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نحوه تایید شاخص طراحی بازدهی انرژی و صدور گواهینامه بین المللی بازدهی انرژی
EEDI Verification and Issuance of IEE certificate

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All respectful ICS Surveyors/ Customers

This Technical Information is published to inform "Procedure for issuing International Energy Efficiency (hereinafter "IEE") certificate", "General information for Ship Energy Efficiency Management Plan (hereinafter "SEEMP") and "Action to be taken by Shipbuilder/ Ship owner and Surveyors" based on Definition of terms/Application used by resolutions and regulations .

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کلیه بازرسان و مشتریان محترم ICS

با سلام و احترام

همانطور که استحضار دارید بتازگی قوانین مربوط به "بازدهی انرژی کشتی ها" که توسط بخشنامه شماره Res.MEPC.203(62) ابلاغ شده است، به عنوان بخش چهارم به ضمیمه ششم از کنوانسیون مارپول افزوده شده و از تاریخ اول ژانویه سال ۲۰۱۳ میلادی لازم الاجرا می باشد.

این اطلاعیه فنی به بررسی "روند صدور گواهینامه بین المللی بازدهی انرژی کشتی (IEEC)" و ارائه اطلاعاتی در زمینه "برنامه مدیریت انرژی کشتی (SEEMP)" و همچنین اقدامات مورد نیاز و وظایف سازندگان، مالکان و بازرسان کشتیها، می پردازد.

قوانین مرتبط بابازدهی انرژی کشتی ها ، کاهش گازهای گلخانه ای و فرآیند تایید شاخص طراحی بازدهی انرژی (EEDI) به پیوست ارائه شده است..

نسخه الکترونیکی بخشنامه مذکور در شبکه داخلی موسسه با آدرس ذیل قابل دسترسی می باشد:

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ع. غلام ابوالفضل

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1. Definition :

- 1) **“New Ship”** means a ship:
- for which the building contract is placed on or after 1 January 2013; or
 - in the absence of a building contract, the keel of which is laid or which is at a similar stage of construction on or after 1 July 2013; or
 - the delivery of which is on or after 1 July 2015

2) **“Existing Ship”** means a ship which is not a new ship.

3) **“Attained Energy Efficiency Design Index** (hereinafter "Attained EEDI")" is the EEDI value achieved by an individual ship in accordance with MARPOL Annex 6 Chapter 4 Regulation 20.

※ MARPOL Annex 6 Chapter 4 Regulation 20 (Attained EEDI):

The Attained EEDI shall be calculated for ship which falls into one or more of the categories in MARPOL Annex 6 Regulation 2.25 to 2.35 (Refer to the Attachment-3).

- each new ship;
- each new ship which has undergone a major conversion; and
- each 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

4) **“Required Energy Efficiency Design Index** (hereinafter "Required EEDI")" is the maximum value of attained EEDI that is allowed by MARPOL Annex 6 Chapter 4 Regulation 21 for the specific ship type and size.

※ MARPOL Annex 6 Chapter 4 Regulation 21 (Required EEDI):

The Required EEDI shall be applied for ship which falls into one of the categories defined in MARPOL Annex 6 Regulation 2.25 to 2.31 and to which MARPOL Annex 6 Chapter 4 is applicable.

- each new ship;
- each new ship which has undergone a major conversion; and
- each 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

5) "**Ship Energy Efficiency Management Plan** (hereinafter "SEEMP")" means that ship operator create a plan to reduce the CO₂ emissions from the ship.

6) "**Energy Efficiency Operational Indicator** (hereinafter "EEOI")" means that as a tool to monitor CO₂ emissions actually emitted from the ship is one of the tool that can be measured.

7) "**Major Conversion**" means in relation to as follows.

(The unified Interpretations<MEPC.1/Circ.795> to MARPOL Annex 6 is an underlined part.)

- which substantially (e.g. change of length between perpendiculars, change of assigned freeboard, increase <5 per cent or more> of total engine power for propulsion) alters the dimensions, carrying capacity or engine power of the ship; or
- which changes the type of the ship; or
- the intent of which in the option of the Administration is substantially to prolong the life of the ship; or
- which otherwise so alters the ship that, if it were a new ship (It is a newly constructed ship which has undergone a major conversion, that is so extensive that the ship is regarded by the Administration, rather than as the defined term in MARPOL Annex 6 Regulation 2.23.), it would become subject to relevant provisions of the present Convention not applicable to it as an existing ship; or
- which substantially alters the energy efficiency of the ship and includes any

modifications that could cause the ship to exceed the applicable required EEDI as set out in MARPOL Annex 6 Chapter 4 Regulation 21. (e.g. the effect on attained EEDI as a result of any change of ship's parameters, particularly any increase in total engine power for propulsion, should be investigated)

8) "**International Energy Efficiency** (hereinafter "IEE") certificate" means a certificate issued after a survey in accordance with MARPOL Annex 6 Regulation 5.4 to any ship of 400 gross tonnage and above, before that ship may engage in voyages to ports or offshore terminals under the jurisdiction of other Parties.

2. Application :

- 1) MARPOL Annex 6 Chapter 4 (Regulations on Energy Efficiency for Ships) shall apply to all ships of 400 gross tonnage and above engaged in international voyages.
- 2) The Attained EEDI shall be calculated for ship which falls into one or more of the categories in MARPOL Annex 6 Regulation 2.25 to 2.35 in accordance with MARPOL Annex 6 Chapter 4 Regulation 20.
- 3) The Required EEDI shall be applied for ship which falls into one of the categories defined in MARPOL Annex 6 Regulation 2.25 to 2.31 and to which MARPOL Annex 6 Chapter 4 is applicable. The detailed information for applying the Required EEDI is noted in paragraph 1.3.2 of Attachment-1.
- 4) However, MARPOL Annex 6 Chapter 4 Regulation 20 and 21 shall not apply to ships which have diesel-electric propulsion, turbine propulsion or hybrid propulsion systems. And, the Administration may waive the requirement of MARPOL Annex 6 Chapter 4 Regulation 20 and 21.

3. Procedure for issuing IEE :

1) Initial survey

- New ship : an initial survey, before a new ship is put in service and before the IEE certificate is issued, shall be conducted. The survey shall verify that the ship's Attained EEDI is in accordance with the requirements in MARPOL Annex 6 Chapter 4, and that the SEEMP is on board. After that, IEE certificate shall be issued.
- Existing ship : the verification of the requirement to have the SEEMP on board shall take place at the first intermediate or renewal survey of IAPP, whichever is the first, on or after 1 January 2013. After that, IEE certificate shall be issued.

2) After conducting initial survey, the issued IEE shall be valid throughout the life of the ship.

3) However, IEE certificate shall cease to be valid in any of the following cases:

- If the ship is withdrawn from service or if a new certificate is issued following major conversion of the ship
- Upon transfer of the ship to the flag of another State

4. General Information for Ship Energy Efficiency Management Plan:

1) All ships with a gross tonnage of 400 tons and above engaged in international voyages shall keep SEEMP on board.

※ However, platforms (including FPSO and FSO) and drilling rig exclude to keep SEEMP on board (Decision of MEPC 64th session)

2) The SEEMP is not necessary to be approved by Administration or classification society. The requirement for keeping SEEMP on board is as below.

- New ship : Before a new ship is put in service

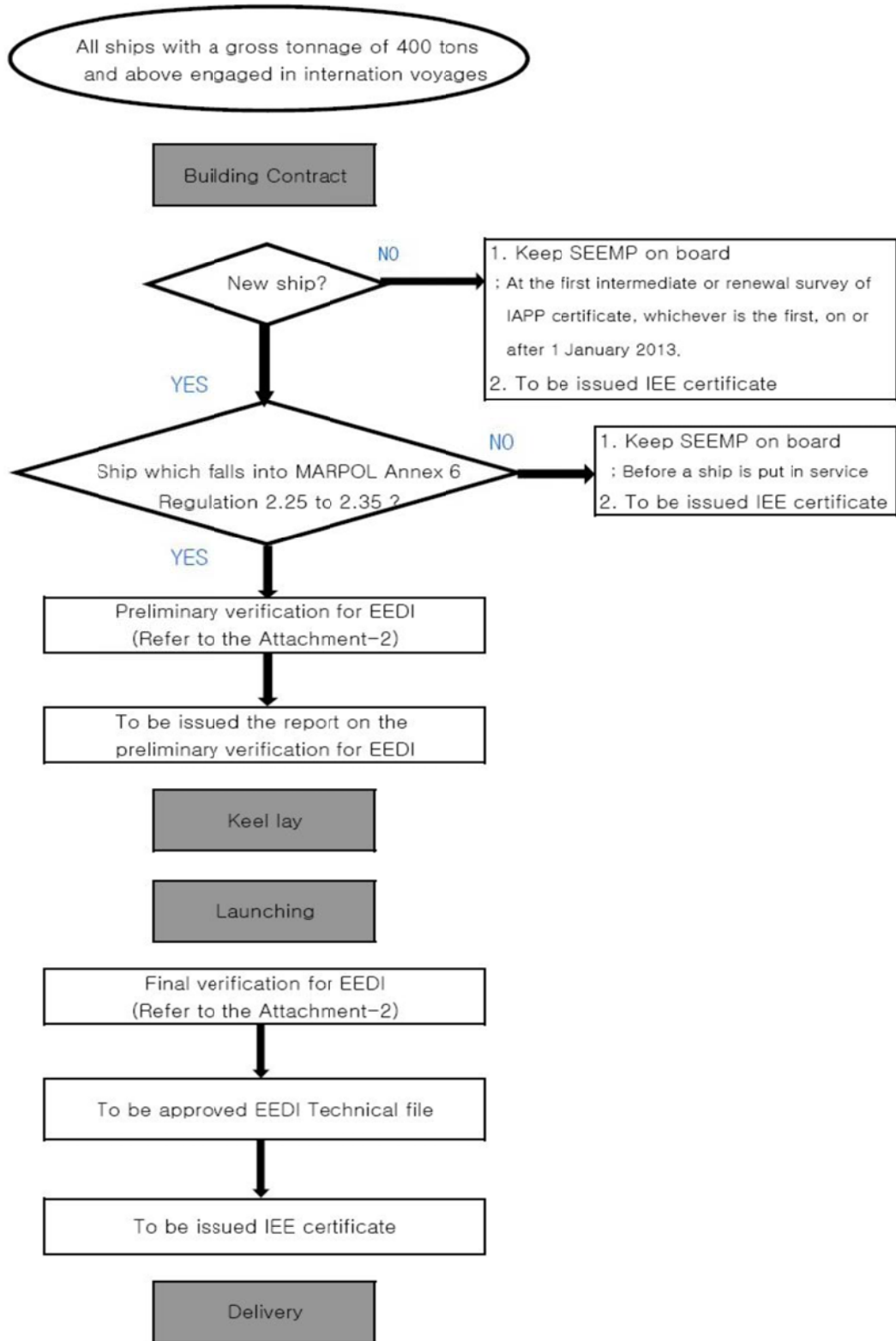
- Existing ship : At the first intermediate or renewal survey of IAPP certificate, whichever is the first, on or after 1 January 2013.

※ Ex) In cases where ship will be delivered on 2 January 2013 :

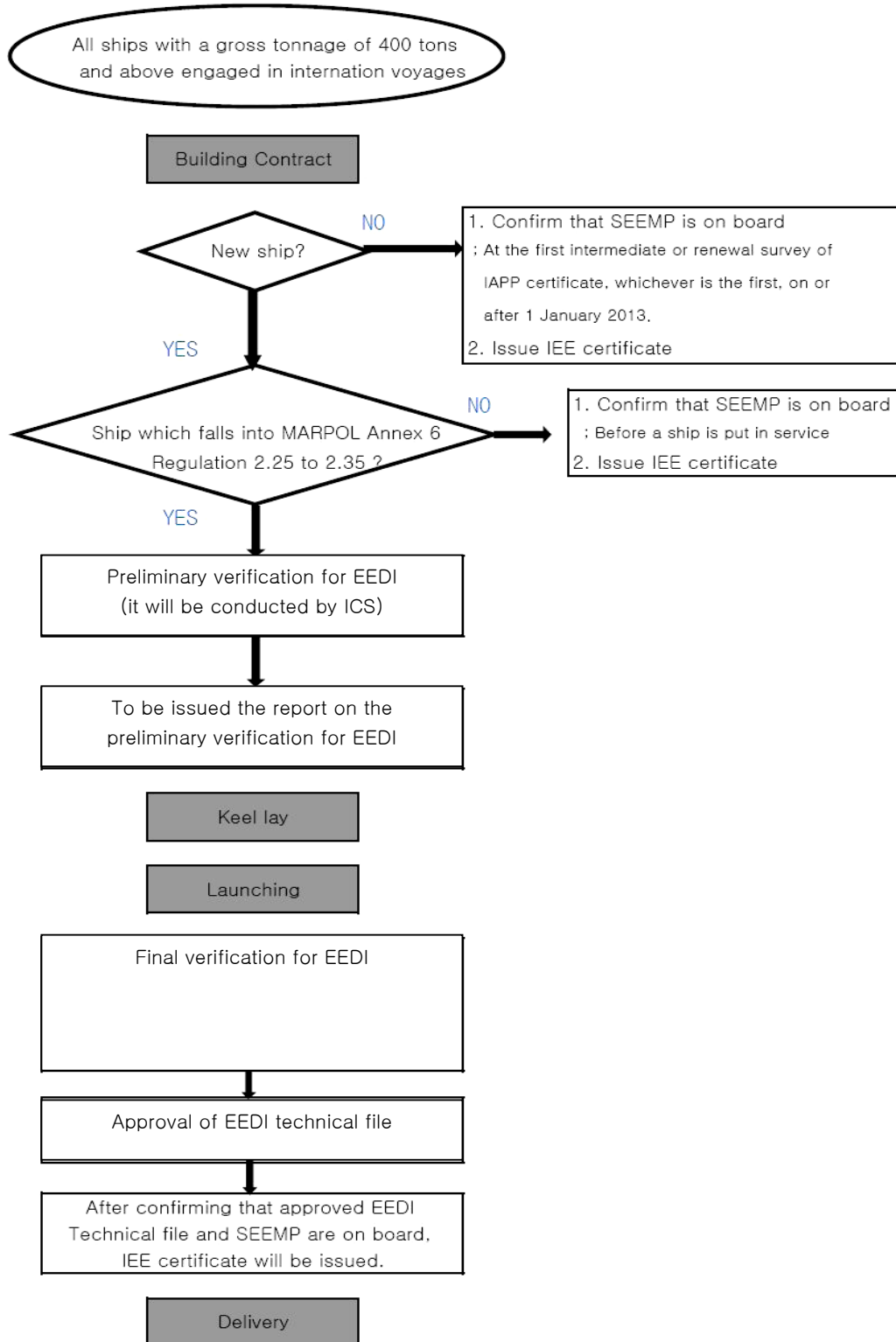
The concerned ship is a existing ship in accordance with MARPOL Annex 6 Regulation 2.22. Accordingly, SEEMP is required on board until the time of the first intermediate survey of IAPP certificate, i.e. 2 or 3 years after her delivery, in accordance with MARPOL Annex 6 Regulation 5.4.4.

3) The forms of SEEMP as per ship type have been developed and registered in CLD department of ICS.

5. Action to be taken by Shipbuilder or Ship owner



6. Action to be taken by Surveyors :



7. Attachments

- 1) Regulations for reducing Greenhouse Gas in IMO
- 2) Procedure for verification of Energy Efficiency Design Index
- 3) MARPOL Annex VI regulation 2.25 to 2.35

[Attachment-1] Regulations for reducing Greenhouse Gas in IMO

Technical Measure	<p>★ EEDI (EEDI, Energy Efficiency Design Index)</p> <p>EEDI is estimating CO2 emission from ship (amount of CO2 emissions from ship when transporting a tone of cargo for 1 nautical miles), and in cases where EEDI exceeds Required EEDI, delivery and operation of ship shall be prohibited. This is mandatory requirement to apply for new ship defined in MARPOL VI Reg.2.23.</p>
Operational Measure	<p>★ EEOI (EEOI, Energy Efficiency Operational Indicator)</p> <p>★ SEEMP (SEEMP, Ship Energy Efficiency Management Plan)</p> <p>The purpose of EEOI and SEEMP is to make plan for improving energy efficiency for ship, monitor energy efficiency for ship and improve energy efficiency for ship.</p>

1. Technical Measures (Energy Efficiency Design Index, EEDI)

; EEDI is some sort of formula for indexing the ship's energy efficiency, the purpose of EEDI is for comparing a CO2 emission characteristic by ship's type or size. This is calculated via the following steps.

.1 Attained EEDI Calculation

; The formula for comparing the characteristics of the ship's CO2 emissions at the design stage is as follows.

$$\frac{\left(\prod_{j=1}^n f_j \left(\sum_{i=1}^{nME} P_{ME(i)} \cdot C_{FME(i)} \cdot SFC_{ME(i)} \right) + P_{AE} \cdot C_{FAE} \cdot SFC_{AE}^{**} + \left(\prod_{j=1}^{nPTI} f_j \cdot \sum_{i=1}^{nPTI} P_{PTI(i)} - \sum_{i=1}^{nPTI} f_{PTI(i)} \cdot P_{AEPTI(i)} \right) C_{FAE} \cdot SFC_{AE} - \left(\sum_{i=1}^{nPTI} f_{PTI(i)} \cdot P_{AEPTI(i)} \cdot C_{FME} \cdot SFC_{ME}^{**} \right) \right)}{j_i \cdot j_c \cdot Capacity \cdot j_s \cdot V_{ref}}$$

5
 ↓ (Simplify)

$$\frac{\left(\sum_{i=1}^n P_{(i)} C_{F(i)} SFC_{(i)} \right)}{Capacity V_{ref}} = \frac{Engine\ Power(kW) \times SFC(g/kWh) \times C_F}{Capacity\ (DWT) \times Speed(kt)}$$

※ P : Engine output(kw) / C_F : Fuel mass to CO2 mass conversion factor / SFC : Fuel Consumption / Capacity : DWT / V_{ref} : Ship speed (nm/h)

$$\frac{[kW] [1] [g / kWh]}{[ton] [nm / h]} = [g / ton . nm]$$

In this regard, numerator from ① to ④ is to calculate CO₂ emission from ship and the meaning is as follows.

- .1 The meaning of ① is to calculate CO₂ emission from Main Engine.
- .2 The meaning of ② is to calculate CO₂ emission from Auxillary Engine for generating electrical power.
- .3 The meaning of ③ is related with shaft motor(P_{PM}) of electric propulsion ship and heat recovery system(P_{Aeff}). The heat recovery system is the auxiliary power reduction due to innovative electrical energy efficient technology.
- .4 The meaning of ④ is considered to reduced CO₂ emission through Energy Saving Technology, except heat recovery system and shaft generator for generating electrical power.

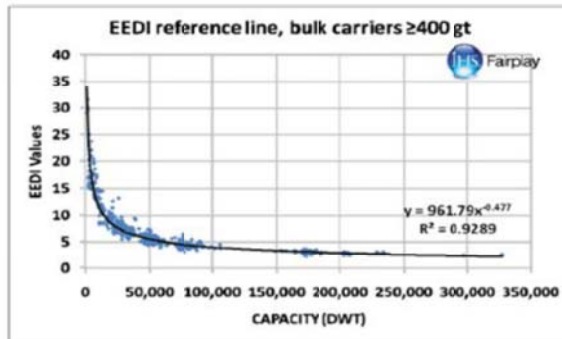
The denominator for ⑤ is related with ship size, speed and correction factor for ship design. The meaning of ⑤ is that "amount of CO₂ emissions from the vessel when transporting a tone of cargo for 1 nautical miles".

.2 Ensured Reference Line

- .1 In order to decide whether the Attained EEDI calculated by numerical formula(above paragraph 1.1) is met to Convention, it is necessary to ensure some criteria.
- .2 To do this, IMO sorted by utilizing IHSF data regarding ship's CO₂ emissions. (after 1999.1.1 but pror to 2009.1.1, every ship of 400 gross tonnage and above). At this time, the used formula was as follows.

$$3.1144 \times \frac{190 \sum_{i=1}^{nME} P_{MEi} + 215 P_{AE}}{Capacity \times V_{ref}}$$

- .3 The results calculated according to the numerical formula, group X= DWT and group Y= calculated outcome



- .4 After then, Reference Line is expressed as following formula through multiple regression, and sorted by ship types.

"Value of Reference Line = a x b^{-C}"

Type	a	b	c
Bulk carrier	961.79	DWT of the ship	0.477
Gas carrier	1120.00	DWT of the ship	0.456
Tanker	1218.80	DWT of the ship	0.488
Container ship	174.22	DWT of the ship	0.201
General cargo ship	107.48	DWT of the ship	0.216
Refrigerated cargo ship	227.01	DWT of the ship	0.244
Combination carrier	1219.00	DWT of the ship	0.488

.3 Required EEDI calculation

.1 According to the MARPOL Annex VI Reg.21,

$$\text{“Attained EEDI} \leq \text{Required EEDI} = (1-X/100) * \text{Reference line value”}$$

(where X is the reduction factor specified in Table 1 for the required EEDI compared to the EEDI Reference line)

[Table-1 : Reduction factors (in percentage) for the EEDI relative to the EEDI Reference line)

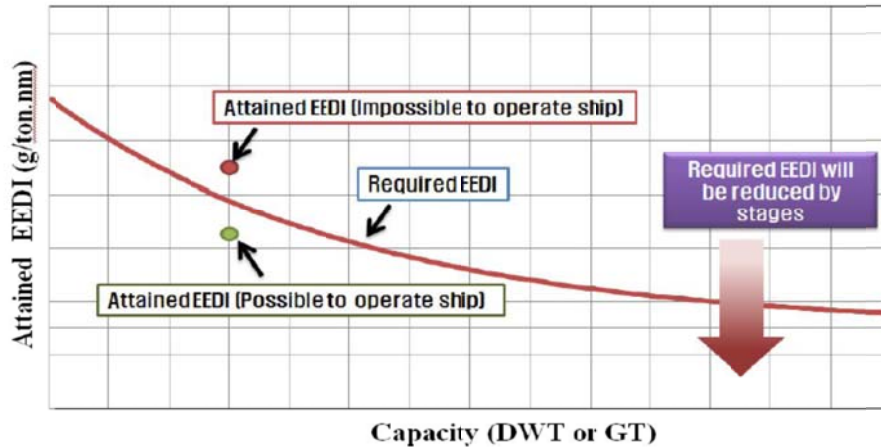
ship type	Capacity	Phase 0 2013.1.1 – 2014.12.31	Phase 1 2015.1.1 – 2019.12.31	Phase 2 2020.1.1 – 2024.12.31	Phase 3 2025.1.1 and onwards
Bulk carrier	20,000 DWT above	0	10	20	30
	10,000 – 20,000 DWT	N/A+	0–10*	0–20*	0–30*
Gas carrier	10,000 DWT	0	10	20	30
	2,000 – 10,000 DWT	N/A+	0–10*	0–20*	0–30*
Tanker	20,000 DWT above	0	10	20	30
	4,000 – 20,000 DWT	N/A+	0–10*	0–20*	0–30*
Container ship	15,000 DWT above	0	10	20	30
	10,000 – 15,000 DWT	N/A+	0–10*	0–20*	0–30*
General Cargo ship	15,000 DWT above	0	10	15	30
	3,000 – 15,000 DWT	N/A+	0–10*	0–15*	0–30*
Refrigerated Cargo ship	5,000 DWT above	0	10	15	30

	3,000 – 5,000 DWT	N/A+	0–10*	0–15*	0–30*
Combination carrier	20,000 DWT above	0	10	20	30
	4,000 – 20,000 DWT	N/A+	0–10*	0–20*	0–30*

- * Reduction factor to be linearly interpolated between the two values dependent upon vessel size. The lower value of the reduction factor is to be applied to the smaller ship size
- + "N/A" means that no required EEDI applies.

- .2 If one or more corresponds to below, Required EEDI shall not apply to :
- .1 The above table marked with "N/A+" part, in case of Phase "0" (2013.1.1 – 2014.12.31)
 - .2 Ship's DWT is less than the above table-1 marked with minimum DWT. (ex : In case of ships of less than 10,000 DWT)
 - .3 In case of corresponds to one of the as MARPOL ANNEX 6 Regulation 32 to 35. (ex : passenger ship, Ro-ro cargo ship(vehicle carrier), Ro-ro cargo ship, Ro-ro passenger ship)

.3 Accordingly, the Attained EEDI value of new ship must be less than Required EEDI value. If the opposite case, the ship can not be operated. For your easy understanding, the following diagram displays the above-mentioned content in form.



- .4 Reduction factors
- ; For application of the definition "new ships" to each Phase specified in above Table-1, it should be interpreted as follows:
 (United interpretation to MARPOL Annex VI : MEPC.1/Circ.795)
- .1 the date specified in regulation 2.23.1 of MARPOL Annex VI should be replaced with the start date of each Phase;

- .2 the date specified in regulation 2.23.2 of MARPOL Annex VI should be replaced with the date six months after the start date of each Phase; and
- .3 the date specified in regulation 2.23.3 of MARPOL Annex VI should for Phase 1, 2 and 3 be replaced with the date 48 months after the start date of each Phase.

* It is easily drawn as follows.

(Building contract is placed)

Building contract Delivery	Before 2013.1.1	2013.1.1 ~ 2014.12.31	2015.1.1 ~ 2019.12.31	2020.1.1 ~ 2024.12.31	2025.1.1 ~
Before 2015.7.1	n/a	Phase 0	Phase 1		
2015.7.1 ~ 2018.12.31	Phase 0	Phase 0	Phase 1		
2019.1.1 ~ 2023.12.31	Phase 1	Phase 1	Phase 1	Phase 2	
2024.1.1 ~ 2028.12.31	Phase 2	Phase 2	Phase 2	Phase 2	Phase 3
2029.1.1 ~	Phase 3	Phase 3	Phase 3	Phase 3	Phase 3

(In the absence of a building contract, the keel lay)

Keel lay Delivery	Before 2013.7.1	2013.7.1 ~ 2015.6.30	2015.7.1 ~ 2020.6.30	2020.7.1 ~ 2025.6.30	2025.7.1 ~
Before 2015.7.1	n/a	Phase 0			
2015.7.1 ~ 2018.12.31	Phase 0	Phase 0	Phase 1		
2019.1.1 ~ 2023.12.31	Phase 1	Phase 1	Phase 1	Phase 2	
2024.1.1 ~ 2028.12.31	Phase 2	Phase 2	Phase 2	Phase 2	Phase 3
2029.1.1 ~	Phase 3	Phase 3	Phase 3	Phase 3	Phase 3

2. Operational Measures (EEOI, SEEMP)

; Unlike new ship's EEDI(compulsory condition) for indexing CO2 emissions characteristics at the design stage, EEOI(voluntary condition) is developed for the purpose of actual CO2 emissions to calculate. It is easily drawn as follows.

$$\frac{CO_2 \text{ Emission}(CO_2 \text{ ton})}{\text{Volume of Transportation}(\text{ton} \times \text{mile})}$$

*Design
Performance*

*Actual
Operation*

.1 Calculation of EEOI

– EEOI is defined as follow numerical formula, and indicated amount of CO2 emissions from ship when transporting a tone of cargo for 1 nautical miles.

$$EEOI = \frac{\sum_j FC_j \times C_{Fj}}{m_{cargo} \times D}$$

If has multiple voyages, the above formula was changed as follows :

$$\text{Average EEOI} = \frac{\sum_i \sum_j (FC_{ij} \times C_{Fj})}{\sum_i (m_{cargo,i} \times D_i)}$$

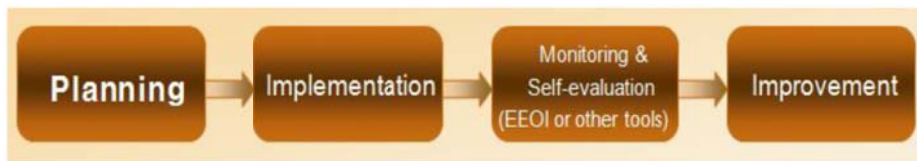
* i : Voyage number, FC : Fuel Consumption, Ccarbon : the fuel mass to CO2 mass conversion factor for fuel, Mcargo : cargo carried(tonnes) or work done(number of TEU or passengers)or gross tonnes for passenger ships, D : the distance in nautical miles corresponding to the cargo carried or work done (nautical miles)

According to the MEPC.1/Circ.684, CO2 conversion factor for fuel are as follows.

Type of fuel	Reference	Carbon content	C _F (t-CO ₂ /t-Fuel)
1. Diesel/Gas Oil	ISO 8217 Grades DMX through DMC	0.875	3.206000
2. Light Fuel Oil (LFO)	ISO 8217 Grades RMA through RMD	0.86	3.151040
3. Heavy Fuel Oil (HFO)	ISO 8217 Grades RME through RMK	0.85	3.114400
4. Liquified Petroleum Gas (LPG)	Propane	0.819	3.000000
	Butane	0.827	3.030000
5. Liquified Natural Gas (LNG)		0.75	2.750000

.2 Definitions of SEEMP

.1 The SEEMP is to make a plan for reducing CO2 emissions from ships efficiently.



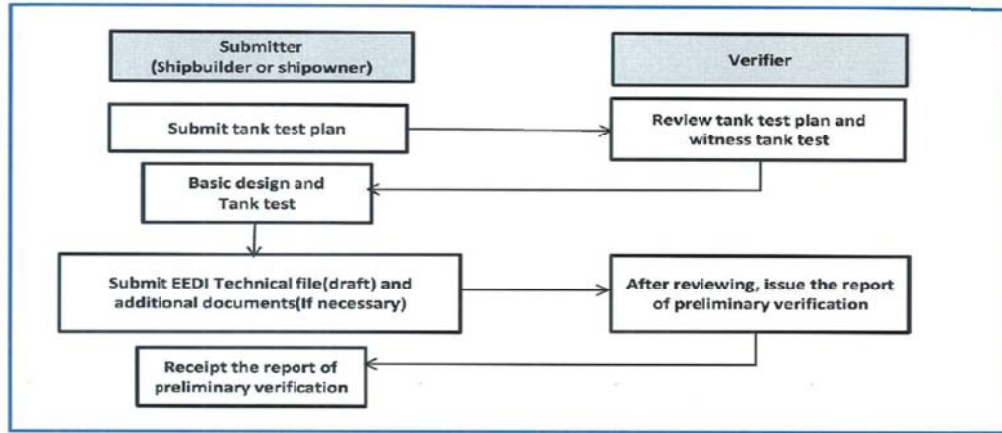
.2 Finally, for improving energy efficiency of ship, SEEMP is carried out and measured by using the tools(EEOI or others).

[Attachment-2] Procedure for verification of Energy Efficiency Design Index

: EEDI verification is conducted in accordance with Res.MEPC.214(63). There are two steps: preliminary verification at the design stage and final verification at the sea trial.

1. Preliminary Verification at the design stage

Preliminary verification at the design stage



1) Submit and review tank test plan (Recipient : ICS Stability, Load Lines and Tonnage Team)

※ In case of tank test exemption

- .1 A tank test for an individual ship may be omitted based on technical justifications such as availability of the results of tank tests for ships of the same type.
- .2 omission of tank tests is acceptable for a ship for which sea trials will be carried out in the intended summer load line, upon agreement of the ship owner and shipbuilder and with approval of the verifier.(stated a EEDI calculation Guidelines under the conditions- Full DWT, MCR 75%)

2) Conduct and witness tank test

3) Develop and verification EEDI Technical file (draft) (Recipient : ICS Stability, Load Lines and Tonnage Team)

.1 The following documents shall be submitted to verifier by shipowner or shipbuilder.

No.	To be submitted	Note
1	EEDI Technical file	Refer to sample of EEDI Technical File at Appendix 1 of Res.MEPC.214(63).
2	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 additional of the quarantine tolerance is to be provided by manufacturer. In this case, the NOx Technical File should be submitted at the final verification stage.
3	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
4	Verification file of power limitation technical arrangement	If the propulsion power is voluntarily limited by verified technical means
5	Power curves	Power-speed curves predicted at full scale in sea trial condition and EEDI condition (MCR 75%, Full DWT)
6	General arrangement plan of Gas fuel oil	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.
7	Tank Tests Plan	Plan explaining the different steps of the tank tests and the scheduled inspections shall be described

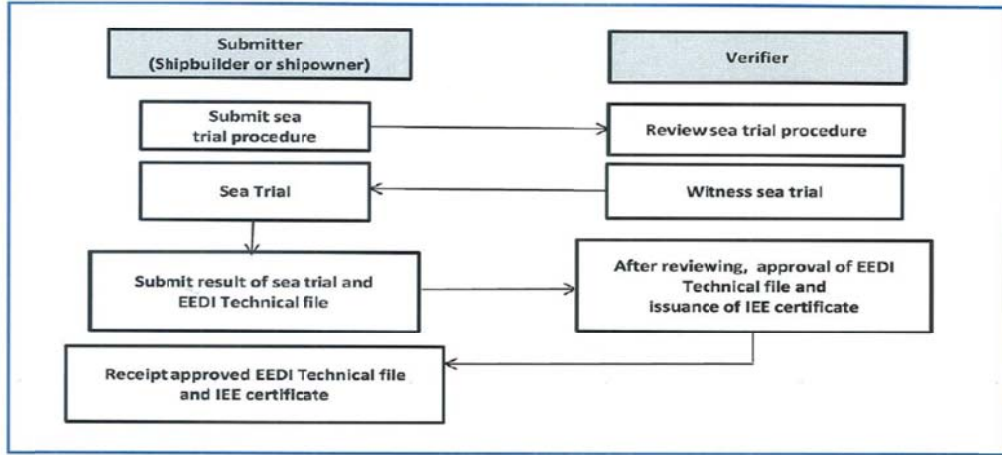
.2 In case of request of verifier, the following documents shall be submitted to verifier by shipowner or shipbuilder.

No.	To be submitted	Note
1	Ship lines and model particulars	- Lines of Ship - Report including the particulars of the ship model and propeller model
2	Description of the tank test facility and tank test organization quality manual	If the verifier has no recent experience with the tank test facility and the tank test organization quality system is not ISO 9001 certified, the following documents shall be submitted. - Quality management system of the tank test including process control, justification concerning repeatability quality management processes - Records of measuring equipment calibration - Standard model-ship extrapolation and correlation method (Applied method and tests description)
3	Tank Tests Report	- Values of the experience-based parameters defined in the standard model-ship correlation method used by the tank test organization/shipyard - Reasons for exempting a tank test, only if applicable - Numerical calculations report and validation file of these calculations, only if calculations are used to derive power curves

4) Issuance of Preliminary verification report

2. Final Verification at the sea trial

Final verification at the sea trial



1) Submit and review the result of sea trial (Recipient : ICS Stability, Load Lines and Tonnage Team)

2) Conduct and witness sea trial

3) Based on the result of sea trial, modify and verify EEDI Technical file(final)

- The following documents shall be submitted to verifier by ship owner or shipbuilder.

(No.1 is to be submitted to ICS office which has witnessed sea trail and No.2 to 4 are to be submitted to ICS Stability, Load Lines and Tonnage Team)

No.	To be submitted	Note
1	Sea trials report (including Speed Measurement Sheet)	Report of sea trials with detailed computation of the corrections allowing determination of the reference speed V_{ref}
2	Inclining experiment(or confirmed data for lightweight) or International Tonnage Certificate	For confirming the capacity, Inclining experiment(or confirmed data for lightweight) or International Tonnage Certificate is necessary.
3	Final power curves	Final power curve in the EEDI condition showing the speed adjustment methodology
4	Revised EEDI Technical File	Including identification of the parameters differing from the calculation performed at the initial verification stage

4) Approval of EEDI Technical file and Issuance of IEE certificate

[Attachment-3] MARPOL Annex 6 Regulation 2.25 to 2.35

Regulation	Type of ship	Definition
2.25	Bulk carrier	A ship which is Intended primarily to carry dry cargo in bulk, including such types as ore carrier as defined in SOLAS chapter XII regulation.1 but excluding combination carriers.
2.26	Gas carrier	A cargo ship constructed or adapted and used for the carriage in bulk of any liquefied gas.
2.27	Tanker	An oil tanker as defined in MARPOL Annex I, regulation 1 or a chemical tanker or an NLS tanker as defined in MARPOL Annex II regulation 1.
2.28	Container ship	A ship designed exclusively for the carriage of containers in holds and on deck.
2.29	General cargo ship	A ship with a multi-deck or single deck hull designed primarily for the carriage of general cargo. This definition excludes specialized dry cargo ships, which are not included in the calculation of reference lines for general cargo ships, namely livestock carrier, barge carrier, heavy load carrier, yacht carrier, nuclear fuel carrier.
2.30	Refrigerated cargo carrier	A ship designed exclusively for the carriage of refrigerated cargoes in holds.
2.31	Combination carrier	A ship designed to load 100 % deadweight with both liquid and dry cargo in bulk
2.32	Passenger ship	A ship which carries more than 12 passengers.
2.33	Ro-ro cargo ship (vehicle carrier)	A multi deck roll-on-roll-off cargo ship designed for the carriage of empty cars and trucks.
2.34	Ro-ro cargo ship	A ship designed for the carriage of roll-on-roll-off cargo transportation units.
2.35	Ro-ro passenger ship	A passenger ship with roll-on-roll-off cargo spaces.