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

Part A. Revision History

Version no.	Approval date	Implementation date when applicable
New (May 2013)	21 May 2013	1 July 2013

- **New (May 2013)**

.1 Origin for Change:

☑ Decision by IACS Council

.2 Main Reason for Change:

Uniform implementation of verification procedure of EEDI as defined in MARPOL by IACS members acting as verifiers.

.3 List of non-IACS Member Classification Societies contributing through the TC Forum and/or participating in IACS Working Group:

None

.4 History of Decisions Made:

Decided by IACS Council 66 (December 2012)

.5 Other Resolutions Changes

None

.6 Dates:

Original Proposal: 14 December 2012 Made by: Council 66
Developed by: JWG/EEDI Chairman on 01 February 2013
GPG Approval: 21 May 2013 (Ref: 13015_IGg)

Part B. Technical Background

List of Technical Background (TB) documents:

- Annex 1. **TB for New (May 2013)**

  See separate TB document in Annex 1.

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Annex 1 Technical background for PR38 New (May 2013)

1. Scope and objectives

The 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 "*2012 Guidelines on Survey and Certification of the Energy Efficiency Design Index (EEDI)*" IMO Resolution MEPC 214(63).
The scope of the procedure is defined in Part I of the Industry Guidelines and corresponds to the calculation and verification of EEDI of Cargo ships, without considering innovative energy efficient technologies, contracted for construction after 1st July 2013.
The procedure requests IACS members to apply the Industry Guidelines for calculation and verification of the Energy Efficiency Design Index (EEDI) here below called "the Industry Guidelines" , provided in annex of the procedure.

2. Engineering background for technical basis and rationale

The first version of "the Industry Guidelines" was developed by a Joint Industry Working Group (JWG) formed by the following shipping associations and organisations: IACS, ITTC, BIMCO, CANSI, CESA, CESS, ICS, INTERCARGO, INTERTANKO, KOSHIPA, OCIMF, SAJ and WSC.
The Industry Guidelines are divided in three parts:
Part I: A definition of the scope of the Industry Guidelines, explaining that the first version of the document applies to cargo ships which are not fitted with innovative energy efficient technologies. It is intended to develop further the Industry Guidelines to remain in line with the future IMO Guidelines energy efficient technologies.
Part II: Explanatory notes on calculation of EEDI in compliance with IMO EEDI calculation Guidelines. This is a kind of "user handbook" on the procedure to compute EEDI, with a developed sample calculation in Appendix 2. Three points appear in the Industry Guidelines:

1. Due to the uncertainties of measurements and estimation of the parameters, the accuracy of the calculation of attained EEDI cannot be better than 1%. Therefore, EEDI values are reported and checked with no more than 3 significant digits as mentioned in section 3.

2. The part dedicated to the computation of EEDI with shaft motor and shaft generator is particularly developed in section 6 to explain paragraphs 2.5.2 and 2.5.3 of the IMO calculation Guidelines. The logic of the treatment of shaft motor in 2.5.3 of the IMO calculation Guidelines is explained in Figure 1.

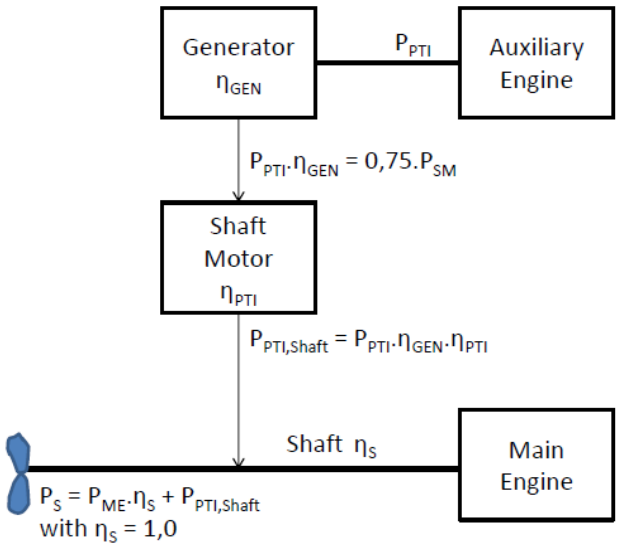

Figure 1: flow of power in a generic shaft motor installation

3. The fi capacity factor in the 2012 Guidelines for the calculation of EEDI is computed as the product of the individual capacity factors for ice notation, voluntary structural enhancements and application of Common Structural Rules. This is implicit in the IMO calculation Guidelines.

Part III: A procedure for verification of the EEDI by the verifier, in compliance with IMO Guidelines on survey and certification of EEDI. It is the part of the Industry Guidelines which corresponds to Note 2 of the IMO Guidelines "A joint industry standard to support the method and role of the verifier will be developed".
The flow of survey and verification process by verifier is given in Figure 2 below:

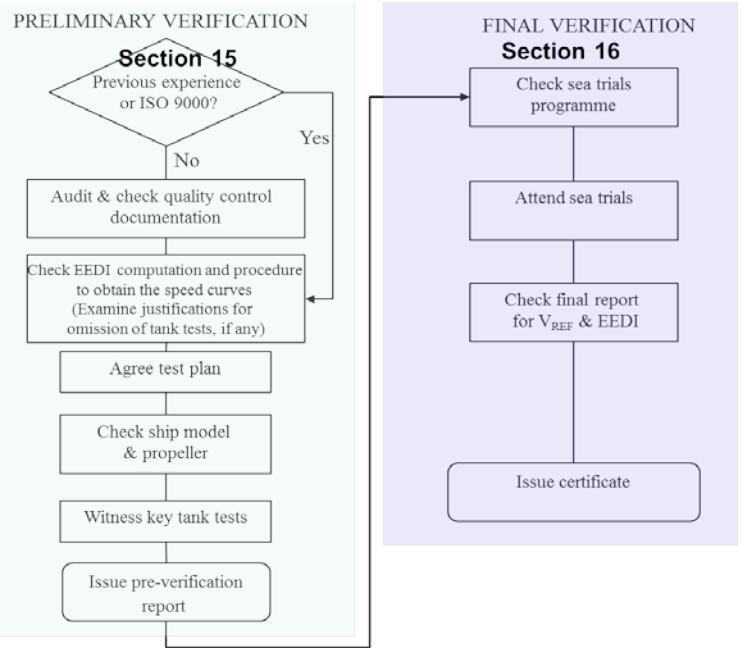

Figure 2: flow of EEDI verification

Section 14 of the Industry Guidelines provides a list of documents to be submitted to the verifier.

Section 15 deals with preliminary verification at the design stage. This verification is based on two items:

a) A review of the towing tank test organisation quality system, when the verifier has no recent experience of the towing tank test facilities and the towing tank test organization quality control system is not certified according to a recognized scheme (ISO 9001 or equivalent)

b) A number of survey and witness points, following the logic of IACS UR Z23 "Hull survey for new construction". The points are listed in Figure 3:

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	
04	Calibration of 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	Tank tests report	Checks described in Appendix 4.3
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
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 19019:2005 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
13	Sea trials – corrections calculation	Review	ITTC 7.5-04-01-01.2.1 rev 0.6 of 2012 or equivalent	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 15016:2002 or equivalent
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

Figure 3: Survey and witness points

Point 8 listed in Figure 3 includes a checking of the model-ship correlation provided by the towing tank test organization which is further detailed under paragraph 15.7 of the Industry Guidelines. SAJ members of the JWG kindly provided the typical values of the experience-based coefficients given in Figures 3.1 and 3.2 of the Industry Guidelines. ITTC member of the JWG kindly provided the text of the appendixes 3 and 4.
Section 16 deals with final verification at sea trial. The main point is the estimation of the EEDI reference speed further to the sea trials. The Industry Guidelines require three measurements of ship speed in sea trials condition as a minimum for each individual vessel, even if the ship is a sistership of a parent vessel and refers to ITTC Recommended Procedure 7.5-04-01-01.2 or equivalent for sea trials corrections, in line with the IMO Verification Guidelines as amended by MEPC 64 (a note in 16.1 of the Industry Guidelines lists the documents considered as equivalent to the ITTC Recommended Procedure 7.5-04-01-01.2).

3. Source / derivation of the proposed IACS Resolution

The procedure implements and mandates compliance with the following IMO Guidelines:

- 2012 Guidelines on the method of calculation of EEDI for new ships, Res. MEPC.212(63) adopted on 2 March 2012, referred to as the "IMO Calculation Guidelines" in the present document, as amended by resolution MEPC.224(64)
- 2012 Guidelines on survey and certification of EEDI, Res. MEPC.214(63) adopted on 2 March 2012, referred to as the "IMO Verification Guidelines" in the present document, as amended by MEPC 64.

4. Summary of Changes intended for the revised Resolution:

None.

5. Points of discussions or possible discussions

Three points were thoroughly discussed in the JWG/EEDI before the final agreement:

1) The consideration of CFD numerical calculations in equivalence to model tests in 15.3 of the Industry Guidelines.
2) The checking of the model-ship correlation established by the Towing tank test organisation in 15.7 of the Industry Guidelines.
3) The request of a minimum of three speed measurements during sea trials even for sisterships of a parent ship in 16.1 of the Industry Guidelines.

6. Attachments if any

None.