage.

5) Calculation of the attained EEDI on design stage

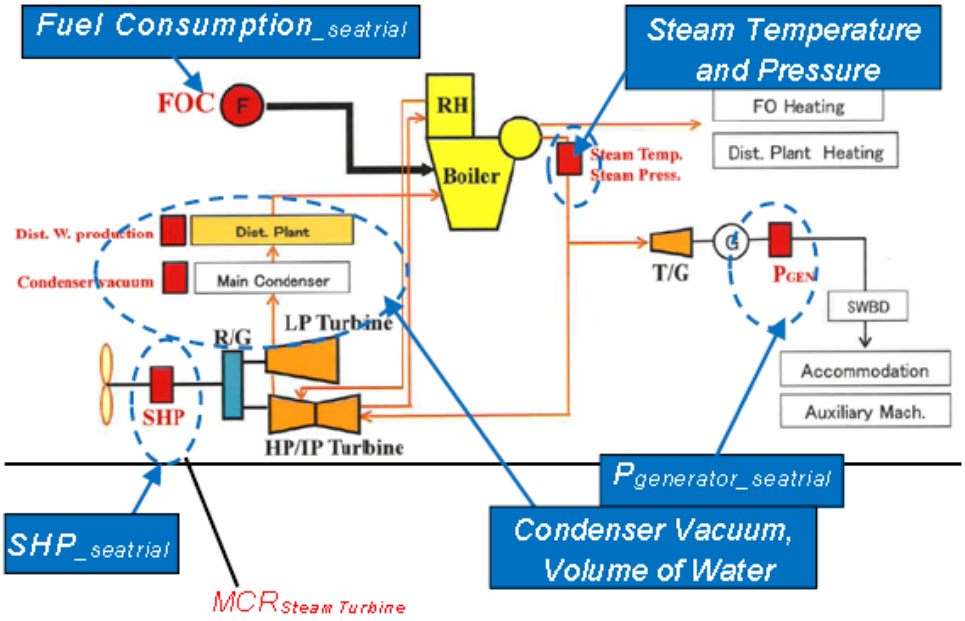
EEDI is calculated in accordance with paragraph 2 of the “2014 guidelines on the method of calculation of the attained energy efficiency design index (EEDI) for new ships”.
The primary fuel is LNG in this example calculation.

$$EEDI = \frac{P_{ME} \cdot C_{FME} \cdot SFC_{ME} + P_{AE} \cdot C_{FAE} \cdot SFC_{AE}}{Capacity \cdot V_{ref}}$$
$$= \frac{20{,}750 \times 2.750 \times 241.0 + 0}{75{,}000(\mathrm{DWT}) \times 18.7(\mathrm{kn})} = 9.81$$

2. Final calculation of attained EEDI at sea trial

Attained EEDI for LNG carrier having steam turbine propulsion system at sea trial is calculated as follows.

1) Typical configuration and example of measurement points at sea trial



In addition to the above, in order to correct measured *Fuel Consumption* to the design conditions corresponding to the SNAME condition, inlet air temperature, sea water temperature, steam temperature, steam pressure, etc. are measured, as appropriate.

P_{AE} is treated as 0(zero) because electric load ($P_{generator\_seatrial}$) is supposed to be included in $SFC_{SteamTurbine}$, in accordance with paragraph 2.5.6.3 and 2.7.2.1 of the "2014 guidelines on the method of calculation of the attained energy efficiency design index (EEDI) for new ships".

2) Specifications

$MCR_{Steam\ turbine}$	25,000 (kW)
$SFC_{Steam\ turbine}$	241.0 (g/kWh)
Deadweight	75,000 (ton)

3) Measured values at sea trial

$P_{generator\_seatrial}$	980 (kW)
$SHP_{seatrial}$	21,520 (kW)
Fuel Consumption$_{\_seatrial}$	5.95 x 10^6 (g/hour)

Each Fuel Consumption$_{(j)\_seatrial}$ should be corrected in accordance with paragraph 2.7.2 of the "2014 guidelines on the method of calculation of the attained energy efficiency design index (EEDI) for new ships".

Coefficient of flow meter	1.0010
Steam temperature	500 degree Celsius
Steam pressure	5.85 (MPaG)

Condenser vacuum	725 (mmHg)
Dist. water production	28.5 (t/day)
Inlet air temperature of FAN	45 degree Celsius

Lower calorific value of fuel used at sea trial 42,030 (kJ/kg)

4) Calculation of $SFC_{SteamTurbine}$ at sea trial

$SFC_{SteamTurbine}$ is calculated in accordance with paragraph 2.7.2 of the "2014 guidelines on the method of calculation of the attained energy efficiency design index (EEDI) for new ships".

$$SFC_{SteamTurbine\_seatrial(i)} = \frac{FuelConsumption_{\_Seatrial}}{SHP_{seatrial}}$$

$$= \frac{5.95 \times 10^6}{21{,}520} \times C_1 \times C_2 \times C_3 \times C_4 \times C_5 \times C_6 \times C_7 \quad {}^{*1}$$

$$= \frac{5.95 \times 10^6}{21{,}520} \times 0.9871 \times 0.8756 \times 1.0010 \times 1.0001 \times 1.0035 \times 0.9999 \times 1.0028$$

$$= 240.7 \ \text{(g/kW/h)}$$

Note:

*1: *SFC* should be corrected to the value corresponding to SNAME and EEDI conditions, in accordance with paragraph 2.7.2 .2 and .3 of the "2014 guidelines on the method of calculation of the attained energy efficiency design index (EEDI) for new ships". Coefficients from C1 to C7 represent as follows.

C1: Coefficient of electric power to the electric load equivalent to

P_{AE} = 0.025 x $MCR_{Steam\ turbine}$ + 250 = 875 (kW)

C2: Coefficient of LCV to the standard LCV of 48,000 kJ/kg for LNG fuel
C3: Coefficient of flow meter
C4: Coefficient of steam temperature and steam pressure
C5: Coefficient of condenser vacuum for steam turbine
C6: Coefficient of water feed of condenser
C7: Coefficient of inlet air temperature

$SFC_{SteamTurbine}$ is calculated as the value to include all losses of machinery and, gears necessary for main propulsion system and the specified electric load of P_{AE}.

Minimum two $SFC_{SteamTurbine}$ at around the EEDI power are obtained at the sea trial. However in this example calculation, all $SFC_{SteamTurbine\ (i)}$ are supposed to the same value of 240.7 g/kWh.

5) Calculation of P_{ME}

P_{ME} is calculated in accordance with paragraph 2.5.1 of the "2014 guidelines on the method of calculation of the attained energy efficiency design index (EEDI) for new ships".

$$P_{ME} = 0.83 \times MCR_{SteamTurbine}$$

$$= 0.83 \times 25{,}000 = 20{,}750 \text{(kW)}$$

6) Calculation of P_{AE}

P_{AE} is treated as 0(zero) because electric load ($P_{generator\_seatrial}$) is supposed to be included in $SFC_{SteamTurbine}$, in accordance with paragraph 2.5.6.3 and 2.7.2.1 of the "2014 guidelines on the method of calculation of the attained energy efficiency design index (EEDI) for new ships".

P_{AE} = 0

7) V_{ref} at EEDI condition

V_{ref} is obtained by the speed-power curves as a result of the sea trial in accordance with paragraph 4.3.9 of the "2013 guidelines on survey and certification of the energy efficiency design index (EEDI)".

Suppose that V_{ref} of 18.8kn is obtained at 83% of $MCR_{SteamTurbine}$, in this example calculation at sea trial.

8) Calculation of the attained EEDI at sea trial

EEDI is calculated in accordance with paragraph 2 of the "2014 guidelines on the method of calculation of the attained energy efficiency design index (EEDI) for new ships".
The primary fuel is LNG in this example calculation.

$$EEDI = \frac{P_{ME} \cdot C_{FME} \cdot SFC_{ME} + P_{AE} \cdot C_{FAE} \cdot SFC_{AE}}{Capacity \cdot V_{ref}}$$

$$= \frac{20{,}750 \times 2.750 \times 240.7 + 0}{75{,}000(\mathrm{DWT}) \times 18.8(\mathrm{kn})} = 9.74$$

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