

Subject

Survey and Certification for EEXI required by the Amendments to ANNEX VI of MARPOL

ClassNK

Technical Information

No. TEC-1250
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To whom it may concern

At the 76th session of the IMO Marine Environment Protection Committee (MEPC 76) held in June 2021, further amendments to MARPOL Annex VI were adopted (IMO Resolution MEPC.328(76)) to implement the Energy Efficiency Existing Ship Index (EEXI) as a technical approach to achieve the short-term target for improved transportation efficiency of at least 40% compared to 2008 and will enter into force on 1 November 2022.

EEXI is calculated using the same formula as EEDI and represents "the amount of CO2 emissions from a ship when the ship sail transports one ton cargo for one nautical mile". Regardless of ship's delivered date, ships of 400 gross tonnage and above engaged in international voyages are subject to the EEXI regulations and the EEXI of each ship is to be calculated. Ships of a specific size and above subject to the EEXI regulations need to comply with the requirement equivalent to the EEDI requirement as of 2023. Under the EEXI regulations, "Bulk carrier", "Tanker", and "Ro-ro cargo ship (vehicle carrier)" need to comply with the EEXI requirement equivalent to Phase 2 EEDI requirement, while "Containership", "General cargo ship", "LNG carrier", and "Gas carrier" comply with the EEXI requirement equivalent to Phase 3 EEDI requirement. Therefore, a ship subject to EEDI regulations which comply with the Phase 2 or Phase 3 requirement automatically complies with the EEXI regulations. If a ship does not meet the EEXI requirement, the ship needs to implement any countermeasures, such as engine power limitation, installation of energy saving devices, etc. to improve the EEXI. Ships delivered before 1 January 2023 need to comply with the EEXI regulations by the first periodical survey of IAPP Certificate on or after 1 January 2023. On the other hand, ships delivered on or after 1 January 2023 need to comply with the EEXI regulations at the delivery. There are about 7,200 ships registered with ClassNK which are subject to the EEXI regulations and about 6,050 ships will need to implement any countermeasures such as engine power limitation. This is equivalent to about 84% of the total number of ships subject to EEXI regulations, which means that a large number of ships need to comply with the EEXI regulations.

This Technical Information provides an overview of the EEXI regulations, preparation for the EEXI regulations, and the procedure of the document review, on-board survey, and issuance/re-issuance of IEE Certificate.

(To be continued)

NOTES:

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- Overview of EEXI regulations

- (1) Ships of 400 gross tonnage and above engaged in international voyages are subject to the EEXI regulations. The EEXI regulations apply to not only ships delivered before 1 January 2023 but also ships delivered on or after 1 January 2023, when the EEXI regulations commence. Ships delivered on or after 1 January 2023 need to comply with both the EEDI and EEXI regulations at delivery.
- (2) The Energy Efficiency Existing Ship Index (hereinafter referred to as "Attained EEXI") is to be calculated as an energy efficiency index for individual ships subject to EEXI regulations. The Attained EEXI can be calculated by the same formula as Attained EEDI. If the ship's Attained EEDI is equal to or less than the allowable maximum value of Attained EEXI (hereinafter referred to as "Required EEXI"), the Attained EEDI can be used as an alternative to the Attained EEXI.
- (3) Ships of a specific size and above subject to the EEXI regulations need to comply with the Required EEXI which is equivalent to the Required EEDI as of 2023. (However, the Required EEXI of some specific ship types is slightly relaxed from the Required EEDI as of 2023.)
The Required EEXI is calculated by multiplying the average of Attained EEDI for each ship type in the EEDI regulations (hereinafter referred to as "EEDI Reference Line") by the reduction factor specified for each ship type and size.
- (4) If the ship's Attained EEXI exceeds the Required EEXI, the ship needs to implement countermeasures, such as engine power limitation, installation of energy saving devices, etc. to improve the Attained EEXI up to the Required EEXI.
- (5) Ships delivered on or after 1 January 2023 need to comply with both the EEDI and EEXI regulations at delivery. At the initial survey of the International Energy Efficiency Certificate (hereinafter referred to as "IEE Certificate"), compliance with both of the regulations will be confirmed, and the IEE Certificate will be issued.
For ships delivered before 1 January 2023, compliance with the EEXI regulation will be confirmed at the first annual, intermediate or renewal survey (hereinafter referred to as "periodical survey") of the International Air Pollution Prevention Certificate (hereinafter referred to as "IAPP Certificate") on or after 1 January 2023, and the IEE Certificate will be re-issued.

(To be continued)

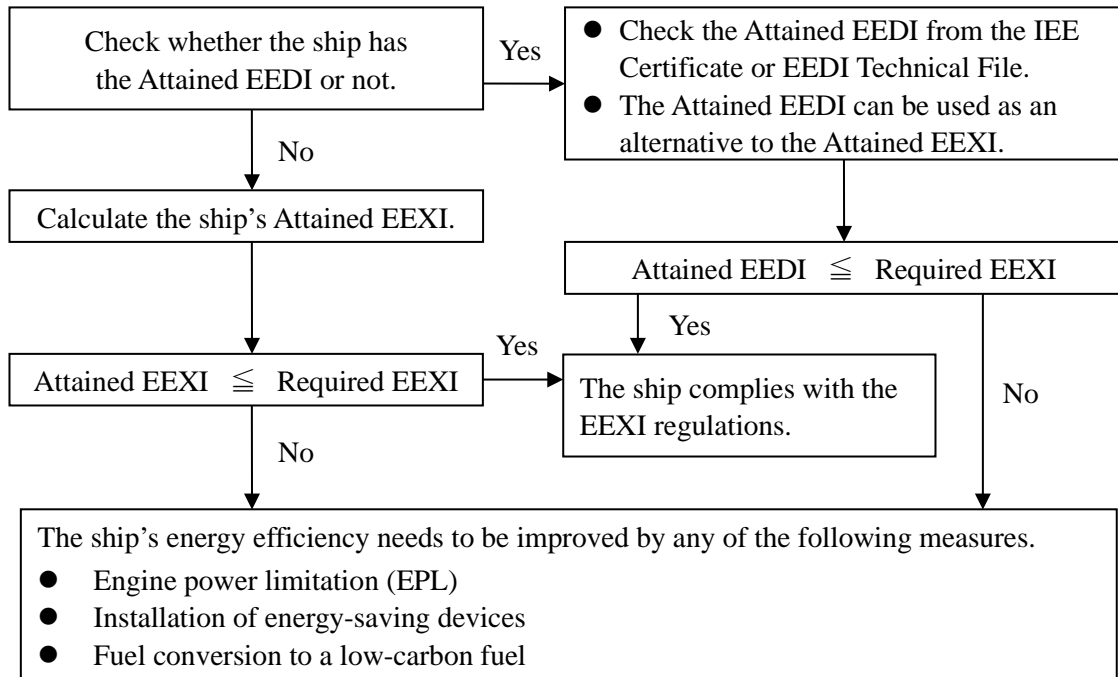


Fig.1 Flow chart for compliance with the EEXI regulations

• Details of EEXI regulations

1. Terminology

The following definitions for terminology will apply in this Technical Information.

- (1) "Attained EEXI" is the EEXI value that indicates the performance for the energy efficiency achieved by an individual ship.
- (2) "Required EEXI" is the allowable maximum value of Attained EEXI for the specific ship type and size.
- (3) "EEDI Reference Line" is the average line of the EEDI determined for existing ships of the same type expressed by an exponential function of the deadweight calculated by the IMO using data on ships built during the ten year period from 1999 to 2008. (For cruise passenger ships, EEDI Reference Line is expressed by an exponential function of gross tonnage (GT)).
- (4) "EEXI Technical File" is a document containing the information necessary for the calculation of the Attained EEXI and shows the process of calculation. It must be kept on-board together with the IEE Certificate for each ship whose Attained EEXI has been calculated.
- (5) "Additional Information" consists of documents that provide supplementary information for the verification of the EEXI, which need to be submitted to ClassNK.
- (6) "Conventional propulsion" means a method of propulsion where a main reciprocating internal combustion engine(s) is the prime mover and coupled to a propulsion shaft either directly or through a gearbox.

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- (7) "Non-conventional propulsion" means a method of propulsion, other than conventional propulsion, including diesel-electric propulsion, turbine propulsion, and hybrid propulsion systems.
- (8) "EPL" is an abbreviation for Engine Power Limitation, which is a system to limit the maximum power of the main engine in normal operation for the purpose of complying with the EEXI regulations.
- (9) "Onboard Management Manual" is a document containing the information necessary for the EPL. It must be kept on-board with the IEE Certificate for each ship which has implemented the EPL to comply with the EEXI regulations.

2. EEXI regulations

(1) Application

The EEXI regulations apply to all ships of 400 gross tonnage and above engaged in international voyages and whose ship type falls into one or more of the categories in regulation 2 of MARPOL Annex VI. The ship types defined in this regulation are: "Bulk carrier", "Gas carrier", "Tanker", "Containership", "General cargo ship", "Refrigerated cargo carrier", "Combination carrier", "Ro-ro cargo ship (vehicle carrier)", "Ro-ro cargo ship", "Ro-ro passenger ship", "LNG carrier", and "Cruise passenger ship (having non-conventional propulsion)". For the definition of each ship type, please refer to Attachment 1.

Notwithstanding the above, the EEXI regulations do not apply to the following ships:

- Ships not propelled by mechanical means, and platforms including FPSOs, FSUs, and drilling rigs regardless of their propulsion (also not required to have the IEE certificate)
- Category A ships as defined in the Polar Code
- Ships having non-conventional propulsion such as diesel-electric propulsion, turbine propulsion, and hybrid propulsion systems (except LNG carriers and Cruise passenger ships)

The EEXI regulations apply to not only ships delivered before 1 January 2023 but also ships delivered on or after 1 January 2023, when the regulations commence. Therefore, ships delivered on or after 1 January 2023 need to comply with both the EEDI and EEXI regulations at delivery.

(To be continued)

(2) Attained EEXI

The Attained EEXI of each ship subject to the EEXI regulations is to be calculated in accordance with "2021 GUIDELINES ON THE METHOD OF CALCULATION OF THE ATTAINED ENERGY EFFICIENCY EXISTING SHIP INDEX (EEXI)" (IMO Resolution MEPC.333(76), as amended). Attained EEXI can be calculated by the same formula as Attained EEDI. If the ship's Attained EEDI is equal to or less than the Required EEXI, the Attained EEDI can be used as an alternative to the Attained EEXI.

(3) Required EEXI

The Required EEXI is applicable to Ships of a specific size and above subject to the EEXI regulations and equivalent to the Required EEDI as of 2023 (however, Required EEXI of some specific ship types is slightly relaxed from the Required EEDI as of 2023). The Required EEXI is calculated by multiplying the EEDI Reference Line by the reduction factor specified for each ship type and size. For the formula of the EEDI Reference Line of each ship type, please refer to Attachment 2. For the reduction factor of each ship type, please refer to Attachment 3.

(4) Compliance deadline

Ships need to comply with the EEXI regulations by the first periodical survey of IAPP Certificate on or after 1 January 2023. Ships delivered on or after 1 January 2023 need to comply with the EEXI regulations at delivery.

3. Preparation for EEXI regulations

If the ship's Attained EEXI exceeds the Required EEXI, the ship needs to implement countermeasures to improve the ship's Attained EEXI up to the Required EEXI.

For your reference, examples of the countermeasures are shown below.

- EPL (Engine Power Limitation)
- Installation or modification of energy-saving devices
- Fuel conversion to a low-carbon fuel

The EPL is to be conducted in accordance with "2021 GUIDELINES ON THE SHAFT / ENGINE POWER LIMITATION SYSTEM TO COMPLY WITH THE EEXI REQUIREMENTS AND USE OF A POWER RESERVE" (IMO Resolution MEPC.334(76), as amended).

The next chapter also describes the procedures for the verification and survey of the EEXI regulations in the case where the EPL is adopted.

4. EEXI document review, on-board survey, and issuance/re-issuance of IEE Certificate

EEXI document review, on-board survey, and issuance/re-issuance of IEE certificates are conducted in accordance with "2021 GUIDELINES ON SURVEY AND CERTIFICATION OF THE ATTAINED ENERGY EFFICIENCY EXISTING SHIP INDEX (EEXI)" (IMO Resolution MEPC.334(76), as amended). Please refer to Attachment 4 for the verification process of the EEXI regulations.

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(1) Review of EEXI Technical File (Preliminary Verification)

The EEXI Technical File is to be submitted to the EEDI Section of Marine GHG Certification Department (hereinafter referred to as "MGD") of ClassNK. After completion of the review, it will be returned to the submitter before the on-board survey for IEE Certificate.

However, if the ship's Attained EEDI is equal to or less than the Required EEXI, the Attained EEDI value is used as an alternative to the Attained EEXI, and the ship's EEDI Technical File is regarded as an EEXI Technical File. Therefore, in this case, the preparation and approval of the EEXI Technical File are not required.

(i) Application for review of EEXI Technical File

Please fill out the "APPLICATION FOR TECHNICAL SERVICE(Form APP-Tech)" and submit it together with the EEXI Technical File to the EEDI Section of MGD.

(ii) Documents to be submitted for review of EEXI Technical File

- (a) EEXI Technical File (2 copies, EEDI Section of MGD)
- (b) Additional Information (1 copy, EEDI Section of MGD)
- (c) NOx Technical File (for confirmation of SFC) (1 copy, EEDI Section of MGD)

(iii) Items to be included in the EEXI Technical File

- (a) Basic data, such as deadweight/gross tonnage, maximum continuous ratings of the main and auxiliary engines, ship speed, specific fuel consumptions of the main and auxiliary engines
- (b) Power curve(s) used for determining/calibrating the ship speed in the EEXI calculation
- (c) Principal particulars of the propulsion system and electric power supply system on-board
- (d) Estimation process and methodology for determining power curve(s)
- (e) Description of energy saving equipment
- (f) Calculated value of Attained EEXI
- (g) For LNG carriers, relevant data required

(iv) Documents to be submitted as Additional Information

- (a) Description of tank test facility
- (b) Lightweight of the ship and displacement table
- (c) Detailed report on the method and results of the tank tests
- (d) Detailed report on the method and results of the speed trial (in cases where the ship speed in the EEXI calculation is determined/calibrated using the speed trial results)
- (e) Detailed calculation process for determining the ship speed, which includes the method of estimation for the power curve(s)

(To be continued)

- (f) For LNG carriers, detailed calculation process of auxiliary engine power (PAE) and specific fuel consumption for steam turbine ($SFC_{\text{SteamTurbine}}$)
- (g) Other documents as deemed necessary

Note:

Since the Additional Information may contain the submitter's confidential information, ClassNK returns such information to the submitter after completion of the verification, if requested. In addition, ClassNK will conclude a confidentiality agreement with the submitter, as necessary.

(2) Review of Onboard Management Manual (Preliminary Verification)

If EPL is adopted to improve the Attained EEXI, the Onboard Management Manual is to be submitted to the EEDI Section of MGD in advance of conducting the EPL work. After completion of the review, it will be returned to the submitter before the on-board survey for the IEE Certificate.

In cases where the ship does not implement EPL, the preparation and approval of the Onboard Management Manual are not required.

(i) Application for the Onboard Management Manual review

Please apply together with "(1) Review of EEXI Technical File (Preliminary Verification)".

(ii) Items to be included in the Onboard Management Manual

- (a) The particulars of the ship (name of ship, distinctive number or letters, port of registry, IMO number, gross tonnage)
- (b) The particulars of the engine (name of manufacturer and type)
- (c) Rated installed power ($MCR_{[kw]}$) and engine speed ($N_{MCR_{[rpm]}}$) before EPL
- (d) Limited installed power ($MCR_{lim_{[kw]}}$)
- (e) Method for sealing the EPL
- (f) Method for monitoring the EPL (electronically controlled engine)
- (g) Procedures and methods for releasing the EPL
- (h) Time required for unlimiting the EPL
- (i) Procedures for survey of the EPL system by ClassNK surveyor
- (j) Administrator of the EPL system
- (k) Procedure for the report on release of the EPL

(3) Issuance of preliminary verification report

A preliminary verification report will be issued by the EEDI Section of MGD after the completion of the document review.

(To be continued)

- (4) On-board survey of IEE Certificate (Final Verification)
- (i) Application for the on-board survey
- (a) For ships delivered on or after 1 January 2023
The on-board survey will be conducted in conjunction with the initial survey of the IEE Certificate. An application for the survey is not required.
- (b) For ships delivered before 1 January 2023
The on-board survey will be conducted at the first periodical survey of the IAPP Certificate on or after 1 January 2023. Please send "Application for Surveys and Issue of Certificate (Form 2A)" to an appropriate ClassNK service site upon ticking the "Energy Efficiency (EE)" and "Occasional" boxes, and indicating "On-board survey for the EEXI regulation" in the description of the survey, together with the application for the survey of the IAPP Certificate.
- (ii) Survey Items
- (a) For ships which are subject to the EEDI regulations and comply with the EEXI regulations without EPL
- The ship's Attained EEDI value is used as an alternative to Attained EEXI, and the EEDI Technical File is regarded as the EEXI Technical File.
 - The ship's approved EEDI Technical File will be confirmed, and the IEE Certificate will be issued/re-issued.
- (b) For ships which are not subject to the EEDI regulations and comply with the EEXI regulations without EPL
- After confirming the EEXI Technical File examined in "(1) Review of EEXI Technical File (Preliminary Verification)", the IEE Certificate will be re-issued, and the approved EEXI Technical File will be returned.
- (c) For ships in which EPL was installed to comply with the EEXI regulations (having mechanically controlled engine with sealing of the mechanical stop screw)
- It will be confirmed that the mechanical stop screw has been sealed as described in the Onboard Management Manual examined in "(2) Review of Onboard Management Manual (Preliminary Verification)".
 - After the above confirmation, the EEXI Technical File examined in "(1) Review of EEXI Technical File (Preliminary Certification)" will also be confirmed. Then, the IEE Certificate will be issued/re-issued, and the approved EEXI Technical File and the approved Onboard Management Manual will be returned and retained on-board.

(To be continued)

- (d) For ships in which EPL was installed to comply with the EEXI regulations (having an electronically controlled engine or mechanically controlled engine without sealing of the mechanical stop screw)
- It will be confirmed that the limitation of the fuel index or direct limitation of the power has been set, and the data logger or other device, which can record the status of the EPL system, has been installed as described in the Onboard Management Manual examined in "(2) Review of the Onboard Management Manual (Preliminary Verification)".
 - After the above confirmation, the EEXI Technical File examined in "(1) Review of EEXI Technical File (Preliminary verification)" will also be confirmed. Then, the IEE Certificate will be issued/re-issued, and the approved EEXI Technical File and the approved Onboard Management Manual will be returned.
- (5) Issuance/re-issuance of IEE Certificate
- (i) For ships delivered on or after 1 January 2023
Ships of 400 gross tonnage and above engaged in international voyages (delivered on or after 1 January 2023) need to comply with the EEDI regulations and EEXI regulations at delivery. After confirming compliance with both regulations, the IEE Certificate will be issued.
- (ii) For ships delivered before 1 January 2023
Ships of 400 gross tonnage and above engaged in international voyages (delivered before 1 January 2023) need to comply with the EEXI regulations by the first periodical survey of the IAPP Certificate on or after 1 January 2023. After confirming compliance with the EEXI regulations, the IEE Certificate will be re-issued.

The IMO guidelines mentioned in this Technical Information are available on the ClassNK website's EEXI regulation section.

HOME > Product & Service > Statutory Service > EEXI

(To be continued)

For any questions about the above, please contact:

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Attachment:

1. Definition of Each Type of Ship Defined in Regulation 2 of MARPOL ANNEX VI
2. Details of the Required EEXI
3. Reduction Factors (in percentage) for the EEXI relative to the EEDI Reference Line
4. Flow of EEXI Verification Process

Attachment 1. to
ClassNK Technical Information No. TEC-1250

Definition of Each Type of Ship Defined in Regulation 2 of MARPOL ANNEX VI

Ship Type	Definition	Calculation of Attained EEXI	Conformity Required EEXI
Bulk carrier	A ship which is intended primarily to carry dry cargo in bulk, including such types as ore carriers as defined in SOLAS chapter XII, regulation 1, but excluding combination carriers.	400 GT and above	10,000 DWT and above
Gas carrier	A cargo ship, other than an LNG carrier as defined in paragraph 2.16 of this regulation, constructed or adapted and used for the carriage in bulk of any liquefied gas.	400 GT and above	2,000 DWT and above
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.	400 GT and above	4,000 DWT and above
Containership	A ship designed exclusively for the carriage of containers in holds and on deck.	400 GT and above	10,000 DWT and above
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 carriers, barge carriers, heavy load carriers, yacht carriers, and nuclear fuel carriers.	400 GT and above	3,000 DWT and above
Refrigerated cargo carrier	A ship designed exclusively for the carriage of refrigerated cargoes in holds.	400 GT and above	3,000 DWT and above
Combination carrier	A ship designed to load 100% deadweight with both liquid and dry cargo in bulk.	400 GT and above	4,000 DWT and above
Ro-ro cargo ship (vehicle carrier)	A multi-deck roll-on-roll-off cargo ship designed for the carriage of empty cars and trucks.	400 GT and above	10,000 DWT and above
Ro-ro cargo ship	A ship designed for the carriage of roll-on-roll-off cargo transportation units.	400 GT and above	1,000 DWT and above
Ro-ro passenger ship	A passenger ship with roll-on-roll-off cargo spaces.	400 GT and above	250 DWT and above
LNG carrier	A cargo ship constructed or adapted and used for the carriage in bulk of liquefied natural gas (LNG).	400 GT and above	10,000 DWT and above
Cruise passenger ship (having non-conventional propulsion)	A passenger ship not having a cargo deck, designed exclusively for commercial transportation of passengers in overnight accommodations on a sea voyage.	400 GT and above	25,000 GT and above

Attachment 2. to
ClassNK Technical Information No. TEC-1250

$$\begin{aligned} \text{Required EEXI} &= \left(1 - \frac{X}{100}\right) \times \text{EEDI Reference line value} \\ &= \left(1 - \frac{X}{100}\right) \times (a \times DWT^{-C}) \end{aligned}$$

X: EEXI Reduction Factor (%) relative to the EEDI Reference Line

Parameters for Determination of Reference Line Values for Each Ship Type

Ship Type		EEDI Reference Line
Bulk carrier	DWT ≤ 279,000	961.79 x DWT ^{-0.477}
	DWT > 279,000	961.79 x 279,000 ^{-0.477}
Gas carrier		1120.00 x DWT ^{-0.456}
Tanker		1218.80 x DWT ^{-0.488}
Containership		174.22 x DWT ^{-0.201}
General cargo ship		107.48 x DWT ^{-0.216}
Refrigerated cargo carrier		227.01 x DWT ^{-0.244}
Combination carrier		1219.00 x DWT ^{-0.488}
Ro-ro cargo ship (vehicle carrier)	DWT/GT < 0.3	(DWT/GT) ^{-0.7} x 780.36 x DWT ^{-0.471}
	DWT/GT ≥ 0.3	1812.63 x DWT ^{-0.471}
Ro-ro cargo ship	DWT ≤ 17,000	1686.17 x DWT ^{-0.498}
	DWT > 17,000	1686.17 x 17,000 ^{-0.498}
Ro-ro passenger ship	DWT ≤ 10,000	902.59 x DWT ^{-0.381}
	DWT > 10,000	902.59 x 10,000 ^{-0.381}
LNG carrier		2253.7 x DWT ^{-0.474}
Cruise passenger ship (having non-conventional propulsion)		170.84 x GT ^{-0.214}

Attachment 3. to
ClassNK Technical Information No. TEC-1250

Reduction Factors (in percentage) for the EEXI relative to the EEDI Reference Line

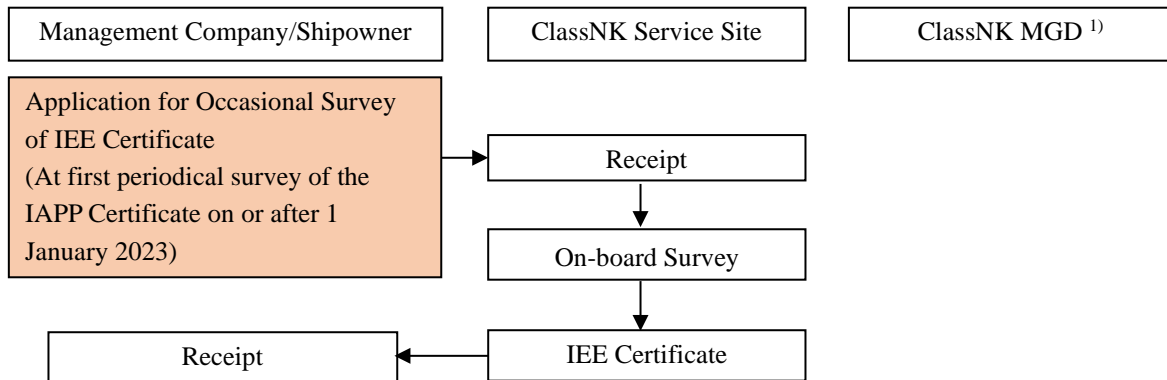
Ship type	Size	EEXI Reduction factor X (%)
Bulk carrier	200,000 DWT and above	15
	20,000 – 200,000 DWT	20
	10,000 – 20,000 DWT	0 – 20*
Gas carrier	15,000 DWT and above	30
	10,000 – 15,000 DWT	20
	2,000 – 10,000 DWT	0 – 20*
Tanker	200,000 DWT and above	15
	20,000 – 200,000 DWT	20
	4,000 – 20,000 DWT	0 – 20*
Containership	200,000 DWT and above	50
	120,000 – 200,000 DWT	45
	80,000 – 120,000 DWT	35
	40,000 – 80,000 DWT	30
	15,000 – 40,000 DWT	20
	10,000 – 15,000 DWT	0 – 20*
General cargo ship	15,000 DWT and above	30
	3,000 – 15,000 DWT	0 – 30*
Refrigerated cargo carrier	5,000 DWT and above	15
	3,000 – 5,000 DWT	0 – 15*
Combination carrier	20,000 DWT and above	20
	4,000 – 20,000 DWT	0 – 20*
Ro-ro cargo ship (vehicle carrier)	10,000 DWT and above	15
Ro-ro cargo ship	2,000 DWT and above	5
	1,000 – 2,000 DWT	0 – 5*
Ro-ro passenger ship	1,000 DWT and above	5
	250 – 1,000 DWT	0 – 5*
LNG carrier	10,000 DWT and above	30
Cruise passenger ship (having non-conventional propulsion)	85,000 GT and above	30
	25,000 – 85,000 GT	0 – 30*

* Reduction factor to be linearly interpolated between the two values dependent upon ship size.

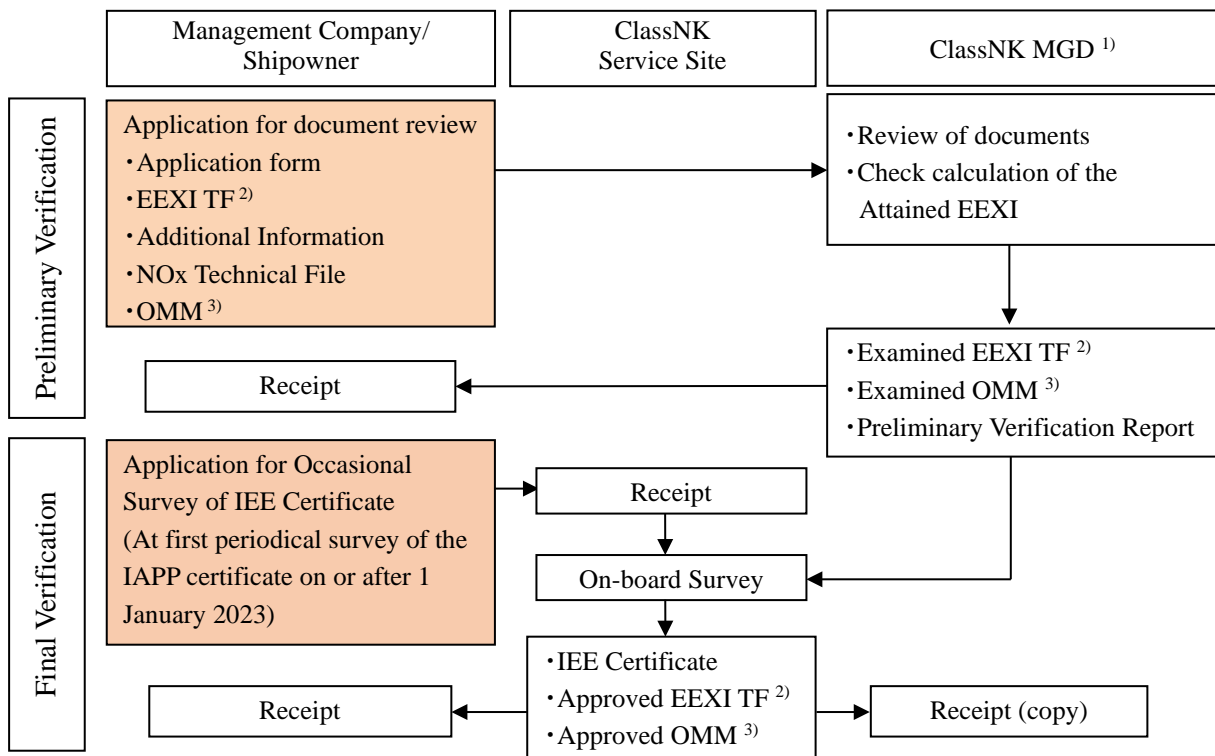
Attachment 4. to
ClassNK Technical Information No. TEC-1250

Flow of EEXI Verification Process

- For EEDI-applied ships which achieve their Required EEXI by their Attained EEDI



- In cases other than the above



¹⁾ "MGD" means the EEDI Section of Marine GHG Certification Department, ClassNK

²⁾ "EEXI TF" means the EEXI Technical File

³⁾ "OMM" means the Onboard Management Manual (If the ship does not implement EPL, the preparation and approval of the OMM are not required.)